Lochinvar®
High Efficiency Water Heaters and Boilers

Charger

Installation, Commissioning, User & Maintenance Instructions

Direct Gas Fired Floor Standing Water Heater with Permanent Pilot Ignition

Models:
CH 100 G CE and PG CE
CH 155 G CE and PG CE
CH 200 G CE and PG CE
CH 300 G CE and PG CE
CH 400 G CE and PG CE
CH 500 G CE and PG CE
CH 600 G CE and PG CE

0310570
March 2012

IMPORTANT INFORMATION

These instructions must be read and understood before installing, commissioning, operating or maintaining the equipment.

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Read this manual carefully

Warning
Read this manual carefully before starting the water heater. Failure to read the manual and to follow the printed instructions may lead to personal injury and damage to the water heater.

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Table of contents

1 Introduction - 7
1.1 About the appliance - 7
1.2 What to do if you smell gas - 7
1.3 Regulations - 7
1.4 Target groups - 8
1.5 Maintenance - 8
1.6 Notation conventions - 9
1.7 Overview of this document - 9

2 Working principle of the water heater - - - - - - - - - - - - - - - 11
2.1 Introduction - 11
2.2 General working principle of the water heater - - - - - - - - - - - - - - - 11
2.3 Water heater operating cycle - 13
2.4 Protection for the water heater - 13
2.5 Safety of the installation - 14

3 Installation - 17
3.1 Introduction - 17
3.2 Packaging - 17
3.3 Ambient conditions - 18
3.4 Technical specifications - 19
3.5 Installation diagram - 23
3.6 Unvented water connections - 24
3.7 Vented water connections - 25
3.8 Gas connection - 27
3.9 Flue gas discharge - 27
3.10 Electrical connection - 28
3.11 Checking the supply pressure and burner pressure - - - - - - - - - - - - 30

4 Conversion to a different gas category - - - - - - - - - - - - - 33
4.1 Conversion to a different gas category - - - - - - - - - - - - - - - - - - 34

5 Filling - 37
5.1 Filling unvented installations - 38
5.2 Filling vented installations - 38

6 Draining - 39
6.1 Draining unvented installations - 40
6.2 Draining vented installations - 40

7 The control panel - 41
7.1 Introduction - 41
7.2 Control panel - 41
7.3 Explanation of icons - 41
7.4 On/off switch - 41
7.5 Control thermostat - 41
7.6 Weekly timer circuit - 42
7.7 Flue gas thermostat reset button - 42

8 Status of the water heater - 43
8.1 Introduction - 43

8.2 Operating modes - 43
8.3 Power Anode status - 43
8.4 Error conditions - 43

9 Starting the water heater - 45
9.1 Introduction - 45
9.2 Starting the appliance - 45
9.3 The appliance's heating cycle - 45

10 Shutting down - 47
10.1 Introduction - 47
10.2 Shutting the appliance down for a brief period ("OFF" mode) - - - - - - - - 47
10.3 Isolating the appliance from the mains - 47
10.4 Shutting the appliance down for a long period - - - - - - - - - - - - - - - - 47

11 Errors - 49
11.1 Introduction - 49
11.2 Troubleshooting table for general errors - - - - - - - - - - - - - - - - - - - 50
11.3 Troubleshooting table - 'no hot water' - 51
11.4 CH Troubleshooting table - 'insufficient hot water' - - - - - - - - - - - - - 52

12 Performing maintenance - 53
12.1 Introduction - 53
12.2 Preparation for maintenance - 53
12.3 Water-side maintenance - 53
12.4 Gas-side maintenance - 55
12.5 Finalising maintenance - 56

13 Warranty (certificate) - 57
13.1 General warranty - 57
13.2 Tank warranty - 57
13.3 Conditions for installation and use - 57
13.4 Exclusions - 58
13.5 Scope of the warranty - 58
13.6 Claims - 58
13.7 Obligations of Lochinvar Ltd - 58

14 Electrical diagram - 59
14.1 Introduction - 59

15 Declaration of Conformity - 63



1 Introduction

1.1 About the appliance

This manual describes how to install, service and use the CH appliance. The CH appliance is a gas-fired open boiler without fan. These Charger devices have a pilot flame ignition feature and flue gas discharge safety device

The CH is an appliance of type B_{11BS}.

The information in this manual applies to types: CH 100, CH 155, CH 200, CH 300, CH 400, CH 500 and CH 600.

CE
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The water heater has been manufactured and equipped in accordance with the European standard for gas-fired storage water heaters for the production of domestic hot water (EN 89). The water heaters are therefore compliant with the European Directive for Gas water heaters, and and are entitled to bear the CE mark.

Warning
Read this manual carefully before starting the water heater. Failure to read the manual and to follow the printed instructions may lead to personal injury and damage to the water heater.

1.2 What to do if you smell gas

Warning
If you **smell gas**:

No naked flames! No smoking!

Avoid causing sparks! Do not use any electrical equipment or switch, i.e. no telephones, plugs or bells!

Open windows and doors!

Shut off the mains gas supply valve!

Warn occupants and leave the building!

After leaving the building, alert the gas distribution company or your installation engineer.

1.3 Regulations

As the (end) user, installation engineer or service and maintenance engineer, you must ensure that the entire installation complies, as a minimum, with the official local:

- building regulations;
- energy supplier's directives for existing gas installations;
- directives and technical guidelines for natural gas installations;
- safety requirements for low-voltage installations;
- regulations governing the supply of drinking water;
- regulations governing ventilation in buildings;
- regulations governing the supply of air for combustion;
- regulations governing the discharge of products of combustion;
- requirements for installations that consume gas;
- regulations governing indoor waste water disposal;
- regulations imposed by fire service, power companies and municipality.



Furthermore, the installation must comply with the manufacturer's instructions.

Note
The installation is also subject to any later amendments and/or additions to all regulations, requirements and guidelines published on or prior to the moment of installation.

1.4 Target groups

The three target groups for this manual are:

- (end) users;
- installation engineers;
- service and maintenance engineers.

Symbols on each page indicate the target groups for whom the information is intended. See the table.

Target group symbols

Symbol	Target Group
	(End) user
	Installation engineer
	Service and maintenance engineer

Caution
This water heater is not intended for use by persons with reduced physical, sensory or mental capacities, or who lack the necessary experience or knowledge, unless the person responsible for their safety is supervising them or has explained to them how the water heater should be used.

Caution
This water heater is not intended to be used by children. Always supervise children, and ensure that they do not play with the water heater.

1.5 Maintenance

A service should be carried out at least once a year, both on the water side and on the gas side. Among other things, the service interval depends on the water quality, the average burning time per day and the set water temperature.

Note
To determine the correct service interval, it is recommended to arrange for the service and maintenance engineer to check the water heater on both the water and gas side within three months following installation. Based on this check, the best service interval can be determined.

Note
Regular maintenance extends the service life of the water heater.

Both the end user and the service and maintenance engineer are responsible for regular maintenance. They will need to establish clear agreements on this.

Note
If the water heater is not regularly serviced, the warranty will become void.



1.6 Notation conventions

The following notation is used in this manual:

Note
Important information.

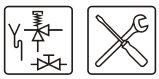
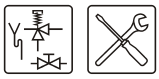
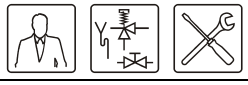
Caution
Ignoring this information can lead to the water heater being damaged.

Warning
Failure to carefully read this information may lead to danger of personal injury, and serious damage to the water heater.

1.7 Overview of this document

The table provides an overview of the contents of this document.

Contents of this document

Chapter	Target groups	Description
Working principle of the water heater		This chapter describes the working principle of the water heater.
Installation		This chapter describes the installation activities to be carried out before final commissioning.
Conversion to a different gas category		This chapter describes how to convert the water heater to a different gas category and/or family of gases.
Filling		This chapter describes how to fill the water heater.
Draining		This chapter describes how to drain the water heater.
The control panel		This chapter describes the appliance's control panel, and how to use it.
Status of the water heater		This chapter describes the status (mode or condition) that the water heater may have, and possible actions to take.
Starting the water heater		This chapter describes how to start the water heater. The general operating cycle of the water heater is also described.
Shutting down		This chapter describes how to decommission the water heater for a brief or long period of time.
Errors		This chapter is mainly intended for the installation engineer and the service and maintenance engineer. It describes appliance errors. A troubleshooting table of possible features, causes and solutions is provided. End users may also refer to this chapter for additional information about the appliance.
Performing maintenance		This chapter sets out the maintenance tasks to be carried out.
General warranty		This chapter states the warranty terms and conditions.



2 Working principle of the water heater

2.1 Introduction

This chapter covers the following topics:

- General working principle of the water heater;
- Water heater operating cycle;
- Protection for the water heater;
- Safety of the installation.

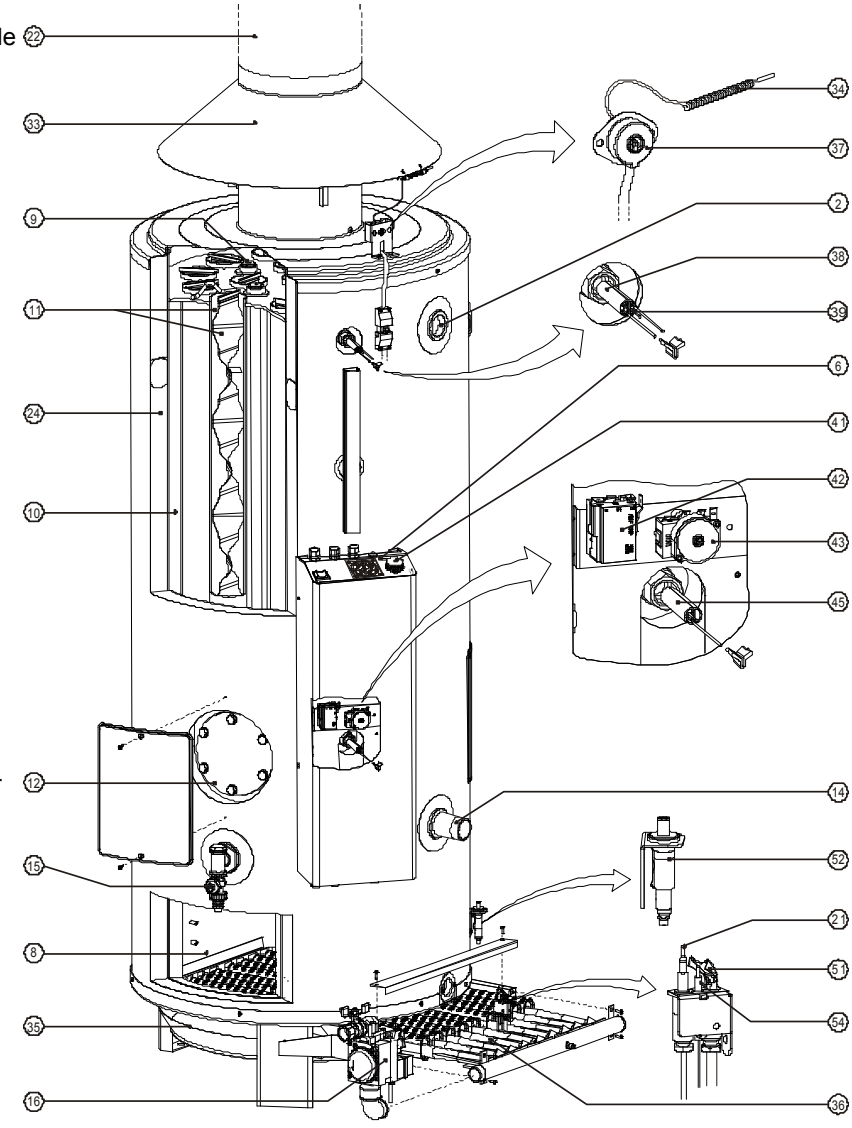
2.2 General working principle of the water heater

Cut-away view of the water heater

Legend

Unused numbers are not applicable

2. hot water outlet
6. control panel
8. combustion chamber
9. anode
10. tank
11. heat exchanger
12. inspection and cleaning opening
14. cold water inlet
15. drain valve
16. gas control valve
21. flame probe
22. chimney pipe
24. insulation layer
33. draught diverter
34. flue gas sensor
35. radiation shield/condensation tray
36. bar burners/burner tray
37. flue gas thermostat
38. safety thermostat sensor
39. high-limit thermostat sensor
41. control thermostat
42. high-limit thermostat
43. safety thermostat
45. control thermostat sensor
51. pilot burner
52. spark igniter



IMD-1037 R0

Working principle of the water heater



In this appliance, the cold water enters the bottom of the tank through the cold water inlet (26). The heat of combustion is conducted to the water by the combustion chamber (10) and flue tubes (4). The heated tap water leaves the tank through the hot water outlet (15). Once the appliance is completely filled with water, it will constantly be under mains water pressure. When hot water is drawn from the appliance, it is immediately replenished with cold water.

The appliance has an ignition probe that lights the pilot flame burner (12).

The gas required for combustion flows via the gas control (12) into the manifold. There are orifices in the manifold. The gas is injected into the burner bars at pressure from these orifices (29). The burner bars together form the burner tray. The injection of gas into the burner bars also draws in the primary air required for combustion. The narrow opening in the orifice causes the gas flow to accelerate. This in turn causes a partial vacuum. It is this partial vacuum that draws in the air (the Venturi effect). Additional air is drawn in through the opening in the burner tray.

When the gas/air mixture starts to flow, it is ignited by the pilot burner.

The flue gases generated by this combustion are led through the flue tubes (4). Flue baffles (5) are fitted inside the flue tubes. These retard the flow of the flue gases, thereby increasing the thermal efficiency of the appliance.

The flue gases are exhausted from the appliance via the draught diverter (2).

A radiation shield/condensation tray (11) is mounted below the burner tray. This prevents overheating of the floor area below the appliance, as well as serving as a collection tray for condensation water.

The insulation layer (6) prevents heat loss. The inside of the tank is enamelled to protect against corrosion. The anodes (3) offer extra protection.



2.3 Water heater operating cycle

The entire appliance is regulated by a control thermostat. The control thermostat monitors the water temperature (T_{water}). The appliance's heating cycle is activated as soon as T_{water} falls below the specified threshold value (T_{set}). The value for T_{set} can be adjusted using the control thermostat (±40°C to ±70°C).

As soon as T_{water} drops below T_{set} there is a demand, and the control thermostat closes, causing the main valve on the gas control to open. The gas mixes with the air it draws along. This mixture is ignited by the pilot burner and the water is heated. As soon as T_{water} exceeds T_{set} , demand ceases, the thermostat opens again, and the heating cycle stops.

The control thermostat has a certain margin both when closing and opening. We refer to this margin as the hysteresis. The hysteresis cannot be adjusted.

2.4 Protection for the water heater

The burner control monitors the water temperature by means of thermostats and ensures safe combustion. This takes place using:

- the Gas control
- the Thermocouple
- the Water temperature protection
- the Flue gas backflow safeguard

2.4.1 Gas control

The gas control has 2 valves for safety purposes:

1. The main valve, which controls the gas supply to the burner tray and which is switched via the I/0/II switch circuit and the control, high-limit and flue gas thermostats. This circuit is powered by the supply voltage.
2. The safety valve, which controls the gas supply to the pilot burner and which is switched via the thermocouple circuit and the safety thermostat. This circuit is powered by the millivoltage from the thermocouple that is located in the pilot flame. Whenever the safety valve closes, the main valve also closes.

2.4.2 Thermocouple

1. To prevent gas flowing when there is no combustion, a thermocouple is fitted. As a result of the presence of the (permanent) pilot flame, the thermocouple maintains a millivoltage which keeps the gas control's safety valve open.
2. If the pilot flame goes out, this voltage disappears and the gas control's safety valve closes, interrupting the gas supply to the burner tray.

2.4.3 Water temperature protection

To ensure a safe water temperature is not exceeded, the high-limit thermostat sensor is installed at the top of the appliance. This is because stratification ('stacking') of the water temperature can mean that the temperature at the top of the appliance can be considerably higher than the set temperature for the hot water.

In the event that both the control and high-limit thermostats should fail, there is also a safety thermostat.

The table explains how the high-limit and safety thermostats respond to the sensors.

Temperature protection

Protection	Description
High-limit thermostat	If the high-limit thermostat sensor (39) detects a temperature greater than 84°C, the high-limit thermostat will open. The demand will cease, and the burner control will stop the heating cycle until the high-limit thermostat closes again. At that moment, the burner control resets the appliance, and the heating cycle resumes. The high-limit safeguard serves to prevent overheating and/or excessive formation of scale in the appliance.
Safety thermostat	If the safety thermostat sensor (38) detects a temperature greater than 93°C, the safety thermostat will open. The demand will cease, and the burner control will immediately stop the heating cycle. A lockout error of the burner control takes place. It must be manually reset before the appliance can resume operation .

2.4.4 Flue gas backflow safeguard

The flue gases are discharged to the outside via the draught diverter (33) and the flue (22). To prevent the flue gases from flowing back into the boiler room, the discharge ducting is monitored by a feature called the Thermal Reflux Safeguard (TRS). This uses a flue gas thermostat (37) with a flue gas thermostat sensor (34) that are located in the draught diverter. Under normal circumstances this sensor will register the ambient temperature.

However, if the chimney is not drawing sufficiently (for example, due to a blockage in the chimney), the flue gases will 'reflux' and flow back past the flue gas thermostat sensor. The sensor will then detect an excessive temperature and the flue gas thermostat will open. The demand will cease, and the burner control will immediately stop the heating cycle. The flue gas thermostat will also lock out. It must be manually reset before the appliance can resume operation .

2.5 Safety of the installation

In addition to the appliance's standard built-in safety monitoring, the appliance must also be protected by an expansion vessel, expansion valve, pressure reducing valve, non-return valve and a T&P valve.

The use of an expansion vessel, expansion valve and/or pressure reducing valve depends on the type of installation: unvented or vented.

2.5.1 Unvented installation

With an unvented installation, an expansion valve valve and expansion vessel prevent the buildup of excessive pressure in the tank. This prevents damage being caused to the enamelled coating (in the appliance) or to the tank. A non-return valve prevents excessive pressure buildup in the water supply system. This valve also prevents water from flowing backwards from the tank into the cold water supply system. The pressure reducing valve protects the installation against an excessively high water supply pressure (> 8 bar). These components are fitted to the cold water pipe (3.7 "Vented water connections").

2.5.2 Vented installation

With a vented installation, excess pressure is taken up by the open cold water head tank. The height of the head tank determines the working pressure in the water heater, which may not exceed 8 bar. The installation must also be fitted with a vent pipe from the hot water pipe, that opens into the cold water tank.

Ideally, the vent pipe should discharge into a separate tundish/drain or otherwise to the open cold water head tank. The water heater should also be fitted on the hot water side with a stop valve (3.6.3 "Hot water side").



2.5.3 T&P valve

A T&P valve is only mandatory in an unvented installation. However, the supplier also recommends the use of a T&P valve in vented installations.

A T&P (Temperature and Pressure Relief) valve monitors the pressure in the tank and the water temperature at the top of the tank. If the pressure in the tank becomes excessive (> 10 bar) or the water temperature is too high (> 97°C), the valve will open. The hot water can now flow out of the tank. Because the appliance is under water supply pressure, cold water will automatically flow into the tank. The valve remains open until the unsafe situation has been rectified. The appliance is fitted standard with a connecting point for a T&P valve (3.6.3 "Hot water side").

Working principle of the water heater



3 Installation

Warning
The installation must be carried out by an approved installation engineer in compliance with the general and local regulations imposed by the gas, water and power supply companies and the fire brigade.

The appliance may only be installed in a room that complies with the requirements stated in national and local ventilation regulations (1.3 "Regulations").

3.1 Introduction

This chapter describes the installation activities to be carried out before the appliance may be started up (9 "Starting the water heater"), in particular:

- Packaging;
- Ambient conditions;
- Technical specifications;
- Vented water connections;
- Vented water connections;
- Gas connection;
- Flue gas discharge;
- Electrical connection;
- Checking the supply pressure and burner pressure.

For a possible conversion to a different gas category, see conversion (4 "Conversion to a different gas category").

3.2 Packaging

To avoid damaging the water heater, remove the packaging carefully.

We recommend unpacking the water heater at or near its intended location.

Caution
The water heater may only be manoeuvred in an upright position. Take care that the water heater is not damaged after unpacking.

3.3 Ambient conditions

Caution
The water heater may not be used in rooms where chemical substances are stored or used due to the risk of explosion, and corrosion of the water heater. Some propellants, bleaching agents and degreasing agents etc. disperse vapours that are explosive and/or cause accelerated corrosion. If the water heater is used in a room in which such substances are present, the warranty will be void.

CH appliances are open appliances and may only be installed in an open boiler room. They are type B_{11BS}.

3.3.1 Air humidity and ambient temperature

The boiler room must be frost-free, or be protected against frost. The table shows the ambient conditions that must be adhered to for correct functioning of the electronics present in the water heater to be guaranteed.

Air humidity and ambient temperature specifications

Air humidity and ambient temperature	
Air humidity	max. 93% RH at +25°C
Ambient temperature	Functional: 0 ≤ T ≤ 60°C

3.3.2 Maximum floor load

Allow for the appliance's weight with respect to the maximum floor load; refer to the table.

Weight of the appliance filled with water

Weight (kg) of the appliance filled with water	
CH 100	507
CH 155	507
CH 200	510
CH 300	581
CH 400	576
CH 500	525
CH 600	526

3.3.3 Working clearances

For access to the appliance, it is recommended that the following clearances are observed (see figure):

- AA: around the appliance's control column and cleaning openings: 100 cm.
- BB: all sides of the appliance: 50 cm.
- Above the appliance (room to replace the anodes):
  - 100 cm if using fixed anodes, or
  - 50 cm if using flexible anodes.

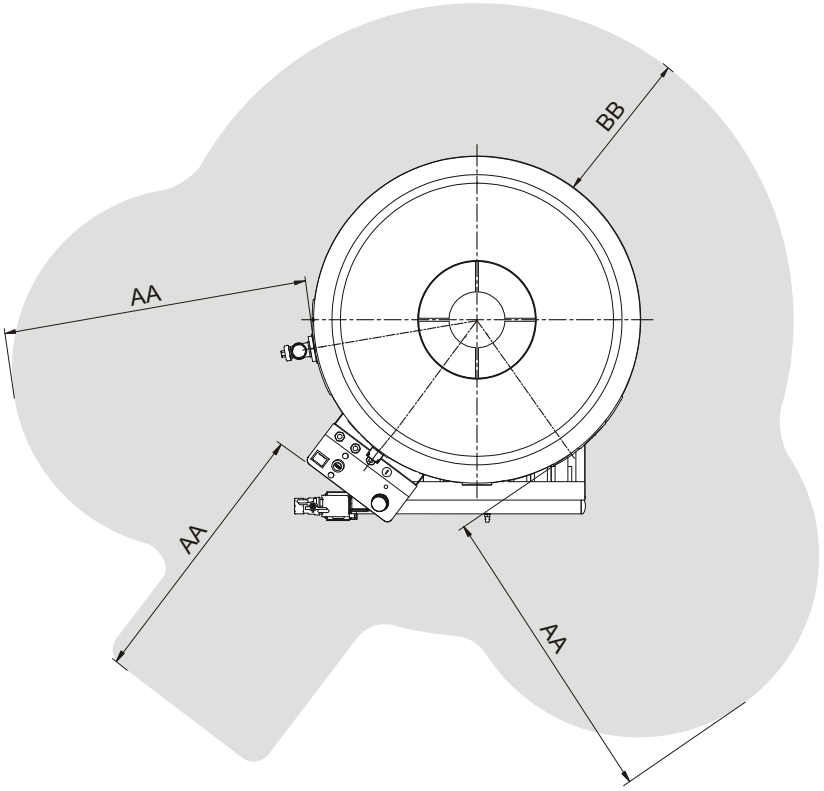
  If the available clearance is less than 100 cm, flexible magnesium anodes may be ordered.

Note

When installing the appliance, be aware that any leakage from the tank and/or connections can cause damage to the immediate environment or floors below the level of the boiler room. If this is the case, the appliance should be installed above a wastewater drain or in a suitable metal leak tray.

The leak tray must have an appropriate wastewater drain and must be at least 5cm deep with a length and width at least 5cm greater than the diameter of the appliance.

Working clearances



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3.4 Technical specifications

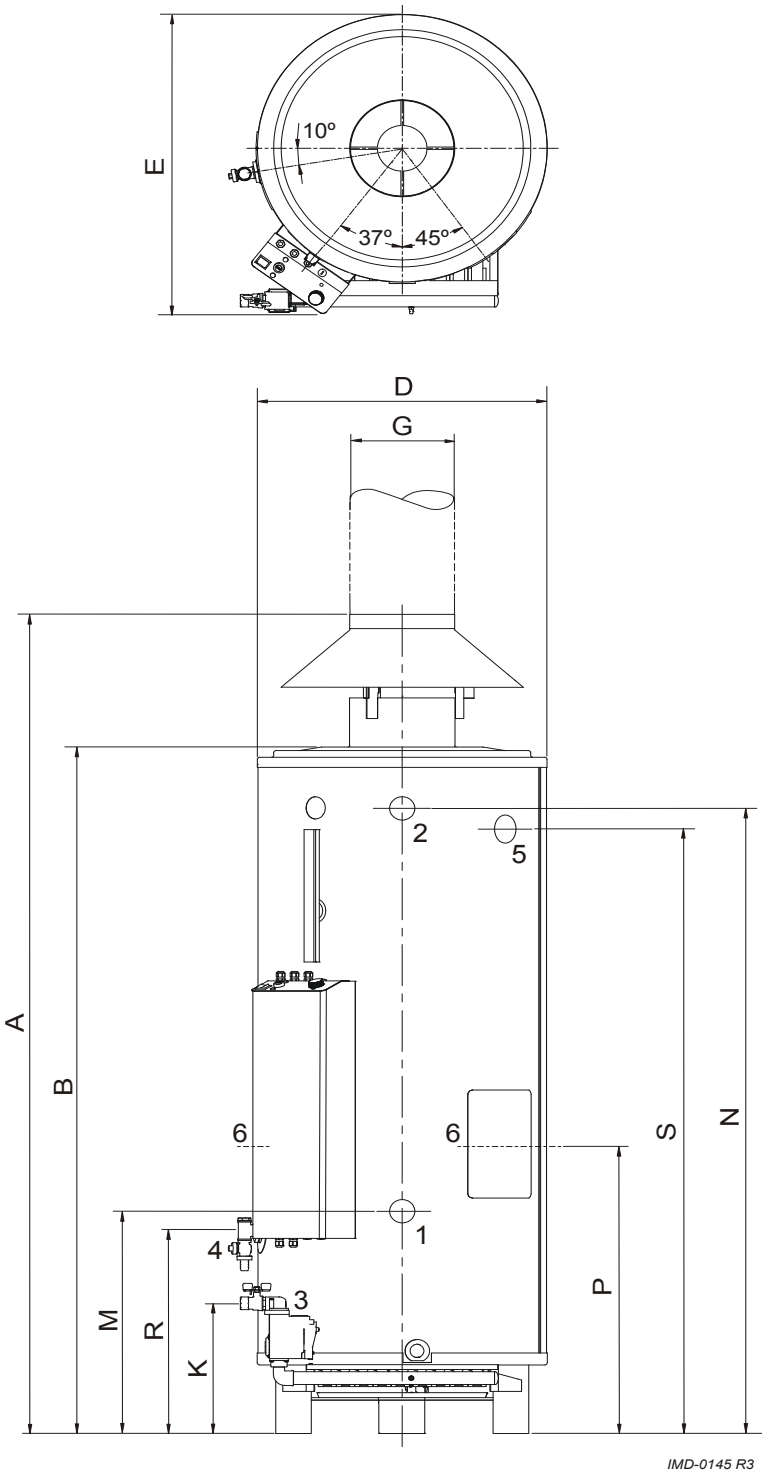
The water heater is supplied without accessories. Check the dimensions (3.4 "Technical specifications"), gas data (3.4.3 "Gas data") and other specifications (3.4.2 "General and electrical specifications") of any accessories you plan to use.

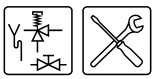
3.4.1 Dimensions of the water heater

Plan and elevation of the water heater

Legend

See the table.





Dimensions (all measurements in mm unless otherwise indicated)

Size	Description	CH 100	CH 155	CH 200	CH 300	CH 400	CH 500	CH 600
A	Overall height	1910	1910	1890	2155	2155	1950	2145
B	Height of top of appliance	1700	1700	1700	1900	1900	1735	1810
D	Appliance diameter	710	710	710	710	710	710	710
F	Width	800	800	800	800	800	800	800
G	Diameter of flue gas discharge	130	130	150	180	180	200	250
K	Height of gas connection	145	145	145	145	145	145	145
M	Height of cold water supply	505	505	505	505	505	515	590
N	Height of hot water outlet	1545	1545	1545	1750	1750	1580	1655
P	Height of cleaning opening	670	670	670	670	670	680	765
R	Height of drain valve connection	440	440	440	453	455	465	540
S	Height of T&P valve connection	1490	1490	1490	1700	1700	1535	1600
1	Cold water supply connection (external)	R1$^1/_2$	R1$^1/_2$	R1$^1/_2$	R1$^1/_2$	R1$^1/_2$	R1$^1/_2$	R1$^1/_2$
2	Hot water outlet connection (internal)	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$
3	Gas control connection (internal)	Rp$^3/_4$	Rp$^3/_4$	Rp$^3/_4$	Rp$^3/_4$	Rp$^3/_4$	Rp$^3/_4$	Rp1
4	Drain valve connection (internal)	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$	Rp1$^1/_2$
5	T&P valve connection (internal)	1 - 11.5 NPT	1 - 11.5 NPT	1 - 11.5 NPT	1 - 11.5 NPT	1 - 11.5 NPT	1 - 11.5 NPT	1 - 11.5 NPT
6	Cleaning/inspection opening	Ø 100	Ø 100	Ø 100	Ø 100	Ø 100	Ø 100	Ø 100

3.4.2 General and electrical specifications

General and electrical specifications

DESCRIPTION	Unit	CH 100	CH 155	CH 200	CH 300	CH 400	CH 500	CH 600
Contents	litres	309	309	298	357	335	278	253
Maximum working pressure	bar	8	8	8	8	8	8	8
Empty weight	kg	198	198	212	224	241	247	273
Heating time $\Delta T = 45^0C$	minutes	38	30	23	25	17	11	8
Number of anodes	-	2	2	2	2	3	3	4
Number of bar burners/orifices	-	3	3	4	4	7	7	9
Number of flue tubes/flue baffles	-	5	5	7	6	9	12	16
Electrical power consumption	W	30	30	30	30	30	30	30
Supply voltage (-15% +10% VAC)	volts	230	230	230	230	230	230	230
Mains frequency	Hz (±1Hz)	50	50	50	50	50	50	50
IP class	-	30	30	30	30	30	30	30

3.4.3 Gas data

Gas data

Description II_{2H3+}	Unit	CH 100	CH 155	CH 200	CH 300	CH 400	CH 500	CH 600
Gas category 2H: General								
Orifice diameter	mm	2.90	3.20	3.20	3.30	2.95	3.20	3.30
(1) = Blank plate (2) = Burner pressure regulator (3) = High/low regulator	1, 2 or 3	2	2	2	2	2	2	2
G20 - 20 mbar								
Nominal load (gross calorific value)	kW	33.9	42.1	53.4	59.9	83.2	102.5	128.4
Nominal output	kW	25.6	31.9	40.4	45.3	62.9	77.6	97.1
Supply pressure	mbar	20	20	20	20	20	20	20
Burner pressure	mbar	8.5	8.6	7.8	8.5	8.5	9.2	7.8
Gas consumption (*)	m^3/h	3.2	4.0	5.1	5.7	7.9	9.8	12.2
General 3+								
Orifice diameter	mm	1.6	1.7	1.6	1.75	1.50	1.70	1.75
(1) = Blank plate (2) = Burner pressure regulator (3) = High/low regulator	1, 2 or 3	1	1	1	1	1	1	1
G30 - 30 mbar (butane)								
Nominal load (gross calorific value)	kW	33.9	42.2	53.4	59.2	80.8	100.1	127.5
Nominal output	kW	26.3	32.7	41.4	45.9	62.6	77.6	98.8
Supply pressure	mbar	30	30	30	30	30	30	30
Burner pressure (†)	mbar	-	-	-	-	-	-	-
Gas consumption (*)	kg/h	2.5	3.1	3.9	4.3	5.9	7.3	9.3
G31 - 37 mbar (propane)								
Nominal load (gross calorific value)	kW	33.1	41.4	52.8	58.2	78.4	98.3	125.5
Nominal output	kW	25.6	32.0	40.8	45.0	60.6	75.9	97.0
Supply pressure	mbar	37	37	37	37	37	37	37
Burner pressure (†)	mbar	-	-	-	-	-	-	-
Gas consumption (*)	kg/h	2.4	3.0	3.8	4.2	5.6	7.0	9.0

(*) Based on 1013.25 mbar and 15 °C.

(†) If using a blank plate instead of a burner pressure regulator, it is assumed that the burner pressure is equal to the supply pressure. In practice, however, the burner pressure will be lower.

3.5 Installation diagram

The figure shows the Installation diagram. This diagram is referred to in the sections describing the actual connection procedure.

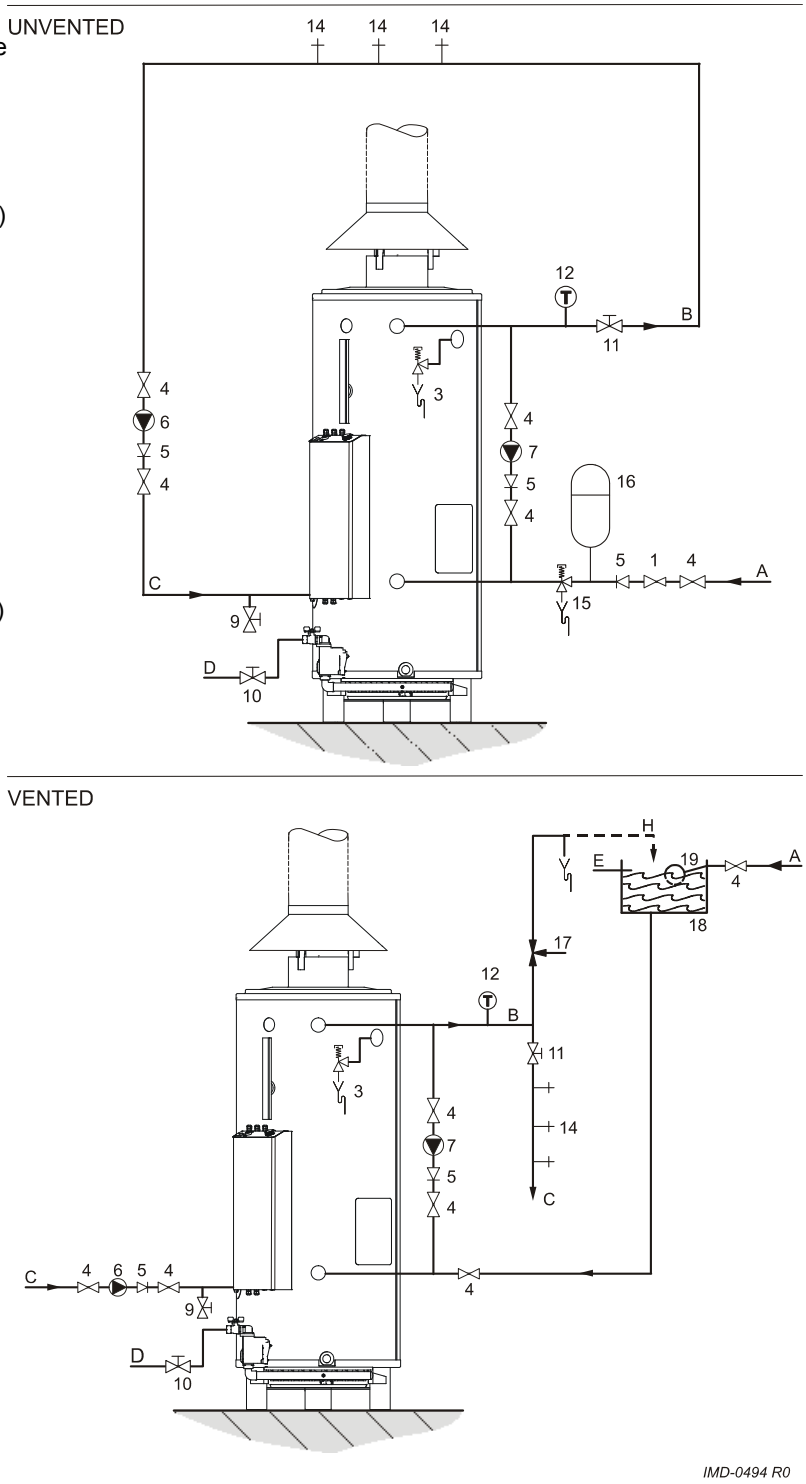
Installation diagram

Legend

Unused numbers are not applicable

1. pressure reducing valve (mandatory)
3. T&P valve (mandatory)
4. stop valve (recommended)
5. non-return valve (mandatory)
6. circulation pump (optional)
7. top to bottom circulation pump (optional)
9. drain valve
10. manual gas valve (mandatory)
11. service stop valve (mandatory)
12. temperature gauge (recommended)
14. draw-off points
15. expansion valve (mandatory)
16. expansion vessel (mandatory)
17. 3-way aeration valve (recommended)
18. cold water head tank
19. float switch

A. cold water supply
B. hot water supply
C. circulation pipe
D. gas supply
E. overflow pipe
H. overflow protection



3.6 Unvented water connections

Warning
The installation should be carried out by a competent person, in compliance with general and locally applicable regulations (1.3 "Regulations").

3.6.1 Cold water side

See (A) in the installation diagram (3.5 "Installation diagram").

1. Fit an approved stop valve (4) on the cold water side as required by the applicable regulations (1.3 "Regulations").
2. The maximum working pressure of the water heater is 8 bar. Because the pressure in the water pipe at times can exceed 8 bar, you must fit an approved pressure-reducing valve (1).
3. Fit a non-return valve (5) and an expansion vessel (16).
4. Fit an expansion valve (15) and connect the overflow side to an open waste water pipe.

3.6.2 Shunt pipe

You can connect a top to bottom circulation pump to prevent stacking of the water in the water heater.

1. Optional: Depending on the draw-off pattern, fit a shunt pipe (Ø 22 mm), a stop valve (11) and a top-to-bottom circulation pump (7).
2. Fit a non-return valve (5).
3. Fit a stop valve (11).

3.6.3 Hot water side

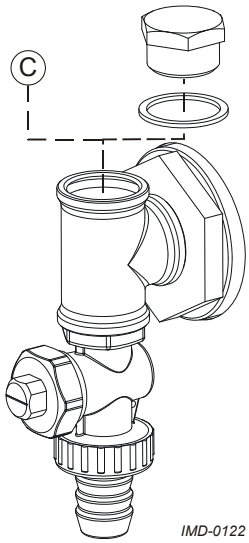
See (B) in the installation diagram (3.5 "Installation diagram").

Note
Insulating long hot water pipes prevents unnecessary energy loss.

1. Optional: fit a temperature gauge (12) so you can check the temperature of the tap water.
2. Fit the T&P valve (3).
3. Fit a stop valve (11) in the hot water outlet pipe for servicing.

3.6.4 Drain valve

1. Fit the standard drain valve supplied (9).
2. If desired, fit a circulation pipe (3.6.5 "Circulation pipe").
   Otherwise, fit the sealing nut and gasket (C) supplied with the drain valve, as per the diagram.



3.6.5 Circulation pipe

See (C) in the installation diagram (3.5 "Installation diagram").

If an immediate flow of hot water is required at draw-off points, a circulation pump can be installed. This improves comfort, and reduces water wastage.

1. Fit a circulation pump (6) of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve (5) after the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves for servicing (4).
4. Connect the circulation piping to the T-piece on the drain valve (9) as per the drain valve diagram (3.6.4 "Drain valve").

3.7 Vented water connections

Warning
The installation should be carried out by a competent person, in compliance with general and locally applicable regulations (1.3 "Regulations").

3.7.1 Cold water side

See (A) in the installation diagram (3.5 "Installation diagram").

1. Fit an approved stop valve (4) on the cold water side between the cold water head tank (18) and the water heater, as required by applicable regulations.

3.7.2 Shunt pipe

You can connect a top to bottom circulation pump to prevent stacking of the water in the water heater.

1. Optional: Depending on the draw-off pattern, fit a shunt pipe (Ø 22 mm), a stop valve (11) and a top-to-bottom circulation pump (7).
2. Fit a non-return valve (5).
3. Fit a stop valve (11).

3.7.3 Hot water side

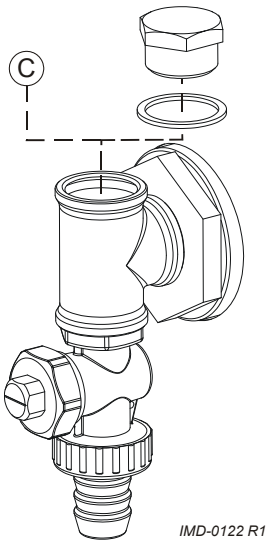
See (B) in the installation diagram (3.5 "Installation diagram").

Note
Insulating long hot water pipes prevents unnecessary energy loss.

1. Fit the T&P valve (3).
2. Optional: fit a temperature gauge (12) so you can check the temperature of the tap water.
3. Fit a stop valve (4) in the hot water outlet pipe for servicing.
4. If a circulation pipe is required, continue by installing the circulation pipe (3.6.5 "Circulation pipe").

3.7.4 Drain valve

1. Fit the standard drain valve supplied (9).
2. If desired, fit a circulation pipe (3.6.5 "Circulation pipe").
   Otherwise, fit the sealing nut and gasket (C) supplied with the drain valve, as per the diagram.



3.7.5 Circulation pipe

See (C) in the installation diagram (3.5 "Installation diagram").

If an immediate flow of hot water is required at draw-off points, a circulation pump can be installed. This improves comfort, and reduces water wastage.

1. Fit a circulation pump (6) of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve (5) after the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves for servicing (4).
4. Connect the circulation piping to the T-piece on the drain valve (9) as per the drain valve diagram (3.6.4 "Drain valve").

3.8 Gas connection

Warning
The installation should be carried out by a competent person, in compliance with general and locally applicable regulations (1.3 "Regulations").

Caution
Make sure that the diameter and length of the gas supply pipe are large enough to supply sufficient capacity to the water heater.

See (D) in the installation diagram (3.5 "Installation diagram").

1. Fit a manual gas valve (10) in the gas supply pipe.
2. Blow the gas pipe clean before use.
3. Close the manual gas valve.
4. Fit the gas supply pipe to the gas control valve.

Warning
After fitting, check for leaks.

3.9 Flue gas discharge

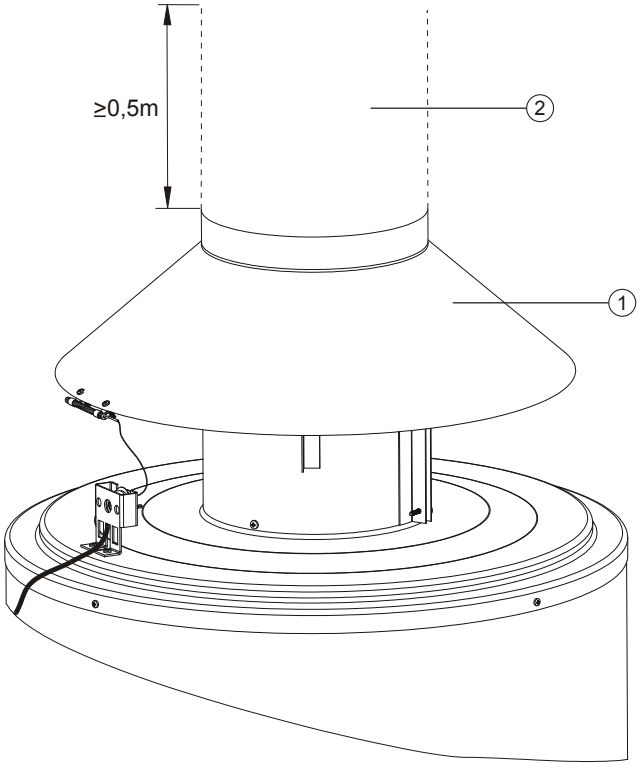
Warning
The installation should be carried out by a competent person, in compliance with general and locally applicable regulations (1.3 "Regulations").

Fit a vertical chimney pipe (2) of at least 0.5 metres length to the opening of the draft diverter, before fitting the rest of the chimney materials according to current regulations (1.3 "Regulations").

Installing the draught diverter

Legend

1 draught diverter
2 flue gas discharge



IMD-0148 R2

Note
Use flue gas discharge materials that comply with the regulations (1.3 "Regulations").

Note
Make sure that the chimney discharges into an area approved for this type of appliance.

3.10 Electrical connection

Warning
The installation should be carried out by a competent person, in compliance with general and locally applicable regulations (1.3 "Regulations").

3.10.1 Introduction

Topics covered in this paragraph, in sequence:

- Preparations;
- Connecting the mains power;
- Weekly timer circuit;

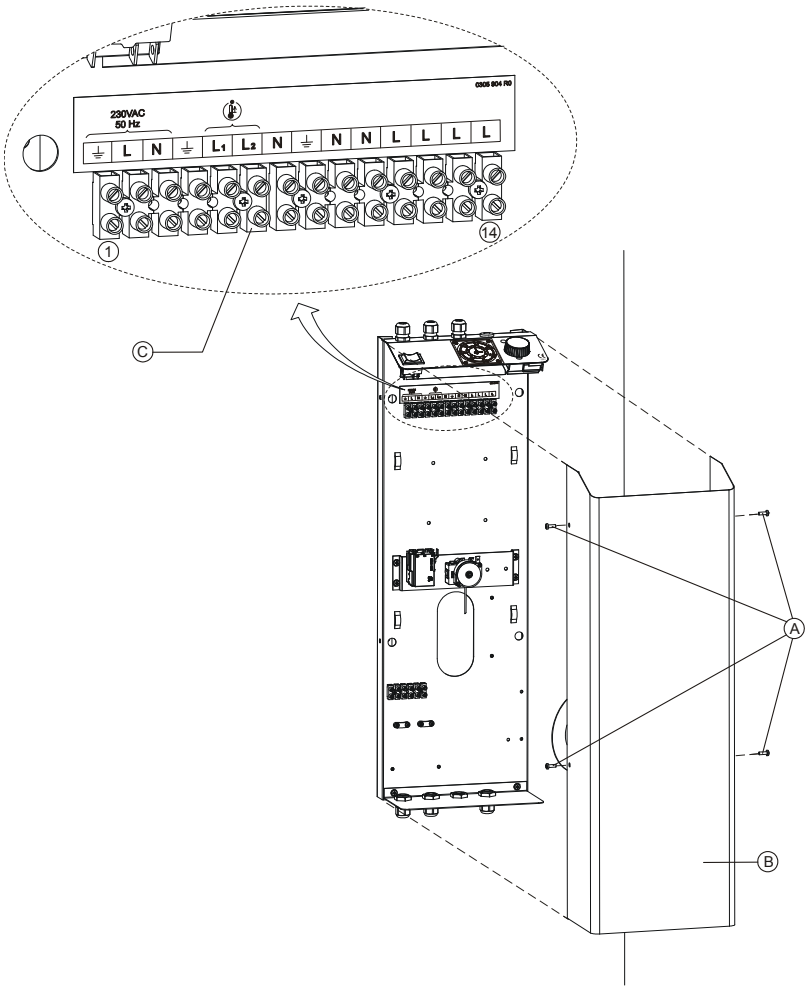
3.10.2 Preparations

The figure shows a view of the terminal block, and the table explains the relevant connections.

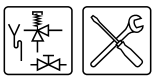
Connector block

Legend

A. screws
B. cover
C. terminal block



IMD-0150 R1



1. In preparation, first remove the protective cover from the control column:
2. Undo the 4 screws (1).
3. Remove the protective cover (2) from the electrical part.

   The connector block (C) is now visible.

Note
Consult the Electrical diagram for the electrical component connections.

Terminal block

Mains power				Flue gas discharge safety				Week timer circuit					
⏚	L_1	N	⏚	L_2	L_3	N	⏚	N	N	L	L	L	L
1	2	3	4	5	6	7	8	9	10	11	12	13	14

3.10.3 Connecting the mains power

The water heater is supplied without a power cable and isolator.

Note
In order to receive electrical power, the water heater has to be connected to the mains power by means of a permanent electrical connection. A double-pole isolator with a contact gap of at least 3 mm must be fitted between this permanent connection and the water heater. The power cable must have cores of at least 3 x 1.0 mm^2 .

Warning
Leave the water heater electrically isolated until you are ready to commission it.

1. Feed the power cable through the metric strain relief in the top of the control column.
2. Connect the earth (⏚), live (L_1) and neutral (N) of the power cable to terminals 1 to 3 of the connection block according to the table.
3. Tighten the strain relief so that the cable is clamped.
4. If you do not need to make any more connections, then fit the protective cover back on the control column.
5. Connect the power cable to the isolator.

3.10.4 Weekly timer circuit

1. Cut the image of the weekly timer from the operating panel.
2. Place the weekly timer in the opening thus created.
3. Connect the cables to points 10 (N), 12 (L) and 14 (L) using wire end sheaths.
4. Connect the cable with the crimped terminal clip onto position B4 on the ON/OFF switch.
5. If you do not need to make any more connections, then fit the protective cover back on the control column.

3.11 Checking the supply pressure and burner pressure

Note
Before starting the appliance and/or checking the supply pressure and burner pressure, you must fill (5 "Filling") the appliance.

Caution
Before starting up for the first time or after conversion, you must always check the supply pressure and burner pressure.

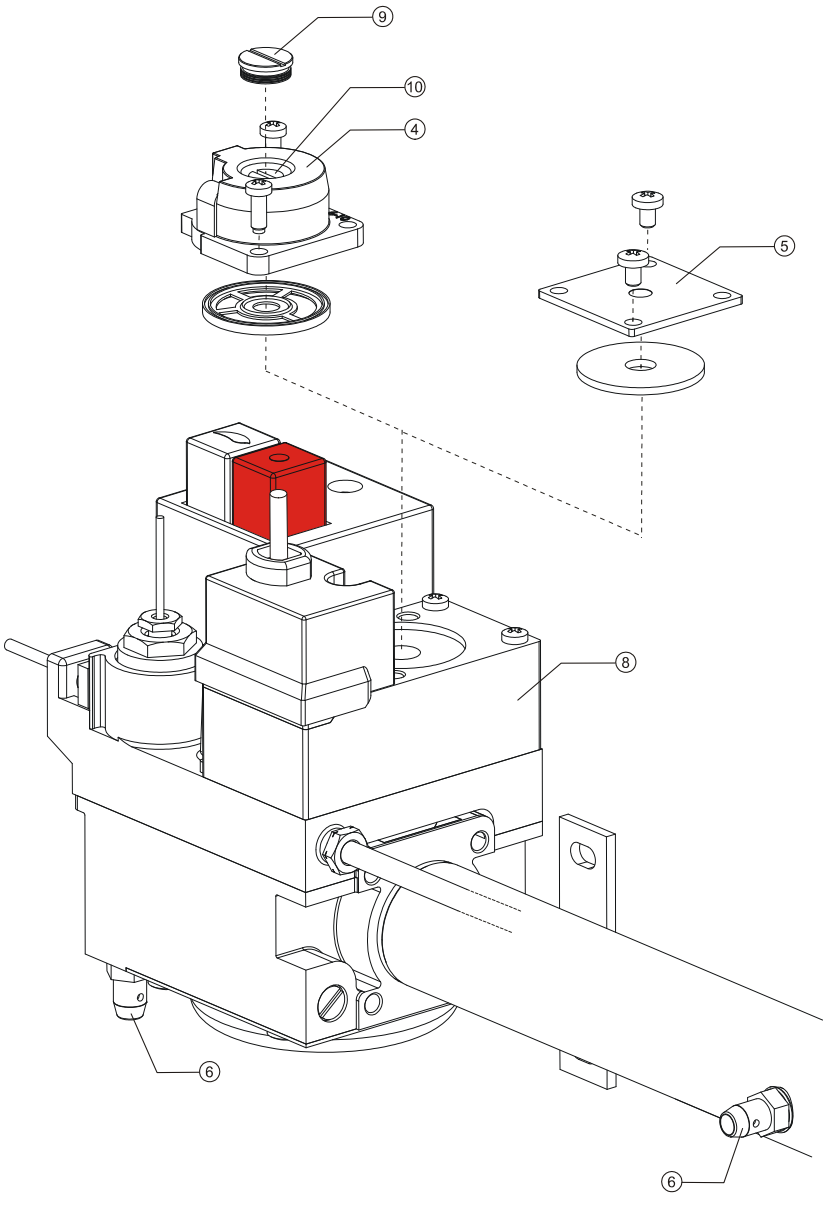
Note
The easiest way to check the gas pressures is by using two pressure gauges. This procedure assumes that these two gauges are available.

Legend

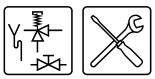
Unused numbers are not applicable

4. burner pressure controller
5. blank plate
6. supply pressure nipple
7. gas control
8. manifold test nipple
9. sealing screw
10. burner pressure adjustment screw

Gas control for CH



IMD-0197 R1



Reading off and adjusting

1. Isolate the appliance from the mains power (10.3 "Isolating the appliance from the mains").
2. To check the supply pressure, test nipple (6) is used. The manifold test nipple (8) is used for measuring the burner pressure.
   Sealing screws are located inside the test nipples. Loosen both sealing screws by a few turns. Do not completely loosen them; they can be difficult to retighten.
3. Connect a pressure gauge to the manifold test nipple (8).
4. Open the gas supply and bleed the air from the mains gas supply via test nipple (6).
5. Connect a pressure gauge to the manifold test nipple (6) when gas starts to flow from this nipple.
6. Switch on the power to the appliance using the isolator on the appliance.
7. Set the control thermostat to the maximum temperature and start the appliance running by setting the ON/OFF switch to position I.
8. The heating cycle will start, and after a short time the burner tray will ignite.
9. After the burner tray has ignited, wait approximately 1 minute before reading the dynamic pressures.

Note
If the burner pressure is not correct and the appliance is fitted with a blank plate or high-low control, you will **not be able to adjust** the pressure. In this case, consult your installation engineer or supplier. If the appliance is indeed fitted with a burner pressure regulator, the pressure can be adjusted ("Adjusting the pressure").

10. Adjust the burner pressure by turning the adjusting screw (10), depending on the correction required:
    - Adjustment screw anticlockwise: burner pressure decreases.
    - Adjustment screw clockwise: burner pressure increases.
11. Cover the opening of the adjusting screw and check the burner pressure against the value given in the gas data table (3.4.3 "Gas data").
12. If the pressure reading is not correct, repeat the burner pressure adjustment until the correct pressure is reached.
13. Fit the cap (9) back on the burner pressure regulator.
14. Shut off the gas supply.
15. Disconnect the two pressure gauges and retighten the sealing screws in the test nipples.

Note
Before starting the appliance up, take time to fill in the warranty card supplied with the appliance. This enables us to guarantee the quality of our systems and further enhance our warranty procedure.

16. Please return this card as soon as possible. Your customer will then receive a warranty certificate with our warranty conditions.

Adjusting the pressure

1. Remove the cap (2) from the burner pressure regulator.
2. Depending on the correction required, correct the burner pressure by turning adjustment screw (3):
   - Adjustment screw anticlockwise: burner pressure decreases.
   - Adjustment screw clockwise: burner pressure increases.
3. Cover the opening of the adjusting screw and check the burner pressure against the value given in thegas data table (3.4.3 "Gas data").
4. If the pressure reading is not correct, repeat the burner pressure adjustment until the correct pressure is reached.
5. Fit the cap (2) back on the burner pressure regulator.

Finalising

1. Shut off the gas supply.
2. Disconnect the two pressure gauges and retighten the sealing screws in the test nipples.
3. Replace the cover.

4 Conversion to a different gas category

Caution
The conversion may only by carried out by a competent person.

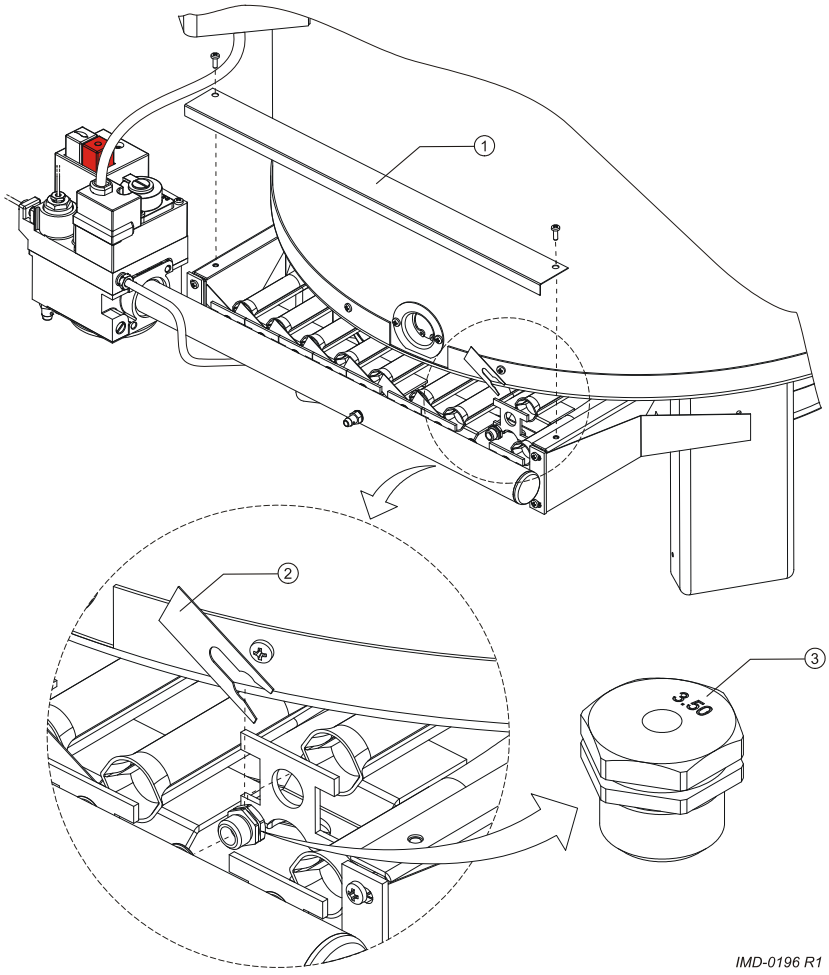
If the appliance has to operate on a different family of gases (liquid petroleum gas or natural gas) or other gas category, other than that for which the appliance has been configured at the factory, then the appliance will have be adapted using a special conversion kit.

Caution
You must check the supply pressure and burner pressure once the conversion is complete.

Exchanging orifices

Legend

1. cover plate
2. locking strips
3. orifice with stamped figures



4.1 Conversion to a different gas category

1. Isolate the appliance from the power supply (10.3 "Isolating the appliance from the mains").
2. Shut off the gas supply.

Caution
The burner may be hot.

3. Unscrew the cover plate (1) from the burner support.
4. Use a suitable tool to remove the retaining strips (2). Note that the retaining strips have very sharp edges. Withdraw the retaining strips straight upwards.

Note
The radiation shield / condensation tray can be temporarily loosened to simplify disassembly of the burner.

5. Remove the burners one by one from their brackets at the front. To do this, you first move them away from you and then downwards. The orifices will now be accessible
6. Remove the orifices.
7. Select and fit the correct orifices from the conversion kit, based on the gas data table (3.4.3 "Gas data"). The orifice diameter is stamped on the orifice itself, see (3).
8. Re-fit the burners back in their original position.
9. Re-fit the retaining strips.
10. If the radiation shield / condensation tray was loosened, re-fasten it.
11. Check whether there is a burner pressure regulator (1) attached to the gas control, or simply a blank plate (5).

Note
If the supply pressure for a gas category is the same as the burner pressure (see the gas data table (3.4.3 "Gas data")) then the gas control must be fitted with a blank plate with cork gasket. A burner pressure that deviates in comparison to the supply pressure requires the use of a burner pressure regulator with rubber gasket. Each conversion kit contains all the necessary components.

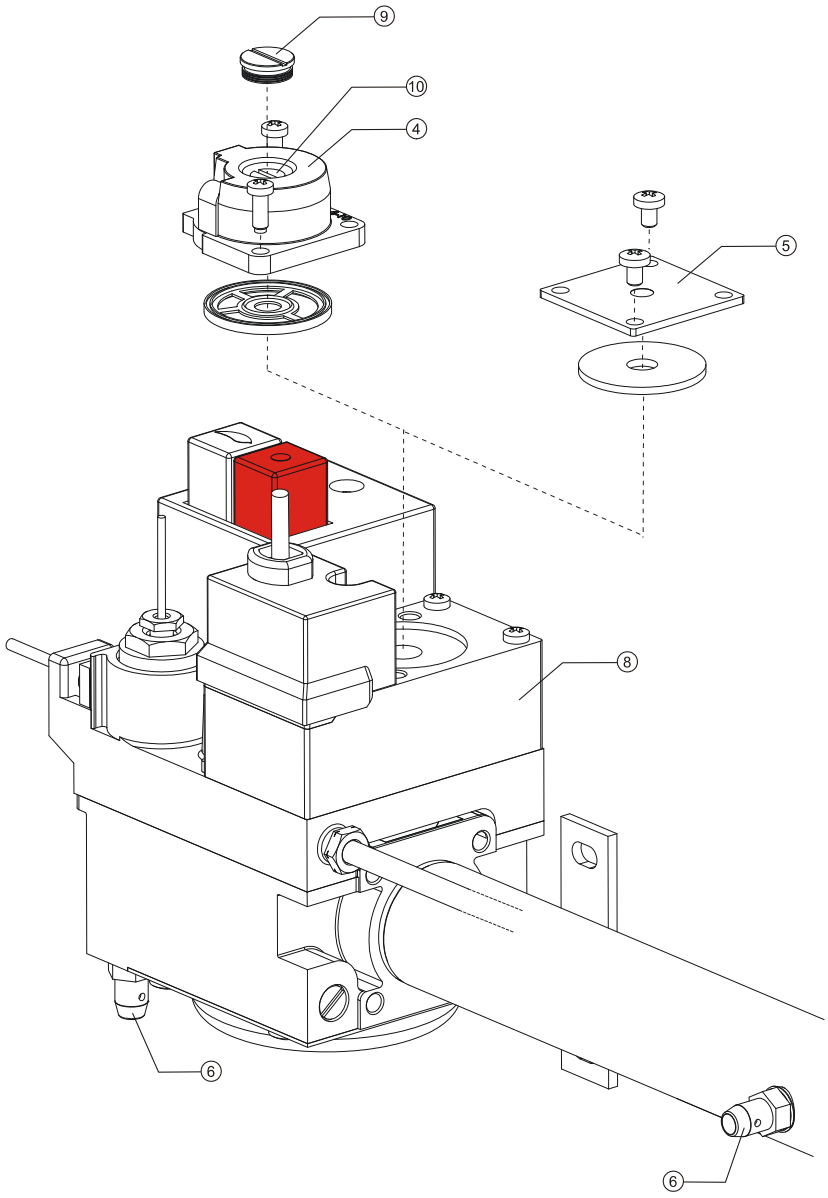
12. If the blank plate or burner pressure regulator need to be replaced:
    - If necessary, remove the blank plate or burner pressure regulator (5) or burner pressure regulator (1).
    - If necessary, fit the blank plate or burner pressure regulator supplied with the conversion kit.
13. Check the supply pressure and burner pressure (3.11 "Checking the supply pressure and burner pressure").
14. Remove the sticker showing the new gas category from the conversion kit, and attach it below the appliance's rating plate. This clearly indicates that the appliance may no longer be run on the gas for which it was originally supplied.
15. Start the appliance (9 "Starting the water heater").

Legend

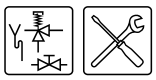
Unused numbers are not applicable

4. burner pressure controller
5. blank plate
6. supply pressure nipple
7. gas control
8. manifold test nipple
9. sealing screw
10. burner pressure adjustment screw

Gas control for CH



IMD-0197 R1



5 Filling

Installation diagram

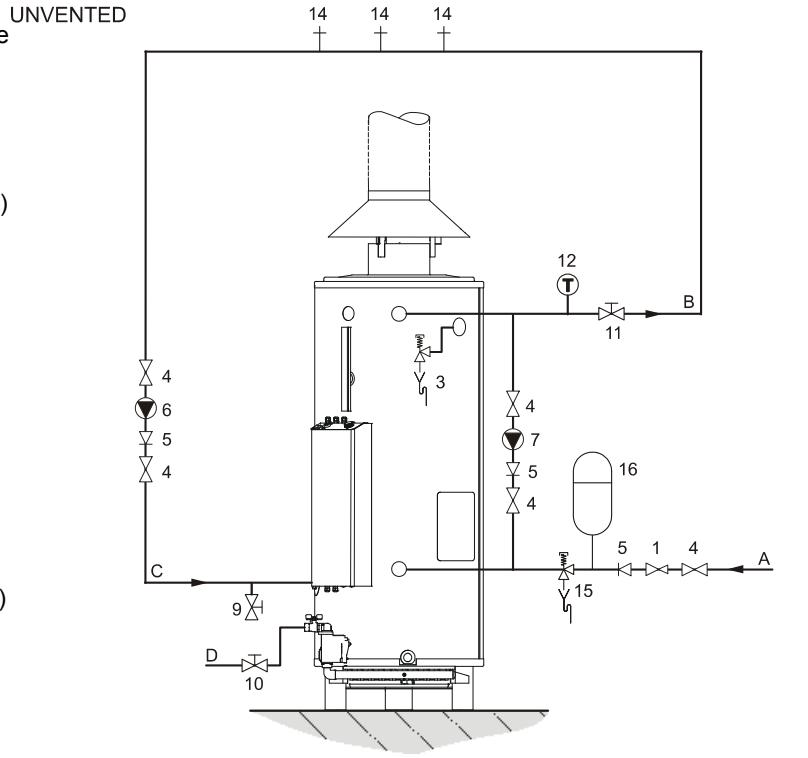
Legend

Unused numbers are not applicable

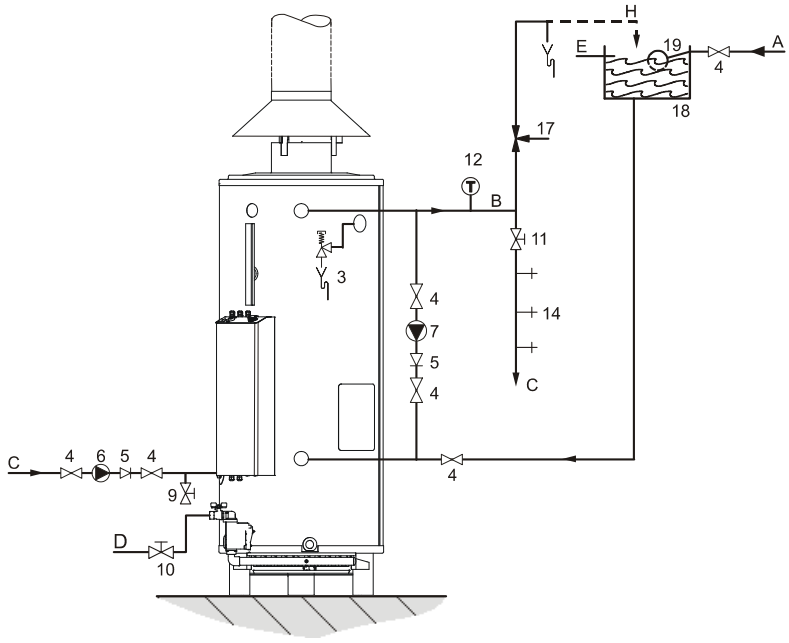
1. pressure reducing valve (mandatory)
3. T&P valve (mandatory)
4. stop valve (recommended)
5. non-return valve (mandatory)
6. circulation pump (optional)
7. top to bottom circulation pump (optional)
9. drain valve
10. manual gas valve (mandatory)
11. service stop valve (mandatory)
12. temperature gauge (recommended)
14. draw-off points
15. expansion valve (mandatory)
16. expansion vessel (mandatory)
17. 3-way aeration valve (recommended)
18. cold water head tank
19. float switch

A. cold water supply
B. hot water supply
C. circulation pipe
D. gas supply
E. overflow pipe
H. overflow protection

UNVENTED



VENTED



IMD-0494 R0



5.1 Filling unvented installations

To fill the water heater, proceed as follows:

1. Open the stop valve (11) in the hot water pipe and, if present, the stop valves (4) for the circulation pump (6).
2. Close the drain valve (9).
3. Open the nearest hot water draw-off point (14).
4. Open the stop valve (4) on the cold water side (A) so that cold water flows into the water heater.
5. Completely fill the water heater. When a full water jet flows from the nearest draw-off point, the water heater is full.
6. Bleed the entire installation of air, for example by opening all draw-off points.
7. The appliance is now under water supply pressure. There should be no water coming out of the expansion valve (15) or out of the T& valve (3). If there is, the cause might be:
   - The T&P valve is defective or incorrectly fitted.
   - The water supply pressure is greater than the specified 8 bar. Rectify this by fitting a pressure reducing valve (1).
   - The expansion valve in the protected cold supply set-up is defective or incorrectly fitted.

5.2 Filling vented installations

To fill the water heater, proceed as follows:

1. Open the stop valve (11) in the hot water pipe and, if present, the stop valves (4) for the circulation pump (6).
2. Close the drain valve (9).
3. Open the nearest hot water draw-off point (14).
4. Open the stop valve (4) on the cold water side (A) so that cold water flows into the water heater.
5. Completely fill the water heater. When a full water jet flows from the nearest draw-off point, the water heater is full.
6. Bleed the entire installation of air, for example by opening all draw-off points.
7. The water heater is now under water supply pressure. There should be no water coming out of the T&P valve (3). If this does happen, the T&P valve might be defective or incorrectly fitted.

6 Draining

Installation diagram

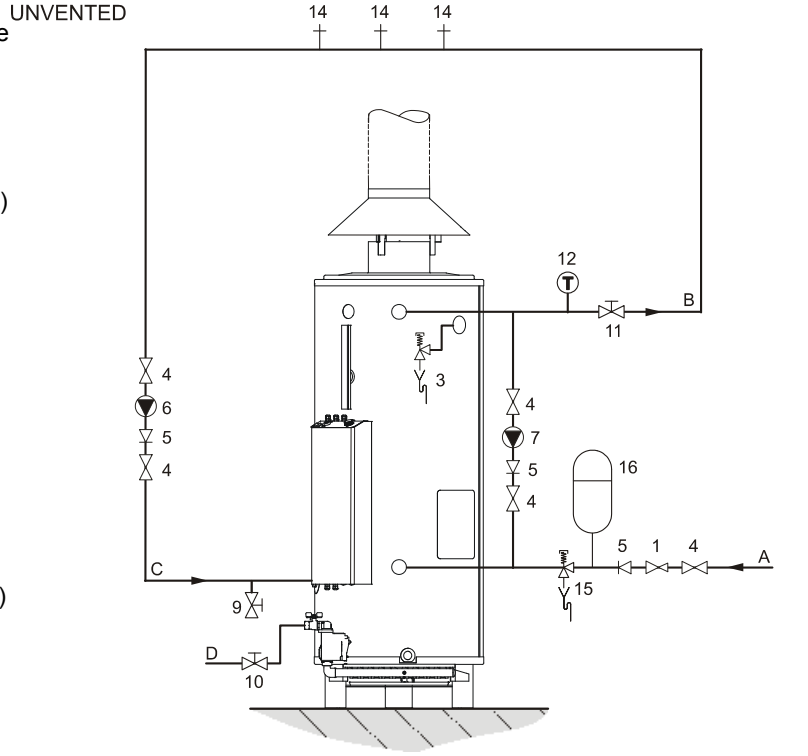
Legend

Unused numbers are not applicable

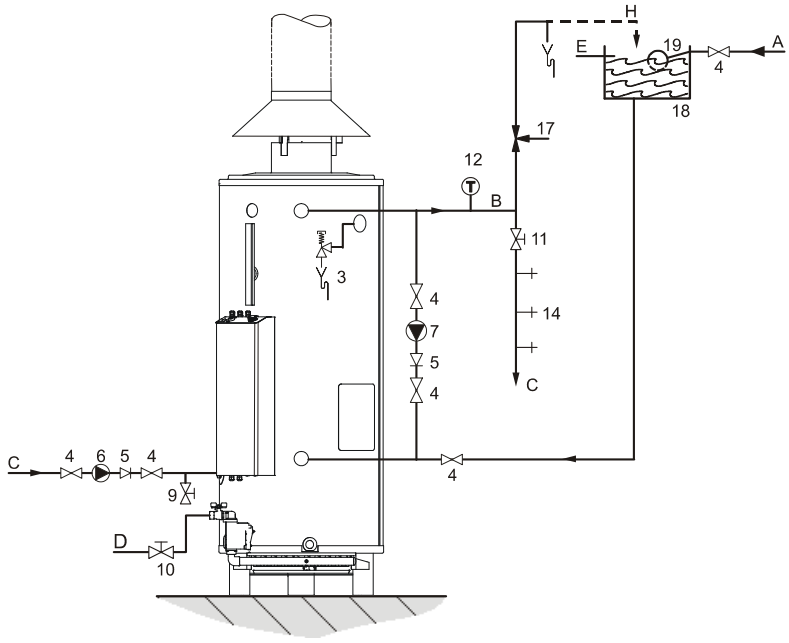
1. pressure reducing valve (mandatory)
3. T&P valve (mandatory)
4. stop valve (recommended)
5. non-return valve (mandatory)
6. circulation pump (optional)
7. top to bottom circulation pump (optional)
9. drain valve
10. manual gas valve (mandatory)
11. service stop valve (mandatory)
12. temperature gauge (recommended)
14. draw-off points
15. expansion valve (mandatory)
16. expansion vessel (mandatory)
17. 3-way aeration valve (recommended)
18. cold water head tank
19. float switch

A. cold water supply
B. hot water supply
C. circulation pipe
D. gas supply
E. overflow pipe
H. overflow protection

UNVENTED



VENTED

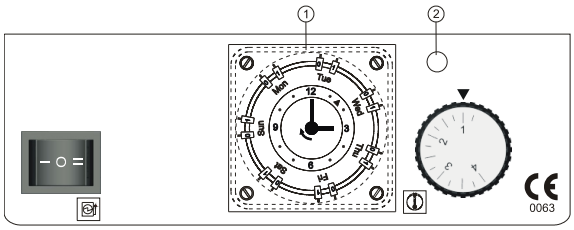


IMD-0494 R0

6.1 Draining unvented installations

Some service activities require the water heater to be drained. The procedure is as follows:

1. Shut down the appliance by setting the ON/OFF switch on the control panel to **position 0**.



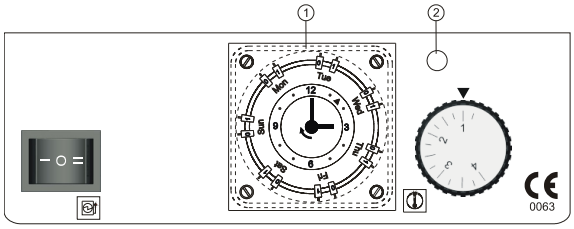
IMD-0495 R0

2. Isolate the water heater from the power supply by putting the isolator between the appliance and the mains power supply to position 0.
3. Shut off the gas supply (10).
4. Close the stop valve (11) in the hot water pipe.
5. Close the supply valve of the cold water supply (A).
6. Open the drain valve (9).
7. Bleed the appliance (or installation) so that it drains completely.

6.2 Draining vented installations

Some service activities require the water heater to be drained. The procedure is as follows:

1. Shut down the appliance by setting the ON/OFF switch on the control panel to **position 0**.



IMD-0495 R0

2. Isolate the water heater from the power supply by putting the isolator between the appliance and the mains power supply to position 0.
3. Shut off the gas supply (10).
4. Close the stop valve (11) in the hot water pipe.
5. Close the stop valve (4) between the cold water head tank and the cold water inlet.
6. Open the drain valve (9).
7. Bleed the appliance (or installation) so that it drains completely.

7 The control panel

7.1 Introduction

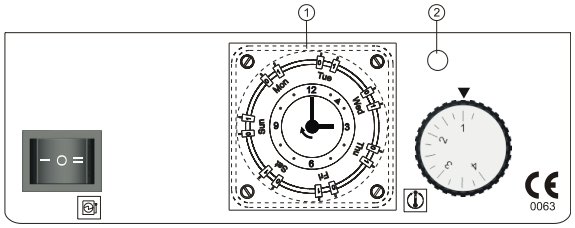
Topics covered in this chapter, in sequence:

- Control panel
- Explanation of icons
- On/off switch
- Control thermostat
- Weekly timer circuit;
- Flue gas thermostat reset button.

7.2 Control panel

This figure shows the control panel.

The control panel



IMD-0495 R0

The control panel comprises:

- an ON/OFF switch (with positions **I/0/II**);
- a control thermostat with rotary knob;
- a weekly timer (optional);
- a Power Anode indicator LED (optional).

7.3 Explanation of icons

The table explains the meanings of the icons.

Icons and their meaning

	Name	Meaning
	ON/OFF switch	Sets appliance mode to 'ON', 'Week Program' or 'OFF'.
	Temperature control	Set water temperature (Tset)
1	weekly timer	Sets the weekly water heating program
2	Power Anode indicator lamp	Shows Power Anode status

7.4 On/off switch

Using the ON/OFF switch, set the appliance to the ON mode (position 'I'), OFF mode (position '0'), or the weekly program mode (position 'II'). See 'Operating modes'.

The appliance remains live, even when in the OFF mode. This ensures that the frost protection remains activated.

Note
To isolate the appliance electrically, you must use the isolator between the appliance and the mains power supply.

7.5 Control thermostat

Use the rotary knob on the control thermostat to set the desired water temperature to between ±40°C and ±70°C. The knob rotates over a scale of 1 to 4. The table shows the temperatures corresponding to each position.

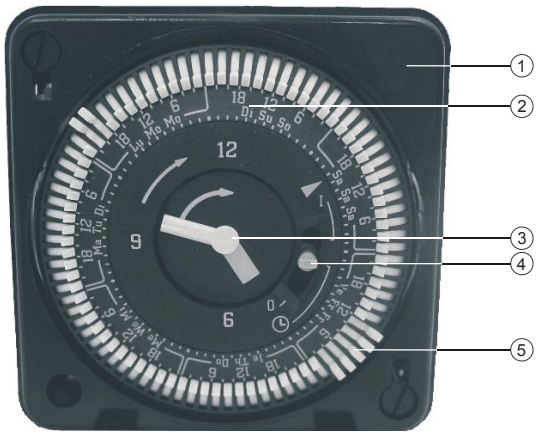
Temperature setting

Position	Temperature
1	approx. 40°C
2	approx. 50?
3	approx. 60?
4	approx. 70?

7.6 Weekly timer circuit

Optionally, you can use the week timer to program when the appliance must fulfil demand. Set the ON/OFF switch to the 'II' position to activate the weekly timer circuit.

Weekly timer



Legend

1 timer
2 weekly disc
3 pointers
4 manual switch
5 tabs

The weekly disk (2) of the timer (1) is divided into seven one-day segments: 'Monday' through 'Sunday'. Each day is divided into 12 segments of 2 hours each by the setting tabs (5).

To set a two-hour period during which the appliance must respond to demand, press the tab for that period outwards.

The current time can be read from the (12-hour) clock hands (3).

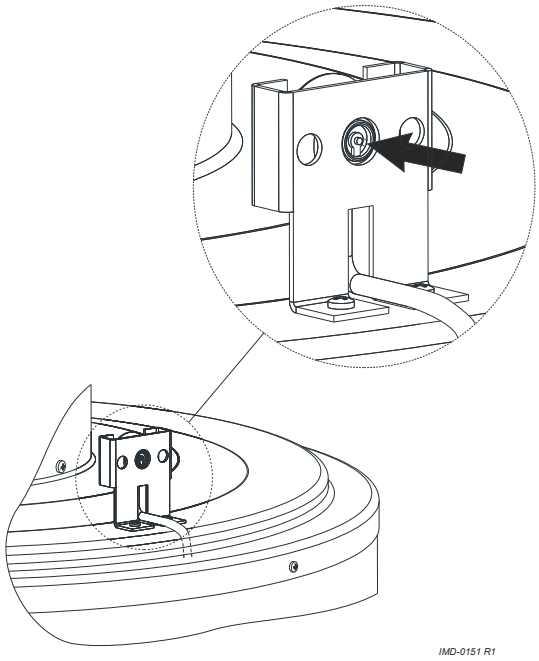
Set the day and time as follows: to set roughly, turn the week disk (2) in the direction of the arrow until the current day of the week is aligned with the marker arrow; for fine setting, turn the large hand clockwise until the current time is set. The manual switch (4) must always be in the central position (this activates the timer program).

7.7 Flue gas thermostat reset button

A malfunction in the flue gas discharge, e.g. a blockage in the chimney, can lead to the flue gas thermostat locking out. This state is evident when the push button on the flue gas thermostat has been activated (refer to the figure). Once the cause has been removed, and the sensor has cooled down sufficiently, press this push button to reset (if the sensor is not sufficiently cooled down, the flue gas thermostat will immediately lock out again). The appliance will then automatically start up again, if there is demand. If this is not the case, please consult the error condition summary (11 "Errors").

Note
The draught diverter may be hot.

Flue gas thermostat reset button



8 Status of the water heater

8.1 Introduction

Topics covered in this chapter, in sequence:

- Operating modes;
- Power Anode status;
- Error conditions.

8.2 Operating modes

When running, the appliance has three basic operating modes, namely:

- **ISOLATED**

  In this mode the appliance is off and all components are electrically dead.

  - The isolator (switch between the appliance and the power supply) is turned off.
  - On the control panel, the on/off switch is at **position 0**.

- **OFF**

  In this mode, the frost protection is activated.

  - The isolator is set to position I.
  - On the control panel, the on/off switch is at **position 0**.

- **ON**

  In this mode the appliance continuously fulfils demand.
  On the control panel:

  - the on/off switch is in **position I**
  - The water temperature can be set using the rotary button on the control thermostat (7.5 "Control thermostat").

8.3 Power Anode status

If the appliance is fitted with a Power Anode, there is an extra indicator lamp on the operating panel. Depending on the status of the appliance, this lamp will be lit either green or red, or it will be off:

- **Green**

  This state indicates that the Power Anode is working correctly.

- **Red**

  This state indicates an error, and the Power Anode is not working.

- **Off**

  This state indicates that the Power Anode is not working.

Note
If there is an error with the Power Anode (red), or if the Power Anode is not working (off), this will have no effect on the hot water supply.

8.4 Error conditions

If the appliance has an error, heat demand will be (temporarily) ignored. There are various types of errors, divided into three groups:

- **Gas control lockout errors**

  In this case the gas control's safety valve is closed, as a result of which the pilot flame is extinguished. Once this error has been rectified, the pilot flame must be re-lit (9.2 "Starting the appliance").

- **Blocking errors**

  In this case the gas control's main valve is closed. Despite a possible demand, combustion is stopped although the pilot flame remains ignited. These conditions disappear automatically once the cause of the error has been eliminated. The appliance then starts running again spontaneously.

- **Lockout error from the flue gas thermostat**

  This error condition has much the same characteristics as a 'Blocking error'. The difference here is that the lockout (push button) for the flue gas thermostat in the draught diverter is activated (7.5 "Control thermostat"). After removing the cause, the push button must be pressed to re-start the appliance.

The cause of the error cannot be seen on the control panel. For a detailed overview of error conditions, please refer to the 'Errors (11 "Errors")'.

If you as an end user come across the appliance when it is in an error status, you can attempt to start the device up (9.2 "Starting the appliance").

However, if the error returns or occurs several times in a short time, you must contact your service and maintenance engineer.

8

Status of the water heater



9 Starting the water heater

9.1 Introduction

Topics covered in this chapter, in sequence:

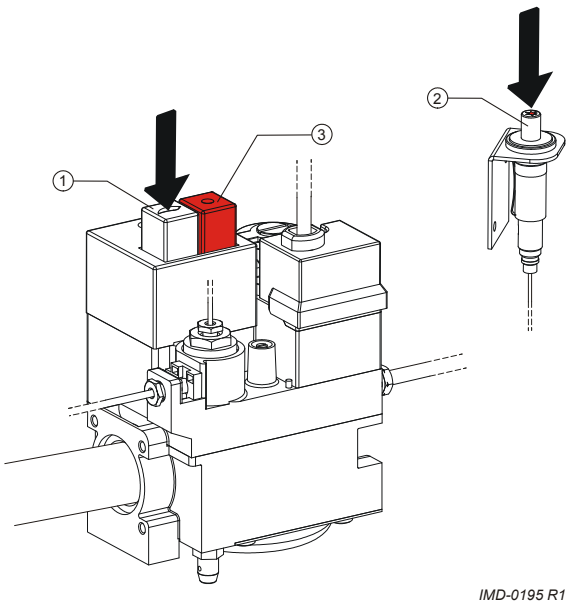
- Starting the appliance.
- The appliance's heating cycle.

9.2 Starting the appliance

Start the water heater as follows:

1. Fill the water heater (5 "Filling").
2. Open (3.5 "Installation diagram") the manual gas valve.
3. Switch on the power to the water heater using the isolator between the water heater and the power supply.
4. Begin the ignition procedure by pressing and holding the white button (1) on the gas control while repeatedly pressing the piezo igniter (2) until the pilot flame ignites. See the figure. The pilot flame can be seen through the inspection window above the burner tray.

Gas control



IMD-0195 R1

5. Keep the white button pressed in for about 30 seconds before carefully releasing it. The pilot flame should now stay lit.
6. Set the appliance in the "ON" mode by setting the on/off switch on the control panel to position I.
7. Set the desired water temperature using the control thermostat (7.5 "Control thermostat").

If there is a heat demand, the appliance will run through the heating cycle (9.3 "The appliance's heating cycle").

Warning
If the pilot flame goes out during the heating cycle or ignition procedure, you must wait 5 minutes before repeating the ignition procedure.

9.3 The appliance's heating cycle

The appliance's heating cycle is activated when the measured water temperature (T_{water}) falls below the threshold value (T_{set}). T_{set} can be adjusted using the control thermostat, for example position 3 (± 60°C).

The heating cycle runs successively through the following states:

1. HEAT DEMAND;
2. IGNITION;
3. RUNNING

The complete cycle is explained in the example set out below.

1. The control thermostat sensor measures the water temperature (T_{water}). If T_{water} drops below the set temperature (T_{set}), there is demand and the control thermostat will close. This will cause the gas control to open.
2. Once the gas control is open, the pilot burner will ignite the gas flow.
3. The appliance is now running. This means that actual heating has started. When the water reaches the set temperature, the demand ceases. The gas control closes and the burner tray is extinguished (the pilot flame stays lit).
4. The appliance is now said to be in an idle state, waiting until T_{water} once again falls below T_{set}.

With any subsequent heat demand, the heating cycle will resume from step 1.

Starting the water heater



10 Shutting down

10.1 Introduction

You can:

- Shutting the appliance down for a brief period ("OFF" mode)
- Isolating the appliance from the mains
- Shutting the appliance down for a long period.

10.2 Shutting the appliance down for a brief period ("OFF" mode)

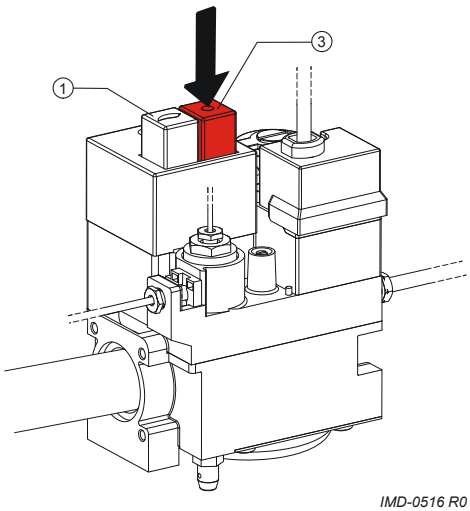
To shut down the appliance for a brief period, you can set the appliance in 'OFF mode'. Activate frost protection by switching the on/off switch on the control panel to the 0 position. The pilot flame will remain on.

10.3 Isolating the appliance from the mains

The appliance may only be isolated from mains power in the correct way. The correct procedure is as follows:

1. Shut down the appliance by putting the ON/OFF switch to position 0.
2. Isolate the appliance from the power supply by setting the isolator between the appliance and the mains power supply to position 0.
3. The pilot flame will remain on, but you can extinguish it if required by pressing the red button (3) on the gas control (see the figure).

Gas control



IMD-0516 R0

Note
The "OFF" and "Isolated" operating modes are advisable only if there is no risk of frost. If frost can be expected, you will need to drain the appliance, see Shutting the appliance down for a long period.

10.4 Shutting the appliance down for a long period

If the device is to be shut down for a longer period, you must drain the appliance (6 "Draining").





11 Errors

11.1 Introduction

This chapter covers the following errors:

- Gas smell
- Water leakage
- Explosive ignition.
- Poor flame profile.
- Power Anode.
- No hot water
- Insufficient hot water

11.2 Troubleshooting table for general errors

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

General faults and failures

Feature	Cause	Measure	Comment
Gas smell	Gas leak	**Warning** Close the main gas valve at once. **Warning** Do not operate any switches. **Warning** No naked flames. **Warning** Ventilate the boiler room.	**Note** Immediately contact your installation engineer or local gas company.
Water leakage	Leakage from a water connection (threaded)	Tighten the threaded connection	If the leak persists, consult your installation engineer
	Leakage from another nearby water water heater or pipe segment	Trace the leak	
	Leakage from the water heater tank	Consult the supplier and/or manufacturer	
	Condensation	Before drawing off (too much) hot tap water, wait until the water in the heater has reached the set temperature.	
Explosive ignition Poor flame profile	Incorrect supply pressure and/or burner pressure	Set the correct supply pressure and/or burner pressure. (3.11 "Checking the supply pressure and burner pressure")	If ignition is not improved, consult your installation engineer.
	Contaminated burner	Clean the burner(s) (12.4.2 "Clean the burner(s)")	
	Contaminated orifice	Clean the orifice(s) (12.4.3 "Clean the orifice(s)")	
	Inadequate air supply	Improve the air supply by better ventilating the boiler room.	

Feature	Cause	Measure	Comment
Power Anode			If the error cannot be rectified, contact your installation engineer
• Indicator lamp is red	• Anodes not making contact with the water • Break in one of the cables • Anode poorly earthed	4. Check to see that all connections have been made properly 5. Check that the Power Anode is properly connected; see Electrical Diagram (14 "Electrical diagram"). 6. Check to see that all connections have been made properly 7. Check all cables for breaks and replace if any are found.	
• Indicator lamp is off	No electrical supply to the potentiostat	Check the electrical supply	

11.3 Troubleshooting table - 'no hot water'

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

No hot water

Feature	Cause	Measure	Comment
No ignition (pilot flame LIT)	No supply voltage present	1. Check whether the isolator is ON. 2. Check whether there is power to the isolator The measured voltage must be 230 V_{AC} (-15%, +10%)	If ignition is not improved, consult your installation engineer.
Pilot flame OUT	Pilot flame blown out	1. Start the appliance up (9 "Starting the water heater")	If the error cannot be resolved or is persistent, contact your installation engineer
	No gas	1. Check that the gas valve is open 2. Check whether the gas control is opening (clicking of the gas control) 3. Check the leads of the gas control	
	The safety thermostat has cut out without apparent reason.	1. The safety thermostat has cut out correctly: - Check whether the control thermostat is working - Check whether the high-limit thermostat is working - Check that the circulation pump (if present) is working 2. The safety thermostat has cut out without apparent reason: - Check whether the thermostat is defective - Check whether the sensor of the thermostat is defective	

11.4 CH Troubleshooting table - 'insufficient hot water'

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

Insufficient hot water

Feature	Cause	Measure	Comment
Insufficient hot water	Water temperature setting (T_{set}) is too low	1. Set the control thermostat (7.5 "Control thermostat") to a higher value	
	Hot water supply is used up	1. Reduce hot water consumption and give the water heater time to heat up. 2. If this error persists, check whether the high-limit thermostat is switching. If this is the case, check that the circulation and/or top to bottom circulation pump are working.	If the error has not been rectified, and no other cause can be found, isolate the appliance from the mains (10.3 "Isolating the appliance from the mains"), shut off the manual gas valve and alert your installation engineer.

12 Performing maintenance

12.1 Introduction

Caution
Maintenance may only be performed by a qualified service and maintenance engineer.

At each service, the appliance undergoes maintenance on both the water side and the gas side. The maintenance must be carried out in the following order.

1. Water-side maintenance
2. Water-side maintenance
3. Gas-side maintenance
4. Finalising maintenance

Note
To order spare parts, it is important to write down the appliance type and model, and the full serial number of the appliance. These details can be found on the rating plate. Only by ordering with this information can you be sure to receive the correct spare parts.

12.2 Preparation for maintenance

To test whether all components are still working properly, complete the following steps:

5. Check the supply and burner pressures (3.11 "Checking the supply pressure and burner pressure") and adjust them if necessary.
6. Also check that this is running properly during the The appliance's heating cycle.
7. Check that all components of the chimney flue system are properly attached.
8. Test the operation of the overflow valve of the protected cold supply setup. The water should spurt out.
9. Test the overflow operation of the T&P valve. The water should spurt out.
10. Check the drainage pipes from the discharge points of all valves and remove any scale deposits that may be present.
11. Drain the appliance (6 "Draining").

12.3 Water-side maintenance

12.3.1 Introduction

The following steps must be carried out on the water side:

1. Checking the anodes.
2. Descaling and cleaning the tank.

12.3.2 Checking the anodes

Timely replacement of the anodes extends the service life of the appliance. The appliance's anodes must be replaced as soon as they are 60% or more used up (take this into consideration when determining the maintenance frequency).

1. Disconnect the plug of the flue gas thermostat from the connector on the appliance.
2. Disconnect the draught diverter from the flue gas discharge.

3. Unscrew the screws from the lid on top of the appliance.
4. Remove the lid from the appliance, including the draught diverter.
5. Remove the sealing ring from the appliance.
6. Loosen the anodes using suitable tools.
7. Check the anodes, and if necessary, replace them.
8. Now also check the flue baffles (12.4.4 "Checking the flue baffles"). Replace them, if necessary.
9. Place a new sealing ring on the rim of the tank and re-fit the lid.
10. Insert the plug of the flue gas thermostat into the connector on the appliance.

Note
You can also use low-maintenance anodes ('Power Anodes') with this appliance. These are available as an accessory and can be ordered separately. Please refer to the instructions with these anodes for how to use them, or discuss it with the installer.

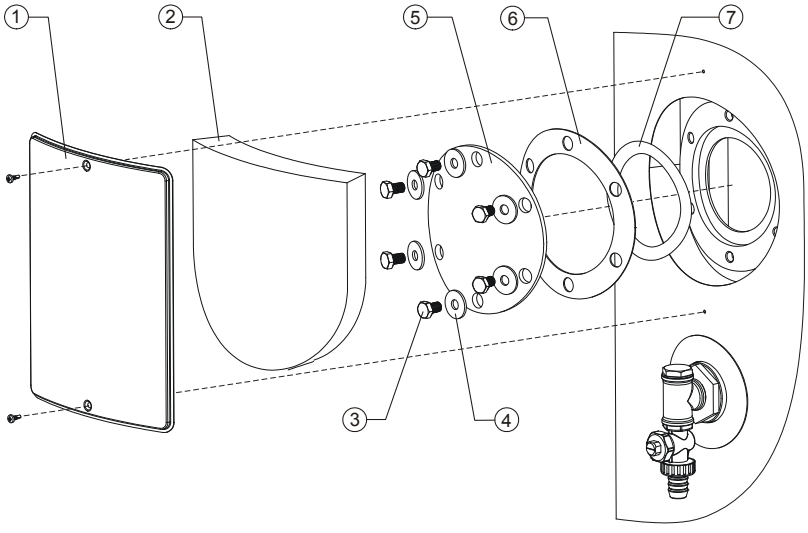
12.3.3 Descaling and cleaning the tank

Scale and lime build-up prevent effective conduction of the heat to the water. Periodic cleaning and descaling prevents build-up of these deposits. This increases the service life of the water heater, and also improves the heating process.

Take the rate of scale formation into account when deciding on the service interval. Scale formation depends on the local water composition, the water consumption and the water temperature setting. A water temperature setting of maximum 60°C is recommended for the prevention of excessive scale build-up.

To guarantee a good, watertight seal around the cleaning opening, replace the gasket (6), the O-ring (7), washers (4), bolts (3) and if necessary the lid (5) with new parts before reassembly (see diagram). A special set is obtainable from the supplier/manufacturer.

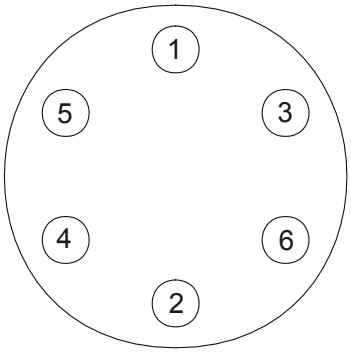
To simplify descaling and cleaning of the tank, the appliance is equipped with two cleaning openings.



IMD-0235 R2

1. Remove the cover plate (1) on the outer jacket (see the figure).
2. Carefully remove the insulation (2) and set it to one side. This will be needed again later.

3. Undo the bolts.
4. Remove the lid, the gasket and the O-ring.
5. Inspect the tank and remove the loose scale deposits and contamination.
6. If the scale cannot be removed by hand, descale the appliance with a descaling agent. Contact the supplier/manufacturer for advice on what descaling agent to use.



IMD-0282 R1

7. Close the cleaning opening. To avoid damage to the tank, tighten the bolts that fasten the lid with a torque no greater than 50 Nm. Use suitable tools for this. To seal the cleaning opening properly, we recommend tightening the bolts in the sequence shown in the diagram.

12.4 Gas-side maintenance

12.4.1 Introduction

The following steps must be carried out on the gas side:

1. Clean the burner(s).
2. Clean the orifice(s).
3. Checking the flue baffles.

12.4.2 Clean the burner(s)

1. Detach the burner(s)
2. Remove all contamination present on the burner(s).
3. Fit the burner(s)

12.4.3 Clean the orifice(s)

1. Detach the orifice(s)
2. Remove all contamination present in the orifice(s).
3. Fit the orifice(s)

12.4.4 Checking the flue baffles

Warning
The flue baffles can be hot.

1. Remove the flue baffles from the appliance.
2. Check the flue baffles for the presence of corrosion, removing this if necessary.
3. Check the flue baffles for wear, and replace the flue baffles if necessary.

12.5 Finalising maintenance

To finalise the maintenance, carry out the following steps:

1. Fill the appliance (5 "Filling").
2. Start the appliance up (9 "Starting the water heater")

13 Warranty (certificate)

13.1 General warranty

If within 1 (one) year of the invoice date or commissioning date of a water heater supplied by Lochinvar Ltd, following verification, and at the sole discretion of Lochinvar Ltd, an assembly or part (with exclusion of the tank) proves to be defective or fails to function correctly due to manufacturing and/or material defects, then Lochinvar Ltd shall repair or replace this assembly or part.

13.2 Tank warranty

If within 3 (three) years of the invoice date or commissioning date of a water heater supplied by Lochinvar Ltd, following verification, and at the sole discretion of Lochinvar Ltd, the enamel-lined steel tank proves to be leaking due to rust or corrosion occurring on the water side, then Lochinvar Ltd shall offer to replace the defective water heater with an entirely new water heater of equivalent size and quality The warranty period given on the replacement water heater shall be equal to the remaining warranty period of the original water heater that was supplied.

13.3 Conditions for installation and use

The warranty set out in articles 1 and 2 will apply solely under the following conditions:

a. The water heater is installed under strict adherence to Lochinvar Ltd installation instructions for the specific model, and must be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations and the byelaws of the local water undertaking. The installation should also be in accordance with any relevant requirements of the local gas distributor and local authority.

b. The water heater remains installed at the original site of installation.

c. The water heater is used exclusively with drinking water, which at all times can freely circulate (a separately installed heat exchanger is mandatory for heating saline water or corrosive water).

d. The tank is safeguarded against harmful scaling and lime build-up by means of periodic maintenance.

e. The water temperatures in the heater do not exceed the maximum setting of the thermostats, which form a part of the water heater.

f. The water pressure and/or heat load do not exceed the maximum values stated on the water heater rating plate.

g. The water heater is installed in a non-corrosive atmosphere or environment.

h. The water heater is connected to a protected cold supply arrangement, which is: approved by the relevant authority; with sufficient capacity for this purpose; supplying a pressure no greater than the working pressure stated on the water heater; and where applicable by a likewise approved temperature and pressure relief valve, fitted in accordance with installation instructions of Lochinvar Ltd applying to the specific model of water heater, and further in compliance with Building Regulations, local authority installation byelaws and the Water Supply (Water Fittings) Regulations 1999 .

i. The water heater is at all times fitted with cathodic protection. If sacrificial anodes are used for this and these anodes have reduced in size by more than 40% at any point along their length or if they are severely pitted, new anodes should be fitted. Particular attention should be paid to the ends of each anode to ensure excessive localized depletion has not



occurred. Where anodes are covered with particles they should be cleaned; for reference, when new, the anode has a diameter of 21 mm. When power anodes are used, it is important to ensure that they continue to work properly.

13.4 Exclusions

The warranty set out in articles 1 and 2 will not apply in the event of:

a. damage to the water heater caused by an external factor;

b. misuse, neglect (including frost damage), modification and incorrect and/or unauthorized use of the water heater;

c. contaminants or other substances having been allowed to enter the tank;

d. any attempts at repair to a defective water heater other than by an approved service engineer.

13.5 Scope of the warranty

The obligations of Lochinvar Ltd pursuant to the specified warranty are limited to free delivery from the warehouse of the replacement assemblies, parts or water heater, respectively. Labor, installation and any other costs associated with the replacement will not be accepted by Lochinvar Ltd.

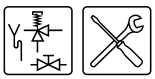
13.6 Claims

A claim on grounds of the specified warranty must be submitted to the dealer from whom the water heater was purchased, or to another authorized dealer of Lochinvar Ltd. Inspection of the water heater as referred to in articles 1 and 2 shall take place in one of the laboratories of Lochinvar Ltd

13.7 Obligations of Lochinvar Ltd

Lochinvar Ltd grants no other warranty or guarantee over its water heaters nor the (assemblies or parts of) water heaters supplied for replacement, other than the warranty expressly set out in these conditions.

Under the terms of the supplied warranty, Lochinvar Ltd is not liable for damage to persons or property caused by (assemblies or parts, or the glass-lined steel tank of) a (replacement) water heater that it has supplied.

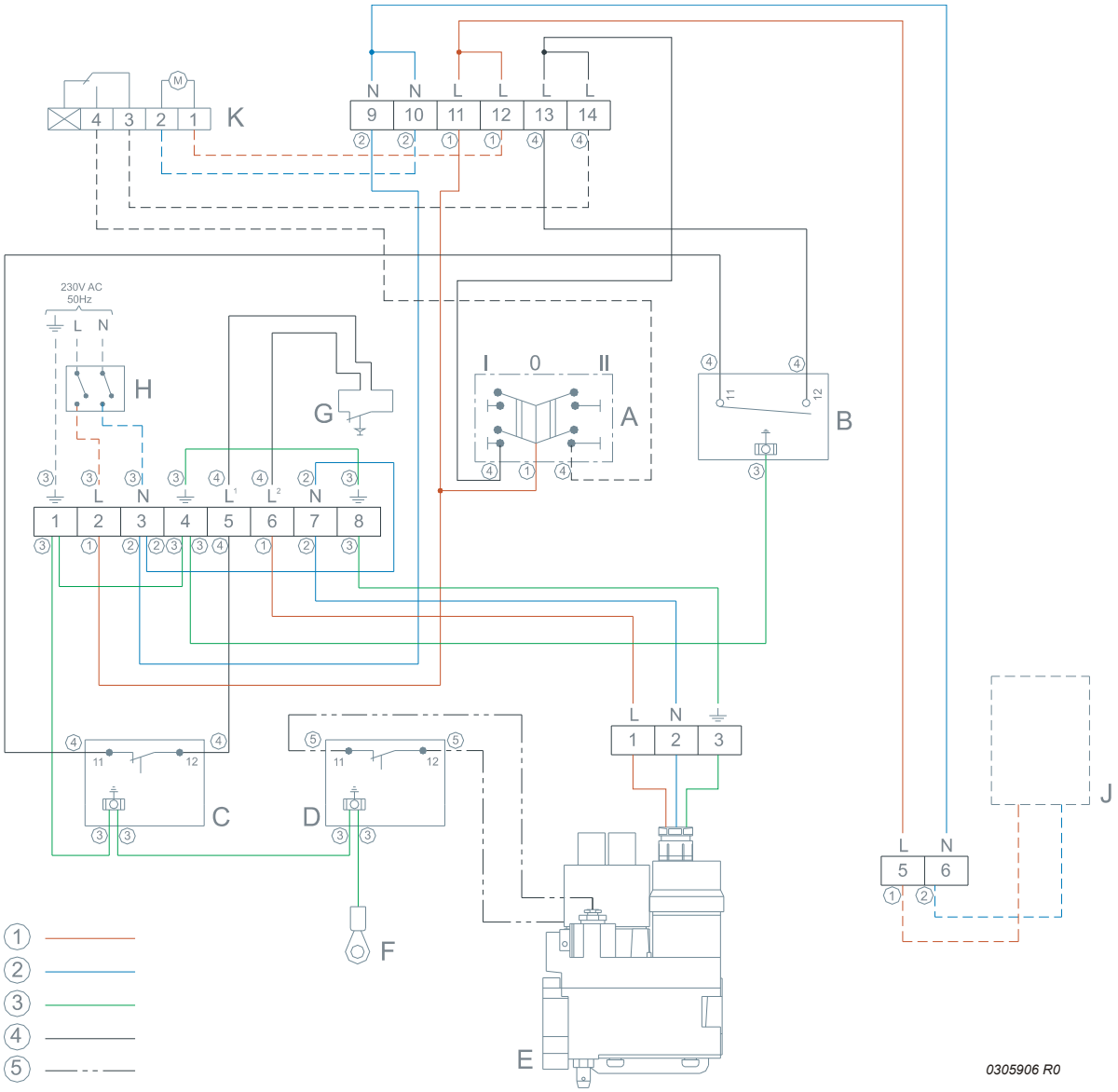


14 Electrical diagram

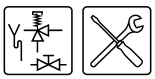
14.1 Introduction

This chapter shows the electrical diagram(s) and accompanying legend.

Electrical diagram



1 = brown, 2 = blue, 3 = yellow/green, 4 = black, 5 = white



TERMINAL STRIP CONNECTIONS:

⏚	Earth
N	Neutral
L	Phase
L^1	Phase input of thermal reflux safeguard
L^2	Phase input of controller

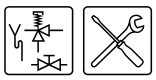
COMPONENTS:

A	ON/OFF switch
B	Control thermostat
C	High-limit thermostat
D	Safety thermostat
E	Gas control
F	Eye terminal (for earthing to the Jacket)
G	Thermal reflux safeguard

OPTIONAL COMPONENTS

H	Control isolator
J	CORREX Power Anode control
K	Weekly timer circuit

Electrical diagram



15 Declaration of Conformity

CE

Lochinvar
High Efficiency Water Heaters and Boilers

EEC - Declaration of Conformity

Supplier: **Lochinvar Limited**
7 Lombard Way
The MXL Centre
Banbury - United Kingdom

hereby declares that the following products:

Product description: **Commercial Gas Fired Storage Water Heater**

Product models: **CH 100, CH 155, CH 200, CH 300, CH 400, CH 500, CH 600**

on the assumption that the installation instructions have been followed are compliant to:

Gas Appliance Directive - 90/396/EC
Standards used:
- EN89: 1999
- EN50165: 1997

Low Voltage Directive - 2006/95/EC
Standards used:
- EN60335-1: 1994
- EN50165: 1997

EMC Directive - 2004/108/EC
Standards used:
- EN55014-1: 1993
- EN55014-2: 1997
- EN61000-3-2: 1995
- EN61000-3-3: 1995
- EN50165: 1997

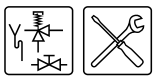
as stated in the EC type-examination report by KIWA-Gastec Certification BV, the Netherlands.

Company: Lochinvar Limited

Date: March 1, 2012

Signature:

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Index

A
ambient conditions 18
ambient temperature 18

B
burner pressure 30

C
connecting the circulation pipe 25, 26
connecting the cold water side 24, 25
connecting the hot water side 24
control thermostat 41
conversion to a different gas category 33

D
document contents 9
draining 39

E
electrical connection 28

F
filling 37
flame probe 14

G
gas category, conversion to different 33
gas connection 27
general specifications 3

H
humidity 18

I
installation diagram 23
installation engineer 8, 9
isolator 29

J
join
- circulation pipe 25, 26
- cold water side 24, 25
- electrical 28, 29
- gas 27
- hot water side 24
- shuntleiding 24, 25

L
liability 3

M
mains power 29
maintenance
- anode 54
- burner 55
- finalizing 56
- gas-side 55
- orifice 55
- performing 53
- water-side 53

N
notation conventions 9

O
operating cycle 13

P
packaging 17
protection 13

S
scale 54
service 8
service engineer 8
shutting down
- electrically isolating 47
- long period 47

specifications 19
supply pressure 30
symbol
- installation engineer 8
- service engineer 8
- user 8

T
target groups 8
top to bottom circulation pump 24, 25
trademarks 3

U
user 8