

**DORCHESTER  
DR-LL MODELS  
HOT WATER  
STORAGE HEATERS**

**Installation, Commissioning  
and Maintenance Instructions**

**DORCHESTER MODELS: DR-LL 50-288, 70-344, 90-322**

**Open Flue, Direct Gas Fired Hot Water Storage Heaters with  
Automatic Ignition for Domestic Hot Water Installations**

**NOTE:**

**THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE  
INSTALLING, COMMISSIONING, OPERATING OR SERVICING EQUIPMENT.**

**THIS WATER HEATER IS FOR USE ON GROUP H NATURAL GAS (2<sup>ND</sup> FAMILY) I<sub>2H</sub>.  
PLEASE ENSURE RELEVANT INFORMATION REQUIRED WITHIN DOCUMENT  
IS FOUND RELATING TO GAS TO BE FIRED BEFORE FIRING HEATER.**

THIS WATER HEATER COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.



# Preface

## Copyright

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Nothing from this publication may be copied, reproduced and/or published by means of printing, photocopying or by whatsoever means, without the prior written approval of Hamworthy Heating.

Hamworthy Heating reserves the right to modify specifications in this manual.

## Trademarks

Brand names in this manual are registered trademarks of their respective owners.

## Warranty

Refer to the appendix [Warranty](#) (see 11.7) for the warranty provisions.

## Liability

### User

Hamworthy accepts no liability when the water heater is not used correctly and requires the user to:

- Read this manual carefully and obey the instructions.
- Ask your installation engineer for advice about the use of the water heater.
- Make sure that the service and maintenance activities are done by a qualified engineer.
- Store the manual, in good condition, near the water heater.

### Installation engineer

Hamworthy accepts no liability when the water heater is not used correctly and requires the installation engineer to:

- Read this manual carefully and obey the instructions.
- Make sure that the entire water heater installation complies with the applicable [regulations](#) (on page 4).
- Make sure that the water heater is tested before the installation is taken into use.
- Explain the correct use to the user.
- Notify the user when service and maintenance activities are necessary.
- Make sure that you hand over all applicable manuals.

## Supplier

The DR-LL water heater is designed in accordance with the applicable regulations. The water heater is delivered with the CE-marking and all necessary documentation to obey these regulations. See the compliance section. (on page 4)

Hamworthy accepts no liability for claims from third parties when:

- The instructions for the correct installation of the water heater are not obeyed.
- The instructions for the correct use of the water heater are not obeyed.
- The water heater did not have maintenance on the correct maintenance interval.

For more information, refer to the General Terms of Sales. These are available on request, free of charge.

We believe that this manual provides you with accurate and complete descriptions of all relevant components. If you, nonetheless find errors or inaccuracies in this manual, please inform Hamworthy. This helps us to further improve our documentation.

## Compliance

To safely produce domestic hot water, the design and construction of the DR-LL water heaters is in accordance with:

- the European Regulations 2016/426 on appliances burning gaseous fuels (GAD).
- the European Standard for Gas-fired storage water heaters for the production of domestic hot water (EN89).
- The European ECO-Design Directive.
- The European Energy Labeling Directive

Refer to the appendix Declaration of conformity.

## Regulations

### Gas Safety (installations and Use) Regulations 1998 (as amended).

It is law that all gas appliances are installed by competent persons, in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your own interest and that of safety, to ensure that this law is complied with.

The installation of the water heater MUST be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, IEE Regulations and the Water Supply (water fittings) Regulations. The installation should also be in accordance with any relevant requirements of the HSE, local gas region and local authority and the relevant recommendations of the following documents:

### British and European Standards

- BS 6891:2015  
Specification for the installation and maintenance of low pressure gas installation pipework of up to 35 mm (R1¼) on premises.
- BS 6798: 2014  
Specification for selection, installation, inspection, commissioning, servicing and maintenance of gas-fired boilers of rated input not exceeding 70 kW net.
- BS 6644: 2011  
Specification for installation and maintenance of gas-fired hot water boilers of rated inputs between 70 kW (net) and 1.8 MW (net) (2nd and 3rd family gases).
- BS EN 806-1: 2000  
Specification for installations inside buildings conveying water for human consumption. General.
- BS EN 806-2: 2005  
Specifications for installations inside buildings conveying water for human consumption. Design.
- BS EN 806-3: 2006  
Specifications for installations inside buildings conveying water for human consumption. Pipe sizing. Simplified method.

- BS EN 806-4: 2010  
Specifications for installations inside buildings conveying water for human consumption. Installation.
- BS EN 806-5: 2012  
Specifications for installations inside buildings conveying water for human consumption. Operation and maintenance.
- BS 8558: 2015  
Guide to design, installation, testing and maintenance of services supplying water to domestic use within buildings and their curtilages. Complementary guidance to BE EN 806.
- BS 5546: 2010  
Specification for installation and maintenance of gas-fired water-heating appliances of rated input not exceeding 70 kW net.
- BS 5440-1: 2008  
Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Specification for installation of gas appliances to chimneys and for maintenance of chimneys.
- BS 5440-2: 2009  
Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Specification for the installation and maintenance of ventilation provision for gas appliances.

### **Institute of Gas Engineers and Managers (IGEM) Publications**

- IGE/UP/1 Edition 3:  
Strength testing, tightness testing and direct purging of industrial and commercial gas installations.
- IGE/UP/1A: Edition 3:  
Strength testing, tightness testing and direct purging of small low pressure industrial and commercial natural gas installations.
- IGE/UP/2: Edition 3:  
Installation pipework on industrial and commercial premises.
- IGE/UP/10 Edition 4:  
Installation of flued gas appliances in industrial and commercial premises.

### **CIBSE Publications**

- Guide G Aug 2014:  
Public Health & Plumbing Engineering

## **Contact information**

In the event of problems with your gas, electricity or water supply connections or when you have any comments or questions, please contact your supplier.



# About this manual

## Scope

This manual gives information about safe and correct use of the water heater and how installation, maintenance and service activities have to be done correctly. You must obey the instructions in this manual.



---

### Caution

Read this manual carefully before you start the water heater. It can cause personal injury and damage to the water heater when you do not read the manual and/or do not obey the instructions.

---

The purpose of this manual is to:

- describe the working principles and layout of the water heater
- explain the safety devices
- highlight possible hazards
- describe the use of the water heater
- describe the installation, service and maintenance of the water heater

This manual has two parts:

- An User part that describes the correct usage of the water heater.
- An Installation, Maintenance and Service part, that describes the correct installation and maintenance procedures.

## Target group

The information in this manual applies to three target groups:

- users
- installation engineers
- service and maintenance engineers

The User part is intended for the (end) users. The Installation, Maintenance and Service part is intended for the installation engineers and the service and maintenance engineers.

## Notation conventions

This manual uses the following text conventions:

- Numbers between parentheses e.g. (1), refer to elements in a figure that are described by the text.
- Cross-references to sections, tables, figures etc. are underlined and written as (see "..."). In the digital version, the cross-references function as hyperlinks that can be used to navigate through the manual by clicking on them. Example: Safety (see 2).

This manual contains the following text styles/symbols for situations that may endanger users/engineers, cause damage to equipment or need special attention:



---

### Note

A note gives more information on a topic.

---



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**Caution**

Obey the caution instructions to prevent damage of the water heater.

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**Warning**

Obey the warning instructions to prevent danger of personal injury, and serious damage to the water heater.

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## Document identification

Article number	Language	Version
0313399	EN	1.2



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# User part

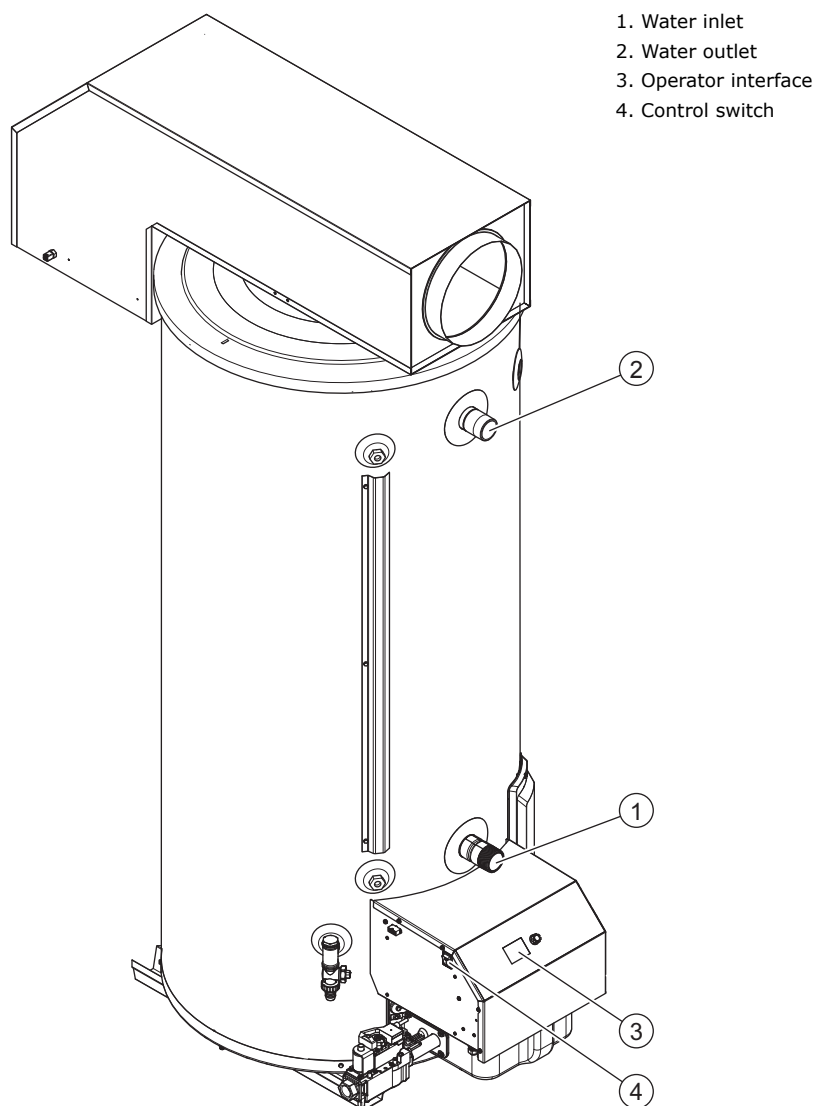


# 1 Introduction

The DR-LL water heater stores and heats water for sanitary purposes.

Cold water enters the bottom of the tank through the water inlet (1). The heated water leaves the tank at the top through the hot water outlet (2). To operate the water heater, the operator interface (3) and control switch (4) are used.

*Fig. DR-LL water heater*







# 2

## Safety

Hamworthy cannot be held responsible for damages or injuries which can be lead back to:

- Failure to follow the instructions provided in this manual.
- Carelessness during use or maintenance of the water heater.

Every user must study the user part of this manual and must follow the instructions in this part of the manual strictly. Do not change the sequence of the described actions. This manual must be available for the user and service engineer at all times.



---

### Warning

If you smell gas:

- Shut off the mains gas supply valve!
- Avoid causing sparks! Do not use any electrical equipment or switch, i.e. no telephones, plugs or bells!
- No naked flames! No smoking!
- Open windows and doors!
- Warn occupants and leave the building!
- After leaving the building, alert the gas distribution company or your installation engineer.



---

### Caution

Do not store or use chemical substances in the room where the water heater is installed because of the risk of explosion and corrosion of the water heater. Some propellants, bleaching agents and degreasing agents etc. disperse of explosive vapors and/or cause accelerated corrosion. If the water heater is used in a room where such substances are stored or used, the warranty will be void.

### Caution

Installation, maintenance and service may only by carried out by a qualified engineer.

### Caution

The water heater is not intended for use by persons (incl. children under the age of 16) with reduced physical, sensory or mental capacities, or who lack the necessary experience or knowledge. When the person responsible for their safety is supervising or has explained how the water heater should be used, these persons can use the water heater.

### Caution

This water heater is not intended to be used by children under the age of 16. Always supervise children, and make sure that they do not play with the water heater.



---

### Note

Regular maintenance extends the service life of the water heater. To determine the correct service interval, the service and maintenance engineer must do a check on both the water and gas side of the water heater three months after installation. Based on this check, the best service interval can be determined.

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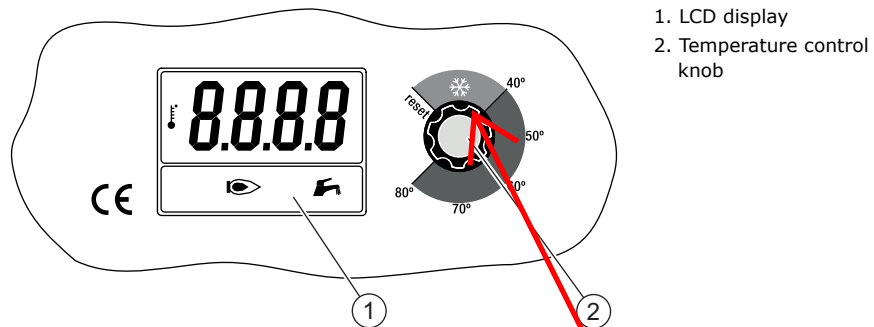
# 3 Interface

## 3.1 Operator interface

The operator interface consists of:

- a control switch (see 3.1.1) on the left side of the water heater.
- a temperature control knob (see 3.1.2) on the front of the water heater.
- a LCD display (see 3.1.3) to view the status of the water heater and to view errors.

Fig. Operator interface



### 3.1.1

#### Control Switch

With the control switch you can turn the water heater on **1** or off **0**.

##### Warning

The power of the water heater stays on when the control switch is set to **0**.



### 3.1.2

#### Temperature control knob

With the temperature control knob you can set the desired water temperature (see 4.1.2) of the water heater.

When the water heater is switched on, you can use the temperature control knob to set the water heater in the **OFF mode** or in the **ON mode**:

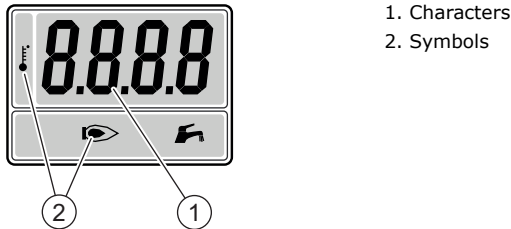
- Turn the temperature control knob clockwise to ignite the main burner (**ON mode**).
- Turn the temperature control knob anticlockwise to shutdown the main burner (**OFF mode**).
- Turn the temperature control knob completely anticlockwise to reset the water heater.

3.1.3

LCD display

The LCD display shows 3 different symbols at the bottom side of the display and 4 characters in the center of the display. The characters represent a temperature or an error code.

Fig. LCD display



3.1.3.1 Symbols on the display

The symbols on the display give visual information about the status of the water heater.

Symbol	Explanation
	Heat demand present
	Water heater in operation
	Display shows a temperature

3.2

Status of the water heater

During operation, the display shows the status of the water heater.

3.2.1

Operating modes

The DR-LL has 2 operating modes:

- OFF mode (see 3.2.1.1)
- ON mode (see 3.2.1.2)

3.2.1.1 OFF mode

In the **OFF mode** the water heater is de-activated. The temperature control knob is set at the frost symbol between **reset** and **40 °C**. The pilot flame is activated.

In the **OFF mode** the water heater is de-activated. The display shows the characters *oFF*.

Fig. **OFF mode** display



Fig. Frost protection is activated



To prevent that the water in the water heater freezes, the frost protection is activated when the water heater is in **OFF mode**. The frost protection starts when the temperature of the water drops below 5°C. The display shows the characters *Fr* followed by the actual temperature. The water heater will heat the water to 20°C and then turns back to **OFF mode**.

### 3.2.1.2 ON mode

In the **ON mode** the water heater continuously responds to the heat demand. The temperature control knob is set between 40 and 80 °C. The pilot flame is activated and ignites the main burners when there is a heat demand.

When the water heater is heating the water, the display on the operator interface alternately shows two different temperatures. The first shows the actual temperature, the second shows the setpoint temperature.

When the water heater is not heating the water, only the actual temperature is shown. The symbols **Heat demand** and **In operation** will not be shown.

Fig. Actual water temperature



Fig. Setpoint



Fig. Standby



## 3.2.2

### Error conditions

If there is an error, the display shows an error code. Error codes always have one letter and two digits.

Fig. Error code display



---

#### Note

When the display shows an error, try to reset the water heater.

Contact your service and maintenance engineer or supplier when the water heater does not restart or when the display shows the error again.

---



# 4

# Use

## 4.1

## Turn on the water heater

### 4.1.1

### Switch to ON mode

To start the water heater:

1. Make sure the water heater connects to the mains power supply.
2. Set the control switch at the left side of the water heater (see 1) to **I**.



#### Note

It is possible that the water heater starts immediately when you turn on the water heater.

#### Note

If necessary, set the water temperature (see 4.1.2).

### 4.1.2

### Set the water temperature

Turn the temperature control knob to set the water temperature.

## 4.2

## Turn off the water heater

### 4.2.1

### Turn off for a short period

To turn off the water heater for less than 2 months:

1. Turn the temperature control knob anticlockwise to set the water heater in **OFF mode**.
2. Wait until the fan stops working.
3. Set the control switch at the left side of the water heater to **0**.



#### Warning

The power of the water heater stays on when the control switch is set to **0**.



#### Note

If the water heater is in **OFF mode** for more than 2 months and no water is drained, air bubbles may be formed in the water heater. This can lead to air in the water pipes.

### 4.2.2

### Isolate from the mains

To isolate the water heater from the mains:

1. Turn the temperature control knob anticlockwise to set the water heater in **OFF mode**.
2. Wait until the fan stops working.
3. Set the control switch to **0**.
4. Disconnect the water heater from the mains by turning the isolator.

### **4.2.3**

#### **Turn off for a long period**

When the water heater needs to be turned off for more than 2 months, contact your service and maintenance engineer to decommission the water heater.



# **Installation, Maintenance and Service part**



# 5 Introduction

## 5.1 About the water heater

The DR-LL water heater is intended for heating water for sanitary purposes.

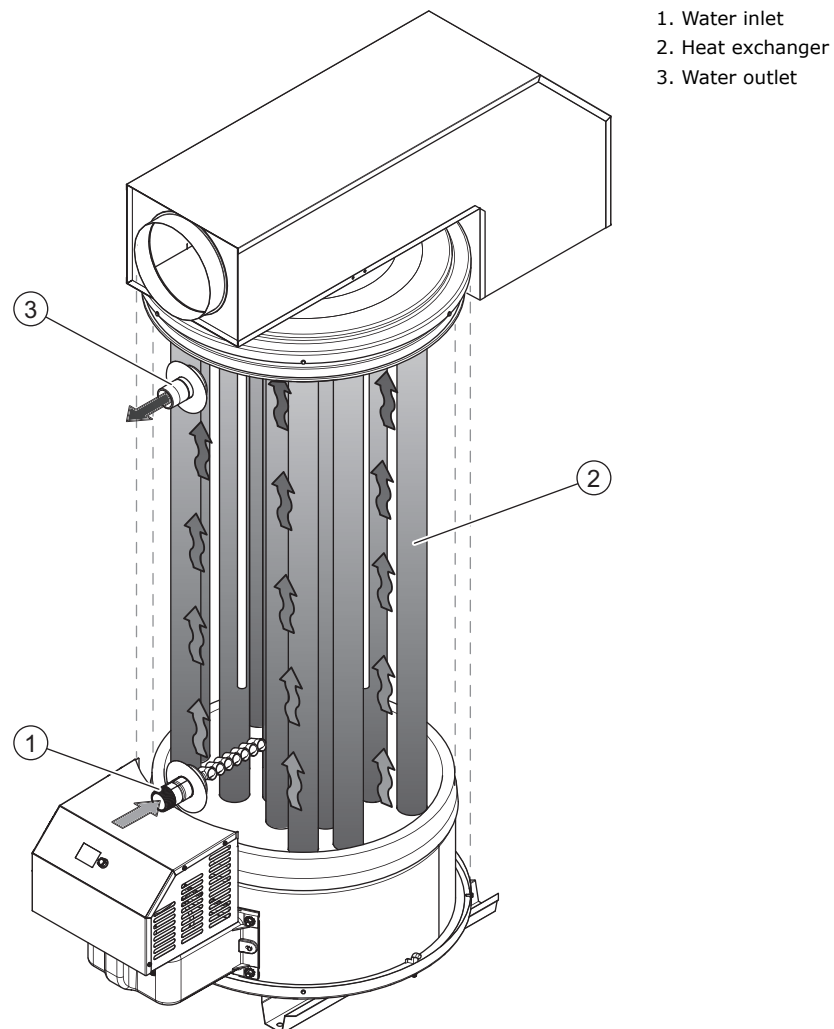
The DR-LL is a gas-fired storage water heater. The flue gasses transfer their heat to the water through an heat exchanger. The water heater has an open flue gas discharge connection.

## 5.2 Working principle

Cold water enters the bottom of the tank through the water inlet (1). A heat exchanger (2) transfers the heat from the flue gasses to the water and the hot water leaves the tank through the water outlet (3) at the top of the tank. The tank of the water heater has to be completely filled during operation. The tank at least must remain under mains water

supply pressure at any time. Fresh cold water is immediately added when hot water is drawn from the water heater. A temperature sensor measures the water temperature.

*Fig. DR-LL water heater*



When the temperature is too low, the water heater starts a operating cycle:

1. The controller detects a "heat demand".
2. The fan starts pre-purging.
3. The air proving switch closes when the air pressure differential is sufficient.
4. The spark plug is activated.
5. The gas valve opens and the pilot flame is ignited.
6. After flame detection the main valve opens and the main burners are ignited.
7. The water heater heats the water in the tank.
8. When the water temperature reaches the setpoint, the heat demand ends and the controller stops the operating cycle.
9. The fan starts post-purging.

The operating cycle starts again when a new heat demand is detected.

# 6

# Safety

## 6.1

## Safety instructions

For safety instructions on the use of the water heater, refer to Safety (see 2) in the User part of this manual.



---

### Warning

Installation, maintenance and service must be carried out by a qualified engineer in compliance with the general and local regulations imposed by the gas and water 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 (on page 4).

---

### Warning

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



---

### Caution

The water heater may only be moved in an upright position. After unpacking, make sure that the water heater is not damaged.

---

### Caution

Use of an incorrect roof flue terminal can cause the water heater to malfunction.

---

### Caution

Make sure that the diameter of the gas supply pipe is large enough to supply sufficient capacity to the water heater.

---

### Caution

Fill the water heater completely before use. Dry firing will damage the water heater.

---

### Caution

After installation, maintenance or service, always check that the appliance is gas tight and make sure that the gas supply pressure, the burner pressure and the air pressure are correct.

If the gas supply pressure is not correct, contact your mains gas supply company. Do not use the water heater.



---

### Danger

Never deactivate the T.R.S.. Backdraft of flue gas can lead to a dangerous situation.



---

### Caution

To prevent that you damage the components of the water heater, make sure that it completely stopped operation before you isolate the water heater from the mains. Wait 1 minute after you switch the water heater to **OFF mode**.

---



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**Note**

Any leakage from the tank and/or connections can cause damage to the immediate environment or floors below the level of the boiler room. Install the water heater above a waste water drain or in a suitable metal leak tray.

The leak tray must have an appropriate waste water drain and must be at least 5 cm deep with a length and width of at least 5 cm larger than the water heater.

---

## 6.2





### Instructions on the water heater

The water heater has some safety instructions on its cover:

- The text "Read the installation instructions before installing the appliance".
- The text "Read the user instructions before putting the appliance into operation".

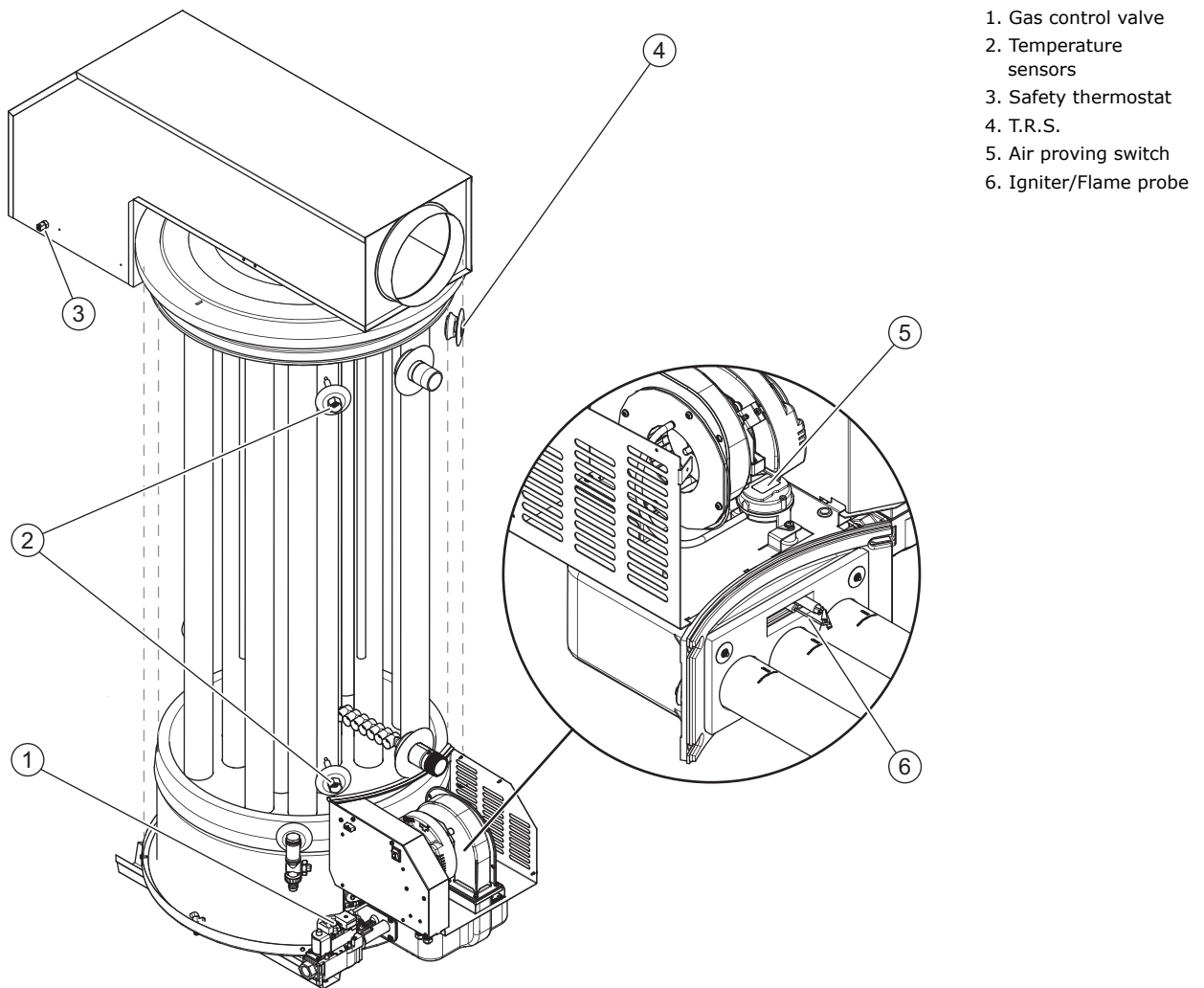
Also the packaging has some safety instructions:

- The text "Read the installation instructions before installing the appliance".
- The text "Read the user instructions before putting the appliance into operation".
- The text "The appliance may only be installed in a room that meets the required ventilation regulations".
- Some safety pictograms:

	CE approved
	this way up
	fragile
	keep dry
	maximum stacking height is 2

## 6.3 Safety devices

Fig. Safety devices



- 1. Gas control valve
- 2. Temperature sensors
- 3. Safety thermostat
- 4. T.R.S.
- 5. Air proving switch
- 6. Igniter/Flame probe

### Safety devices of the water heater:

<b>Gas control valve (1)</b>	The gas control valve controls the gas supply to the burner.
<b>Temperature sensors (2)</b>	The water heater controls the water temperature using two temperature sensors. When the water temperature is too high ( $> 88\text{ }^{\circ}\text{C}$ ), the water heater shows a blocking error because this is the maximum temperature. When the water temperature decreases to $< 80\text{ }^{\circ}\text{C}$ , the blocking error is removed.
<b>Safety thermostat (3)</b>	The safety thermostat makes sure that the gas supply is shut off when the water temperature is too high ( $> 95\text{ }^{\circ}\text{C}$ ), for safety. The water heater shows a lock-out error. Turn the temperature control knob completely anticlockwise to reset the water heater when the water temperature is decreased to $< 80\text{ }^{\circ}\text{C}$ .

<b>T.R.S. (Thermal Reflux Safeguard) (4)</b>	The T.R.S. detects the presence of returning flue gases on the draught diverter. The T.R.S. detects an increase of temperature in the edge of the draft diverter. When the temperature becomes too high, the gas supply is closed.
<b>Air proving switch (5)</b>	The air proving switch checks the air flow during post-purging, when the water heater is in operation and during pre-purging. This guarantees that there is sufficient air supply.
<b>Igniter/ Flame probe (6)</b>	The igniter/flame probe ignites the pilot burner and detects if there is a flame.

### **Safety devices of the installation:**

<b>Inlet security group</b>	An inlet security group has a stop valve, a non return valve and a pressure relief valve. The inlet security group prevents excessive pressure in the tank and back flow of expansion water into the cold water main supply.
<b>Pressure-reducing valve</b>	The pressure-reducing valve reduces the water mains pressure, if necessary.
<b>Temperature and pressure relief valve (T&amp;P valve) (1)</b>	The T&P valve prevents excessive pressure and temperature in the tank.

1- All water heaters have a T&P valve connection.



## 6.4

## Environmental aspects

### 6.4.1

### Recycling



The packaging material is environmentally friendly, recyclable and relatively easy to discard.

### 6.4.2

### Disposal



Old end-of-life appliances contain materials that need to be recycled. When you discard devices at the end of their service life, you must obey local legislation related to waste disposal.

Never discard your old device together with regular waste. Put the device into a municipal waste collection depot for electrical and electronic equipment. If necessary, ask your supplier or your service and maintenance engineer for advice.



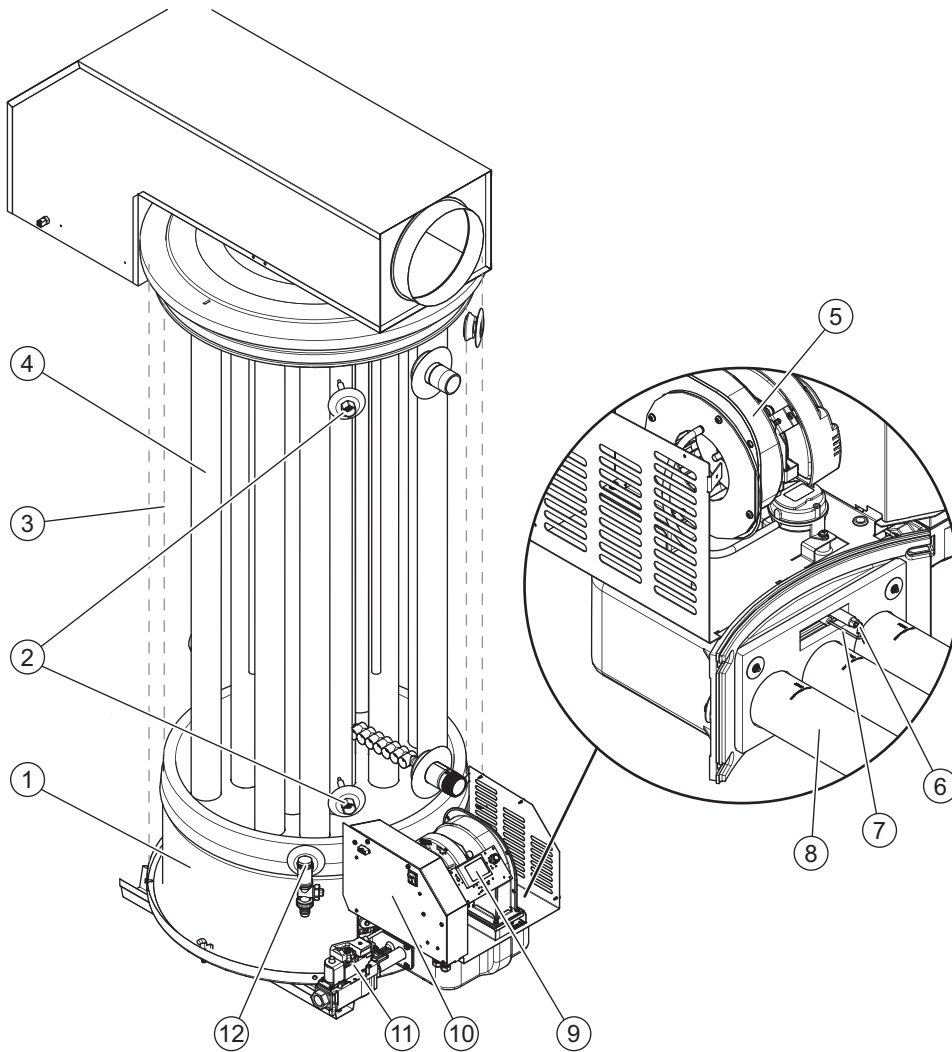
# 7 Water heater

## 7.1 Structure of the water heater

The water heater has the following main components:

<b>Controller (10)</b>	The controller monitors and manages all internal processes of the water heater for a safe operation.
<b>Operator interface (9)</b>	To control the water heater and to verify the status, the operator interface has a temperature control knob and a 4-character display. Refer to <a href="#">Operator interface</a> (see 3.1).
<b>Tank (3)</b>	The water is stored and heated up in the tank.
<b>Burner (8)</b>	At the burner the air and gas mixture are ignited to heat up the water.

Fig. Components water heater



1. Combustion chamber
2. Temperature sensors
3. Tank
4. Heat exchanger
5. Fan
6. Pilot burner
7. Igniter/Flame probe
8. Burner
9. Operator interface
10. Controller
11. Gas control valve
12. Drain valve

# 8 Installation



---

**Warning**

The installation must be done by a qualified person, in compliance with general and local applicable [regulations](#) (on page 4).

---



---

**Caution**

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

---

For more safety instructions, refer to [Safety instructions](#) (see 6.1).

## 8.1 Packaging

Hamworthy recommends to unpack the water heater at or near its intended location. Remove the packaging material carefully to prevent damage to the water heater.

## 8.2 Conditions

The water heater must be installed in a location, separated from living area's, with adequate ventilation and a suitable flue gas discharge (BS5440-2-2009, BS6644-2011 and IGEN/UP/10 Edition 4).

### 8.2.1 Ambient conditions

The installation site must be frost-free. If necessary, adjust the installation site to keep it frost-free.

Make sure that the ambient conditions are correct to prevent malfunction of the electronics in the water heater.

Air humidity and ambient temperature	
Air humidity	Max. 93% RH at + 25 °C
Ambient temperature	Functionality: $0 < T < 40\text{ °C}$

### 8.2.2 Maximum floor load

Refer to the building construction engineer and the general specifications in the [appendices](#) (see 11) to make sure that the maximum floor load is sufficient for the weight of the water heater.

### 8.2.3

### Water composition

The water must comply with the regulations for drinking water for human consumption.

Water composition	
Water hardness	> 1.00 mmol/l: <ul style="list-style-type: none"><li>- German hardness &gt; 5.6° dH</li><li>- French hardness &gt; 10.0° fH</li><li>- English hardness &gt; 7.0° e</li><li>- <math>\text{CaCO}_3</math> &gt; 100 ppm</li></ul>
Conductivity	> 125 $\mu\text{S}/\text{cm}$
Acidity (pH value)	7.0 - 9.5



#### Note

Water quality may adversely affect the efficiency, performance and lifetime of the water heater, refer to Warranty (on page 3). If water specifications differ from the specifications in the table a water treatment specialist should be consulted.

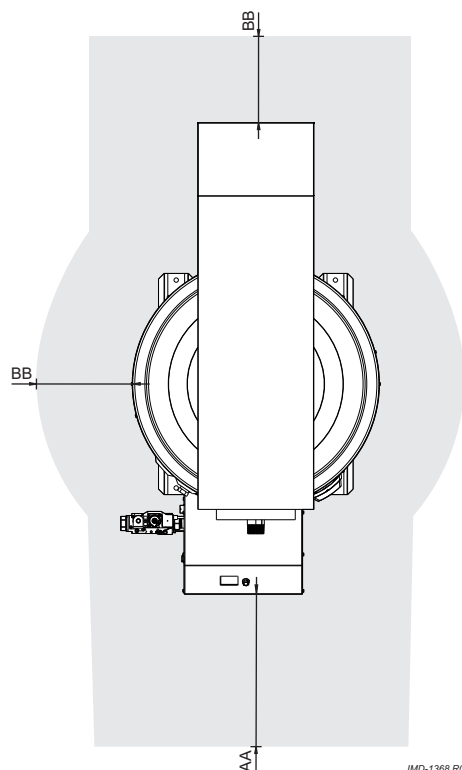
### 8.2.4

### Working clearances

Make sure that there is sufficient clearance to access the water heater:

- 100 cm in front of the water heater (AA).
- 50 cm at the left and right side of the water heater (BB).
- 100 cm at the top of the water heater.

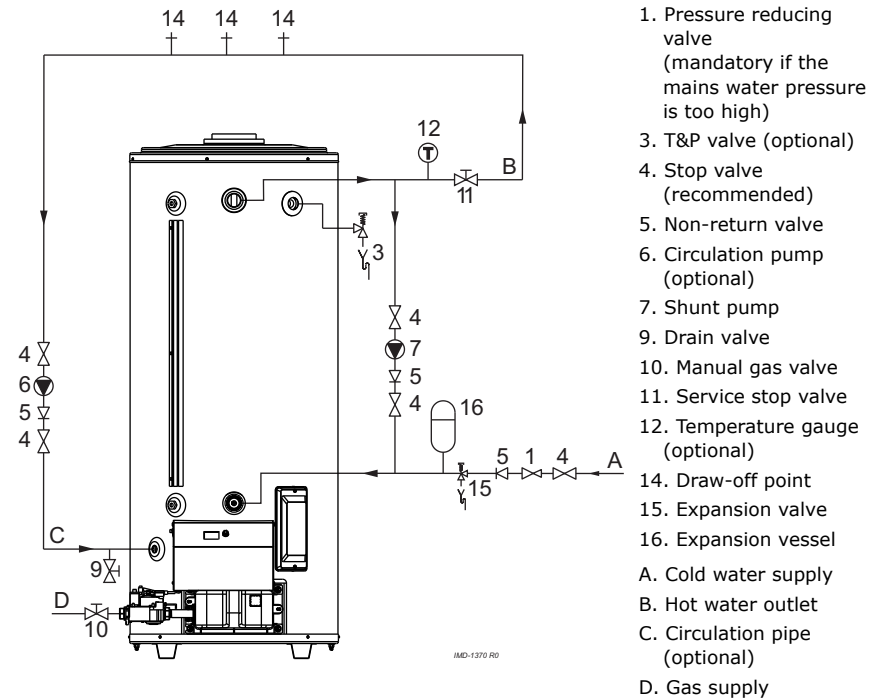
Fig. Working clearances



## 8.3

## Installation diagram

Fig. Installation diagram



### Note

Use this installation diagram when you:

- install the water connections (see 8.4)
- install the gas connection (see 8.5)
- fill the water heater (see 8.8.1)
- drain the water heater (see 8.9.2)

## 8.4

## Water connections

### 8.4.1

### Cold water connection

Install the cold water connection:

1. Install an approved stop valve (4), as required by the applicable regulations (on page 4).
2. Install an approved pressure reducing valve (1) to prevent that the pressure in the cold water supply pipe exceeds the maximum working pressure of the tank, 8 bar. Refer to the Technical details.
3. Install a non-return valve (5).
4. Install an expansion valve (15).
5. Connect the overflow connection of the expansion valve, to an open waste water pipe.
6. Install an expansion vessel (16).

### 8.4.2

### Hot water connection

#### Note

Insulate long hot water pipes to prevent unnecessary energy loss.

Install the hot water connection:

1. Install a stop valve (11) in the hot water outlet pipe for service reasons.
2. If applicable, install a temperature gauge (12).
3. Install a T&P valve (3).

### 8.4.3

### Circulation connection

Install a circulation system when an immediate flow of hot water at draw-off points is required. This improves comfort and reduces water wastage.



---

**Note**

Use the drain valve connection (9) as a connection of the circulation pipe on the water heater.

**Note**

Make sure that the circulation pump has the correct capacity for the length and resistance of the circulation system.

---

Install a circulation pump:

1. Install a circulation pump (6).
2. Install a non-return valve (5) after the circulation pump to make sure that the direction of circulation is guaranteed.
3. Install a stop valve (4) before the circulation pump.
4. Install a stop valve (4) after the non-return valve.
5. Connect the circulation pipe to the drain valve (9).

### 8.4.4

### Drain valve

Install the drain valve:

1. Fasten the drain valve (9) in the connection in the front of the water heater.
2. Place the cap over the connection to make it watertight.

## 8.5

## Gas connection



---

**Caution**

Make sure that the gas supply pipe has the correct diameter and length to supply sufficient capacity to the water heater.

**Caution**

Make sure that the gas supply pipe is clean. Contamination in the pipe can cause damage to the gas control valve, during operation.

**Caution**

Install a manual gas valve on a spot accessible for the user.

---

Install the gas connection:

1. Install the manual gas valve (10) in the gas supply pipe.
2. Make sure that the gas pipe is clean before use. If necessary, remove the contamination from the pipe.
3. Close a manual gas valve.
4. Install the gas supply pipe to the gas control valve.
5. Make sure that there are no gas leaks.



## 8.6

## Flue gas discharge



### Caution

It is not allowed to make changes to the flue gas discharge or to apply casings on it.

Install the flue gas discharge:

1. Make sure that there is a draught diverter installed on top of the water heater (see 8.6.1).
2. Connect the T.R.S. (see 8.6.2).
3. Install the discharge pipe (see 8.6.3).

### 8.6.1

### Draught diverter

On delivery a draught diverter is installed on top of the water heater.

For the correct installation to the discharge pipe, it can be necessary to replace the draught diverter with another one. Please contact your supplier for advise. You can order one of the following alternative draught diverters.

	Hamworthy Part Numbers		
	DR-LL 50-288	DR-LL 70-344	DR-LL 90-322
<b>Default</b>	T.B.D.	T.B.D.	T.B.D.
<b>Alternative 1</b>	224499	224500	224501
<b>Alternative 2</b>	224502	224503	224504

*Fig. Default draught diverter*

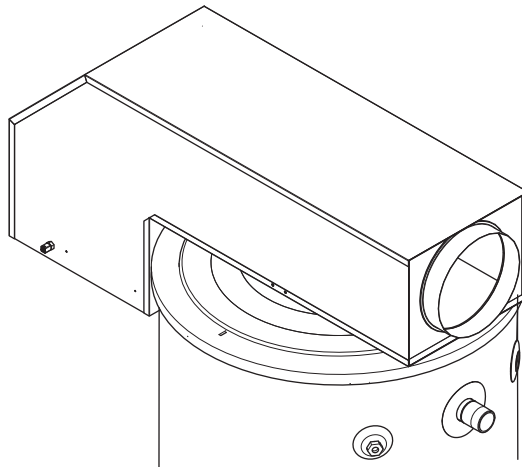


Fig. Draught diverter alternative 1

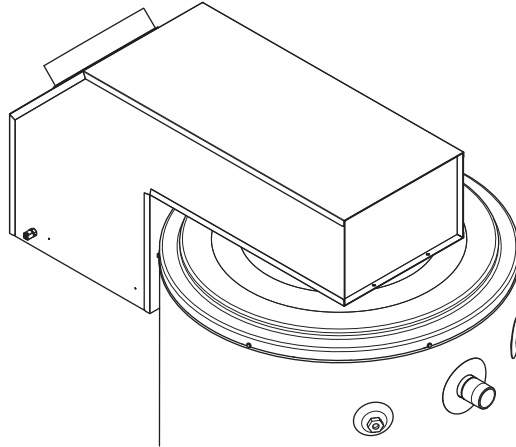
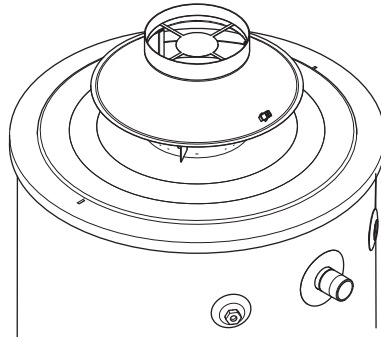


Fig. Draught diverter alternative 2



### 8.6.2

#### **T.R.S. (Thermal Reflux Safeguard)**

The T.R.S. (Thermal Reflux Safeguard) is pre-installed on the draught diverter.

Connect the plug of the T.R.S.thermostat.

### 8.6.3

#### **Discharge pipe**

Install a vertical discharge pipe directly on top of the draught diverter. This pipe must have at least 50 cm of length before the first bent.



---

**Note**

Make sure that the discharge pipe is protected against corrosion and has at least the same diameter of the draught diverter.

---

## 8.7

### **Electrical connections**



---

**Warning**

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

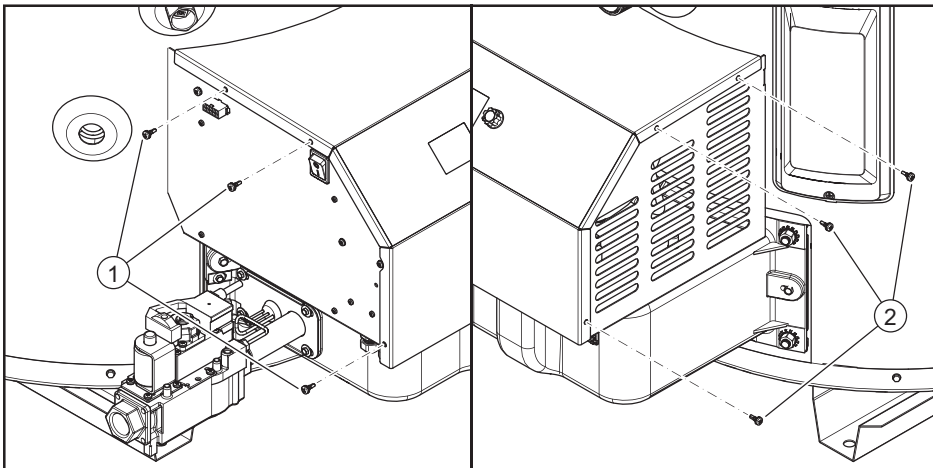
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### 8.7.1

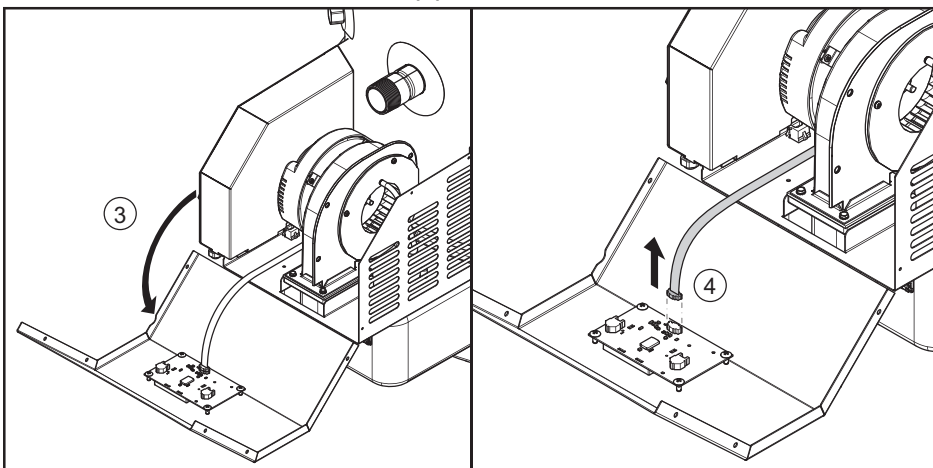
#### Preparation

Remove the cover of the water heater to make the electrical section and the terminal block visible:

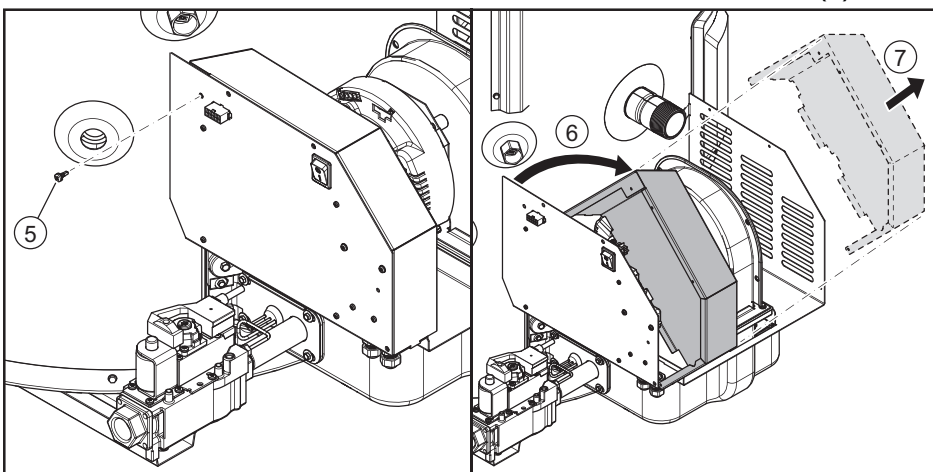
1. Use a screw driver to remove three screws at the left side (1) and three screws on the right side (2) of the cover.



2. Take the cover from the water heater (3).

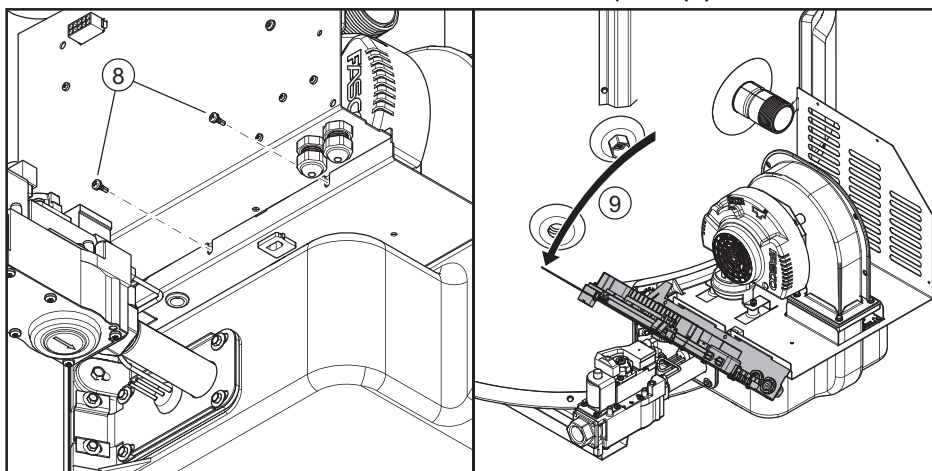


3. Disconnect the plug (4) from the display board at the inside of the cover.
4. Use a screw driver to remove the screw at the left side of the control cover (5).



5. Hinge the control cover to the front (6) and remove it carefully from the water heater (7).

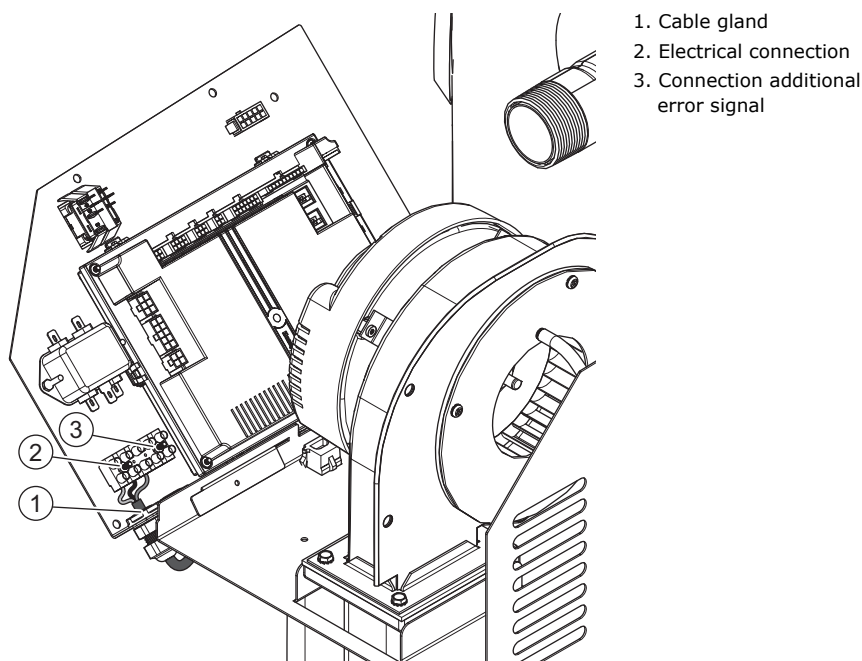
6. Use a screw driver to remove the screws at the left side panel (8).



7. Move the left side panel to the left (9) until it is positioned horizontally.

The mains power and optional electrical connections have to be connected to the terminal block of the controller, refer to Structure of the water heater (see 7.1).

*Fig. Terminal block*



## 8.7.2

### Mains power



#### Note

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

Use a power cable with cores of at least  $3 \times 0,75 \text{ mm}^2$  and an overvoltage category III, double-pole isolator with a contact gap of at least 3 mm. The double-pole isolator must be incorporated in the fixed wiring in accordance with the wiring rules.

Connect the water heater to the mains power supply:

1. Pull the power cable through the cable gland.
2. Connect the mains neutral core to N, the mains live core to L and the mains earth core to  $\perp$ .

3. Connect the power cable to the double pole isolator.
4. Secure the power cable in the cable gland.



---

**Note**

The length of the mains earth core, that is connected to the electrical connection, must be longer than the core of the mains neutral and live.

---

### 8.7.3

#### Additional error signal (optional)

The appliance has a 230VAC output that is switched when an error is detected. This can be used to signal errors, for example with a bulb. A 230V circuit can be connected directly. Other voltages require a relay.

1. Pull the cables through the cable gland.
2. Connect the neutral core (N) to X1, and the live core (L) to X2 on the terminal block (see 11.5).
3. Secure the cables in the cable gland.

### 8.7.4

#### Finalization

When all connections are made, install the covers on the water heater:

1. Place the left side panel vertically and use a screw driver to tighten the screws on the bottom side.
2. Place the control cover back:
  - a) Place the hook at the front in the correct position.
  - b) Hinge the cover backwards to place it in the correct position.
  - c) Use a screw driver to tighten the screw on the left side of the control cover.
3. Connect the plug at the inside to the display board.
4. Place the cover back.
5. Use a screw driver to tighten the three screws at the left side and the three screws on the right side of the cover.

## 8.8

### Commissioning

To commission the water heater:

1. Fill the water heater (see 8.8.1).
2. Check the gas supply pressure (see 8.8.2).
3. Check the burner pressure (see 8.8.3).
4. Check the air pressure (see 8.8.4).
5. Turn on the water heater (see 8.8.5).

### 8.8.1

#### Filling

Refer to the installation diagram when you fill the water heater:

1. Open the stop valve (11) in the hot water supply pipe.
2. If applicable, open the stop valves (4) of the circulation pipe (C).
3. Make sure that the drain valve (9) is closed.
4. Open the nearest hot water draw-off point (14).
5. Open the stop valve (4) of the cold water supply pipe (A). Cold water flows into the water heater.
6. Fill the water heater until a full water jet flows from the nearest draw-off point. The water heater is completely full.
7. Open all draw-off points to bleed the entire installation of air. The water heater is now under water supply pressure.
8. Make sure that no water comes out of the expansion valve (15) or the T&P valve (3). If water comes out:
  - Examine if the water supply pressure is greater than the specified value in the Technical details. If necessary, install a pressure reducing valve (1).
  - Examine if the expansion valve in the protected cold supply set-up is installed correctly and is not defect. If necessary, replace the expansion valve.

## 8.8.2

### Gas supply pressure

Check the gas supply pressure:

1. Loosen the sealing screw (2) of the test nipple by a few turns.



---

**Note**

Do not completely loosen the sealing screw, it can be difficult to retighten it.

---

2. Open the gas supply to vent the gas pipes through the test nipple.
3. Connect a pressure gauge to the test nipple as soon as you smell gas.
4. Turn on the water heater (see 4.1).
5. If necessary, create a heat demand:
  - Use a hot water draw-off point to tap water, or
  - Raise the setpoint of the water temperature, refer to Set the water temperature (see 4.1.2).
6. Wait about 1 minute.
7. Use the pressure gauge to read the supply pressure and compare it with the value from the appendix Gas details.



---

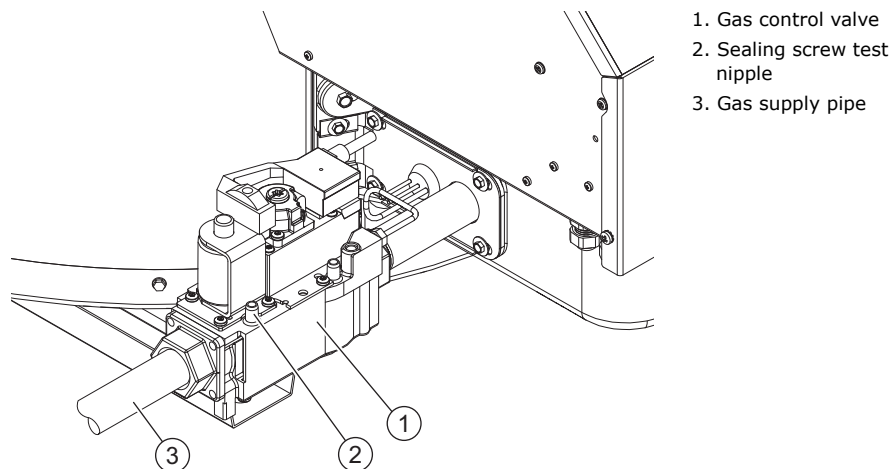
**Note**

Consult the mains gas supply company if the supply pressure is not correct. Take the water heater out of service until the supply pressure is correct, refer to section Decommissioning (see 8.9).

---

8. Set the control switch on the front of the water heater to **0** to turn off the water heater (see 4.2).
9. Shut off the gas supply.
10. Disconnect the pressure gauge.
11. Tighten the sealing screw in the test nipple.

Fig. Gas supply pressure



## 8.8.3

### Burner pressure

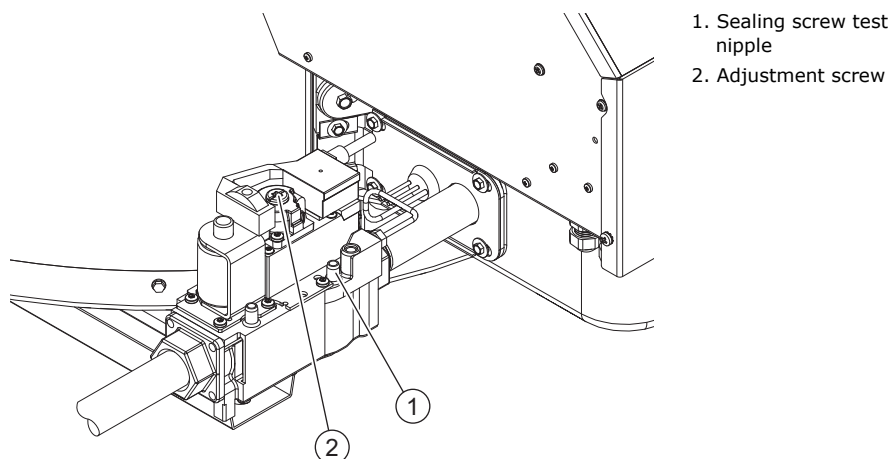
Make sure that the burner pressure is set correctly.

Check the burner pressure:

1. Remove the sealing screw of the test nipple (1).
2. Connect a pressure gauge to the test nipple.
3. Turn on the water heater (see 4.1).
4. If necessary, create a heat demand:
  - Use a hot water draw-off point to tap water, or
  - Use the temperature control knob to raise the setpoint of the water temperature (see 4.1.2).
5. Wait about 1 minute.
6. Use the pressure gauge to read the burner pressure and compare it with the value from the appendix Gas details (see 11.3).

7. If necessary, correct the burner pressure with the pressure adjustment screw (2). Turn the screw anticlockwise to decrease the burner pressure or clockwise to increase the burner pressure.
8. Turn the water heater off (see 4.2).
9. Disconnect the pressure gauge.
10. Replace the sealing screw and tighten it on the test nipple.

*Fig. Burner pressure*



## 8.8.4

### Air pressure differential

Check the air pressure across the air pressure switch:

1. Remove the cover from the water heater (see 8.7.1). Leave the control cover on the water heater.
2. Pull the pressure gauge hose through the right side of the water heater housing (1).
3. Disconnect the hose (2) of the air pressure switch (3) and use a T-piece to connect this side of the hose to the - of the pressure gauge.
4. Connect the remaining port of the T-piece to the air proving switch.
5. Place the cover back (see 8.7.4).
6. Turn on the water heater (see 4.1).
7. Wait about 1 minute.
8. Use the pressure gauge to read the air pressure differential and compare it with the value from the table (see 11.1).



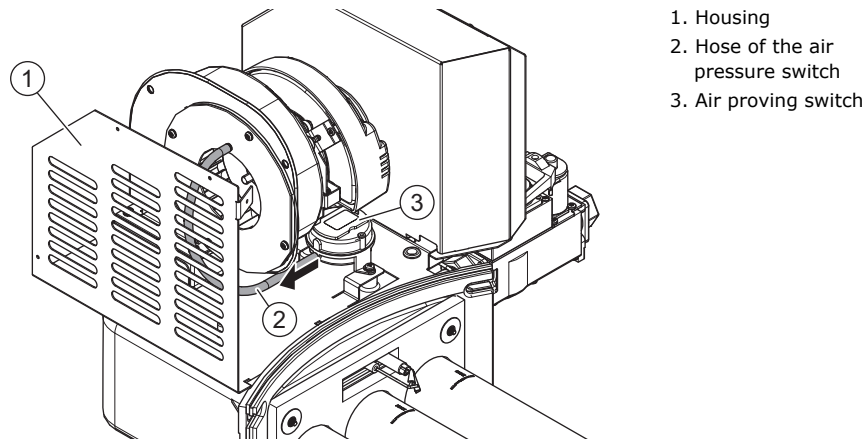
#### **Note**

When the air pressure differential is not correct, refer to Displayed errors (see 10.1.2), error LDS with code *F03*.

9. Turn the water heater off (see 4.2).
10. Disconnect the pressure gauge.

11. Remove the T-piece.
12. Reconnect the hose to the air proving switch.

*Fig. Air pressure differential*



1. Housing
2. Hose of the air pressure switch
3. Air proving switch

### 8.8.5 Turn on the water heater

Refer to the procedure in the user part to Turn on the water heater (see 4.1).

## 8.9 Decommisioning

To decommission the water heater:

1. Turn off the water heater (see 8.9.1)
2. Drain the water heater (see 8.9.2)

### 8.9.1 Turn off the water heater

Refer to the procedure in the user part to Turn off the water heater (see 4.2) and isolate the water heater from the mains power supply.

### 8.9.2 Draining

Refer to the installation diagram when you drain the water heater:

1. Close the manual gas valve (10).
2. If applicable, close the service stop valve (11) in the hot water pipe.
3. Close the stop valve (10).
4. Open the drain valve (9).
5. Aerate the entire installation of air until the water heater is completely drained.



# 9

## Maintenance

The water heater needs maintenance at least once a year. The maintenance interval is determined by the water quality, the average burning time each day and the set water temperature.

To determine the correct interval, Hamworthy recommends to do a system check on both the water and the gas side, three months after installation.



---

### Note

Do maintenance to maintain an effective and efficient transfer of heat to the water. This significantly increases the service life of the water heater.

### Note

When needed, spare parts can be ordered. To be sure that you receive the correct spare parts, look at the data plate for the full serial number, the water heater model, and the used gas category. Use this information when you order the spare parts.

---

Do the following maintenance activities:

- [Performance check](#) (see 9.1)
- [Water side maintenance](#) (see 9.3)
- [Gas side maintenance](#) (see 9.4)
- [Finalization](#) (see 9.5).



---

### Note

For maintenance purposes, a special gasket and mounting set must be ordered at your supplier. This kit contains the necessary gaskets, bolts and washers. Look at the data plate for the correct ordering information.

---

## 9.1

### Performance check

Check if the performance of all components is correct:

1. Make sure that the water heater operates the operating cycle correctly.
2. If applicable, make sure that the T&P valve operates correctly.  
Open the T&P valve pressure relief and make sure that water spurt out.



---

### Warning

Hot water can come out of the T&P valve.

---

3. Make sure the pressure relief connection of the inlet security group operates correctly.  
Open this pressure relief and make sure that water spurt out.
4. Remove the covers from the water heater, refer to [Installation](#) (see 8.7.1).
5. Make sure that there are no leaks in the flue gas discharge.
6. Make sure the gas supply pressure is correct, refer to [Gas supply pressure](#) (see 8.8.2).
7. Make sure the burner pressure is correct, refer to [Burner pressure](#) (see 8.8.3).
8. Make sure the air pressure is correct, refer to [Air pressure](#) (see 8.8.4).

## 9.2

## Preparation

Isolate the water heater from the mains before you start maintenance tasks.

## 9.3

## Water-side maintenance

To do water side maintenance:

- Inspect the anode (see 9.3.1)
- Inspect the inlet security group (see 9.3.2)
- Descale the tank

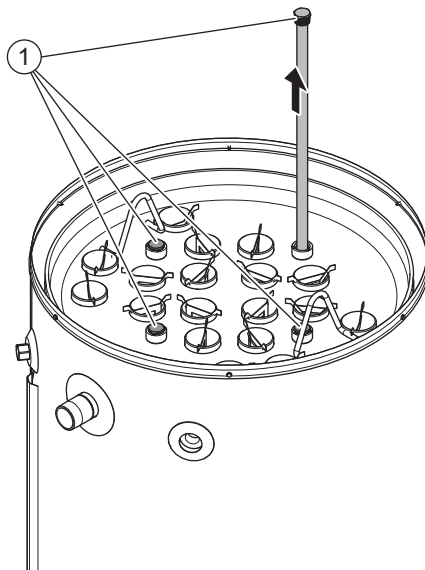
### 9.3.1

### Inspect the anode

The life cycle of the anode is determined by the quality and the quantity of the water that flows through the water heater. Inspect the anode at least once a year to make sure that the tank is protected against corrosion.

To inspect the anode:

1. Close the cold water supply.
2. Open the nearest hot water tap to reduce the water pressure in the water heater.
3. Disconnect the discharge pipe.
4. Remove the draught diverter.
5. Use a screw driver to remove the screws from the top cover.
6. Remove the top cover.
7. Remove the inner cover.
8. Remove the four anodes (1).



9. Inspect the diameter of the anode. When the diameter of the anode is less than 8,4 mm somewhere along the length of the anode , replace the anode.



---

**Note**

If the anode needs to be replaced, always use an anode of the same type. Please refer to the type and the serial number on the data plate.

---

10. Place the anode in the water heater.
11. Use a wrench to fasten the anode. Make sure that the connection is watertight.



---

**Note**

Never install an anode isolated from the metal tank.

---

12. Replace the inner cover.
13. Replace the isolation.
14. Replace the top cover.

15. Install the draught diverter please refer to the installation instructions delivered with the draught diverter.
16. Reconnect the discharge pipe.

### 9.3.2

#### Inspect the inlet security group

To inspect the inlet security group:

1. Check if the cold water supply is open. If not, open the cold water supply.
2. Open the relief valve of the inlet security group and make sure that the water flows out with a full jet of water.
3. Close the relief valve.
4. Check if the water is drained through the tundish. If not, remove the blockage.
5. Check the water flow again by opening the relief valve.

### 9.3.3

#### Descale the tank



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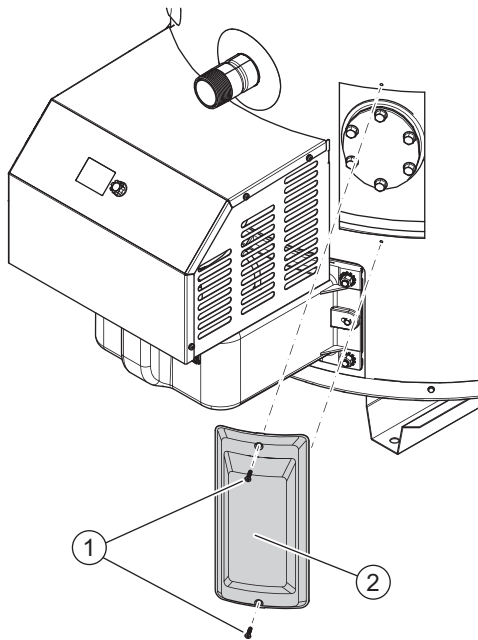
**Note**

Hard water may cause the formation of limescale, which will reduce the operating efficiency and may cause early product failure. Failure of the water heater due to limescale or other deposits would not be classed as manufacturing defect and as such would not be covered under the terms of the warranty (on page 3).

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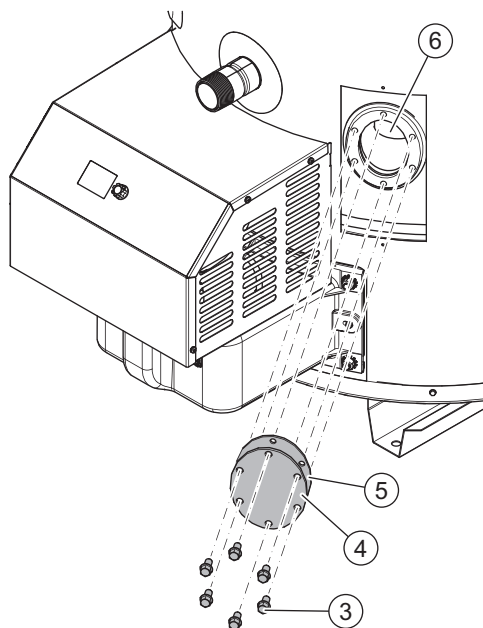
To descale and clean the tank:

1. Decommision the water heater (see 8.9).
2. Loosen the two screws (1) to remove the cover plate on side of the tank (2).



3. Push the isolating material aside to see the cleaning opening.

4. Loosen the 6 bolts (3).



5. Remove the cleaning opening cover (4).
6. Remove the gasket (5).
7. Inspect the tank (6) and remove the loose scale deposits and contamination:
  - a) Remove the scale and contamination by hand.
  - b) If necessary use a descaling agent to remove the scale and contamination from the tank. Contact Hamworthy for advice on what descaling agent to use.
8. Replace the gasket.
9. Close the cleaning opening.
10. Use a torque wrench to tighten the bolts with a maximal torque of 50 Nm to prevent damage to the tank
11. Put the isolating material in place.
12. Put the cover plate in place and tighten the two screws.
13. Fill the water heater (see 8.8.1).

## 9.4

### Gas-side maintenance

Do gas side maintenance when the water heater does not operate correctly, the air pressure is not correct and/or the burner pressure is not correct.

To do gas side maintenance:

- Clean the burner (see 9.4.1)
- Check the pilot burner (see 9.4.2)
- Clean the combustion chamber (see 9.4.3)

#### 9.4.1

#### Clean the burner



##### Caution

Be careful, the burner can be hot

##### Caution

Always replace the gaskets after removal of the burner. Look at the data plate for the correct ordering information.



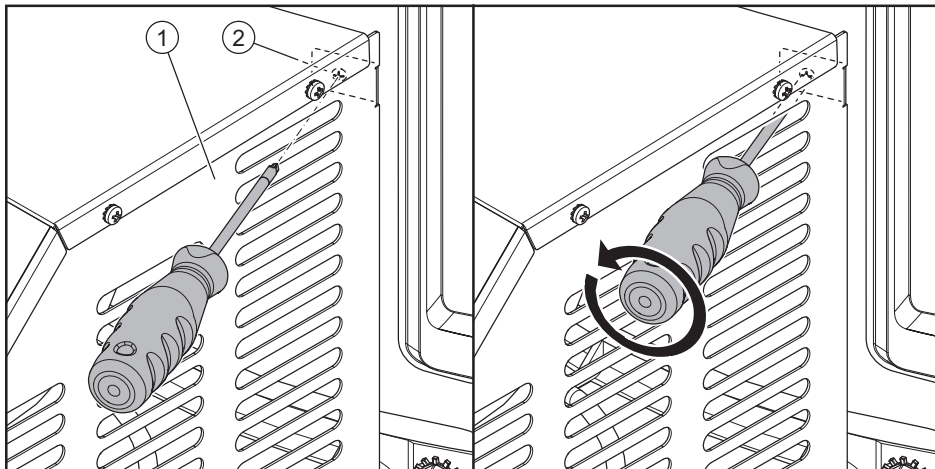
##### Note

Mind the ground cable!

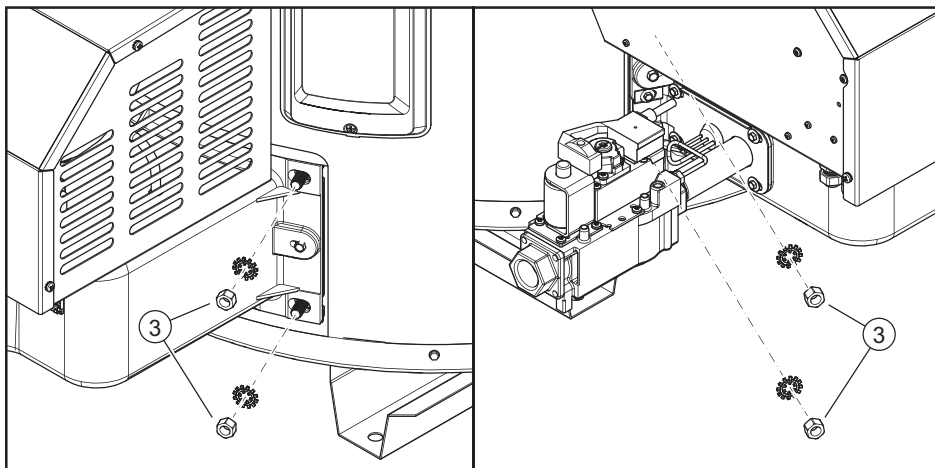
Remove the burner:

1. Close the manual gas valve, refer to Installation diagram (see 8.3).

2. Place a screw driver through the air inlet opening on the right side of the housing (1) to loosen the screw (2) at the inside of the housing.

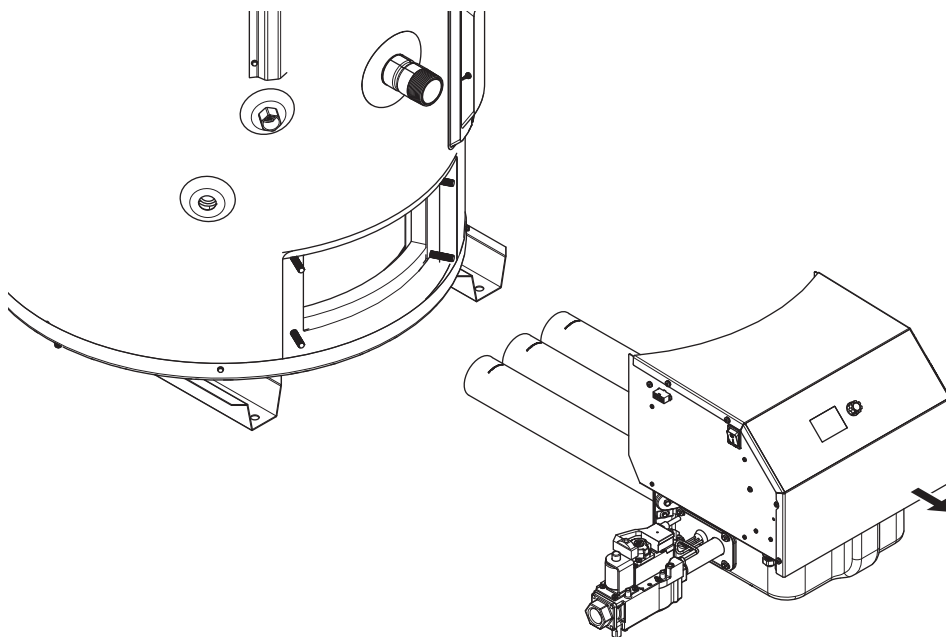


3. Remove the four nuts (3).



4. Carefully pull the complete burner assembly out of the water heater.

*Fig. Remove the burner assembly*



Use a brush to remove all contamination from the burner.

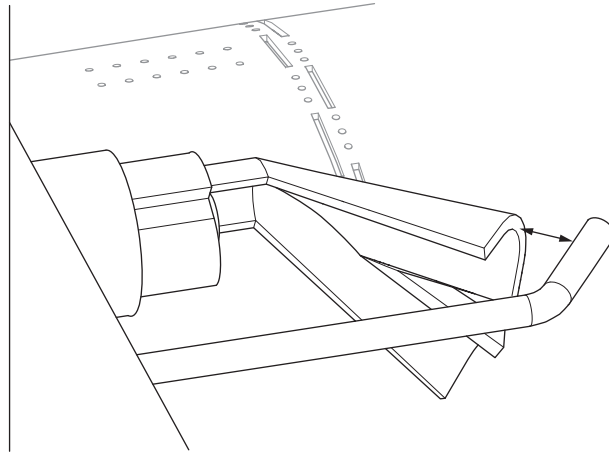
### 9.4.2

### Check the pilot burner

Make sure that the pilot burner is in a good condition:

1. Remove contamination from the igniter and the pilot burner.
2. Make sure that the distance between the igniter and the pilot burner is between 0,26 cm and 0,40 cm.

*Fig. Distance between igniter and pilot burner*



### 9.4.3

### Clean the combustion chamber

If necessary, remove the contamination in the combustion chamber (1) by hand.

### 9.4.4

### Assemble the burner

Assemble the burner again when the main burner, the pilot burner and the combustion chamber are cleaned.



---

**Note**

Before reassembly replace the gasket, bolts and washers. You must order a special gasket and mounting set at your supplier. Look at the data plate for the correct ordering information.

---

Refer to the figures in [Clean the burner](#) (see 9.4.1) to assemble the burner:

1. Carefully place the burner assembly into the water heater.
2. Tighten the burner assembly with the four nuts.
  - a) Tighten the two nuts on the right side by hand.
  - b) Tighten the two nuts on the left side by hand.
  - c) Fully tighten the two nuts on the right side.
  - d) Fully tighten the two nuts on the left side.
3. Use a screw driver through the air inlet opening on the right side of the housing to replace the screw at the inside of the housing.
4. Open the gas control valve, refer to [Installation diagram](#) (see 8.3).

## 9.5

## Finalization

When all maintenance activities are done:

1. [Fill the water heater](#) (see 8.8.1).
2. Make sure the gas supply pressure is correct, refer to [Gas supply pressure](#) (see 8.8.2).
3. Make sure the burner pressure is correct, refer to [Burner pressure](#) (see 8.8.3).
4. Make sure the air pressure is correct, refer to [Air pressure differential](#) (see 8.8.4).
5. [Turn on the water heater](#) (see 4.1).

# 10 Troubleshooting

## 10.1 Errors and warnings

The water heater can have two different kinds of errors:

- General errors (see 10.1.1), which are not displayed
- Displayed errors (see 10.1.2), which are divided in two different groups:
  - Lock out errors: when the cause is removed, you can reset the error to resume operation. The displayed code and the back-light of the display blink.
  - Blocking errors: when the cause is removed, the error resets automatically to resume operation. The code is displayed continuously and the back-light of the display blinks.

### 10.1.1 General errors



#### Note

For the coding of the connections, refer to the Electrical wiring diagram.

Indication	Cause	Measure
Gas smell	There is a gas leak	<ul style="list-style-type: none"><li>- Close the mains gas valve at once.</li><li>- Do not operate any switches.</li><li>- No naked flames.</li><li>- Ventilate the boiler room.</li><li>- Immediately contact your installation engineer or your local gas company.</li></ul>
	The water heater is off.	<u>Turn on the water heater</u> (see 4.1).
	There is no supply voltage.	Make sure that: <ul style="list-style-type: none"><li>- the control switch is set to <b>I</b>.</li><li>- the isolator is in <b>ON</b> position.</li><li>- there is power on the isolator.</li><li>- there is power to the electrical connector block.</li></ul> The measured voltage must be 230 V <sub>AC</sub> (-15%, +10%).
Water leakage	Defective fuse(s)	Replace the fuse(s).
	There is a leakage from a threaded water connection.	Tighten the threaded connection.
	There is a leakage from another nearby water heater or pipe segment.	Trace the leakage.
	There is a leakage from the water heater tank.	Contact the supplier of your water heater.

Indication	Cause	Measure
<b>Explosive ignition</b>	The gas supply pressure is incorrect.	Check the gas supply pressure, refer to <u>Gas supply pressure</u> (see 8.8.2).
	The burner pressure is incorrect.	Check the burner pressure, refer to <u>Burner pressure</u> (see 8.8.3).
	The burner is contaminated.	Clean the burner, refer to <u>Gas-side maintenance</u> (see 9.4).
<b>Insufficient or no hot water</b>	The water heater is off.	<u>Turn on the water heater</u> (see 4.1).
	There is no supply voltage.	Make sure that: <ul style="list-style-type: none"> <li>- the control switch is set to <b>I</b>.</li> <li>- the isolator is in <b>ON</b> position.</li> <li>- there is power on the isolator.</li> <li>- there is power to the electrical connector block.</li> </ul> The measured voltage must be 230 V <sub>AC</sub> (-15%, +10%).
	The hot water supply is used up.	Reduce the hot water consumption. Wait until the water heater heats up.
	The controller is in the <b>OFF mode</b> .	<u>Set the controller in the ON mode</u> (see 4.1.1).
	The temperature (T <sub>set</sub> ) is set too low.	<u>Set the temperature (T<sub>set</sub>) to a higher value</u> (see 4.1.2).

## 10.1.2

### Displayed errors



#### Note

For the coding of the connections, refer to the Electrical wiring diagram.

#### Note

Contact your service and maintenance engineer if the error persists.

Code and description	Cause	Measure
<b>c02 (lock out error)</b> <b>Control error</b> Error message from the controller	Internal error from the controller.	Reset the controller.  If the error reappears, replace the controller.
<b>c03 (blocking error)</b> <b>Control error</b>	More than 5 resets detected in a 15 minutes.	Wait for the error to disappear (maximal 1 hour).  If the error does not disappear, replace the controller
<b>E01 (blocking error)</b> <b>Temperature error</b>	The temperature in the tank is above 88°C.	<ul style="list-style-type: none"> <li>- Tap off water, so the temperature drops in the water heater.</li> <li>- Make sure that there is no scale on the temperature sensor. If necessary, replace the sensor.</li> </ul> When the temperature is below 80°C, the error is reset automatically.



Code and description	Cause	Measure
<b>E04 (lock out error)</b> <b>Flue gas error</b>	The flue gas sensors have a difference of > 10K. during a period longer than 1 minute.	Make sure that the sensor wiring is connected and not damaged. Reset the controller.  If necessary replace the sensor and/or wiring if the error reappears.
<b>E05 (lock out error)</b> <b>Control error</b>	Control was in a blocking error for at least 20 hours.	- Reset the controller.  If the error reappears:  - Find the cause of the blocking error.  - Remove the cause and reset the controller.  If the error reappears, replace the controller.
<b>E06 (blocking error)</b> <b>Flue gas error</b>	The temperature of the flue gas is above 70°C.	Make sure that there are no blockages in the chimney flue pipe.  After 10 minutes, the error is reset automatically, when the temperature is below 70°C.
<b>F02 (lock out error)</b> <b>Fan error</b>  Fan does not run on correct speed	Damaged or disconnected wiring.	- Make sure that the wiring between the fan and the controller is connected and not damaged.  - If necessary, replace the wiring. Reset the controller when the wiring is reconnected
	Contaminated or blocked fan.	- Make sure that the motor and/or rotor of the fan are not dirty or blocked.  - If necessary remove the dirt and/or blockage.  - Reset the controller.  - Make sure that the rotor of the fan can rotate freely and reset the controller.
	Due to a drop in supply voltage, the fan will not run at the correct speed.	- Make sure that the supply voltage is correct and reset the controller. The measured voltage must be 230 V <sub>AC</sub> (-15%, +10%)  - Contact your maintenance and service engineer when the supply voltage is not correct.
	Defective motor and/or rotor.	- Make sure that the motor and/or rotor are not defective and reset the controller.  - Replace the fan when the motor and/or rotor are defective and reset the controller.

Code and description	Cause	Measure
<b>F03 (lock out error)</b> <b>Air proving switch error</b> Switch is closed when fan is not running.	Damaged wiring/closed circuit.	<ul style="list-style-type: none"> <li>- Make sure that the wiring, between the air proving switch and the control, is connected and not damaged.</li> <li>- If necessary replace the wires or reconnect the wires. Reset the controller, when wires are replaced or reconnected.</li> </ul>
	Air proving switch defect.	<ul style="list-style-type: none"> <li>- Make sure that the air proving switch works properly.</li> <li>- If necessary, replace the air proving switch.</li> <li>- When the air proving switch is replaced and reconnected, reset the controller.</li> </ul>

Code and description	Cause	Measure
<b>F03 (lock out error)</b> <b>Air proving switch error</b> Switch is not closed when fan is running.	Fan is not running.	- See measure of error F02.
	Hose is damaged.	<ul style="list-style-type: none"> <li>- Make sure that the hose, between the air proving switch and the fan is not damaged and reset the controller.</li> <li>- If necessary replace the hose</li> <li>- When the hose is replaced and reconnected, reset the controller.</li> </ul>
	Wiring is damaged.	<ul style="list-style-type: none"> <li>- Make sure that the wiring, between the air proving switch and the control, is connected and not damaged.</li> <li>- If necessary, replace the wires or reconnect the wires.</li> <li>- When wires are replaced or reconnected, reset the controller.</li> </ul>
	Air proving switch defect.	<ul style="list-style-type: none"> <li>- Make sure that the air proving switch works properly.</li> <li>- If necessary, replace the air proving switch.</li> <li>- When the air proving switch is replaced and reconnected, reset the controller.</li> </ul>
	Leakage of air between fan and the restriction plate.	Check the gasket between the fan and the restriction plate. If necessary, replace the gasket.
	Incorrect restriction plate on the fan.	Make sure that the restriction plate has the <u>correct diameter</u> (see 11.3). If necessary, replace the restriction plate.
	Not enough pressure differential across the air proving switch, due to: <ul style="list-style-type: none"> <li>- dirty burner</li> <li>- blocked heat exchanger</li> </ul>	Check, after each fix, if the error reappears. If the error reappears continue in finding the cause. <ul style="list-style-type: none"> <li>- Measure the pressure differential across the air proving switch, refer to <u>Air pressure differential</u> (see 8.8.4).</li> </ul> Burner: <ul style="list-style-type: none"> <li>- Make sure that the the burner is clean.</li> <li>- Measure the pressure differential across the air proving switch again.</li> </ul> Heat exchanger: <ul style="list-style-type: none"> <li>- If the pressure differential is insufficient, clean the heat exchanger.</li> <li>- Measure the pressure differential across the air proving switch again.</li> </ul>

Code and description	Cause	Measure
<b>F04 (lock out error)</b> <b>Ignition error</b> Five unsuccessful ignition attempts.	No gas.	<ul style="list-style-type: none"> <li>- Make sure that the main gas supply valve is open. If necessary, open the valve.</li> <li>- Make sure that the manual gas supply valve, before the gas control valve, is open. If necessary, open the valve.</li> <li>- Make sure that the gas supply pressure to the gas control valve is correct, refer to <a href="#">Gas supply pressure</a> (see 8.8.2).</li> </ul>
	Air in the gas pipes.	- Bleed the air out of the gas pipe.
	Defect in the ignition/ionisation circuit.	<ul style="list-style-type: none"> <li>- <a href="#">Check the pilot burner</a> (see 9.4.2).</li> <li>- Make sure that the wiring of the igniter is not damaged.</li> </ul> If necessary, replace the igniter.
	Ceramic part of the igniter/flame probe is broken or cracked.	<ul style="list-style-type: none"> <li>- Make sure that the ceramic part of the igniter/flame probe is not broken or cracked.</li> <li>- If necessary, replace the igniter/flame probe.</li> </ul>
	Supply voltage too low.	<ul style="list-style-type: none"> <li>- Make sure that the supply voltage on the controller is correct.</li> <li>- If the supply voltage is below the stated tolerance and the error persists, contact your maintenance and service engineer.</li> </ul>
<b>F05 (lock out error)</b> <b>Flame error</b> Too many flame failures are detected	No sufficient gas supply.	Make sure that the gas supply pressure is correct.
	Air in the gas pipes.	Bleed the air out of the gas pipe.
	Not enough air supply.	Make sure that the ventilation is according to the <a href="#">local requirements</a> (see 8.2).
	Defect in the igniter/ionisation circuit.	<ul style="list-style-type: none"> <li>- <a href="#">Check the pilot burner</a> (see 9.4.2).</li> <li>- Make sure that the wiring of the igniter is not damaged.</li> </ul> If necessary, replace the igniter.
	Ceramic part of the igniter/flame probe is broken or cracked.	<ul style="list-style-type: none"> <li>- Make sure that the ceramic part of the igniter/flame probe is not broken or cracked.</li> <li>- If necessary, replace the igniter/flame probe.</li> </ul>
	Supply voltage too low.	<ul style="list-style-type: none"> <li>- Make sure that the supply voltage on the controller is correct.</li> <li>- If the supply voltage is below the stated tolerance and the error persists, contact your maintenance and service engineer.</li> </ul>
<b>F08 (lock out error)</b> <b>Ionization error</b> Ionization measured before the gas control valve was opened	False flame signal.	<ul style="list-style-type: none"> <li>- Reset the controller.</li> <li>- If error appears again, replace the controller and/or the gas control valve.</li> </ul>

Code and description	Cause	Measure
<b>F09 (lock out error)</b> <b>Temperature error</b>	Temperature, in the tank is above the 95°C.	<ul style="list-style-type: none"> <li>- See measure of error E01.</li> <li>- Make sure that the wiring between 2 and 8 and 4 and 11 of X13 is connected and not damaged.</li> <li>- If necessary, replace or reconnect the wiring.</li> <li>- When the wiring is reconnected, reset the controller.</li> </ul>
<b>F10 (lock out error)</b> <b>Air proving switch error</b>	Air pressure switch is opened, during burning, 5 times in one heating cycle.	See measure of error F03, excluding the measure "The fan is not running".
<b>F12 (lock out error)</b> <b>Flue gas error</b>	More than four E05 errors within 1 hour and/or within the same warming up attempt.	<ul style="list-style-type: none"> <li>- Make sure that there are no blockages in the chimney flue pipe. If necessary remove any blockages.</li> <li>- Make sure that the chimney flue pipe is according the requirements. If necessary, adjust the chimney flue pipe configuration.</li> </ul>
<b>F19 (blocking error)</b> <b>Supply voltage error</b>  Three unsuccessful ignition attempts.	There is not enough supply voltage during 60 seconds. The measured voltage between live and neutral must be 230 V <sub>AC</sub> (-15%, +10%). The supply voltage between live and earth must be between 110 V <sub>AC</sub> and 230 V <sub>AC</sub> (-15%, +10%)	<ul style="list-style-type: none"> <li>- Make sure that the supply voltage on the controller is correct.</li> <li>- If the supply voltage is above or below the stated tolerance and the error persists, contact your maintenance and service engineer.</li> </ul>
<b>F21 (lock out error)</b> <b>Gas valve error</b>  Feedback signal of the main valve is not correct.	Damaged wiring/open circuit.	<ul style="list-style-type: none"> <li>- Make sure that the wiring between the air proving switch and the control is connected and not damaged.</li> <li>- If necessary, replace or reconnect the wiring.</li> <li>- When the wiring is replaced or reconnected, reset the controller.</li> </ul>
	Gas valve or controller defect.	<ul style="list-style-type: none"> <li>- <u>Check the burner pressure</u> (see 8.8.3) to make sure that the main valve opens.</li> <li>- If necessary, replace the gas valve.</li> <li>- When the gas valve is replaced, reset the controller.</li> <li>- If the error reappears, replace the controller.</li> </ul>
<b>S01 (Blocking error)</b> <b>Sensor error</b>  Open circuit from the bottom tank temperature sensor	Sensor not (correctly) connected.	<ul style="list-style-type: none"> <li>- Make sure that the connector is connected to X13 (4 and 11).</li> <li>- Make sure that the wire is connected to the sensor.</li> </ul>
	Damaged wiring and/or defective sensor.	Replace the wiring and/or sensor.
<b>S02 (blocking error)</b> <b>Sensor error</b>  Open circuit from the top tank temperature sensor	Sensor is not (correctly) connected.	<ul style="list-style-type: none"> <li>- Make sure that the connector is connected to X13 (2 and 8).</li> <li>- Make sure that the wire is connected to the sensor.</li> </ul>
	Damaged wiring and/or defective sensor.	Replace the wiring and/or sensor.

Code and description	Cause	Measure
<b>504 (lock out error)</b> <b>Sensor error</b> Open circuit from flue gas sensor 1	Sensor is not (correctly) connected.	- Make sure that the connector is connected to X13 (5 and 12). - Make sure that the wire is connected to the sensor.
	Damaged wiring and/or defective sensor.	Replace the wiring and/or sensor.
<b>505 (lock out error)</b> <b>Sensor error</b> Open circuit from flue gas sensor 2	Sensor is not (correctly) connected.	- Make sure that the connector is connected to X13 (6 and 13). - Make sure that the wire is connected to the sensor.
	Damaged wiring and/or defective sensor.	Replace the wiring and/or sensor.
<b>511 (blocking error)</b> <b>Sensor error</b> Short circuit of the bottom tank temperature sensor	Short circuit in the sensor circuit.	Replace the wiring and/or sensor.
<b>512 (blocking error)</b> <b>Sensor error</b> Short circuit of the top tank temperature sensor	Short circuit in the sensor circuit.	Replace the wiring and/or sensor.
<b>514 (lock out error)</b> <b>Sensor error</b> Short circuit in flue gas sensor 1	Short circuit in the sensor circuit.	Replace the wiring and/or sensor.
<b>515 (lock out error)</b> <b>Sensor error</b> Short circuit in flue gas sensor 2	Short circuit in the sensor circuit.	Replace the wiring and/or sensor.

# 11 Appendices

## 11.1 Technical details

Description	Unit	DR-LL 50-288	DR-LL 70-344	DR-LL 90-322
<b>General</b>				
Capacity	l	291	347	325
Empty Weight	kg	245	272	308
Maximum floor load	kg	533	616	630
Maximum operating pressure	kPa (bar)	800 (8)	800 (8)	800 (8)
Control thermostat - adjustment range	°C	40-80	40-80	40-80
Control thermostat - default value	°C	40	40	40
Hysteresis upwards - adjustment range	°C	-	-	-
Hysteresis upwards - default value	°C	-	-	-
Hysteresis downwards - adjustment range	°C	-	-	-
Hysteresis downwards - default value	°C	4	4	4
Number of (electrical) anodes	-	4	4	4
Fan speed at ignition	rpm	2000	2000	2000
Fan operating speed	rpm	3300	3300	3300
Minimum measured air pressure differential across the pressure switch	Pa	>300	>300	>300
Setpoint pressure switch	Pa	250	250	250
Heating time $\Delta T = 45\text{ °C}$	min.	19	17	12

Description	Unit	DR-LL 50-288	DR-LL 70-344	DR-LL 90-322
<b>Electrical</b>				
Electrical power consumption (peak)	W	110	120	130
Electrical power consumption (nominal)	W	65	75	100
Electrical power consumption (standby)	W	3	3	3
Supply voltage / Main frequency	VAC / Hz	230 (-15%, +10%) / 50 (+/- 1)		

## 11.2 Dimensions

Size	Description	Unit	DR-LL 50-288	DR-LL 70-344	DR-LL 90-322
<b>Dimensions water heater with default draught diverter</b>					
A	Height	mm	1750	2000	2000
D	Width	mm	705	705	705
E1	Depth	mm	605	605	605
E2	Depth	mm	610	750	750
	Depth (E1 + E2)	mm	1215	1355	1355
G	Flue gas outlet	mm	150	180	250 <sub>(1)</sub>
<b>Dimensions water heater with alternative 1 draught diverter</b>					
A	Height	mm	1675	1880	1950
D	Width	mm	705	705	705
E1	Depth	mm	605	605	605
E2	Depth	mm	695	695	750
	Depth (E1 + E2)	mm	1300	1300	1355
G	Flue gas outlet	mm	150	180	225 <sub>(1)</sub>
<b>Dimensions water heater with alternative 2 draught diverter</b>					
A	Height	mm	1740	1995	1965
D	Width	mm	705	705	705
E1	Depth	mm	605	605	605
E2	Depth	mm	355	355	355
	Depth (E1 + E2)	mm	960	960	960
G	Flue gas outlet	mm	150	180	200

1 - Use an adapter Ø 225-250 mm to connect the flue gas outlet to the water heater. You can order the correct adapter at your supplier.



Size	Description	Unit	DR-LL 50-288	DR-LL 70-344	DR-LL 90-322
<b>Dimensions connections</b>					
1	Cold water supply connection (male)	-	R 1 1/2	R 1 1/2	R 1 1/2
2	Hot water outlet connection (female)	-	R 1 1/2	R 1 1/2	R 1 1/2
3	Gas control valve connection (male)	-	Rp 3/4	Rp 3/4	Rp 3/4
4	Drain valve connection (female)	-	1" NPT	1" NPT	1" NPT
5	T&P-valve connection (female)	-	3/4" NPT	1" NPT	1" NPT
6	Cleaning/inspection opening	mm	95x70	95x70	95x70

Fig. Dimensions  
water heater

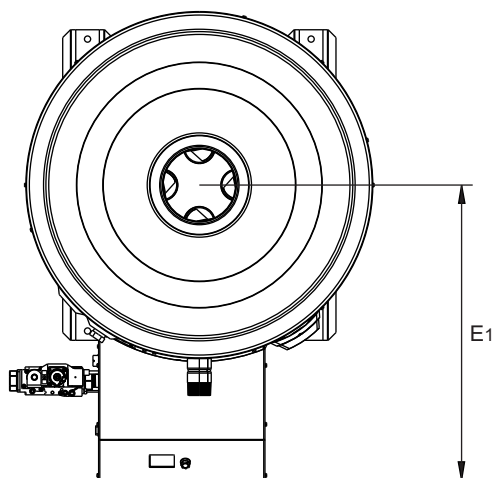
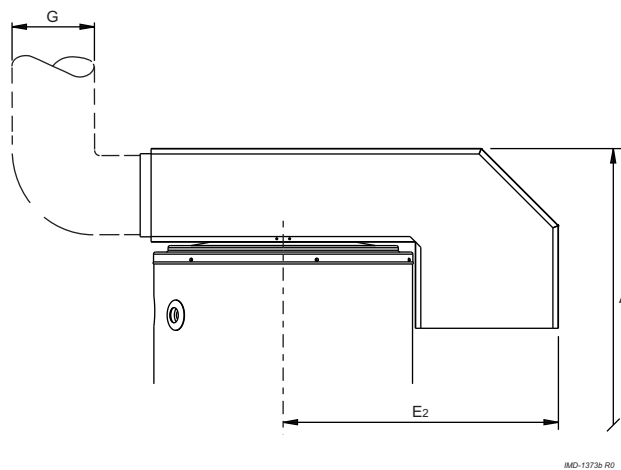
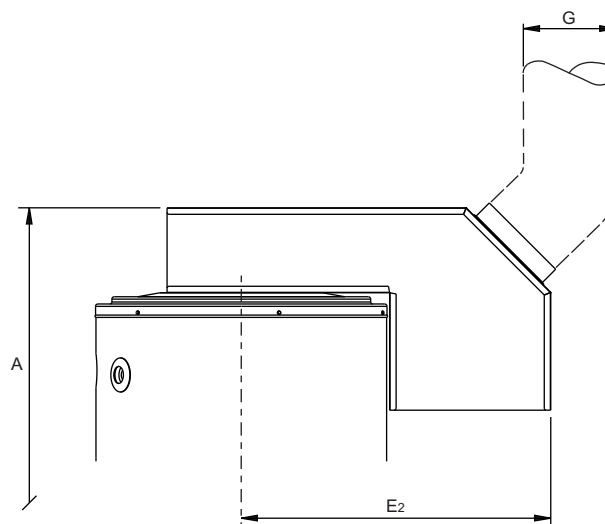


Fig. Default draught diverter



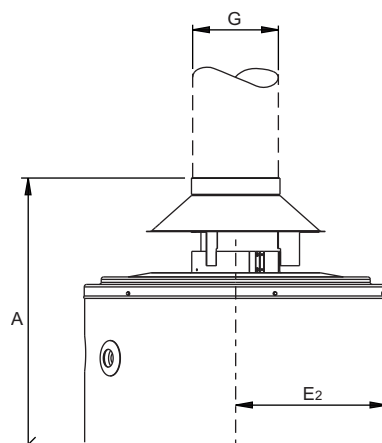
IMD-1373b R0

Fig. Draught diverter alternative 1

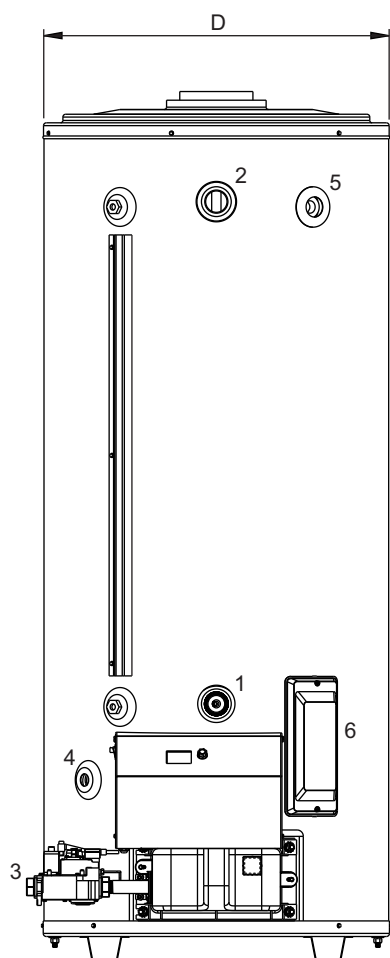


IMD-1372b R0

Fig. Draught diverter alternative 2



IMD-1374b R0



IMD-1371b R0

## 11.3 Gas details

Description	Unit	DR-LL 50-288	DR-LL 70-344	DR-LL 90-322
<b>Gas category 2H - G20</b>				
Diameter of the orifices	mm	3.150	2.819	3.607
Diameter of the orifice restrictor	mm	26.9	23.2	19.1
Diameter of the fan restrictor	mm	43.2	52.1	82.6
Nominal Load (lower value)	kW	54.0	73.0	93.0
Nominal Load (gross)	kW	60.0	81.1	103.3
Nominal output	kW	49.1	66.4	84.4
Gas consumption (1)	m <sup>3</sup> /h	5.7	7.7	9.8
Supply pressure	mbar	20.0	20.0	20
Burner pressure	mbar	7.2	6.6	5.6
CO <sub>2</sub> (2)	vol%	7.3 ± 1.0 (default) 6.3 ± 1.0 (alt. 1) 5.9 ± 1.0 (alt. 2)	6.3 ± 1.0 (default) 5.9 ± 1.0 (alt. 1) 4.9 ± 1.0 (alt. 2)	5.7 ± 1.0 (default) 4.7 ± 1.0 (alt. 1) 5.4 ± 1.0 (alt. 2)
O <sub>2</sub> (2)	vol%	7.9 ± 1.8 (default) 9.7 ± 1.8 (alt. 1) 10.4 ± 1.8 (alt. 2)	9.7 ± 1.8 (default) 5.9 ± 1.8 (alt. 1) 4.9 ± 1.8 (alt. 2)	10.7 ± 1.8 (default) 12.5 ± 1.8 (alt. 1) 11.3 ± 1.8 (alt. 2)
NO <sub>x</sub> emission	mg/kWh GCV	45	35	40
Mass flow rate flue gases (nominal load) (2)	kg/h	118 (default) 126 (alt. 1) 161 (alt. 2)	184 (default) 196 (alt. 1) 234 (alt. 2)	258 (default) 310 (alt. 1) 271 (alt. 2)
Mass flow rate flue gases (minimal load) (2)	kg/h	118 (default) 126 (alt. 1) 161 (alt. 2)	184 (default) 196 (alt. 1) 234 (alt. 2)	258 (default) 271 (alt. 1) 258 (alt. 2)
Flue gas temperature (nominal load) (2)	°C	133 (default) 126 (alt. 1) 161 (alt. 2)	129 (default) 97 (alt. 1) 172 (alt. 2)	121 (default) 107 (alt. 1) 125 (alt. 2)

1 - Based on 1013.25 mbar and 15°C.

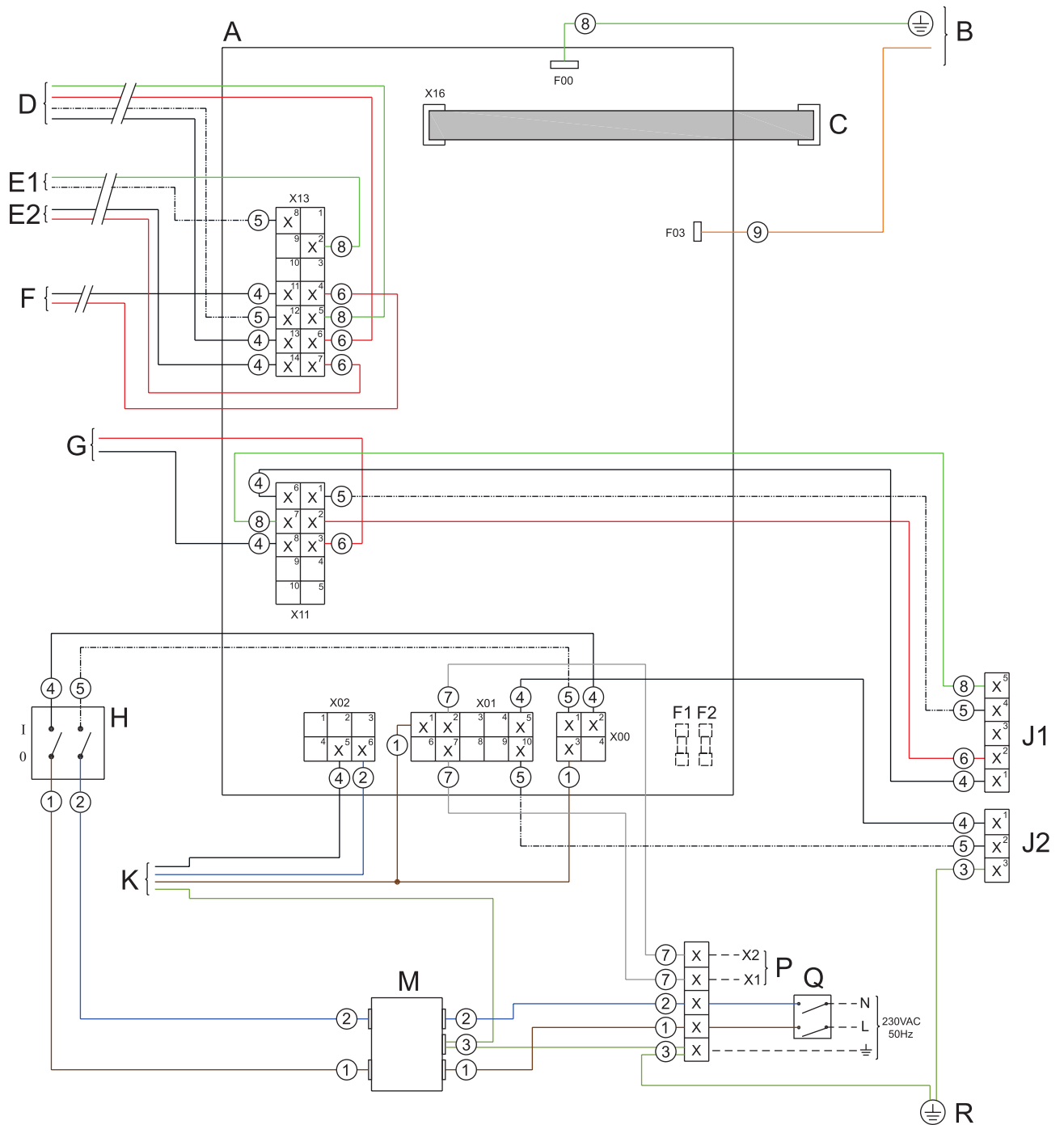
2 - This value is different for the different draught diverters. Make sure you have the correct article number, refer to [Draught diverter](#) (see 8.6.1).

## 11.4 Energy labeling

Description	Unit	DR-LL 50-288	DR-LL 70-344	DR-LL 90-322
<b>Declared load profile</b>				
Load profile	-	XXL	XXL	3XL
Energy efficiency class (Energy label)	-	B	B	-
Energy efficiency	%	66	66	71
Daily electricity consumption	kWh	0.105	0.105	0.136
Daily fuel consumption	kWh GCV	36.748	37.135	65.540
Mixed water 40°C (V40)	l	∞	∞	524
<b>Additional load profile</b>				
Load profile	-	-	3XL	-
Energy efficiency class (Energy label)	-	-	-	-
Energy efficiency	%	-	71	-
Daily electricity consumption	kWh	-	0.129	-
Daily fuel consumption	kWh GCV	-	65.809	-
Mixed water 40°C (V40)	l	-	570	

## 11.5 Electrical wiring diagram

Fig. Electrical wiring diagram



**Cable colors**

1. Brown
2. Blue
3. Green/Yellow
4. Black
5. White
6. Red
7. Grey
8. Green
9. Orange

**Terminal block connections**

- |    |                         |
|----|-------------------------|
| A  | Earth                   |
| N. | Neutral                 |
| L. | Phase input             |
| X1 | Additional error signal |
| X2 | Additional error signal |

**Components**

- |     |   |
|-----|---|
| A.  | Control                                     |
| B.  | Pilot burner                                |
| C.  | Display                                     |
| D.  | Temperature sensor<br>(flue gas)            |
| E1. | Temperature sensor<br>(T1 - top of tank)    |
| E2. | Safety thermostat                           |
| F.  | Temperature sensor<br>(T2 - bottom of tank) |

- |     |                                |
|-----|--------------------------------|
| G.  | Pressure switch                |
| H.  | Control switch                 |
| J1. | Fan (PWM control)              |
| J2. | Fan (power supply)             |
| K.  | Gas valve                      |
| M.  | Line filter                    |
| P.  | Additional error signal (0.8A) |
| Q.  | Main switch                    |
| R.  | Earth connection housing       |
| F1. | Fuse (T3, 15AL-250V)           |
| F2. | Fuse (T3, 15AL-250V)           |

## 11.6

## Declaration of conformity

### Hamworthy Heating Limited

Registered office: Fleets Corner | Poole | Dorset | BH17 0HH | England  
 Registered in England: Registered No. 2223589  
 Contact: 01202 66 25 00 | sales@hamworthy-heating.com | hamworthy-heating.com



Heating **at work.**

### Declaration of Conformity

**The Manufacturer of the Products covered by this Declaration is :-**

Hamworthy Heating Ltd.

Date: 10/12/19

**The Product Covered by this Declaration :-**

Condensing gas fired storage water heater: Dorchester DR-LL 50-288, DR-LL 70-344, DR-LL 90-322

**The Basis on which Conformity is being Declared :-**

The product identified above complies with and satisfies the requirements of the following named Directives:-

#### **Electromagnetic Compatibility Directive (EMC) - 2004/108/EG**

This product demonstrates compliance with the following standards-

EN 55014-1 :2007

*Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Emission*

EN 55014-2:2015

*Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus.*

*Immunity. Product family standard*

EN 61000-3-2:2014

*Electromagnetic compatibility (EMC). Limits. Limits for harmonic current emissions (equipment input current  $\leq 16$  A per phase)*

EN 61000-3-3:2013

*Electromagnetic compatibility (EMC). Limits. Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current  $\leq 16$  A per phase and not subject to conditional connection*

#### **Low Voltage Directive (LVD) - 2006/95/EG**

This product demonstrates compliance with the following standards-

EN 60335-1 :2012

*Household and similar electrical appliances. Safety. General requirements*

EN 60335-2-102:2006

*Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections*

#### **Gas Appliance Regulation (GAR) - (EU) 2016/426**

This product demonstrates compliance with the following standards-

EN 89:2015

*Gas-fired storage water heaters for the production of domestic hot water*

#### **Pressure Equipment Directive (PED)- 97/23/EG**

This product demonstrates compliance with the following directive-

*Based on Art. 3, Sub 3. (PS < 10 bar, pressure vessel for non-hazardous fluids)*

#### **ECO Design Directive (ErP) - 2009/125/EG**

This product demonstrates compliance with the following directive-

*Commission regulation No. 814/2013 based on notices 2014/C - 207103*

#### **Energy Labelling Directive - 2010/30/EG**

This product demonstrates compliance with the following directive-

*Commission regulation No. 812/2013*

The technical documentation required to demonstrate that the products meet these Directives has been compiled and is available for inspection by the relevant enforcement authorities. (As stated in the EC type-examination report, 180700637, by KIWA Gastec Certification b.v., The Netherlands.)

The CE mark was first applied in :- 2019

Signed :  Dr. E. Lancaster

Date: 29/01/2020



R & D Director (empowered to bind the company)



## **11.7**

### **Warranty**

Please contact your supplier for the guarantee conditions.



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