Lochinvar®
High Efficiency Water Heaters and Boilers

Charger

Installation, Commissioning, User & Maintenance Instructions

Direct Gas Fired Floor Standing Water Heater with Automatic Pilot Ignition

Models:
CHA 100 G CE and PG CE
CHA 155 G CE and PG CE
CHA 200 G CE and PG CE
CHA 300 G CE and PG CE
CHA 400 G CE and PG CE
CHA 500 G CE and PG CE
CHA 600 G CE and PG CE
CHA 700 G CE and PG CE

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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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In the event of problems with your gas, electricity or water supply connections, please contact the supplier/installation engineer of your installation.



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1 Introduction

1.1 About the appliance

This manual describes how to install, service and use the CHA appliance. The CHA 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 CHA is an appliance of type B_{11BS}.

The information in this manual applies to types: CHA 100, CHA 155, CHA 200, CHA 300, CHA 400, CHA 500, CHA 600 and CHA 700.

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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.

Comment
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

Note
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.

Note
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.

Comment
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.

Comment
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.

Comment
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:

Comment
Important information.

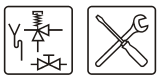
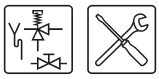
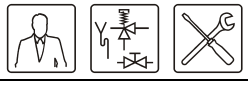
Note
Ignoring this information can lead to the water heater being damaged.

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.
Warranty (certificate)		This chapter states the warranty terms and conditions.



2 Working principle of the water heater

2.1 Introduction

This chapter covers the following topics:

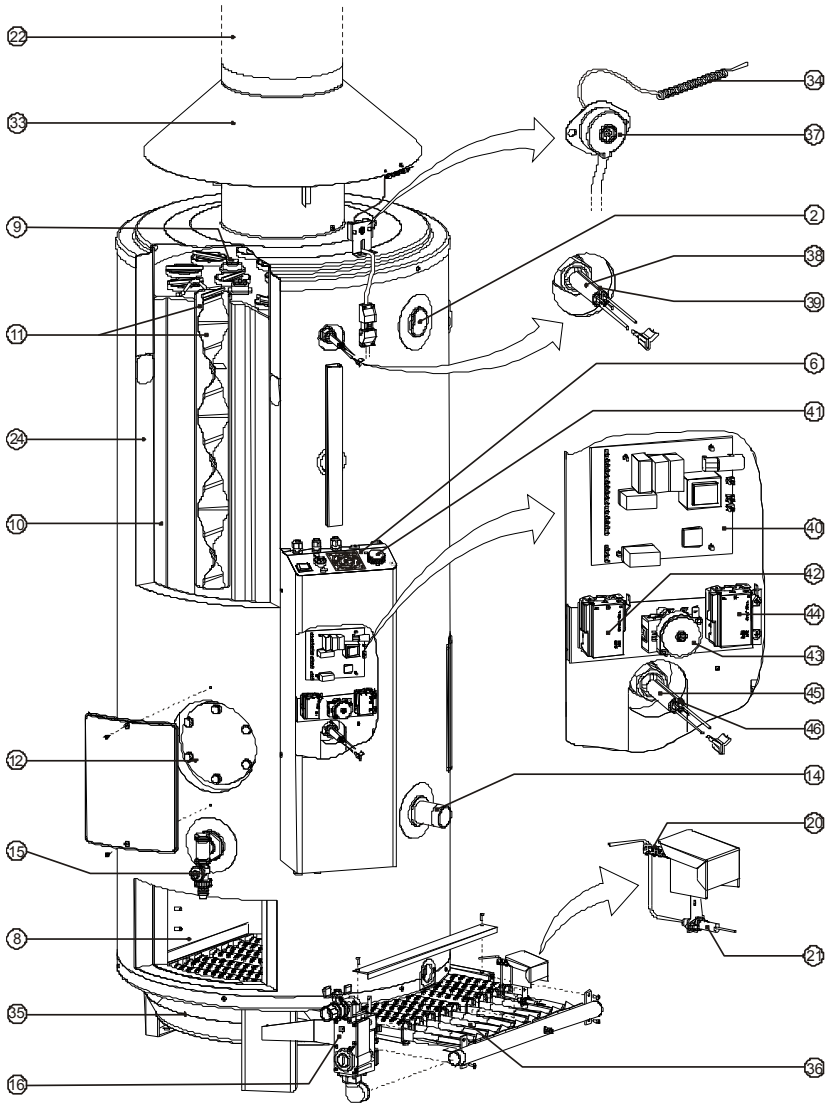
- General working principle of the water heater;
- Water heater operating cycle;
- Protection for the water heater;
- Safety of the installation.

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
20. hot surface igniter
21. flame probe
22. chimney flue
24. insulation layer
33. draught diverter
34. flue gas thermostat sensor
35. radiation shield/condensation tray
36. bar burners/burner tray
37. flue gas thermostat
38. safety thermostat sensor
39. high-limit thermostat sensor
40. burner control
41. control thermostat
42. high-limit thermostat
43. safety thermostat
44. frost thermostat
45. control thermostat sensor
46. frost thermostat sensor



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Working principle of the water heater



In this appliance, the cold water enters the bottom of the tank through the cold water inlet (14). The heat of combustion is conducted to the water by the combustion chamber (8) and flue tubes. The heated tap water leaves the tank through the hot water outlet (2). 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 gas required for combustion flows via the gas control (16) into the manifold. There are orifices in the manifold. The gas is injected into the burner bars at pressure from these orifices (36). 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.

The hot surface igniter (20) ensures ignition of the gas/air mixture.

The flue gases released by this combustion are led through the flue tubes of the heat exchanger (11). Flue baffles 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 (33).

A radiation shield/condensation tray (35) 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 (24) prevents heat loss. The inside of the tank is enamelled to protect against corrosion. The anodes (9) offer extra protection.



2.3 Water heater operating cycle

The entire appliance is controlled by the burner control (40) and the control thermostat (41) or frost thermostat (44). The control thermostat and frost thermostat both independently measure 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 of T_{set} depends on the selected appliance operating mode (8.2 "Operating modes"). If the appliance is in the 'OFF' mode (frost protection), then this value is determined by the frost thermostat (threshold value = 20°C). If the appliance is in the 'ON' mode, then the threshold value is selectable via the control thermostat (±40°C to ±70°C).

As soon as T_{water} falls below T_{set}, the relevant thermostat (control or frost) will close, and the burner control will register demand. The gas control (16) is opened, and the gas is mixed with air. This mixture is ignited by the hot surface igniter (20) and the water is heated. As soon as T_{water} gets higher than T_{set}, the thermostat opens again. The demand will cease, and the burner control will stop the heating cycle.

The thermostats have 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

2.4.1 Introduction

The burner control monitors the water temperature by means of thermostats and ensures safe combustion. This is done by:

- the Water temperature protection device;
- the Flue gas backflow safeguard;
- the Flame probe;

2.4.2 Water temperature protection

By means of the frost, high-limit and safety thermostats, the burner control monitors three temperatures that are important for safety. The table explains the working principle of the thermostats with sensors.

Temperature protection

Protection	Description
Frost thermostat	When the frost thermostat sensor (46) measures a temperature of 20°C or less, the heating cycle (2.3 "Water heater operating cycle") will start.
High-limit thermostat	When the high-limit thermostat sensor (39) measures a temperature higher than 84°C, the high-limit thermostat will open. The heat demand is terminated and the burner control halts the heating cycle until the high-limit thermostats close once more. At that moment the burner control will reset the appliance and the heating cycle will restart. The high-limit safeguard serves to prevent overheating and/or excessive formation of scale in the appliance.
Safety thermostat	When the safety thermostat sensor (38) measures a temperature higher than 93°C, the safety thermostat will open. The heat demand is terminated and the burner control will immediately halt the heating cycle. The burner control will go into a lockout error state. This must be manually reset before the appliance can resume operation.

2.4.3 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 .

2.4.4 Flame probe

To ensure that no gas can flow when there is no combustion, the water heater is fitted with a flame probe (21). The burner control uses the ionisation-detecting properties of this probe for flame detection. The burner control closes the gas valve the instant it determines that there is a gas flow but no flame is present.

2.4.5 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.

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 (3.6 "Vented water connections").

Vented installation

With vented installation, excess pressure is taken up by the open cold water head tank. The head height of the 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 (3.6.3 "Hot water side"), which opens into the cold water tank.

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 (3.7.3 "Hot water side").

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.

Note
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

Note
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.

CHA 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	
CHA 100	507
CHA 155	507
CHA 200	510
CHA 300	581
CHA 400	576
CHA 500	525
CHA 600	526
CHA 700	584

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.

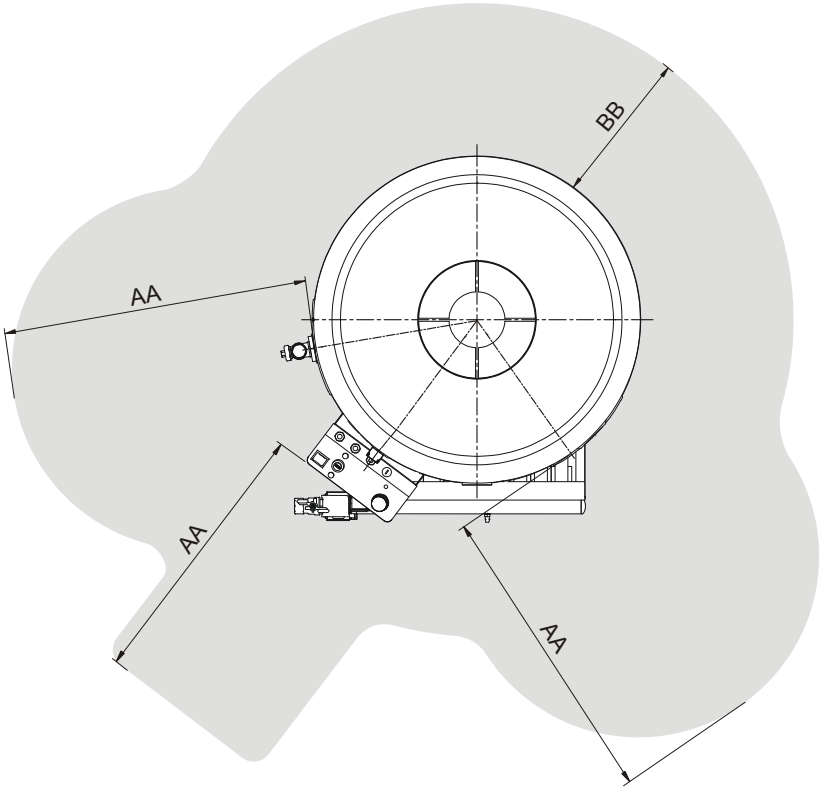
  If the available clearance is less than 100 cm, flexible magnesium anodes may be ordered.

Comment

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

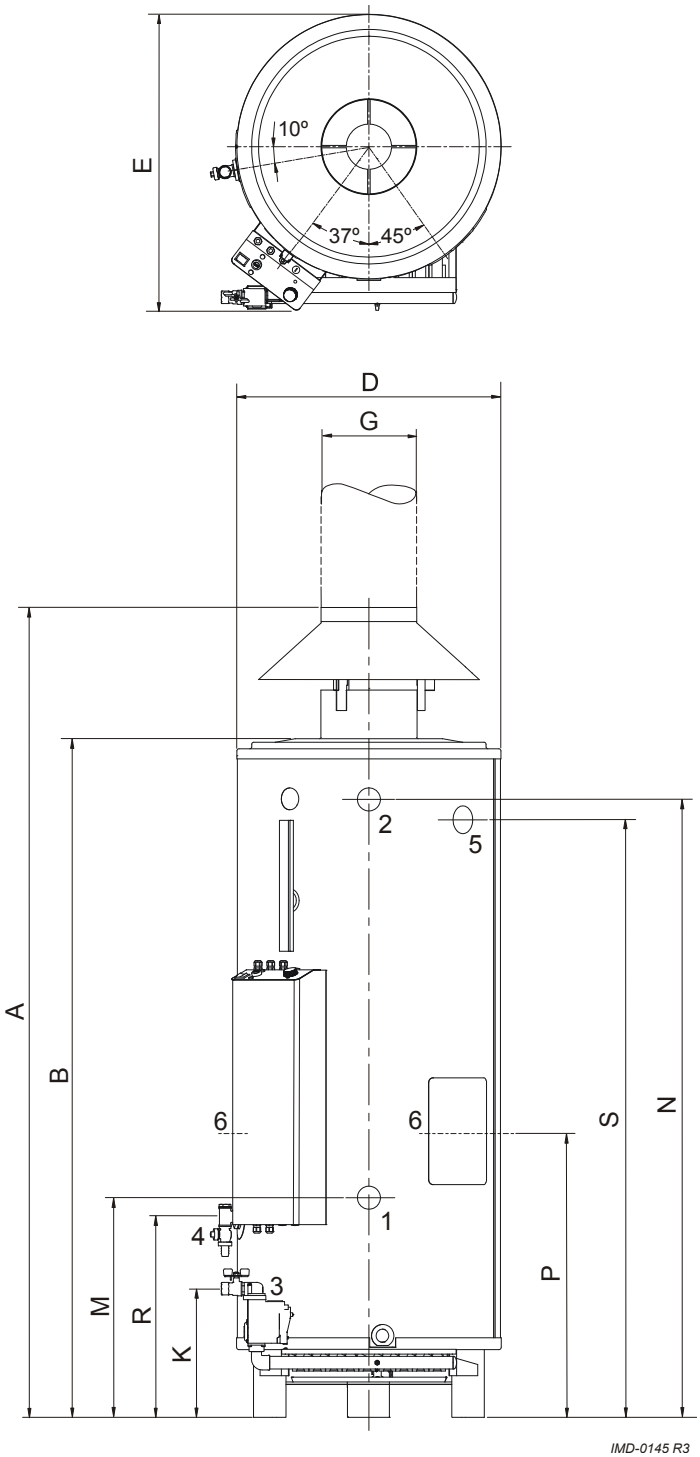
The water heater is supplied without accessories. Check the dimensions (3.4 "Technical specifications"), gas data (3.4.3 "Gas data") and other specifications (3.4.2 "General and electrical specifications") of any accessories you plan to use.

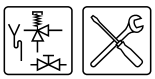
3.4.1 Dimensions of the water heater

Plan and elevation of the water heater

Legend

See the table.





Dimensions (all measurements in mm unless otherwise indicated)

	CHA 100	**CHA 155**	**CHA 200**	**CHA 300**	**CHA 400**	**CHA 500**	**CHA 600**	**CHA 700**
A) Overall height	1910	1910	1890	2155	2155	1950	2145	2145
B) Height of top of appliance	1700	1700	1700	1900	1900	1735	1810	1810
D) Diameter of appliance	710	710	710	710	710	710	710	710
F) Width	800	800	800	800	800	800	800	800
G) |Chimney flue outlet diameter	130	130	150	180	180	200	250	250
K) Gas connection height	145	145	145	145	145	145	145	145
M) Cold water supply height	505	505	505	505	505	515	590	590
N) Hot water outlet height	1545	1545	1545	1750	1750	1580	1655	1655
P) Height of cleaning opening	670	670	670	670	670	680	765	795
R) Height of drain valve connection	440	440	440	455	455	465	540	535
S) Height of T&P valve connection	1490	1490	1490	1700	1700	1700	1600	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	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	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	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	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	1-11.5 NPT
6) Cleaning/inspection opening	Ø 100	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	**CHA 100**	**CHA 155**	**CHA 200**	**CHA 300**	**CHA 400**	**CHA 500**	**CHA 600**	**CHA 700**
Capacity (litres)	309	309	298	357	335	278	253	252
Maximum operating pressure (bar)	8	8	8	8	8	8	8	8
Empty weight (kg)	198	198	212	224	241	247	273	332
Heating time dT = 45°C (minutes)	38	30	23	25	17	11	8	7
Number of anodes	2	2	2	2	3	3	4	4
Number of bar burners/orifices	3	3	4	4	7	7	9	6
Number of flue tubes/flue baffles	5	5	7	6	9	12	16	17
Electrical power consumption (W)	30	30	30	30	30	30	30	60
Supply voltage (-15% +10% VAC)	230	230	230	230	230	230	230	230
Mains frequency (±1Hz)	50	50	50	50	50	50	50	50
IP class	30	30	30	30	30	30	30	30

3.4.3 Gas data

Gas data

Description II_{2H3+}	Unit	CHA 100	CHA 155	CHA 200	CHA 300	CHA 400	CHA 500	CHA 600	CHA 700
2H: G20 - 20 mbar									
Orifice diameter	mm	2.90	3.20	3.20	3.30	2.95	3.20	3.30	3.90
(1) = Blank plate (2) = Burner pressure regulator (3) = High/low regulator	1, 2 or 3	2	2	2	2	2	2	2	2
Nominal load (gross calorific value)	kW	33.9	42.1	53.4	59.9	83.2	102.5	128.4	142.4
Nominal output	kW	25.6	31.9	40.4	45.3	62.9	77.6	97.1	107.7
Supply pressure	mbar	20	20	20	20	20	20	20	20
Burner pressure	mbar	8.5	8.6	7.8	8.5	8.5	9.2	7.8	11.5
Gas consumption (*)	m3/h	3.2	4.0	5.1	5.7	7.9	9.8	12.2	13.6
General 3+									
Injector orifice diameter	mm	1.60	1.70	1.60	1.75	1.50	1.70	1.75	2.25
(1) = Blank plate (2) = Burner pressure regulator (3) = High-low control	1, 2 or 3	1	1	1	1	1	1	1	3
G30 - 30 mbar (butane)									
Nominal load (gross calorific value)	kW	33.9	42.2	53.4	59.2	80.8	100.1	127.5	140.3
Nominal output	kW	26.3	32.7	41.4	45.9	62.6	77.6	98.8	108.8
Supply pressure	mbar	30	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	10.2
G31 - 37 mbar (propane)									
Nominal load (gross calorific value)	kW	33.1	41.4	52.8	58.2	78.4	98.3	125.5	136.2
Nominal output	kW	25.6	32.0	40.8	45.0	60.6	75.9	97.0	105.2
Supply pressure	mbar	37	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	9.7

(*) 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

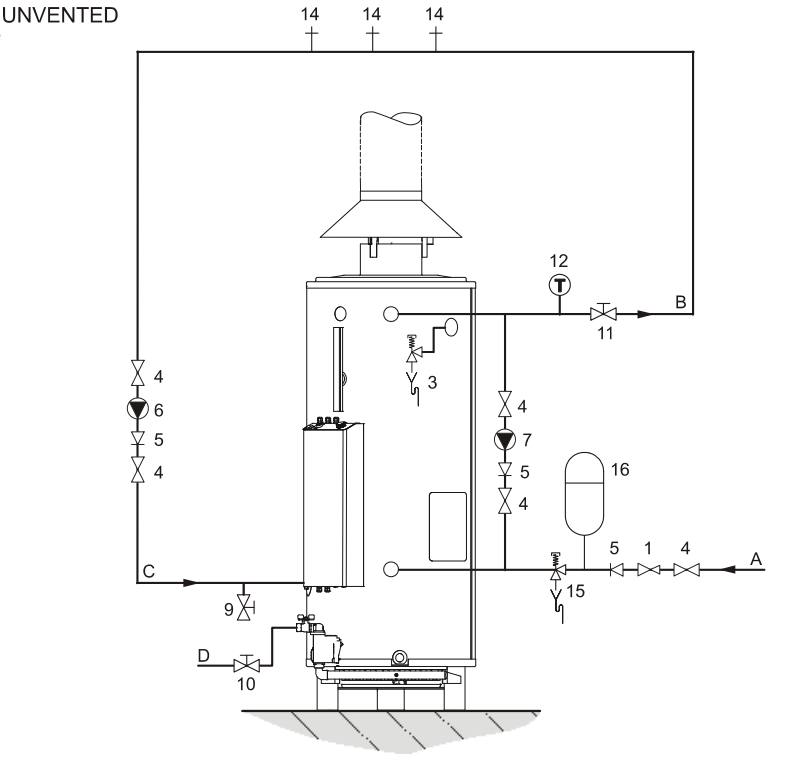
Legend

Unused numbers are not applicable

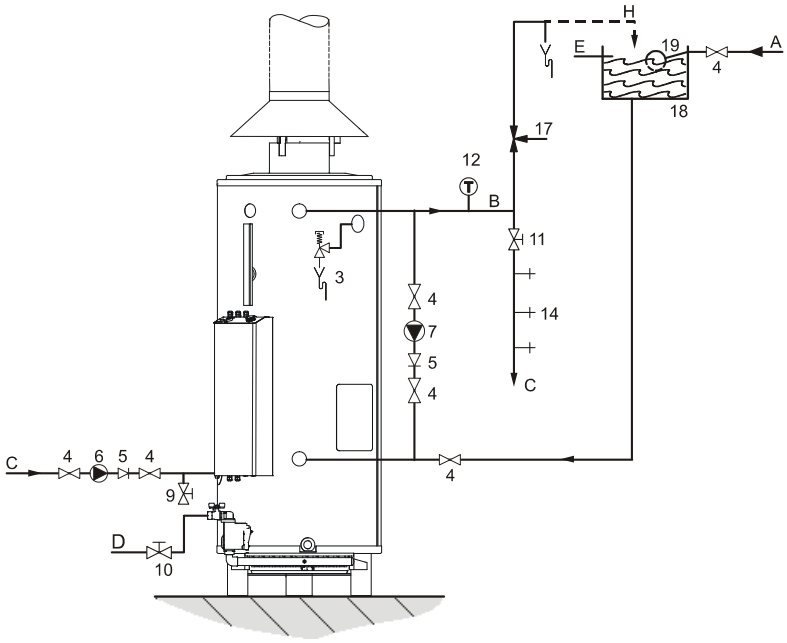
1. pressure reducing valve (mandatory)
3. T&P valve (mandatory)
4. stop valve (recommended)
5. non-return valve (mandatory)
6. circulation pump (optional)
7. top to bottom circulation pump (optional)
9. drain valve
10. manual gas valve (mandatory)
11. service stop valve (mandatory)
12. temperature gauge (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

UNVENTED



VENTED



IMD-0494 R0

3.6 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").

3.6.1 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 between the cold water head tank (18) and the water heater, as required by applicable regulations.

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

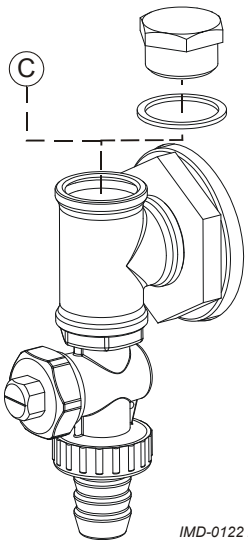
See (B) in the installation diagram (3.5 "Installation diagram").

Comment
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").

3.6.4 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.



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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 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").

3.7.1 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 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.

3.7.2 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

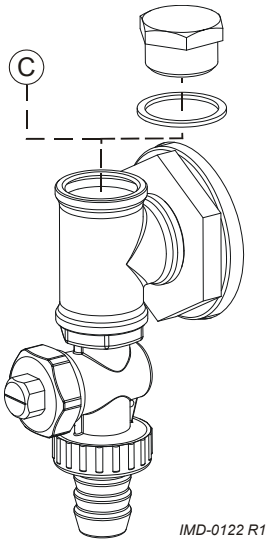
See (B) in the installation diagram (3.5 "Installation diagram").

Comment
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.

3.7.4 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").

Note
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.

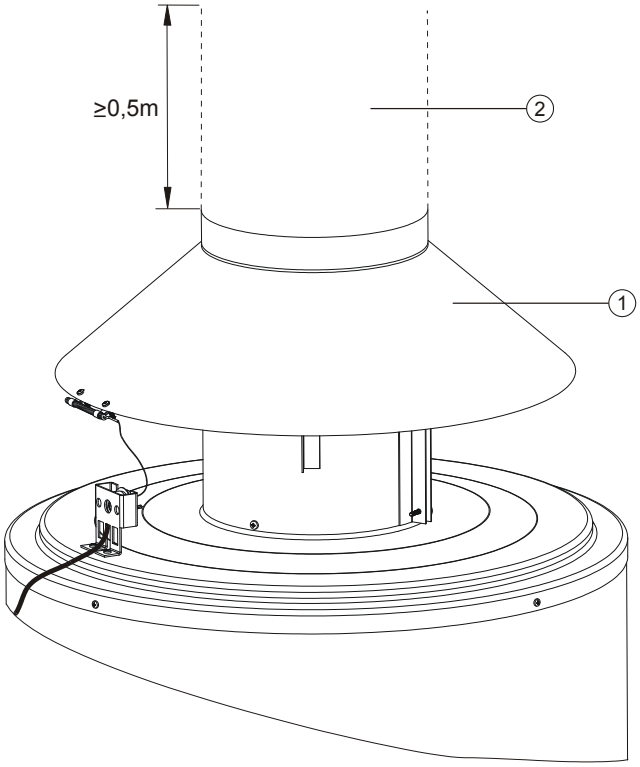
3.9 Flue gas discharge

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

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

Comment
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 Preparations

Note
The appliance is phase-sensitive. It is **absolutely essential** to connect the mains live (L) to the live of the appliance, and the mains neutral (N) to the neutral of the appliance.

Note
There must also be **no potential difference** between neutral (N) and earth (⏚). Contact the supplier if this is the case.

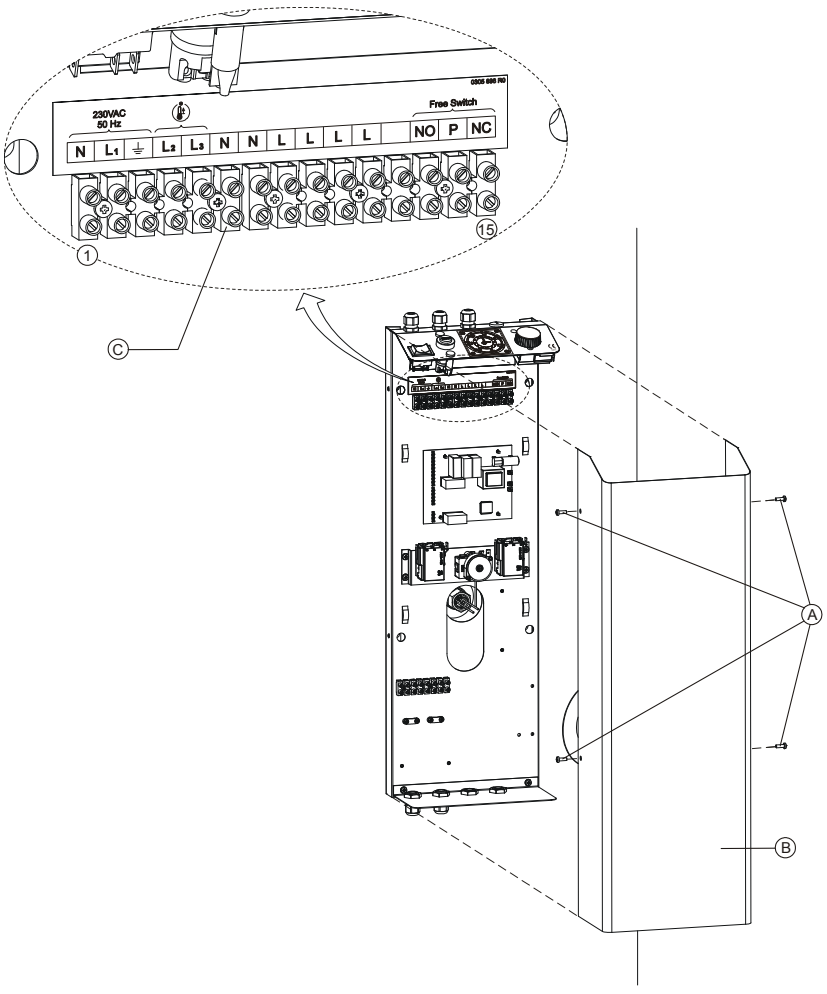
For more information or to order this isolating transformer, please contact the supplier.

The figure shows a view of the electrical connector block, and the table shows the appropriate connections.

Connector block

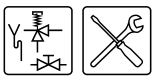
Legend

A. screws
B. cover
C. terminal block



IMD-0149 R1

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



The connector block (C) is now visible.

Comment
Please consult (14 "Electrical diagram") the appropriate electrical diagram for details of the connections of the electrical components.

Terminal block

Mains voltage			Flue gas thermostat		Week timer circuit						Un used	Potential-free contact		
⏚	L1	N			N	N	L	L	L	L	-	NO	P	NC
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

3.10.2 Introduction

Topics covered in this paragraph, in sequence:

- Preparations;
- Connecting the mains power;
- Flue gas discharge safety device;
- Weekly timer circuit;
- Extra error signal ("Alarm OUT")..

3.10.3 Connecting the mains power

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

Comment
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 Flue gas discharge safety device

1. Feed the cable for the weekly timer circuit through the metric strain relief in the top of the control column.
2. Connect the weekly timer circuit to points 7 (L) and 8 (N) of the connector block
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.

3.10.5 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 7 (N), 8 (L) and 11 (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.

3.10.6 Extra error signal ("Alarm OUT").

Alarm OUT is a potential free terminal that is switched when an error is detected. Devices (e.g. one or more lights) can be connected to this in order to signal the fault (max. 250V, 10A).

The device or devices may be connected in either a circuit with a make-contact (light illuminated when there is an error) or a circuit with a break-contact (light illuminated during normal use).

1. Feed the extra signalling cable through the metric strain relief in the top of the control column.
2. Connect the extra signalling device to points 13 (N) and 14 (P) and/or 14 (P) and 15 (NC) as show in the Terminal block.
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.

3.11 Checking the supply pressure and burner pressure

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

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

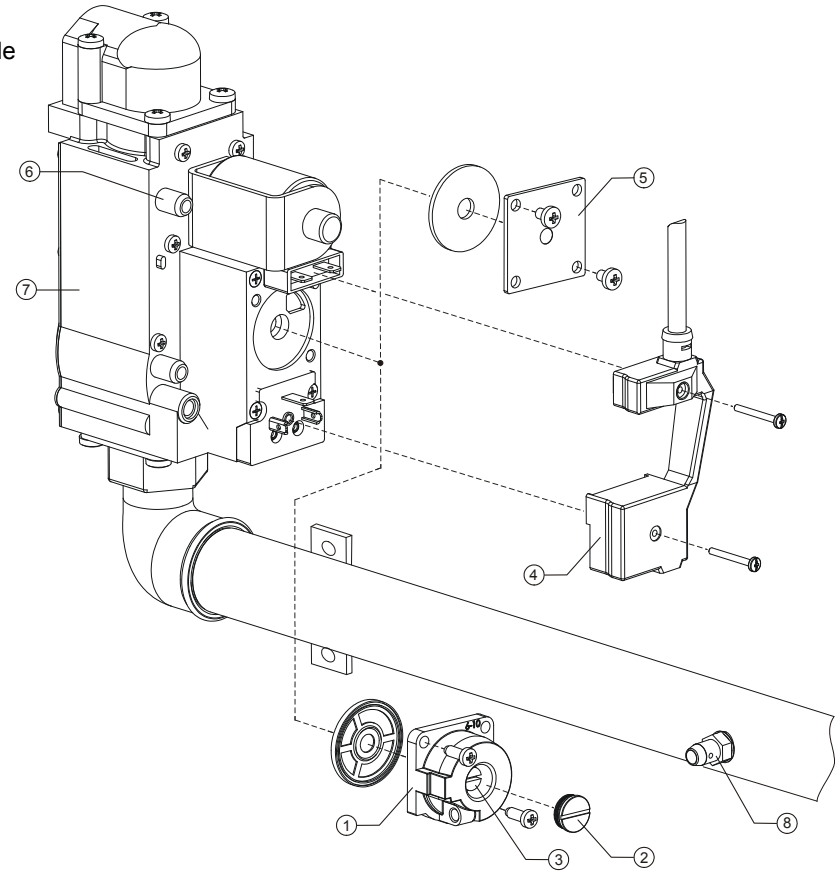
Comment
The easiest way to check the gas pressures is by using two pressure gauges. This procedure assumes that these two gauges are available.

Gas control for CHA 100 to 600

Legend

Unused numbers are not applicable

1. burner pressure regulator
2. burner pressure regulator cap
3. burner pressure regulator adjusting screw
4. gas control connector
5. blank plate
6. supply pressure nipple
7. gas control
8. manifold test nipple



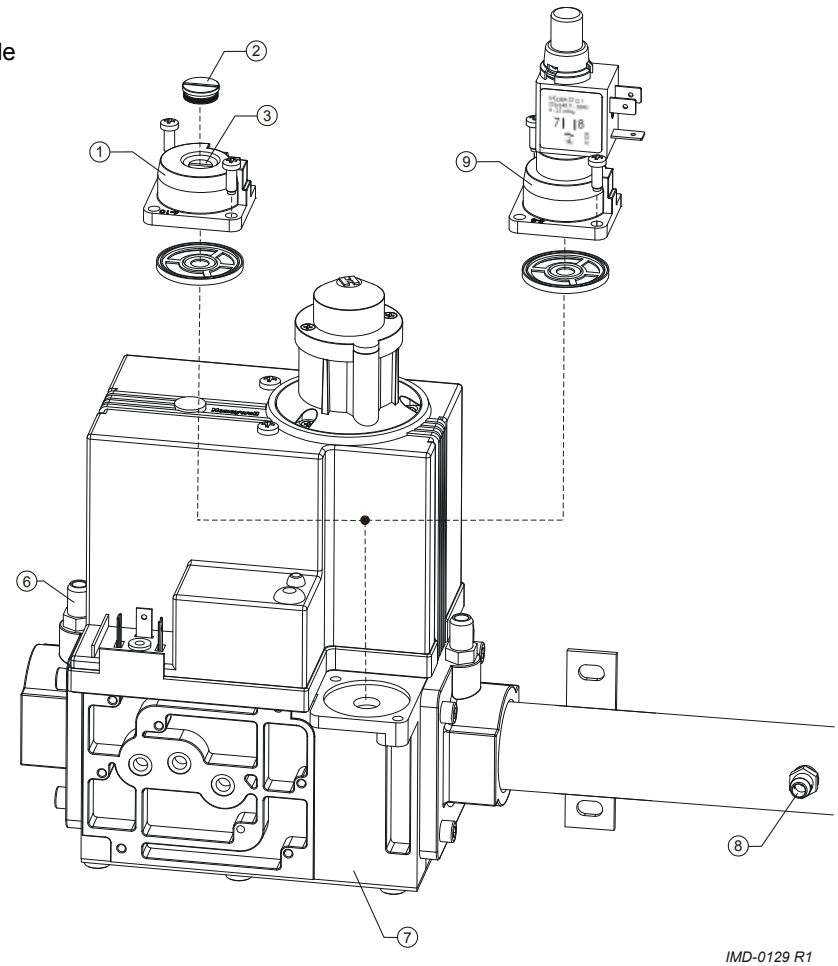
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Gas control for CHA 700

Legend

Unused numbers are not applicable

1. burner pressure regulator
2. burner pressure regulator cap
3. burner pressure regulator adjusting screw
6. supply pressure nipple
7. gas control
8. manifold test nipple
9. high-low control



IMD-0129 R1

3.11.1 Preparations

1. Isolate the appliance from the power supply (10.3 "Isolating the appliance from the mains").
2. There are two test nipples on the gas control. Test nipple (6) is used to check the supply pressure. The other test nipple on the gas control is not used. The manifold test nipple (8) is used to measure 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 re-tighten.
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.

10. Use the pressure gauge to read the supply pressure at test nipple (6). Refer to the gas data table (3.4.3 "Gas data").

Comment
Consult the mains gas supply company if the supply pressure is not correct.

11. Use the pressure gauge to read the burner pressure at nipple (8). Refer to the gas data table (3.4.3 "Gas data").

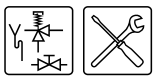
Comment
If the burner pressure is not correct and the appliance is fitted with a blank plate or high-low control, you will **not be able to adjust** the pressure. In this case, consult your installation engineer or supplier. If the appliance is indeed fitted with a burner pressure regulator, the pressure can be adjusted (3.11.2 "Adjusting the pressure").

3.11.2 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.

3.11.3 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

Note
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.

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

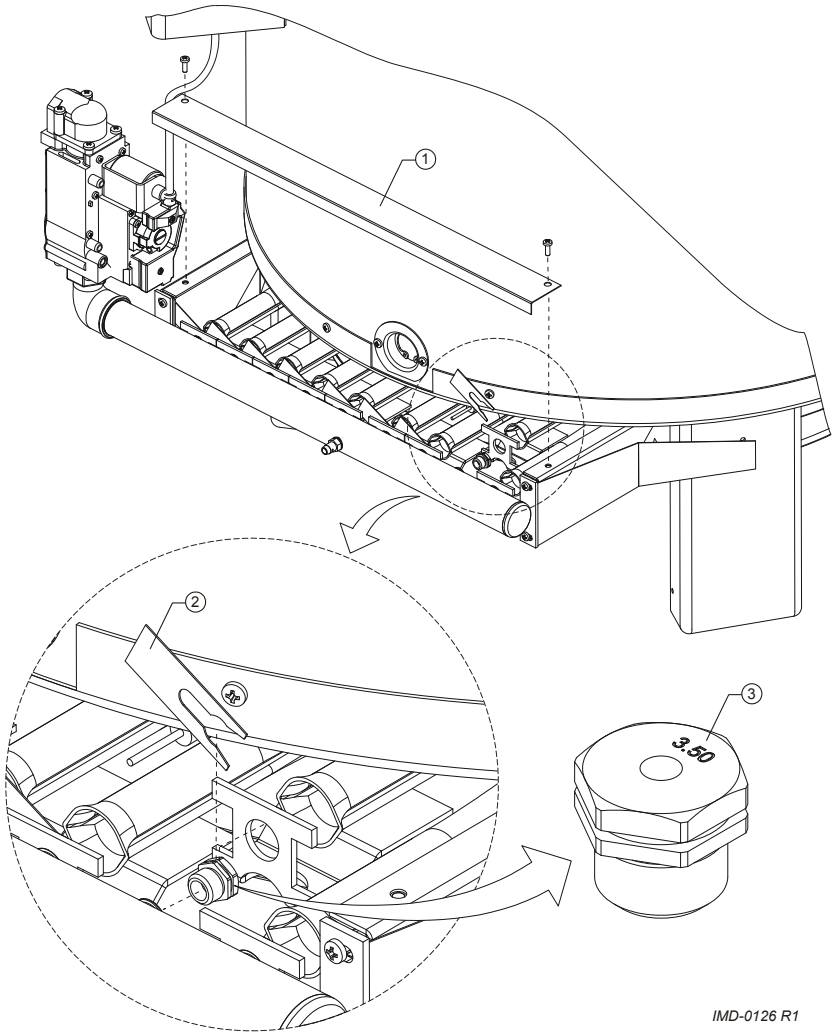
This chapter covers the following:

- Conversion of CHA 100 to 600 to another gas category.
- Conversion of CHA 700 to another gas category.

Exchanging orifices

Legend

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



4.1 Conversion of CHA 100 to 600 to another gas category

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

Note
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.

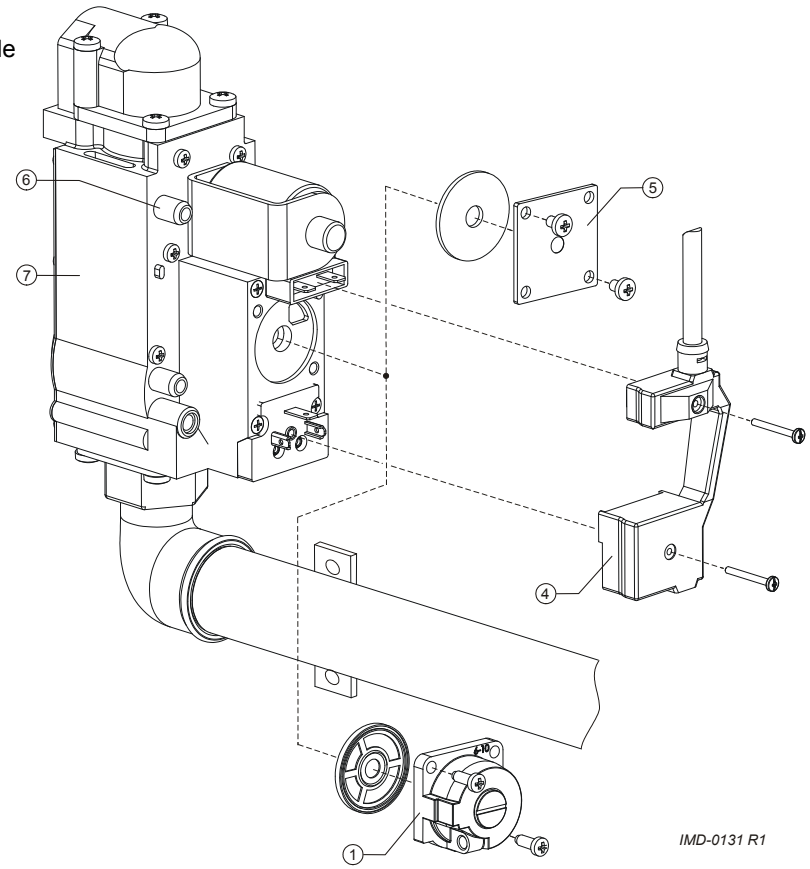
Comment
The radiation shield / condensation tray can be temporarily loosened to simplify disassembly of the burner.

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.

Conversion of gas control

Legend
Unused numbers are not applicable
1. burner pressure regulator
4. gas control connector
5. blank plate
6. supply pressure test nipple
7. gas control



11. Check whether there is a burner pressure regulator (1) attached to the gas control, or simply a blank plate (5).

Comment
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:
    - Unscrew the connector (4) of the gas control.
    - 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.
    - Fit the connector (4) of the gas control.

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").

4.2 Conversion of CHA 700 to another gas category

4.2.1 Introduction

This paragraph describes:

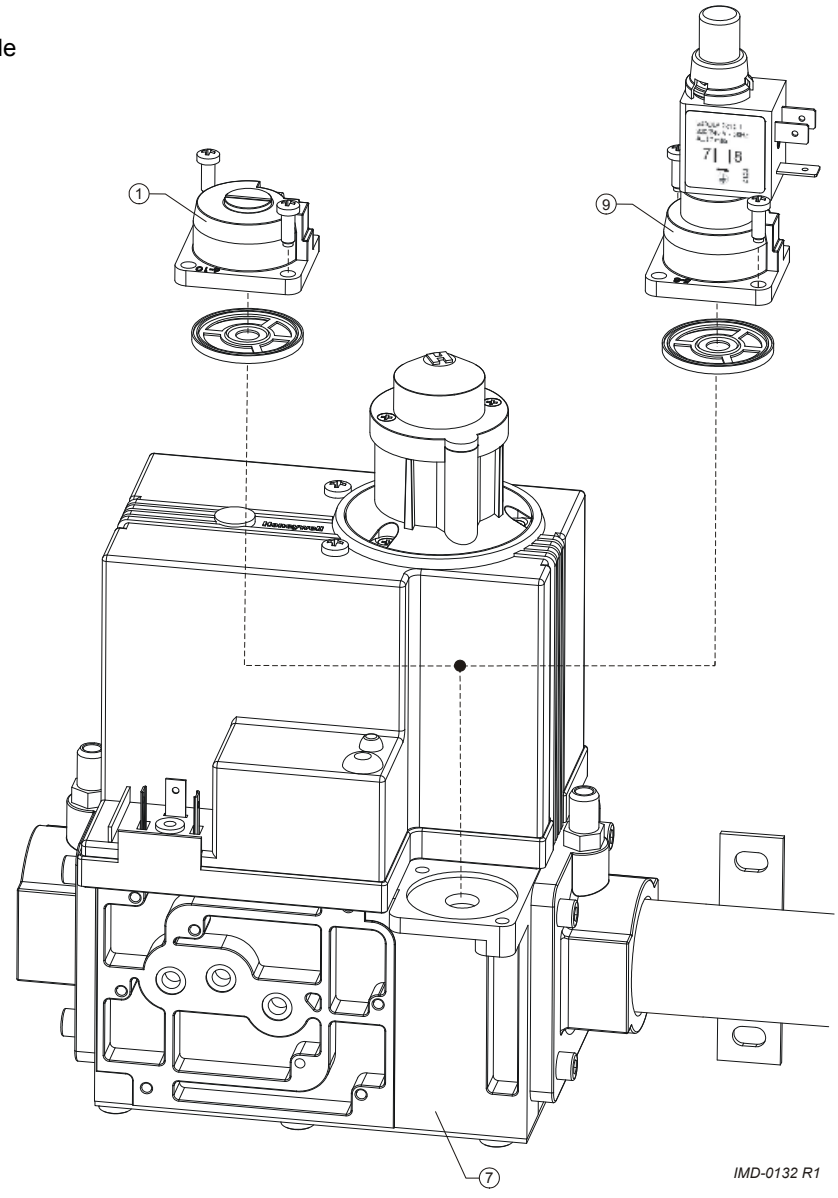
- Conversion from LP gas to natural gas
- Conversion from natural gas to LP gas

Conversion of gas control

Legend

Unused numbers are not applicable

1. burner pressure regulator
7. gas control
9. high-low control



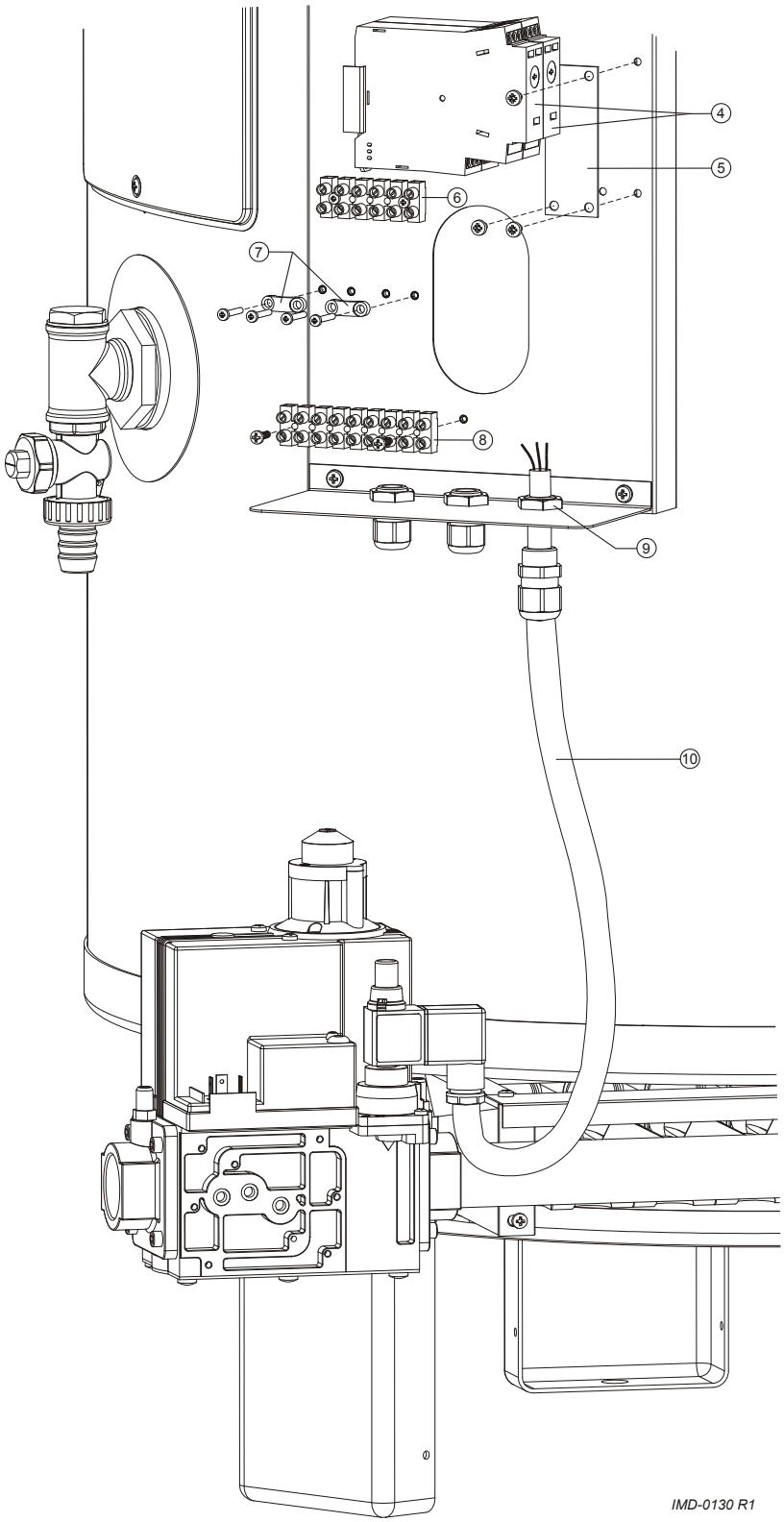
4.3 Conversion from LP gas to natural gas

Installing and removing add-on components

Legend

Unused numbers are not applicable

4. timers
5. bracket
6. 6-contact terminal strip
7 pull reliefs
8. 9-contact terminal strip
9. metric pull relief
10. high-low control lead



1. Carry out steps 1 through 9 (4.1 "Conversion of CHA 100 to 600 to another gas category").
2. Detach the high-low control (9)

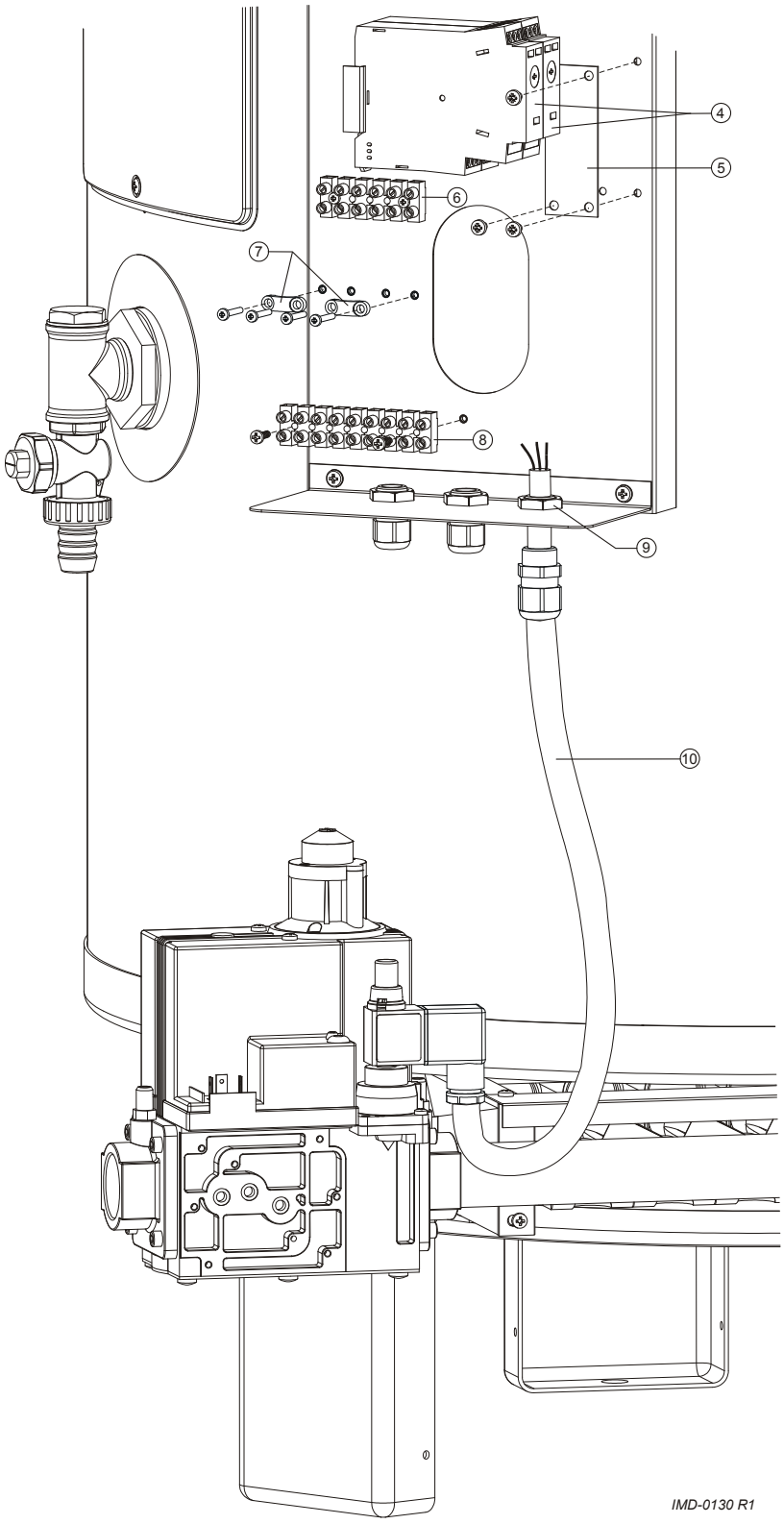
3. Fit the burner pressure regulator (1) including the sealing gasket from the conversion set. Attach the burner pressure regulator to the gas control using the two small screws supplied. (7).

Installing and removing add-on components

Legend

Unused numbers are not applicable

4. timers
5. bracket
6. 6-contact terminal strip
7. strain relief
8. 9-contact terminal strip
9. metric strain relief
10. high-low control lead

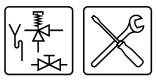


4. Detach the leads between the 6contact terminal strip(6) and the 9contact terminal strip (8). These are the leads for the timers, high-low control, gas control, hot surface igniter and flame probe.
5. Remove the timers (4), bracket (5), wiring harness (not shown) and 9contact terminal strip.
6. Turn the metric strain relief (9) with the high-low control lead (10) to loosen it. Remove this lead.
7. Fit the stop plug from the conversion set in the place of the metric strain relief.
8. Connect the cables of the gas control, the hot surface igniter and flame probe to the 6contact terminal strip as indicated in the electrical diagram (14 "Electrical diagram").
9. Clamp the gas control cable in one of the supplied strain reliefs (7). Do the same for the leads of the hot surface igniter and flame probe.
10. Check the supply pressure and burner pressure (3.11 "Checking the supply pressure and burner pressure").
11. 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.
12. Start the appliance (9 "Starting the water heater").

4.4 Conversion from natural gas to LP gas

1. Carry out steps 1 through 9 (4.1 "Conversion of CHA 100 to 600 to another gas category").
2. Detach the burner pressure regulator (1).
3. Fit the high-low controller (9) including the sealing gasket from the conversion set. Attach the high-low control to the gas control using two small screws.
4. Detach the leads from the gas control, the hot surface igniter and the flame probe from the 6contact connector strip (6) and the strain relief (7).
5. 5. Fit the timers (4) including cable harness plus 9contact connector strip (6) from the conversion kit, to the control column.
6. Remove the stop plug (not shown) from the underside of the control column and replace this with the metric strain relief (9) from the conversion kit.
7. Draw the high-low control lead (10) through the strain relief and tighten the strain relief by turning it until the lead is clamped.
8. Connect the high-low control lead (10) plug to the high-low control (9).
9. Connect the cables from the timers, highlow control, gas control and the hot surface igniter as shown in the electrical diagram (14 "Electrical diagram").
10. Check the supply pressure and burner pressure (3.11 "Checking the supply pressure and burner pressure").
11. 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.
12. Start the appliance (9 "Starting the water heater").

Conversion to a different gas category



5 Filling

Installation diagram

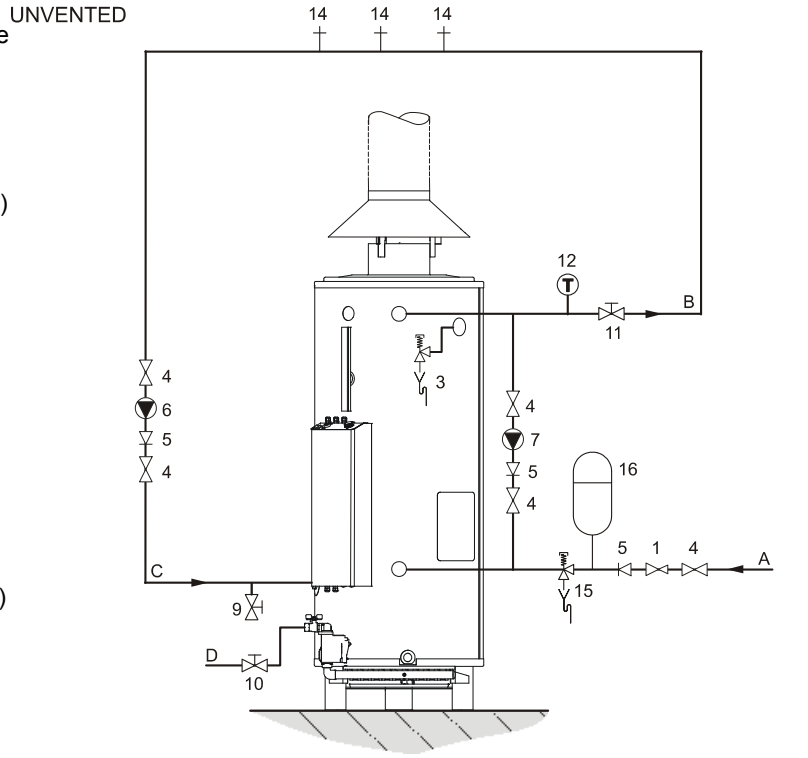
Legend

Unused numbers are not applicable

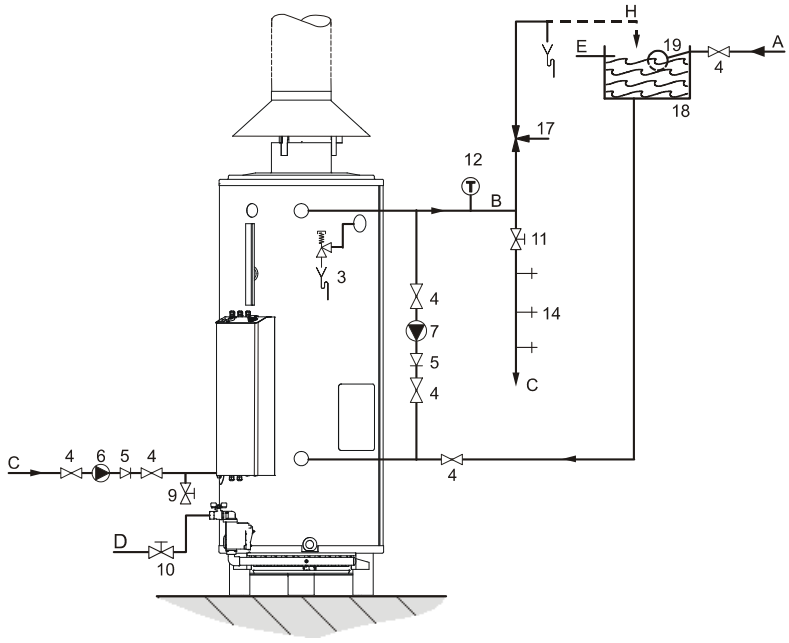
1. pressure reducing valve (mandatory)
3. T&P valve (mandatory)
4. stop valve (recommended)
5. non-return valve (mandatory)
6. circulation pump (optional)
7. top to bottom circulation pump (optional)
9. drain valve
10. manual gas valve (mandatory)
11. service stop valve (mandatory)
12. temperature gauge (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

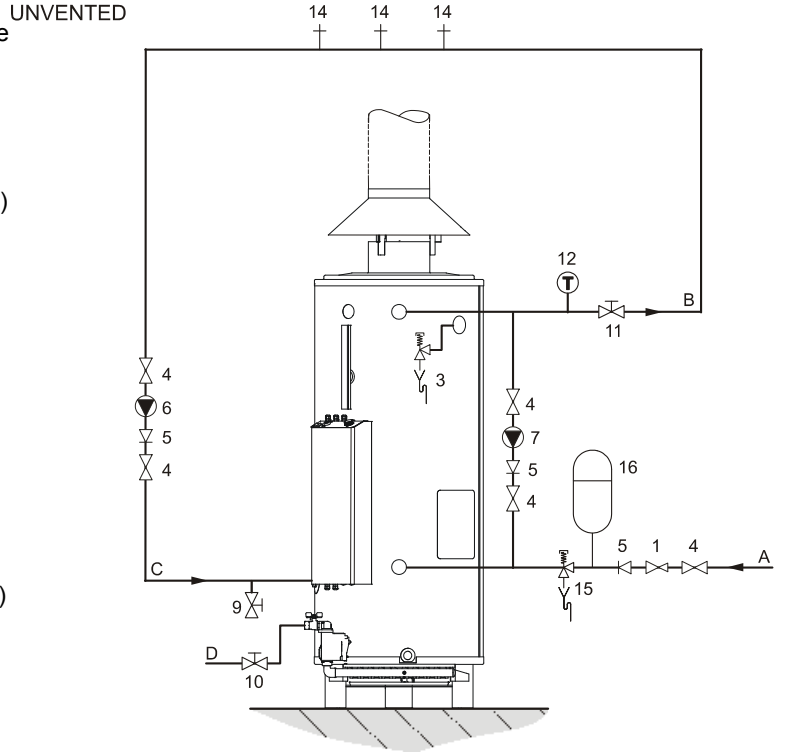
Legend

Unused numbers are not applicable

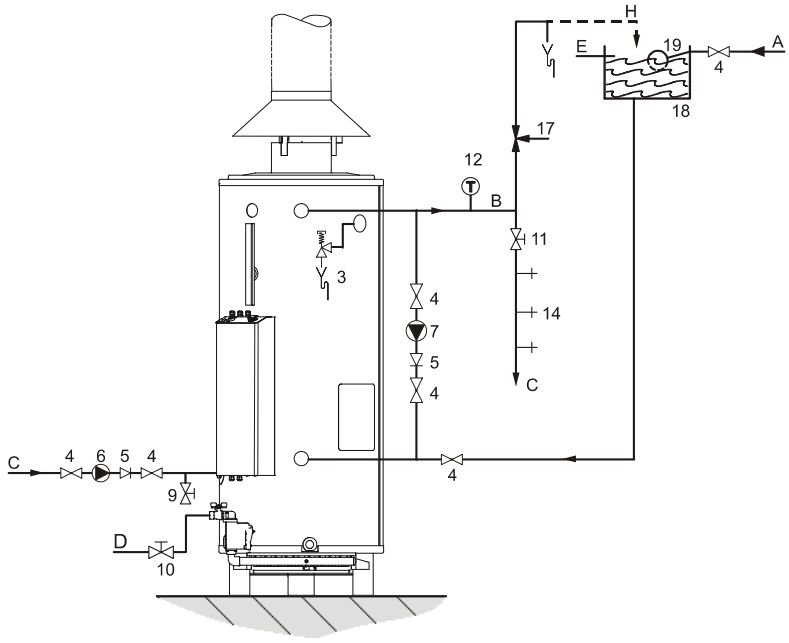
1. pressure reducing valve (mandatory)
3. T&P valve (mandatory)
4. stop valve (recommended)
5. non-return valve (mandatory)
6. circulation pump (optional)
7. top to bottom circulation pump (optional)
9. drain valve
10. manual gas valve (mandatory)
11. service stop valve (mandatory)
12. temperature gauge (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

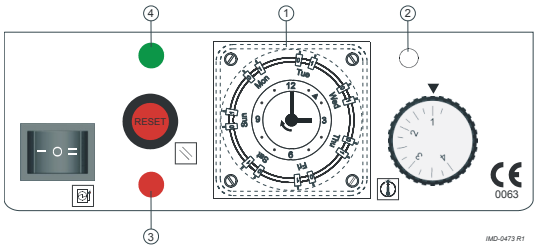


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6.1 Draining unvented installations

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**.

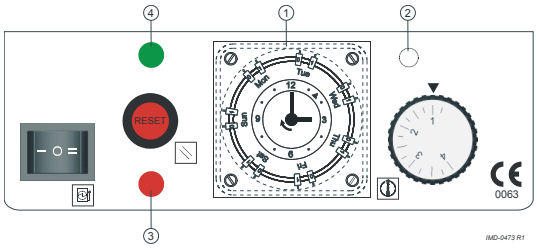


2. Isolate the water heater from the power supply by putting the isolator between the appliance and the mains power supply to position 0.
3. Shut off the gas supply (10).
4. Close the stop valve (11) in the hot water pipe.
5. Close the supply valve of the cold water supply (A).
6. Open the drain valve (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**.



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

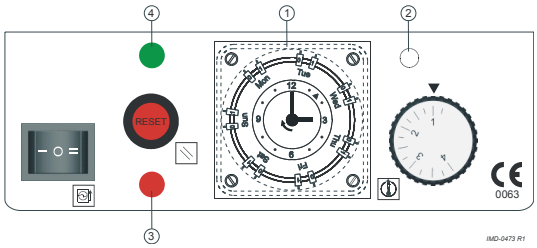
Topics covered in this chapter, in sequence:

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

7.2 Control panel

This figure shows the control panel.

The control panel



The control panel comprises:

- an ON/OFF switch (with positions I/0/II)
- a reset button
- a control thermostat with rotary knob
- two status LEDs;
- weekly timer (optional);
- 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	'ON' mode/'OFF' mode
	Reset button	Reset burner control
	Temperature control	Set water temperature (Tset)

	Name	Meaning
1	Week timer	Sets the weekly water heating program
2	Power Anode indicator LED	Shows the Power Anode status
3	Error LED	Burner control lockout
4	Voltage lamp	Shows whether there is voltage (power) for the burner control

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.

Comment

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 Burner control reset button

An error can cause the burner control to lock out. When this happens, the red LED on the control panel will illuminate. After eliminating the cause of the error, you can reset the appliance using the reset button.

Comment
Before resetting, always eliminate the cause of the error.

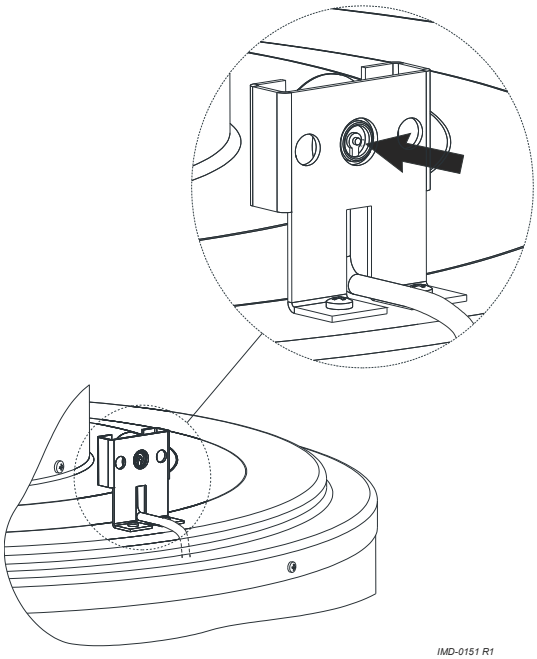
The appliance's error conditions (8.3 "Power Anode status") and how to resolve them are described in the error condition summary (11 "Errors").

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").

Comment
The draught diverter may be hot.

Flue gas thermostat reset button

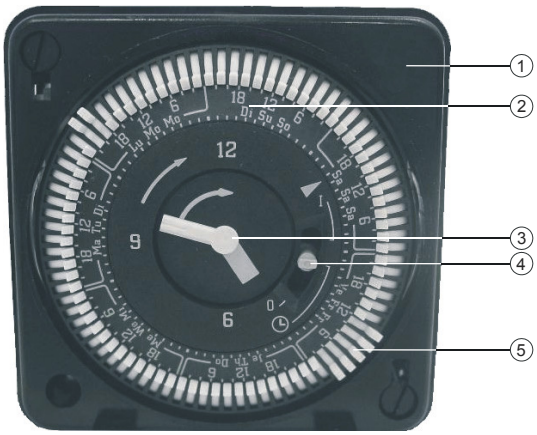


IMD-0151 R1

7.8 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



IMD-0474 R0

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).

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 in position 0;
  - the green LED is off.

- **WEEK PROGRAM (optional)**

  In this position the appliance only meets demand during the periods set by the timer. Outside these periods, only frost protection is active.

  On the control panel:

  - The ON/OFF switch is in position II.
  - The water temperature can be set by turning the knob on the control thermostat, see paragraph '5.5 Control thermostat'.
  - The period during which demand must be fulfilled can be programmed using the week timer, see paragraph 5.6 'Weekly timer circuit'.
  - the green LED is illuminated.

Comment
If no week timer is installed, the 'II' mode is the same as the '0' mode.

- **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 in position 0;
  - the green LED is illuminated.

- **Contractor**

  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 by turning the knob on the control thermostat, see paragraph '5.5 Control thermostat'.
  - the green LED is illuminated.

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.

Comment
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 water heater goes into an "error" condition, you will be unable to draw hot water. The frost protection will also be out of operation. These error conditions are divided into three groups:

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

  The safety (pushbutton) on the flue gas thermostat in the draught diverter has been activated. After removing the cause, the pushbutton (7.6 "Burner control reset button") must be pressed to restart the appliance.

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

  When this happens, the red LED on the control panel will be illuminated. The burner control is locked out.
  After eliminating the cause, the appliance must be returned to service by pressing the reset button (7.6 "Burner control reset button").

- **Blocking errors**

  You can recognise this condition from the fact that the appliance does not start running even though the water temperature is lower than the setting that you have defined using the control thermostat (7.5 "Control thermostat").
  These errors disappear automatically once the cause of the error has been removed, after which the appliance resumes operation by itself.

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

If, as end-user, you find the appliance in an error condition, you may attempt to restart the appliance by pressing the reset button once. However, if the error returns or occurs several times in a short time, you must contact your service and maintenance engineer.

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. Use the ON/OFF switch on the control panel to put the appliance in 'ON' mode (position 'I') or the weekly program mode (position 'II'); see paragraph 6.2 'Operating modes'.
5. 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").

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}). This threshold value depends on the currently selected appliance operating mode. If the appliance is in the 'OFF' mode (frost protection), for example, this value is 20°C. If the appliance is in the 'ON' mode, this threshold value can be selected, for example, position 3 (±60°C).

The heating cycle runs successively through the following states:

1. HEAT DEMAND;
2. WAITING TIME;
3. PRE-GLOW;
4. IGNITION;
5. RUNNING;
6. WAITING TIME.

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

Comment
The appliance runs through an identical cycle when frost protection is activated.

1. The control thermostat sensor measures the water temperature. The water temperature falls below the set temperature of (for example) 60°C, causing the control thermostat to close. The burner control now detects a demand and starts the heating cycle.
2. Following demand, the waiting time starts. This waiting time ensures that ignition takes place safely. The waiting time lasts about 15 seconds.
3. Once the waiting time is over (audible 'clicking' of the relay in the burner control) the pre-glowing of the hot surface igniter is started
4. After about 12 seconds (pre-)glowing, the gas control is opened and ignition can take place.
5. After ignition, the flame is detected and the appliance will be running. This means that actual heating has started.
6. When the water reaches the set temperature, the demand ceases. The gas control closes, and the burner tray is extinguished. A new waiting time begins, of about 10 seconds.
7. After this waiting time, the appliance enters an idle state, and waits until the water temperature again falls below the set temperature.

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

Starting the water heater





10 Shutting down

10.1 Introduction

Topics covered in this chapter:

- Shut 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 Shut the appliance down for a brief period ('OFF' mode)

To disable the device for a short period, you must switch on the frost protection using the appliance heating cycle (2.3 "Water heater operating cycle").

You can use the frost protection to prevent water freezing in the appliance. Activate frost protection by switching the ON/OFF switch on the control panel to the 0 position.

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.

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").

Shutting down



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 Error conditions

If the water heater goes into an "error" condition, you will be unable to draw hot water. The frost protection will also be out of operation. These error conditions are divided into three groups:

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

  The safety (pushbutton) on the flue gas thermostat in the draught diverter has been activated. After removing the cause, the pushbutton (7.6 "Burner control reset button") must be pressed to restart the appliance.

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

  When this happens, the red LED on the control panel will be illuminated. The burner control is locked out.
  After eliminating the cause, the appliance must be returned to service by pressing the reset button (7.6 "Burner control reset button").

- **Blocking errors**

  You can recognise this condition from the fact that the appliance does not start running even though the water temperature is lower than the setting that you have defined using the control thermostat (7.5 "Control thermostat").
  These errors disappear automatically once the cause of the error has been removed, after which the appliance resumes operation by itself.

The following pages provide troubleshooting tables for each type of error.

Comment
Footnotes referred to from within any table are shown at the bottom of the last page of that table.

11.3 CHA 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.	**Warning** 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	3. Check to see that all connections have been made properly 4. Check that the Power Anode is properly connected; see Electrical Diagram (14 "Electrical diagram"). 5. Check to see that all connections have been made properly 6. 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	

11.4 CHA 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
Green LED OFF and **Red LED OFF**	No supply voltage present	1. Check whether the isolator is ON. 2. Check whether there is power to the isolator 3. Check whether there is power to the electrical connector block 4. Check whether there is power to the burner control 5. Check fuse in the burner control The measured voltage must be 230 V_{AC} (-15%, +10%)	See the electrical diagram (14 "Electrical diagram"). If the error cannot be rectified, contact your installation engineer
Green LED ON and **Red LED OFF**	Blockage in the flue gas discharge (the flue gas thermostat has cut out)	1. Trace the blockage 2. Remove the blockage 3. Reset flue gas thermostat (7.7 "Flue gas thermostat reset button").	When a demand is detected, the appliance will restart

Feature	Cause	Measure	Comment
Green LED ON and **Red LED ON**	There are three possible causes for this error. In order to determine the cause, you must cause the error to appear again: 1. Reset the appliance by pressing the reset button 1x 2. If nothing happens, then the reset button has been pressed too often (maximum 5 times in a single heating cycle). Disconnect the appliance from the mains and then restart it. SeeIsolating the appliance from the mains and steps 3 through 5 of Starting the water heater. 3. Decide which type of cause (a) or (b) describes the situation.		If the error cannot be resolved or is persistent, contact your installation engineer
	(a) three unsuccessful start attempts in a row	1. No gas: - Check that the gas valve is open - Check whether the gas control is opening (clicking of the gas control) - Check the leads of the gas control 2. No ignition: - Check whether the hot surface igniter lights up - Check the electrical supply to the hot surface igniter. - Check the leads of the glow igniter 3. No flame detection: - Check that the Phase (L) and Neutral (N) are correctly connected (from the mains) to the appliance - Check whether the flame probe is defective - Check that the flame probe leads are properly connected	
	(b) The safety thermostat has cut out	1. The safety thermostat has cut out correctly: - Reset the appliance - 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	

11.5 CHA 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	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

Note
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

Comment
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:

1. On the control panel, set the ON/OFF switch to **position 0**.
2. Set the control thermostat (note the original setting) to the highest position, and put the ON/OFF switch back to **position I**.
3. If there is no demand, draw some hot water off to create demand.
4. Check whether the heating cycle (9.3 "The appliance's heating cycle") is running correctly .
5. Set the control thermostat back to the original setting, and put the ON/OFF switch back to **position I**.
6. Check the supply and burner pressures (3.11 "Checking the supply pressure and burner pressure") and adjust them where necessary.
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 drainpipes 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. Undo 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.

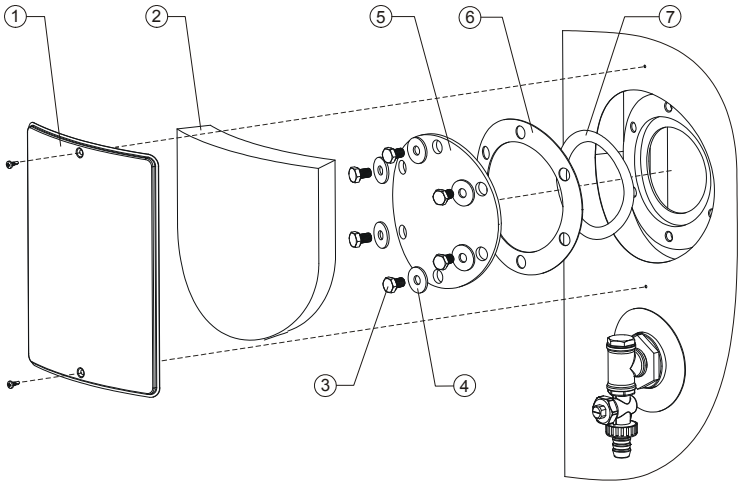
12.3.3 Descaling and cleaning the tank

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.

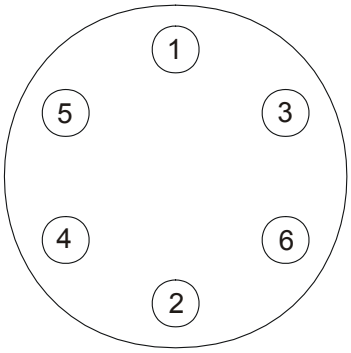
To simplify descaling and cleaning of the tank, the appliance is equipped with two cleaning openings.



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 may be hot.

1. Carry out steps 1 through 7 of the anode (1 "Disconnect the plug of the flue gas thermostat from the connector on the appliance.") check.
1. Remove the flue baffles from the appliance.
2. Check the flue baffles for rust, and remove any which is present.
3. Check the flue baffles for wear, and replace any worn flue baffles.
4. Place a new sealing ring on the rim of the tank and re-fit the lid.
5. Insert the plug of the flue gas thermostat into the connector on the appliance.

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)

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.

13.1 Garantie (certificaat)

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.

13.2 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.

13.3 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.

13.4 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.

13.5 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

13.6 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.

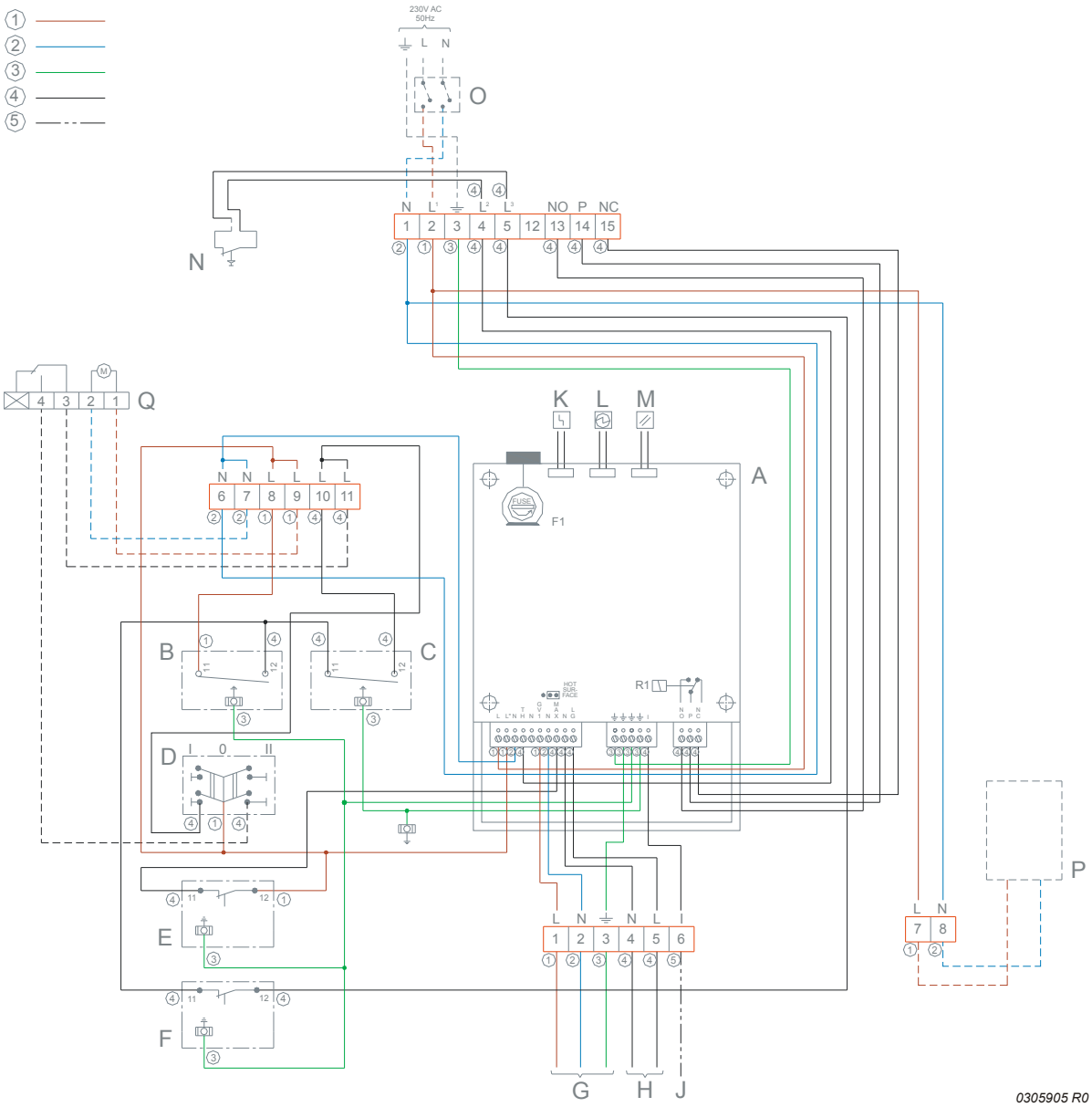
14 Electrical diagram

14.1 Introduction

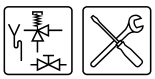
This section gives the electrical diagrams for:

- Electrical diagram for CHA 100 to 700 natural gas, CHA 100 to 600 LPG
- Electrical diagram for CHA 700 LPG

14.1.1 Electrical diagram for CHA 100 to 700 natural gas, CHA 100 to 600 LPG



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



TERMINAL STRIP CONNECTIONS:

⏚	Earth
N	Neutral
L	Live
L^1	Phase input of controller
L^2	Phase input of thermal reflux safeguard
L^3	Phase input of safety circuit for releasing temperature regulation
NO	Normal open
P	PVC supply
NC	Normal closed

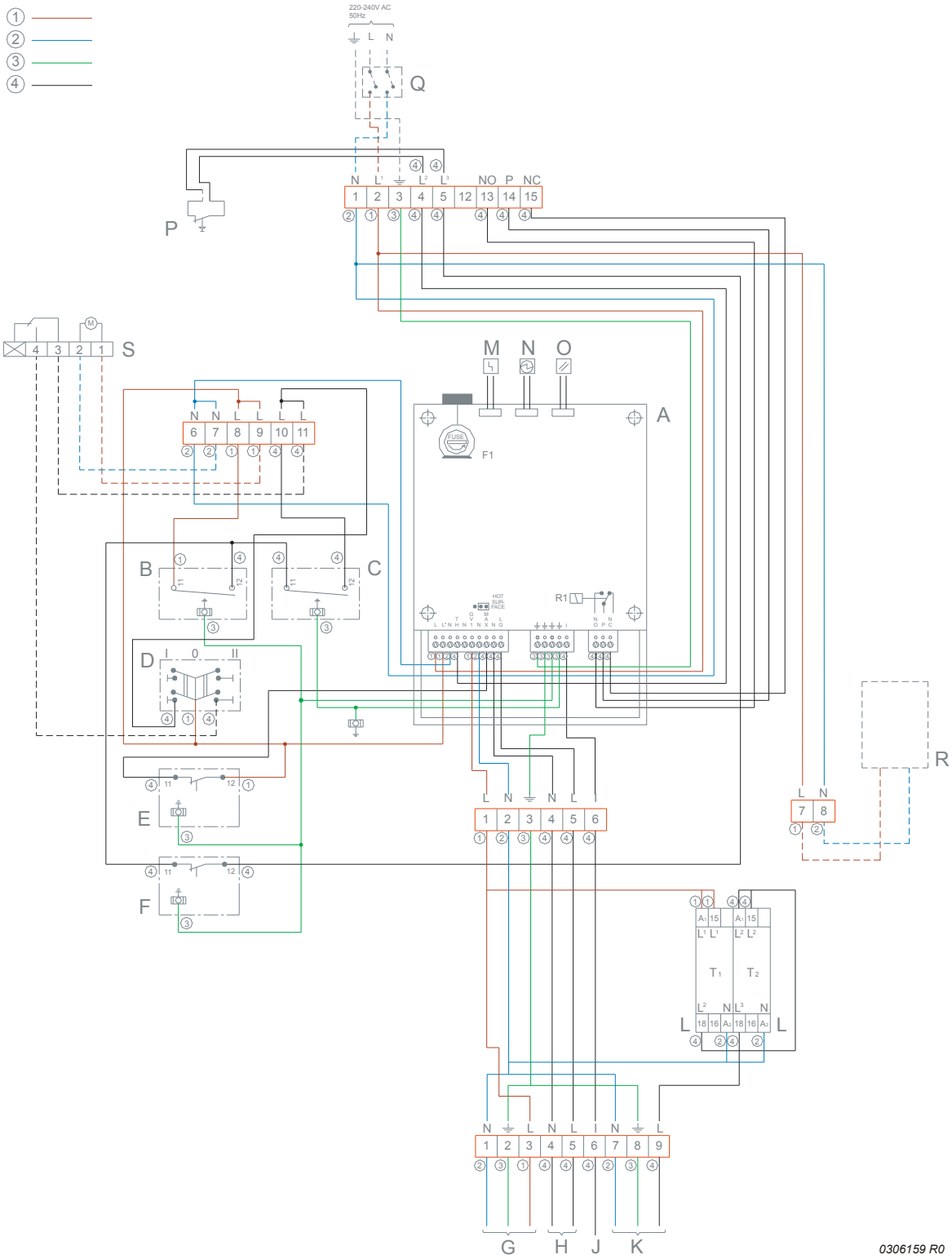
COMPONENTS:

A	Burner control
N	Neutral
⏚	Earth
L'	Phase input to controller
L"	Phase output
TH	Phase input of thermostat circuit
GV1	Phase output to gas control
MAX	Phase input to safety thermostat
LG	Phase output to hot surface igniter
I	Ionisation detection = output
NO	Normal open
P	Phase input to alarm
NC	Normal closed
F1	Fuse (T5A)
R1	Relay max. 250V, 10A
B	Frost thermostat
C	Control thermostat
D	On/off/on switch
E	Safety thermostat
F	High-limit thermostat
G	Gas valve
H	Hot surface igniter
J	Flame probe
K	Error signal
L	Operational signal
M	Reset button
N	Thermal reflux safeguard

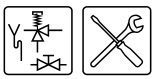
OPTIONAL COMPONENTS:

O	Control isolator
P	CORREX Power Anode control
Q	Weekly timer circuit

14.1.2 Electrical diagram for CHA 700 LPG



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



TERMINAL STRIP CONNECTIONS:

⏚	Earth
N	Neutral
L	Live
L^1	Phase input of controller
L^2	Phase input of thermal reflux safeguard
L^3	Phase input of safety circuit for releasing temperature regulation
NO	Normal open
P	PVC supply
NC	Normal closed

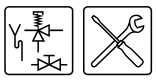
COMPONENTS:

A	Burner control
N	Neutral
⏚	Earth
L'	Phase input to controller
L"	Phase output
TH	Phase input of thermostat circuit
GV1	Phase output to gas control
MAX	Phase input to safety thermostat
LG	Phase output to hot surface igniter
I	Ionisation detection = output
NO	Normal open
P	Phase input to alarm
NC	Normal closed
F1	Fuse (T5A)
R1	Relay max. 250V, 10A
B	Frost thermostat
C	Control thermostat
D	On/off/on switch
E	Safety thermostat
F	High-limit thermostat
G	Gas control
H	Hot surface igniter
J	Flame probe
K	High-low control
L	Timer
M	Error signal
N	Operational signal
O	Reset button
P	Thermal reflux safeguard

OPTIONAL COMPONENTS:

Q	Control isolator
R	CORREX Power Anode control
S	Weekly timer circuit

Electrical diagram



15 Declaration of Conformity

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: **CHA 100, CHA 155, CHA 200, CHA 300, CHA 400, CHA 500, CHA 600, CHA 700**

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

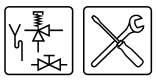
as stated in the EC type-examination report by KIWA-Gastec Certification BV, the Netherlands.

Company: Lochinvar Limited

Date: March 1, 2012

Signature:

D. J. Pepper
Managing Director





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