Dorchester DR-LP Range of Hot Water Storage Heaters

Open Flue, Direct Gas Fired Hot Water Storage Heaters with Permanent Pilot Ignition for Domestic Hot Water Installations

Installation, Commissioning and Servicing Instructions

DORCHESTER DR-LP 30, 40, 45, 60, 75, 95 Models

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^{ND} FAMILY) I_{2H} OR LPG (3^{RD} FAMILY) I_{3+}. PLEASE ENSURE RELEVANT INFORMATION REQUIRED WITHIN DOCUMENT IS FOUND RELATING TO SPECIFIC GAS TO BE FIRED BEFORE FIRING HEATER.

THIS WATER HEATER COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.

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1 Introduction

1.1 About the water heater

This manual describes how to install, service and use an DR-LP-water heater. An DR-LP water heater is a gas-fired open water heater without a fan. The DR-LP-water heater is fitted with a combustion products discharge safety device and falls into the water heater category B_{11BS}. This information is located on the water heater's identification plate. The information in this manual is applicable to types DR-LP: 30, 40, 45, 60, 75, 95.

The construction and fittings of each water heater conform to the European standard for gas-fired storage water heaters for sanitary use (EN 89). The water heaters are compliant with the European Directive on Gas Appliances and thereby authorised to bear the CE mark.

CE
0063

Warning
Read this manual carefully before commissioning 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
Whenever there is a **smell of gas**:

No naked flames! No smoking!

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

Shut off the mains gas supply!

Open windows and doors!

Warn occupants and leave the building!

After leaving the building, alert the gas distribution company or installer.

1.3 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 boiler **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 Standards

- **BS 6891**: Specification for installation of low pressure gas pipework of up to 28 mm (R1) in domestic premises (2nd family gas). For larger installations see IGE/UP/2 below.

- **BS 6798**: Specification for installation of gas-fired boilers of rated input not exceeding 70 kW net.
- **BS 6644**: Specification for installation of gas-fired hot water boilers of rated inputs between 60 kW and 2 MW (2nd and 3rd family gases).
- **BS 6700**: Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.
- **BS EN 806-2**: Specification for installations inside buildings conveying water for human consumption. Part 2: Design.
- **BS 5546**: Specification for installation of hot water supplies for domestic purposes, using gas-fired appliances of rated input not exceeding 70 kW.
- **BS 5440**: Installation and maintenance of flues and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Part 1: Flues. Part 2: Ventilation.

Institute of Gas Engineers and Managers Publications

- IGE/UP/1 Soundness testing and purging of industrial and commercial gas installations.
- IGE/UP/1A Soundness testing and direct purging of small low pressure industrial and commercial natural gas installations.
- IGE/UP/2 Gas installation pipework, boosters and compressors on industrial and commercial premises.
- IGE/UP/10 Installation of gas appliances in industrial and commercial premises. Part 1: flued appliances.

CIBSE Publications:- "CIBSE Guide"

Section B4 : Water Service Systems.

1.4 Target groups

The three target groups for this manual are:

- (end) users;
- installers;
- service engineers.

Symbols on each page indicate the target groups for whom the information is intended. See Table 1.1.

Table 1.1 Symbols for each target group

Symbol	Target groups
	(End) user
	Installer
	Service and maintenance engineer

1.5 Maintenance

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

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

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

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

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

1.6 Forms of notation

The following notation is used in this manual:

Note
Important information.

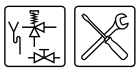
Caution
Ignoring this information can lead to the water heater being damaged.

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

1.7 Overview of this document

Table 1.2 provides an overview of the contents of this document.

Table 1.2 Content of document

Chapter	Target groups	Description
2 Functioning of the water heater		This chapter describes how the water heater functions.
3 Installation		This chapter describes the installation activity to be completed before you actually start up the water heater. Instructions are also provided for the installation and/or service engineer on converting the water heater to other types of gas.
4 Filling and draining		This chapter describes how to fill and drain the water heater.
5 Controls		This chapter describes the water heater's control panel and how to use it.
6 Error states of the water heater		This chapter describes each status (state) that the water heater may be in and how to respond, if necessary.
7 Starting up and shutting down		This chapter describes how to start up the water heater and how to shut it down for a brief or long period of time. The general heating cycle of the water heater is also described.
8 Troubleshooting		This chapter is mainly intended for the installer and the service engineer. It describes water heater errors. These errors are indicated on the display. A table of possible causes and solutions is provided. End users may also refer to this additional information about the water heater.
9 Maintenance		This chapter sets out the maintenance tasks to be carried out during a service.

2 Functioning of the water heater

2.1 Introduction

This chapter successively covers the following topics:

- Functional description of the water heater
- Heating cycle of the water heater
- Protection for the water heater
- Safety of the installation
- Indicators and Alarms
- Options

2.2 Functional description of the water heater

Figure 2.1 shows a cut-away view of the water heater.

Legend

❶ flue gas discharge
❷ draught diverter
❸ anodes
❹ flue tubes
❺ flue gas thermostat sensor
❻ flue gas thermostat
❼ flue baffles
❽ insulation layer
❾ hot water tank
❿ cleaning opening
⓫ drain valve
⓬ combustion chamber
⓭ radiation shield/condensation tray
⓮ gas control
⓯ hot water outlet
⓰ safety thermostat sensor
⓱ high-limit thermostat sensor
⓲ control panel
⓳ control thermostat
⓴ high-limit thermostat
㉑ control thermostat sensor
㉒ safety thermostat
㉓ cold water inlet
㉔ piezo igniter
㉕ thermo-couple
㉖ pilot burner
㉗ igniter electrode
㉘ bar burners/burner tray

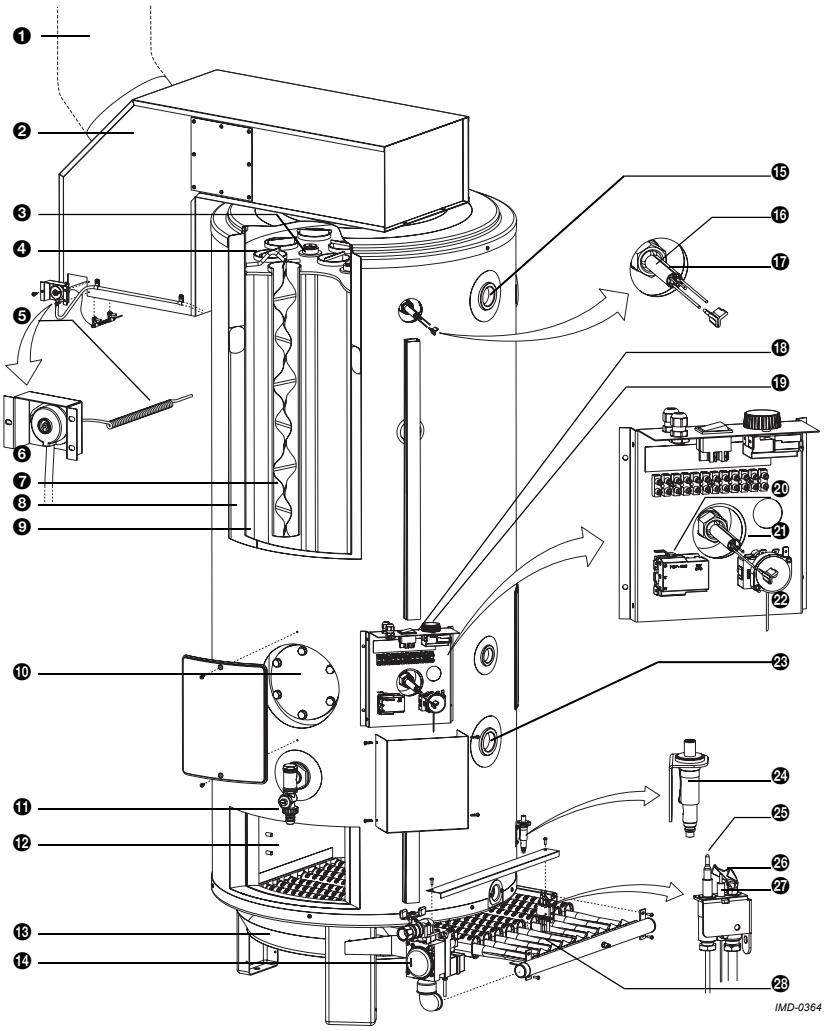


Figure 2.1 Cut-away view of the water heater

In this water heater the cold water enters the bottom of the it via the cold water inlet ㉓. The heat of combustion is transferred to the water through the combustion chamber ⓬ and flue tubes ❹. The heated tap water leaves the heater through the hot water outlet ⓯. Once the water heater is completely filled with water, it remains constantly under water supply pressure. As hot water from the water heater is consumed, it is continuously replenished with cold water.

The water heater is fitted with a igniter electrode ㉗ which ignites the pilot burner ㉖. The gas that fuels the combustion flows via the gas control ⓮ into the manifold, in which Injectors are located. Via these injectors, the gas enters the bar burners ㉘. Together the bar burners constitute the burner tray. As the gas is injected into the bar burners, the primary air required for combustion is also drawn in(1). Additional air is drawn through the openings in the burner tray. When the gas/air mixture starts to flow, it is ignited by the pilot burner.

The flue gases arising from combustion here are drawn upwards through the flue tubes ❹. Flue baffles ❼ are located in the flue tubes. These slow down the flue gas exhaust, improving the heat transfer efficiency. The flue gases leave the water heater via the draught diverter ❷. A radiation shield/condensation tray ⓲ is fitted under the burner tray. This prevents overheating of the floor surface under the water heater and serves as a collection tray for condensate.

The insulation layer ❽ prevents heat loss. The inside of the hot water tank is enamelled to protect against corrosion. The anodes ❸ provide additional protection.

2.3 Heating cycle of the water heater

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

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

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

2.4 Protection for the water heater

The water heater is protected by means of the following:

- the Gas Control
- the Thermocouple
- the Water Temperature Safeguard
- the Combustion products discgarge safety device

2.4.1 Gas control

The gas control has 2 valves for safety purposes:

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

2.4.2 Thermocouple

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

2.4.3 Water temperature protection

To ensure a safe water temperature is not exceeded, the high-limit thermostat sensor is installed at the top of the water heater. In the event of stratification of the water temperature, the temperature at the top of the water heater can be considerably higher than the set temperature for the hot water.

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

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1. The gas flow is accelerated through the narrow opening in the injector. This creates a vacuum, which also draws in air, through the Venturi effect.

Table 2.1 explains how the high-limit and safety thermostats respond to the sensors.

Table 2.1 Temperature protection

Protection	Description
High-limit thermostat	If the high-limit thermostat sensor ⓱ detects a temperature greater than 84°C, the high-limit thermostat opens and the gas control's main valve circuit is broken, closing the valve. The heating cycle stops until the high-limit thermostat closes again. At this point the gas control opens again and the heating cycle is repeated. The high-limit protection also prevents excessive scale forming in the water heater.
Safety thermostat	If the safety thermostat sensor ⓰ detects a temperature greater than 93°C, the safety thermostat opens. The gas control's safety valve circuit is broken and the safety and main valve both close. Combustion immediately ceases and the pilot flame also goes out. In order to re-start the water heater, the pilot flame must be re-lit.

2.4.4 Combustion products discharge safety device

The flue gases are drawn outside via the draught diverter ❷ and the flue gas discharge ❶. To prevent the flue gases from flowing back into the installation room, the discharge ducting is monitored by a feature called the combustion products discharge safety device. For this purpose a flue gas thermostat sensor ❺ complete with flue gas thermostat ❻ is fitted in the draught diverter. Under normal circumstances this sensor measures 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 then detects an excessive temperature and the flue gas thermostat will open. The circuit of the main valve of the gas control is interrupted and the valve closes, which forces the heating cycle to stop. The flue gas discharge thermostat will be locked out and the water heater will require a manual reset before it can be re-started.

2.5 Safety of the installation

2.5.1 Unvented installation

With an unvented installation, an expension valve and expansion vessel prevent excessive pressure in the water heather. This prevents damage of the water heater. A non-return valve prevents excessive pressure in the water supply system. This valve also prevents water from flowing backwards from the heater into the cold water supply system. The pressure reducing regulates the water supply pressure to a normal operating pressure of 3.5 bar. The components are fitted to the cold water pipe. See paragraph 3.6.1 Cold water side.

2.5.2 Vented installation

With a vented installation, excess pressure is taken up by the open water tank. The level of the water determines the working pressure which may not exceed 8 bar.The installation must also be fitted with an open vent from the hot water pipe. Ideally the vent pipe should be linked to a separate tundish/drain or else to the cold water storage tank. A safety valve should also be fitted to the water heather. See paragraph 3.6.3 Hot water side.

2.5.3 Temparature and Pressure valve (T&P valve)

A T&P valve is mandatory in an 'unvented' installation.

A T&P valve monitors the water pressure in the water heater and the water temperature at the top of it. If the pressure in the water heater becomes excessive (> 7 bar) or the water temperature is too high (>97°C), the valve will open. The hot water will immediately flow out of the heater. Because the water heater is under water supply pressure, cold water will automatically flow into it. The valve remains open until the unsafe situation has been averted. A connecting point for a T&P valve is standard on the water heater. See paragraph 3.6.3 Hot water side

2.6 Indicators and Alarms

2.6.1 Volt Free Contacts

Volt free contacts are supplied as standard to give remote indication/alarm of 'normal run' and 'lockout'. The 'lockout' indication includes shut down due to operation of the safety thermostat, loss of flame and failure to ignite.

2.7 Options

The heaters can be supplied with the following additional variations, either ready fitted or for site fitting:

2.7.1 LPG

The heaters can be supplied adjusted for use on propane or butane, see section 3.12. It is most important that the heater is correctly adjusted for the gas to be fired.

2.7.2 Unvented Supply

The heaters can be supplied with a purpose designed and sized unvented kit comprising pressure reducing valve, non-return valve, expansion vessel, expansion relief valve and pressure/temperature relief valve, to enable the heater to be coupled directly to the mains water. For details see 2.5.1, 2.5.3 and 3.6.

2.7.3 Top to Bottom Circulation

In order to give enhanced temperature control to aid compliance with the HSE guidance and the DHss Code of Practice for 'The Control of Legionellae in Health Care Premises', a pump circulation kit can be supplied comprising 230 volt single phase pump, non-return valve, pipe work and sufficient fittings to contact between the hot water flow and the bottom connection. For details see section 3.5 of this manual.

3 Installation

Warning
The installation should be carried out by an authorised installation engineer in compliance with the official local regulations imposed by the gas, water and power supply companies and the fire service.

The water heater may only be installed in a room which complies with the requirements stated in national and local ventilation regulations.

See also paragraph 1.3 Regulations.

3.1 Introduction

This chapter describes the installation activities to be carried out before the water heater may be started up, namely:

- Packaging;
- Environmental conditions;
- Technical specifications;
- Water connections Unvented;
- Water connections Vented;
- Gas connection;
- Flue gas discharge;
- Electrical connection;
- Conversion to a different gas category;
- Checking the supply pressure and burner pressure;

Note
Starting up the water heater is described in chapter 7 Starting up and shutting down.

Figure 3.1 shows a plan and elevation drawing of the water heater.

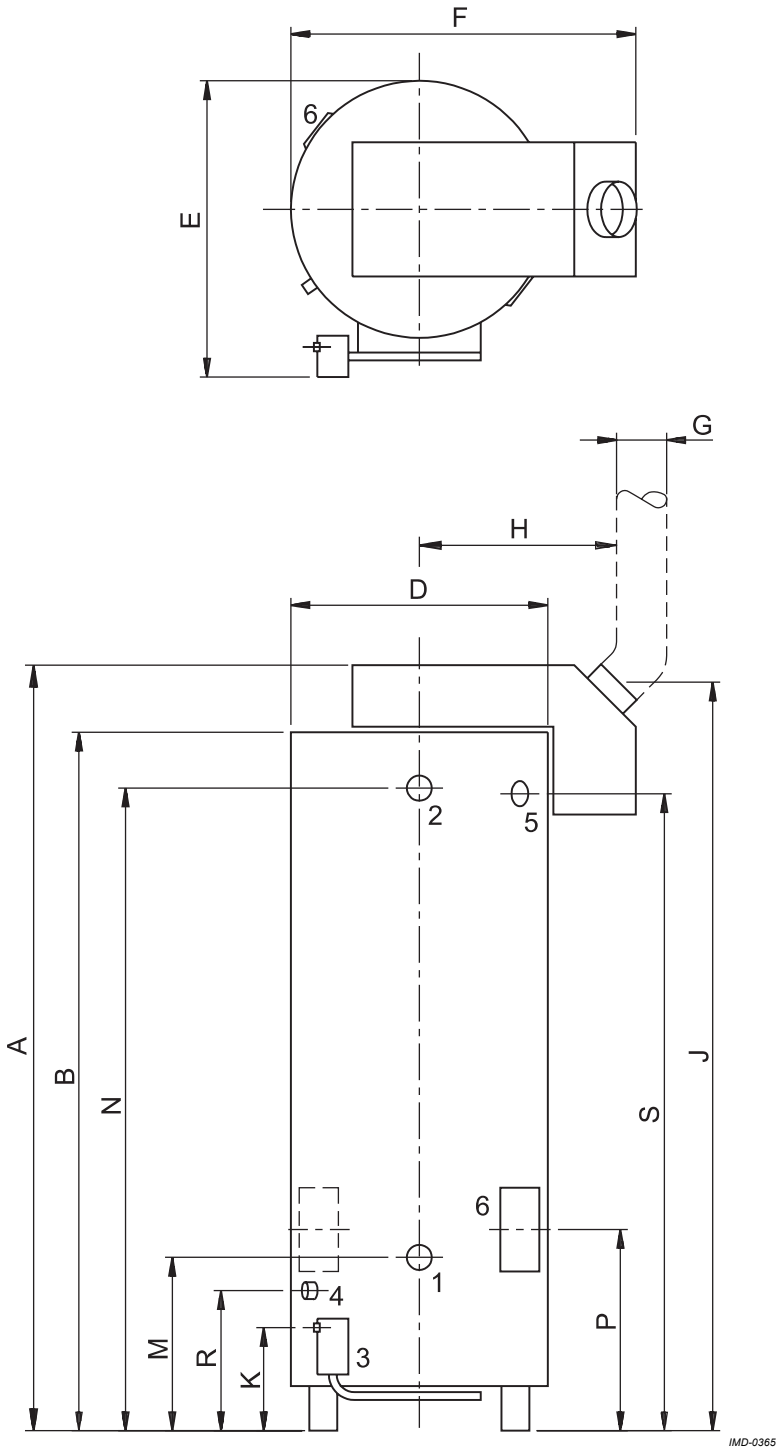


Figure 3.1 Plan and elevation of the water heater

3.2 Packaging

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

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

Caution

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

3.3 Environmental conditions

Caution

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

DR-LP-water heaters are open water heaters and may only be placed in an open boiler room. They fall under category B_{11BS}.

3.3.1 Working clearances

For access to the water heater it is recommended that the following clearances are observed (see Figure 3.1):

- AA: around the water heater's control column and cleaning openings: 100 cm.
- BB: around the water heater itself: 50 cm.
- Above the water heater (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 from Hamworthy heating limited.

Note

When installing the water heater, be aware that any leakage from it 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 water heater 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 5 cm deep with a length and width at least 5 cm greater than the diameter of the water heater.

3.3.2 Humidity and ambient temperature

The boiler room must be frost-free or be protected against frost. Table 3.1 shows the environmental specifications which must be observed to guarantee correct functioning of the water heater.

Table 3.1 Humidity and ambient temperature specifications

Humidity and ambient temperature	
Humidity	max. 93% RH at +25°C
Ambient temperature	Functional: 0 ≤t ≤60°C

3.3.3 Maximum floor loading

Because of the weight of the water heater when filled (see Table 3.2), verify that the maximum floor loading for the boiler room is not exceeded.

Table 3.2 Weight specifications with regard to maximum floor loading

Weight of the water heater filled with water					
DR-LP 30	DR-LP 40	DR-LP 45	DR-LP 60	DR-LP 75	DR-LP 95
504 kg	578 kg	507 kg	573 kg	522 kg	523 kg

3.4 Technical specifications

The water heater is supplied without accessories. Check the dimensions and other specifications for any accessories to be used against Figure 3.1 and tables Table 3.3 through Table 3.6.

Table 3.3 Dimensions DR-LP

Dimension & Description		**DR-LP 30**	**DR-LP 40**	**DR-LP 45**	**DR-LP 60**	**DR-LP 75**	**DR-LP 95**
A.	Height including draught diverter (mm)	1900	2100	1900	2040	2025	2085
B.	Height excluding draught diverter (mm)	1760	1960	1760	1900	1795	1810
D.	Diameter of the water heater (mm)	710	710	710	710	710	710
E.	Depth including control column (mm)	800	800	800	800	800	800
F.	Width of water heater incl. draught diverter (mm)	1100	1100	1100	1100	1105	1105
G.	Flue gas outlet diameter (mm)	150	150	180	180	225	225
J.	Height flue gas discharge (mm)	1840	2040	1840	2040	1935	2010
K.	Height of the gas connection (mm)	205	205	205	205	205	205
M.	Height of the cold water supply (mm)	565	565	565	505	575	590
N.	Height of the hot water outlet (mm)	1605	1810	1605	1750	1640	1655
P.	Height of the cleaning opening centre (mm)	730	730	730	670	740	765
R.	Height of the drain valve centre (mm)	500	515	500	455	525	540
S.	Height of the T&P plug centre (mm)	1550	1760	1550	1700	1595	1600
1.	Cold water supply connection (external thread)	R 1 $^1/_2$					
2.	Hot water outlet connection (internal thread)	Rp 1 $^1/_2$					
3.	Gas control connection (internal thread)	Rp $^3/_4$					Rp $^3/_4$
4.	Drain valve connection (internal thread)	Rp 1 $^1/_2$					
5.	T&P valve connection (internal thread)	1" NPT				1" NPT	
6.	Dimension of cleaning and inspection openings (mm)	Ø 100					

Table 3.4 Specifications for gas categories, water heater category: II_{2H3+}

Description	Unit	DR-LP 30	DR-LP 40	DR-LP 45	DR-LP 60	DR-LP 75	DR-LP 95
Gas category 2H: G20 - 20 mbar							
Diameter of orifices	mm	3.20	3.20	3.10	2.95	3.20	3.20
Diameter of pilot flame orifice	mm	0.56/ 0.41	0.56/ 0.41	0.56/ 0.41	0.56/ 0.41	0.56/ 0.41	0.56/ 0.41
(1) = Blanking plate (2) = Burner pressure regulator	1 or 2	2	2	2	2	2	2
Nominal load (gross)	kW	41.4	55.4	65.2	81.0	96.4	124.2
Nominal output	kW	31.7	41.9	49.3	61.2	72.9	93.9
Burner pressure(1)	mbar	8.5	8.5	8.5	8.5	8.5	8.5
Gas consumption(2)	m³/h	4.0	5.4	6.3	7.9	9.4	12.1
Gas category 3+: G30 - 30 mbar							
Diameter of orifices	mm	1.70	1.70	1.70	1.50	1.70	1.70
Diameter of pilot flame orifice	mm	0.25	0.25	0.25	0.25	0.25	0.25
(1) = Blanking plate (2) = Burner pressure regulator	1 or 2	1	1	1	1	1	1
Nominal load (gross)	kW	40.9	54.2	66.9	79.2	94.3	121.2
Nominal output	kW	32.0	42.0	51.8	61.4	73.1	93.9
Burner pressure(1)	mbar	-	-	-	-	-	-
Gas consumption(2)	kg/h	3.0	4.0	5.0	5.9	7.0	9.0
Gas category 3+: G31 - 37 mbar							
(1) = Blanking plate (2) = Burner pressure regulator	1or 2	1	1	1	1	1	1
Nominal load (gross)	kW	37.6	50.1	62.1	76.2	87.8	110.9
Nominal output	kW	29.4	38.7	48.0	58.9	67.9	85.7
Diameter of orifices	mm	1.70	1.70	1.70	1.50	1.70	1.70
Burner pressure(1)	mbar	-	-	-	-	-	-
Gas consumption(2)	kg/h	2.7	3.7	4.5	5.6	6.4	8.1

1. *If using a blank plate instead or 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*
2. *Based on 1013.25 mbar and 15°C*

Table 3.5 General and electrical data

Description	Unit	DR-LP 30	DR-LP 40	DR-LP 45	DR-LP 60	DR-LP 75	DR-LP 95
Storage Capacity	litres	324	374	312	351	291	265
Maximum operating pressure	bar	8	8	8	8	8	8
Maximum operating pressure unvented	bar	5,5	5,5	5,5	5,5	5,5	5,5
Nominal operating pressure unvented	bar	3,5	3,5	3,5	3,5	3,5	3,5
Number of anodes	-	2	2	2	3	3	4
Empty Weight	kg	195	221	209	238	244	270
Heating time T = 45°C	min.	32	28	20	18	13	9
Number of anodes	-	3	3	4	4	7	7
Number of bar burners/orifices	-	3	4	5	7	7	9
Number of flue tubes/baffles	-	5	6	7	9	12	16
Electrical power consumption	W	30					
Supply voltage	ACS (VAC)	230 (-15% +10%)					
Mains frequency	Hz	50 (±1 Hz)					

3.5 Installation diagrams

Figure 3.2 shows the water and gas connection diagrams for unvented and vented installations. The following paragraphs, describing the connections in detail, make reference to these diagrams.

3.6 Water connections Unvented

3.6.1 Cold water side

See ❹ in Figure 3.2.

1. Fit an approved stop valve ❾ on the cold water side as required by regulations.
   See also paragraph 1.3 Regulations.
2. The maximum working pressure of the water heater is 8 bar. The expansion valve regulates the pressure to 5.5 bar. The operatiing pressure is 3.5 bar. Fit an approved pressure-reducing valve ❶.
3. Fit a non-return valve ❺ and an expansion vessel ❷.
4. Fit an expension valve ⓮ and connect the discharge to a drain via tundish.

3.6.2 Top to bottom recirculating pump

You can connect a top to bottom recirculation pump to prevent stratification of the water in the water heater.

1. Fit a pipe (Ø 22 mm), a stop valve ❹ and a top to bottom recirculation pump ⓫.
2. Fit non-return valve ❺.
3. Fit stop valves ❾.

Legend

- ❶ pressure-reducing valve (mandatory)
- ❷ expansion vessel (mandatory)
- ❸ T&P valve (mandatory)
  - ❸a) safety valve
- ❹ stop valve (recommended)
- ❺ non-return valve (mandatory)
  - ❺a) non-return valve
- ❻ circulation pump (optional)
- ❼ drain valve
- ❽ gas valve (mandatory)
- ❾ stop valve (mandatory)
- ❿ temperature gauge (recommended)
- ⓫ top to bottom recirculation pump (optional)
- ⓬ draught diverter
- ⓭ hot water draw-off points
- ⓮ expension valve (mandatory)
- ⓯ water tank
- ⓰ float valve
- ⓱ 3-way venting valve (optional)
- ⓲ overflow pipe
- Ⓐ cold water supply
- Ⓑ hot water outlet
- Ⓒ circulation pipe
- Ⓓ gas supply
- Ⓔ flue gas discharge

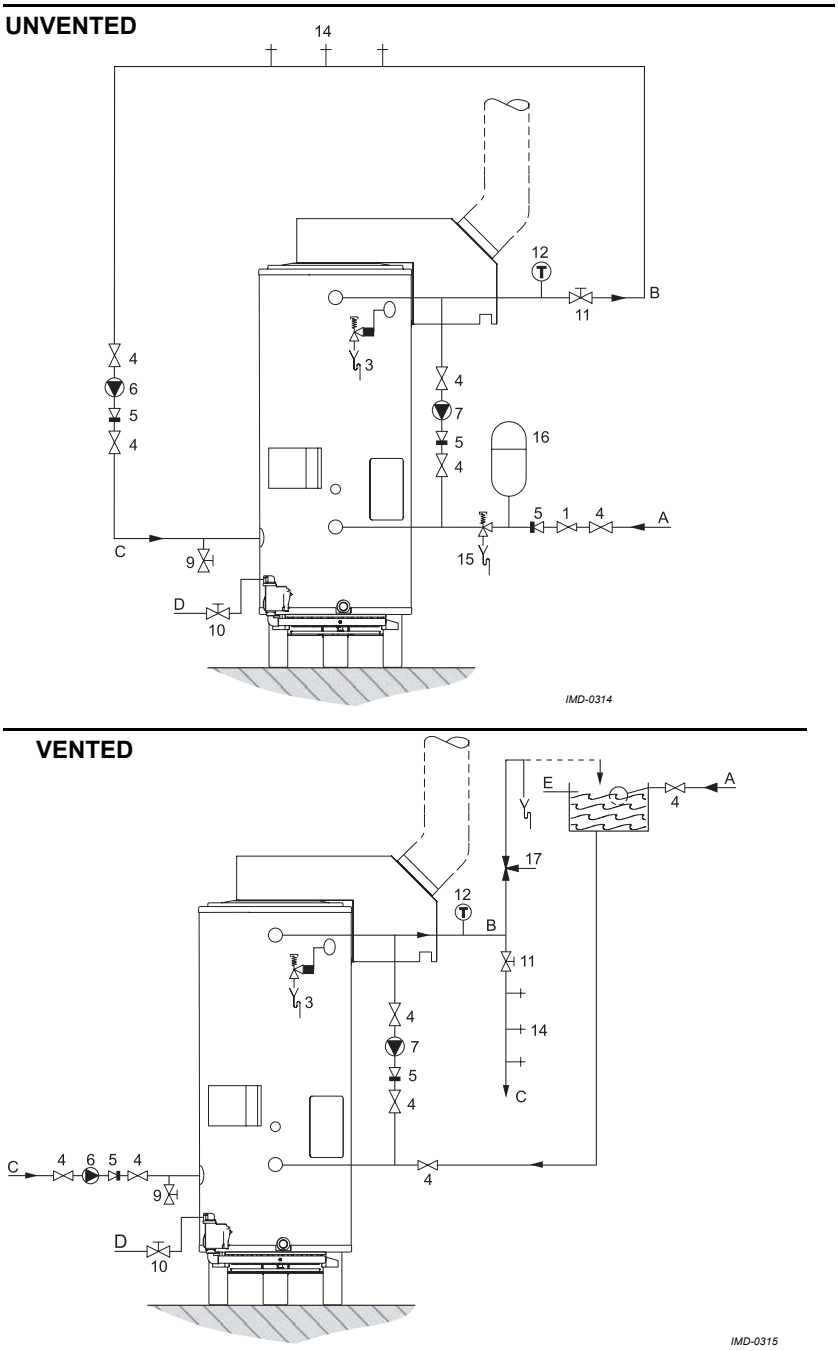


Figure 3.2 Installation diagrams

3.6.3 Hot water side

See Ⓑ in Figure 3.2.

Note
Insulating long hot water pipes prevents unnecessary energy loss.

1. Optional: fit a temperature gauge ❿ to be able to check the temperature of the tap water.
2. Fit the T&P valve ❸.

3. Fit a stop valve ❾ in the hot water outlet pipe, for use when servicing.

3.6.4 Drain valve

1. Fit the standard drain valve ❼ supplied.
2. Refer to paragraph 3.6.5 if a circulation pipe is to be fitted. Otherwise, fit the sealing nut and gasket supplied with the drain valve. See Figure 3.3.

3.6.5 Circulation pipe

See Ⓒ in Figure 3.2. and Figure 3.3.

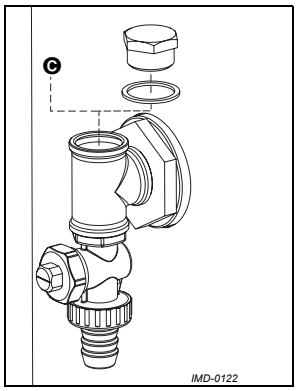


Figure 3.3 Drain valve

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 ❻ of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve ❺a downstream the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves for servicing ❹.
4. Connect the circulation pipe to the T-piece on the drain valve ❼. See Figure 3.3.

3.7 Water connections Vented

3.7.1 Cold water side

See Ⓐ in Figure 3.2.

- Fit an approved stop valve (recommended) on the cold water side between the water tank ⓯ and the water heater ❾ as required by regulations. Ideally the vent pipe should be linked to a separate tundish/drain or else to the cold water storage tank. See also paragraph 1.3 Regulations.

3.7.2 Top to bottom recirculating pump

You can connect a top to bottom recirculation pump to prevent stratification of the water in the water heater.

1. Fit a pipe (Ø 22 mm), a stop valve ❹ and a top to bottom recirculation pump ⓫.
2. Fit non-return valve ❺.
3. Fit stop valves ❾.

3.7.3 Hot water side

See Ⓑ in Figure 3.2.

Note
Insulating long hot water pipes prevents unnecessary energy loss.

1. Fit the safety valve ❸a.
2. Optional: fit a temperature gauge (recommended) ❿ to be able to check the temperature of the tap water.
3. Fit a stop valve (mandatory) ❾ in the hot water outlet pipe, for use when servicing.
4. Refer to paragraph 3.7.4 if a circulation pipe is to be fitted.

3.7.4 Circulation pipe

See ❻ in Figure 3.2.

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 ❻ of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve ❺a downstream the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves for servicing ❹.
4. Connect the circulation pipe to the T-piece on the drain valve ❼. See Figure 3.3.

3.8 Gas connection

Warning
Gas installation may only be carried out by an authorised installation engineer in compliance with the general regulations imposed by the gas company.
See also paragraph 1.3 Regulations.

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

See ❽ in Figure 3.2.

1. Fit a gas valve (mandatory) ❽ in the gas supply pipe.
2. Blow the gas pipe through before use, to be sure it is clean.
3. Close the gas valve.
4. Fit the gas supply pipe to the gas control.

Warning
Check for leaks after fitting.

3.9 Flue gas discharge

Warning
The installation should be carried out by an authorised installation engineer, in compliance with the general and local regulations imposed by gas, water supply and power supply companies and the fire service. Refer also to paragraph 1.3 Regulations and documents.

3.9.1 Introduction

When connecting the water heater to the chimney, the draught diverter ⓬ supplied with the water heater must be used. The standard flue gas thermostat and sensor that are supplied must be fitted in the draught diverter.

3.9.2 Fitting the draught diverter

The draught diverter can be positioned according to preference. After positioning, the draught diverter is secured using two screws ❷ to the top surface of the water heater and also sits on a support bracket ❻ attached to the side of the water heater. The assembly procedure is as follows:

Legend

❶ sealing ring
❷ fastening screws
❸ chimney pipe
❹ 45° bend
❺ holes to attach support bracket
❻ support bracket

Note
To guarantee draught a chimney pipe with a lenght of at least 0.5 m should be fitted to the 45° bend.

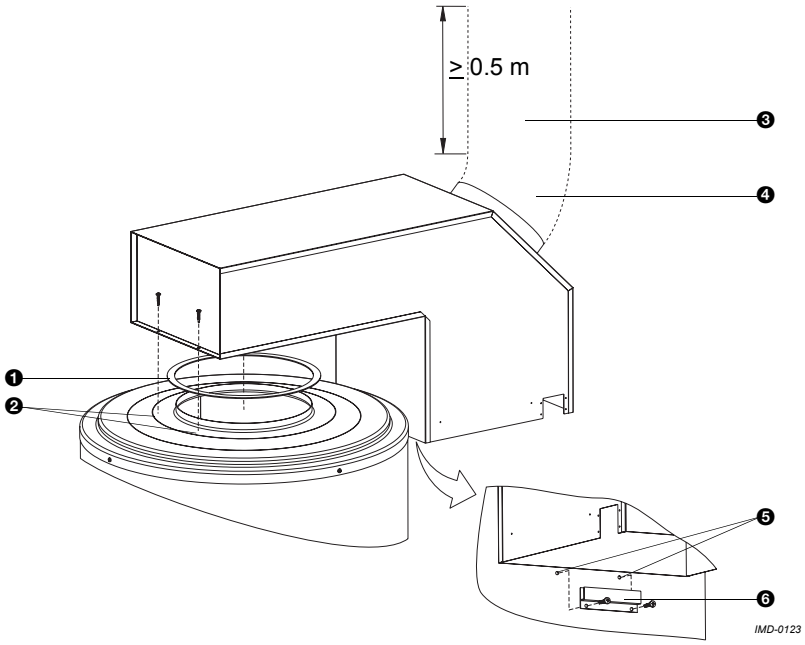


Figure 3.4 Placing the draught diverter

1. Take the support bracket out of the bag.
2. Fit the support bracket ❻ in such a way that it properly supports the draught diverter.
3. Drill two holes ❺ (3.2 mm drill) for the support bracket screws.
4. Screw the support bracket tightly to the water heater.
5. Place the draught diverter in the support bracket and mark the centres for the two drill holes on the top surface of the water heater. Remove the draught diverter from the water heater.
6. Now drill two holes ❷ into the top of the water heater (3.2 mm drill).
7. Place the sealing ring ❶ on the water heater.
8. Screw the draught diverter tightly in place.
9. Fit:
   - a 45° bend ❹ onto the outlet of the draught diverter, followed by:
   - a corrosion-resistant vertical chimney pipe ❸ of at least 0.5 metre,
   - the remaining flue components.

Note
Use flue gas discharge materials that comply with the regulations. See paragraph 1.3 Regulations and documents.

Note
Make sure that the chimney discharges into an area where this is permitted for this category of water heater.

3.9.3 Flue gas thermostat assembly

Attached to the control column is a plastic bag containing the flue gas thermostat with sensor and related attachment materials. The cable from the sensor is already connected in the control column. The thermostat/bracket and sensor have yet to be fitted inside the draught diverter. See Figure 3.5.

Warning
If the flue gas thermostat is not (or is incorrectly) fitted/connected, the flue gas discharge will not be protected. An incorrectly fitted chimney can cause flue gases to backflow into the boiler room.

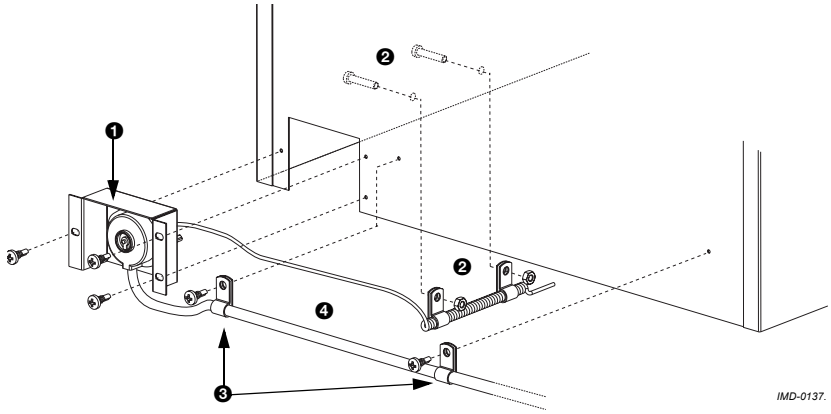


Figure 3.5 Flue gas thermostat assembly

Fit the flue gas thermostat as follows:

1. Take the bracket ❶ with thermostat and sensor ❷ from the packaging.
2. Place the bracket in the draught diverter and screw the bracket and the sensor firmly in place.
3. Bend the cable clips ❸ around the cable ❹ of the flue gas thermostat.

Screw the cable clips ❸ in place in the draught diverter and the water heater.

3.10 Electrical connection

Warning
The installation should 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 service.
See also paragraph 1.3 Regulations.

3.10.1 Introduction

This paragraph covers the connectons of the 3.10.2 Mains power;

Figure 3.6 shows a front view of the electrical connecting block. Table 3.6 shows the associated connections.

Table 3.6 Electrical connecting block DR-LP

Mains voltage				Time clock connection		Time clock power		Combustion products discharge safety device			
⏚	L	N	⏚	L	L	L_1	N	L_2	L_3	N	⏚
1	2	3	4	5	6	7	8	9	10	11	12

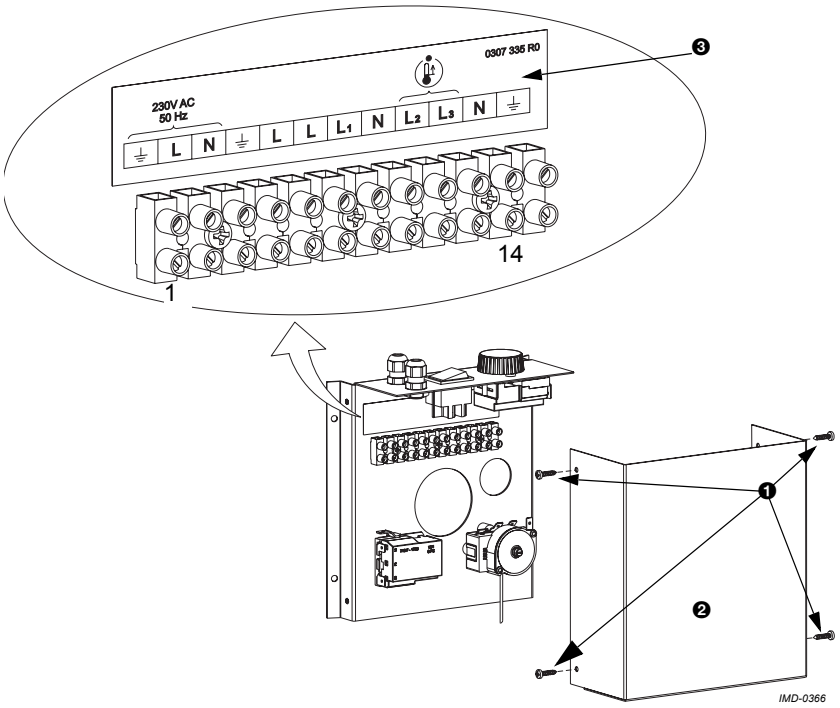


Figure 3.6 Connecting block (connections 1 to 14 explained in Table 3.6)

In preparation, first remove the protective cover from the control column:

- Undo the 4 screws ❶ and remove the protective cover ❷ from the electrical section. The connecting block ❸ is now visible.

Note
Consult A DR-LP electrical diagram for electrical component connections.

3.10.2 Mains power

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

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

1. Feed the power cable through the metric strain relief on the top of the control column.
2. Connect earth (⏚), phase (L_1) and neutral (N) on the power cable to terminals 1 to 3 of the connecting block as set out in Table 3.6.
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 cap on the control column.
5. Connect the power cable to the isolator.

Warning
Leave the water heater disconnected until you are ready to start it up.

3.11 Conversion to a different gas category

Caution
The conversion may only by carried out by an authorised installation engineer.

3.11.1 Introduction

If the water heater must operate on a family of gas (LP-gas or natural gas) other than the category of gas for which the water heater has been set up at the factory, the water heater will have be adapted using a special conversion kit. Converting the DR-LP water heaters is described in 3.11.2 Conversion to a different gas category.

Legend
- ❶ cover plate
- ❷ locking strip
- ❸ orifice with stamped figures

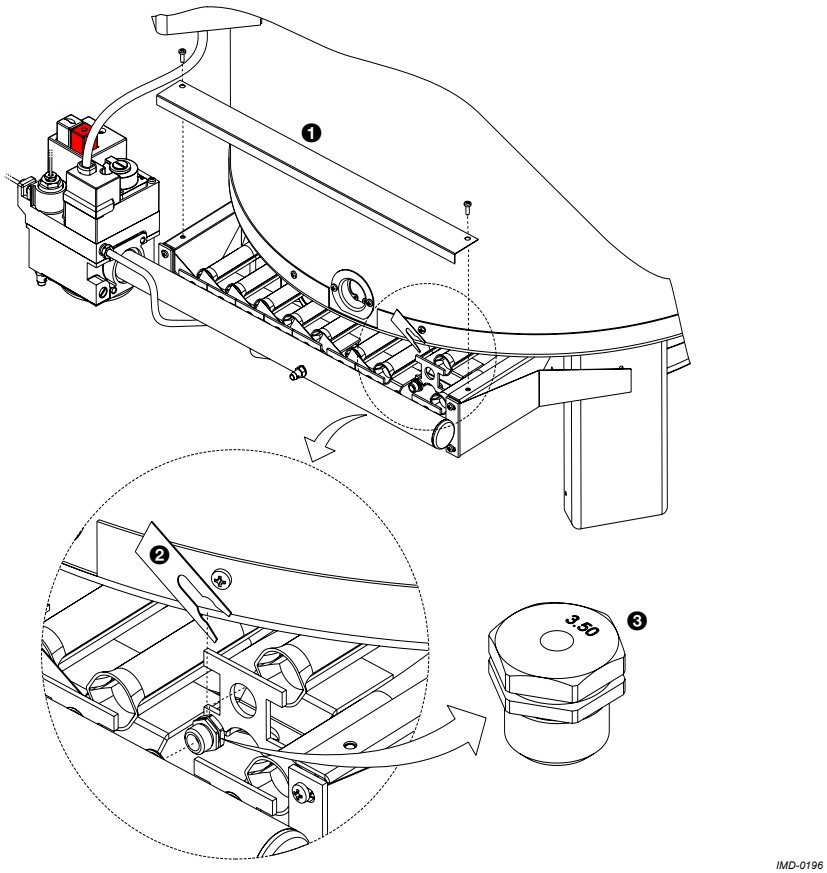


Figure 3.7 Replacing the orifices

3.11.2 Conversion to a different gas category

1. Disconnect the water heater from the power supply. See paragraph 7.3.2 Isolate the water heater from the power supply.
2. Shut off the gas supply.
3. Unscrew the cover plate ❶ from the burner support.
4. Use a suitable tool to remove the locking strips ❷. Note: the locking strips have especially sharp edges.
   Withdraw the locking strips straight upwards.
5. The radiation shield / condensation tray can be temporarily loosened to simplify assembly of the burner.
6. 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 are then accessible.
7. Remove the orifices.
8. Select and fit the correct orifices from the conversion kit, by referring to Table 3.4. The orifice diameter is shown on the orifice by means of stamped figures ❸.

Take care
The burner may be hot.

Legend
See Figure 3.7 for ❶ to ❸.

- ❹ burner pressure regulator
- ❺ blank plate
- ❻ supply pressure test nipple
- ❼ burner pressure test nipple
- ❽ gas control valve
- ❾ burner pressure control cap
- ❿ burner pressure control adjusting screw

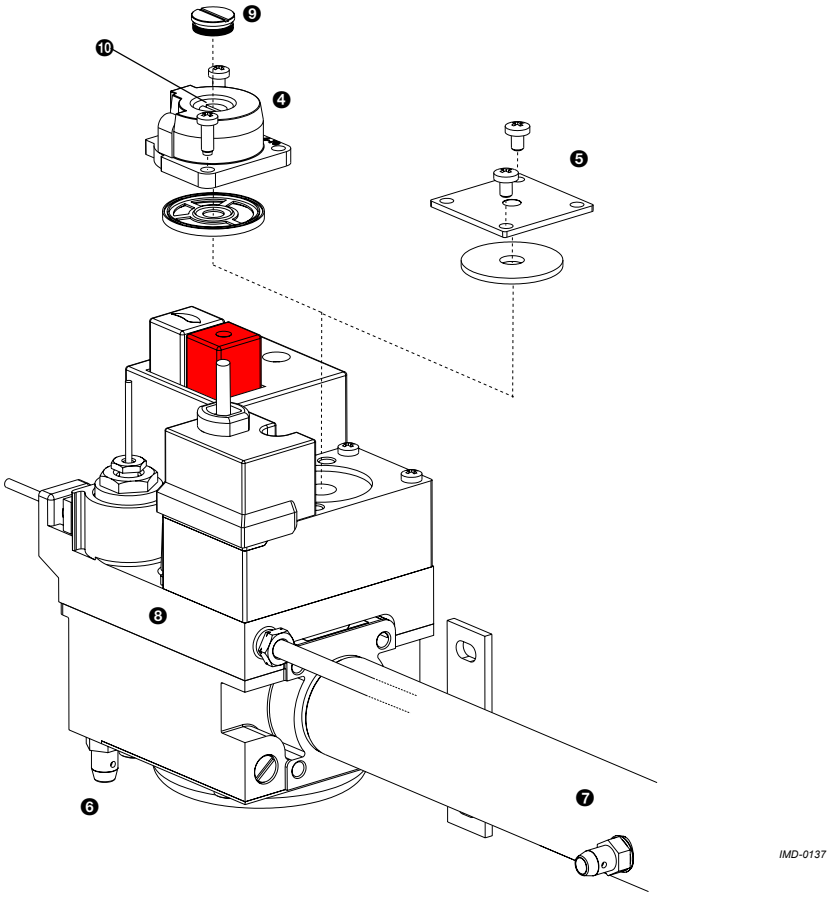


Figure 3.8 Converting the gas control

9. Refit the burners back in their original position.
10. Re-fit the locking strips.
11. If the radiation shield /condensation tray was loosened, re-tighten it.
12. Check whether there is a burner pressure regulator ❹ attached to the top of the gas control or simply a blank plate ❺.
13. Check with the help of the burner pressure in Table 3.4 whether a burner pressure regulator is required for the new gas category.
14. If the blank plate must be replaced with a burner pressure regulator or vice versa:
    - Remove the existing blank plate ❺ or burner pressure regulator ❹.
    - Fit the new burner pressure regulator or blank plate supplied with the conversion kit.
15. Check the burner pressure and supply pressure (see paragraph 3.12).
16. Remove the sticker showing the new gas category from the conversion kit, attach it below the water heater's rating plate. This clearly indicates that the water heater may no longer be run on the gas for which it was originally supplied.
17. Start up the water heater (see paragraph 7.2).

3.12 Checking the supply pressure and burner pressure

Note
Before you start up the water heater and/or begin to check the supply pressure and burner pressure, you must fill the water heater. For the filling procedure, please refer to paragraph 4.2 Filling the water heater.

Caution
Before starting-up for the first time and following conversion, you must always check the supply pressure and burner pressure. If necessary, adjust these to be certain of optimum performance of the water heater.

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

1. Switch off the power to the water heater and extinguish the pilot flame. See paragraph 7.3.2 Isolate the water heater from the power supply.
2. The supply pressure is checked using a test nipple ❻ on the gas control (Figure 3.8). The manifold test nipple ❼ is used for measuring the burner pressure. Sealing screws are located inside the test nipples. Loosen both sealing screws by a few turns. Do no completely undo them, as it may be awkward retightening them.
3. There are two test nipples on the gas control ❼.

Note
All gas pipes should be bleeded and free of leakage.

4. Open the gas supply.
5. Connect a pressure gauge to the supply pressure test nipple ❻ as soon as gas starts to flow from this nipple.
6. Switch on the power to the water heater using the isolator on the water heater.
7. Begin the ignition procedure by pressing and holding the white button on the gas control while repeatedly pressing the piezo igniter until the pilot flame ignites. The pilot flame can be seen through the inspection window above the burner tray.
8. Keep the white button pressed in for about 30 seconds before carefully releasing it. The pilot flame must now keep burning.
9. Set the control thermostat to the highest position (take note of the original setting) and set the **On/Off**-switch back to position **I**.
10. If there is no heat demand, then draw-off some hot water to initiate a heat demand.
11. The heating cycle will start and the burner tray will ignite after a short time.

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

12. After the burner tray has ignited, wait for approximately 1 minute before you start reading the dynamic pressures.

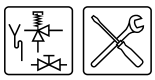
13. Use the pressure gauge to read the supply pressure at the test nipple ❻. Refer to Table 3.4.

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

14. Use the pressure gauge to read the burner pressure at the burner pressure test nipple. Refer to Table 3.4.

Note
If the burner pressure is not correct and the water heater is fitted with a blank plate (❺), you will not be able to adjust the pressure. In this case, consult your installation engineer or supplier. If the water heater is fitted with a burner pressure regulator, then the pressure can be adjusted by following steps 15 to 20.

15. Remove the cap ❾ from the burner pressure regulator ❹.
16. Adjust the burner pressure by turning the adjusting screw ❿, depending on the correction required:
    - To reduce burner pressure, turn the adjusting screw anti-clockwise;
    - To increase burner pressure, turn the adjusting screw clockwise;
17. Cover the opening of the adjusting screw and check the burner pressure against the target value from Table 3.4.
18. If the pressure reading is not correct, repeat steps 16 and 17 until the correct pressure is attained.
19. Re-fit the cap ❾ on the burner pressure regulator.
20. Shut down the water heater by setting the **On/Off**-switch to the **0 position**.
21. Shut off the gas supply.
22. Disconnect the two pressure gauges and re-tighten the sealing screws in the test nipples.



4 Filling and draining

4.1 Introduction

Topics covered in this chapter:

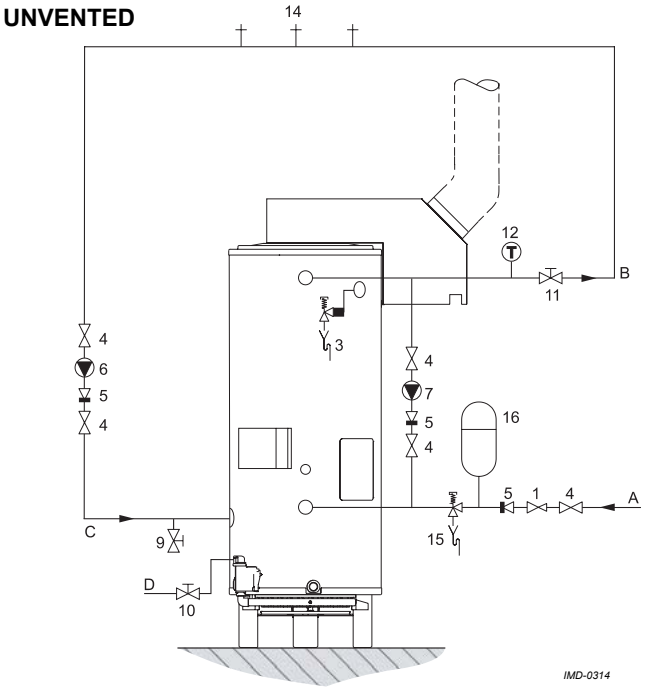
- Filling the water heater.
- Draining the water heater.

The components referred to in these sections are illustrated in Figure 4.1.

Legend

- ❶ pressure-reducing valve (mandatory)
- ❷ expansion vessel (mandatory)
- ❸ T&P valve (mandatory)
  - ❸a) safety valve
- ❹ stop valve (recommended)
- ❺ check valve (mandatory)
  - ❺a) non-return valve
- ❻ circulation pump (optional)
- ❼ drain valve
- ❽ gas valve (mandatory)
- ❾ stop valve (mandatory)
- ❿ temperature gauge (recommended)
- ⓫ top to bottom recirculation pump (optional)
- ⓬ draught diverter
- ⓭ hot water draw-off points
- ⓮ expension valve (mandatory)
- ⓯ water tank
- ⓰ float valve
- ⓱ 3-way venting valve (optional)
- ⓲ overflow pipe
- Ⓐ cold water supply
- Ⓑ hot water outlet
- Ⓒ circulation pipe
- Ⓓ gas supply
- Ⓔ flue gas discharge

UNVENTED



VENTED

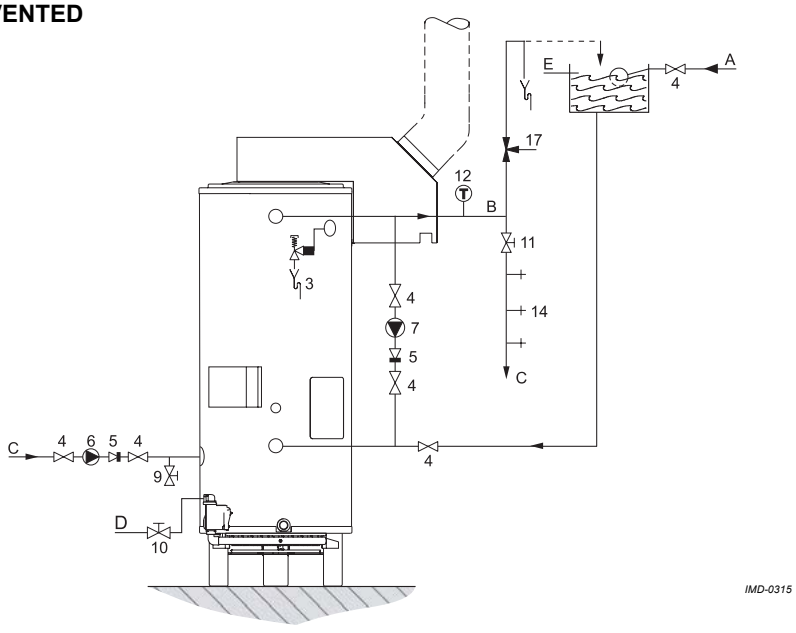


Figure 4.1 Connection diagrams

4.2 Filling the water heater

4.2.1 Filling unvented installations

To fill the water heater, proceed as follows.

1. Open the stop valve ❾ on the hot water pipe and, if present, the stop valves ❹ for the circulation pump.
2. Close the drain valve ❼.
3. Open the nearest hot water draw-off point ⓲.
4. Open the stop valve ❾ on the cold water side Ⓐ so that cold water flows into the water heater.
5. Completely fill the water heater (when cold water flows at normal pressure from the nearest hot water draw-off point, the water heater is full).
6. Vent the entire installation of air, by opening all hot water draw-off points, for example.
7. The water heater is now under water supply pressure. There should be no water coming out of the expansion valve ⓮ nor the T&P-valve ❸. If this does happen, the cause might be:
   - The water supply pressure is greater than the specified 3.5bar. Check the correct pressure.
   - The expansion valve in the cold water supply arrangement is defective or incorrectly fitted.

4.2.2 Filling vented installations

To fill the water heater, proceed as follows:

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

4.3 Draining the water heater

4.3.1 Draining unvented installations

For some procedures may require the water heater to be drained. Proceed as follows:

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

1. Shut the water heater down by putting the On/Off switch to **position 0**.
2. Disconnect the water heater by putting switching the mains isolator off.
3. Shut off the gas supply ❽.
4. Close the stop valve ❾ in the hot water pipe.
5. Close the supply valve in the cold water supply Ⓐ.

6. Open the drain valve ❼.
7. Vent the water heater (or installation) so that it drains completely.

4.3.2 Draining vented installations

For some procedures may require the water heater to be drained. Proceed as follows:

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

1. Shut the water heater down by putting the On/Off switch to **position 0**.
2. Switch the mains isolation off.
3. Shut off the gas supply ❽.
4. Close the stop valve ❾ in the hot water pipe.
5. Close the stop valve between the water tank and the cold water inlet.
6. Open the drain valve ❼.

5 Controls

5.1 Introduction

Topics covered in this chapter:

- 5.2 Control panel;
- 5.3 Explanation of the symbols;
- 5.4 On/Off-switch;
- 5.5 Control thermostat;
- 5.6 Flue gas thermostat reset button.

5.2 Control panel

Figure 5.1 illustrates the control panel. The panel consists of:

- an On/Off-switch;
- a control thermostat with rotary knob.

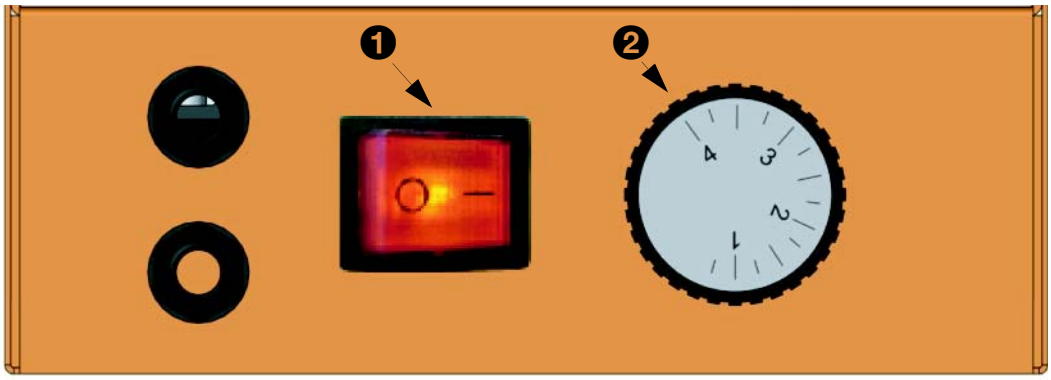


Figure 5.1 The control panel

5.3 Explanation of the symbols

Table 5.1 explains the icons on the control panel.

Table 5.1 Control panel icons

Symbol	Name	Explanation
	On/Off switch	Sets water heater mode to 'ON', 'Week Program' or 'OFF'.
	Temperature control	Sets water temperature (T_{set})

5.4 On/Off-switch

Using the **On/Off**-switch, set the water heater to the ON mode ('I' position) or OFF mode ('0' position). The water heater remains live, even when in the OFF mode. This keeps the weekly water heating program and/or Power Anode active.

Note
To electrically isolate the water heater, you must use the local switch between the water heater and the mains power supply.

5.5 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. Table 5.2 shows the approximate temperature at each position.

Table 5.2 Temperature settings

Position	Temperature
1	≈ 40°C
2	≈ 50°C
3	≈ 60°C
4	≈ 70°C

5.6 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, see Figure 5.2. 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 water heater will then automatically start up again, if there is a demand. If this does not happen, refer to chapter 8 Troubleshooting for a complete troubleshooting guide.

Take care
The draught diverter can be hot.

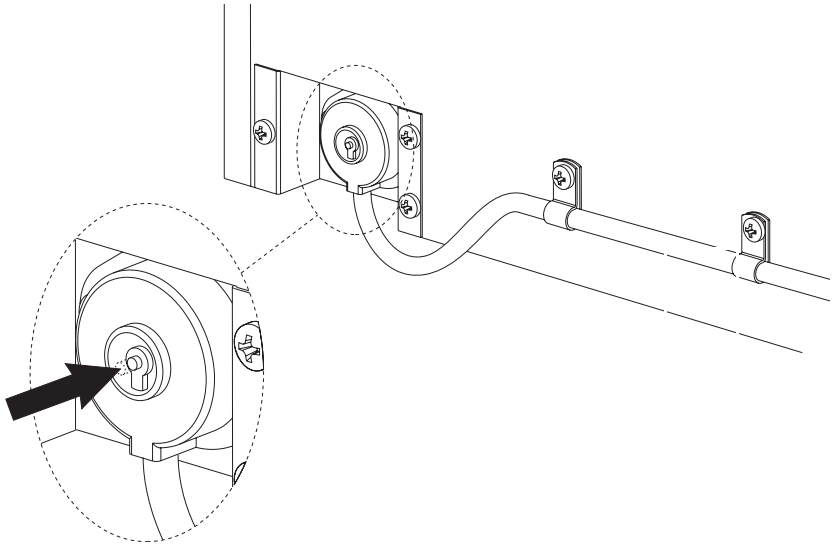


Figure 5.2 Flue gas thermostat reset button

6 Error states of the water heater

6.1 Error states

If the water heater has an error the heater will not operate. The frost protection will also be out of operation.

If the water heater should go into an "error" state, you will be unable to continuosly draw hot water. These error conditions are divided into three groups:

- **Gas control lock out errors**

  In this case the gas control's safety valve is closed, as a result of which the pilot flame is extinguished. Once this error has been rectified, the pilot flame must be re-lit. See paragraph 7.2 Starting up.
- **Blocking error due to high limit thermostats**
  You can recognise this status by the fact that the water heater will not start operation, despite the water temperature being lower than you have set with the control thermostat (see 5.5 Control thermostat).
  This error disappears automatically once the high limit thermostat resets itself, after which the water heater re-starts.
- **Lock out error due to the combustion products discharge safety device**

  This error state has much the same characteristics as a 'Blocking error'. The difference here is that the lock out (push button) for the flue gas thermostat in the draught diverter is activated. See paragraph 5.6 Flue gas thermostat reset button. After removing the cause, the push button must be pressed to allow the water heater to automatically re-start.

The cause of the error cannot be seen on the control panel. Please refer to chapter8 Troubleshooting for a detailed overview of error states.

If you find the water heater in a fault state, as an end user you can attempt to re-start the water heater, see paragraph '7.2 Starting up

However, should the error return or become persistent, you should contact your service engineer.

7 Starting up and shutting down

7.1 Introduction

Topics covered in this chapter:

- Starting up;
- Shutting down.

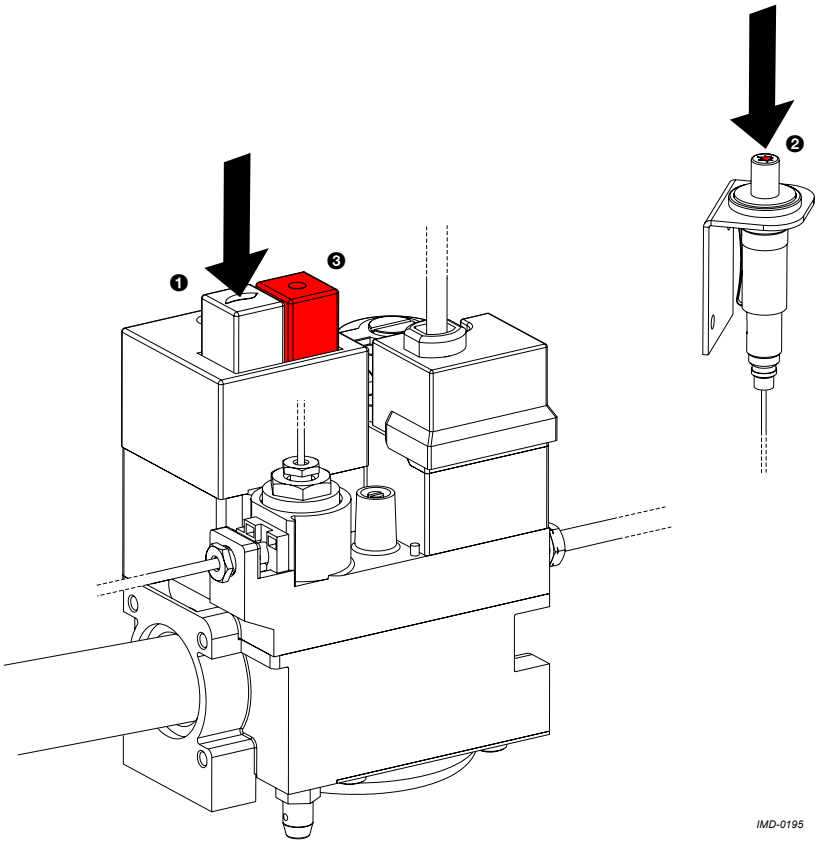


Figure 7.1 Gas control

7.2 Starting up

Start-up the water heater as follows:

1. Fill the water heater. See chapter 4 Filling and draining.
2. Open the manual gas valve. See Figure 4.1 Connection diagrams.
3. Switch on the power to the water heater using the isolator between the water heater and the power supply.

4. Begin the ignition procedure by pressing and holding the white button ❶ on the gas control while repeatedly pressing the piezo igniter ❷ until the pilot flame ignites. See Figure 7.1. The pilot flame can be viewed through the inspection window above the burner tray.

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

5. Keep the white button pressed in for about 30 seconds before carefully releasing it. The pilot flame should now stay lit.
6. Switch the water heater to the 'ON mode' by switching the **On/Off**-switch on the control panel to the **I position**.
7. Set the desired water temperature using the control thermostat. See paragraph 5.5 Control thermostat.

If there is a heat demand, the heating cycle will run its course. See paragraph 7.4 Heating cycle'.

7.3 Shutting down

You can:

- Shut the water heater down for brief periods ("OFF mode").
- Isolate the water heater from the power supply.
- Shut the water heater down for a longer period.

7.3.1 Shut the water heater down for brief periods ("OFF mode")

To shut down the water heater for a brief period, you can set the water heater in "OFF-mode". Activate frost protection by switching the **On/Off**-switch on the control panel to the **0 position**. The pilot flame will remain on.

7.3.2 Isolate the water heater from the power supply

When servicing, the water heater must be electrically isolated. The correct procedure is as follows:

1. Put the water heater in OFF mode by switching the **On/Off**-switch to the **0 position**.
2. Switch off the power to the water heater by switching the isolator between the water heater and the mains power supply to position 0.
3. The pilot flame will remain on, but you can extinguish it if required by pressing the red button ❸ on the gas control. See Figure 7.1.

Caution
These operating states of "OFF mode" and "Isolated" are advisable only if there is no risk of frost. If frost can be expected, you will need to drain the water heater, see paragraph 7.3.3 Shut the water heater down for a longer period.

7.3.3 Shut the water heater down for a longer period

Drain the water heater if you are shutting it down for a longer period of time. Proceed as described in paragraph 4.3 Draining the water heater.

7.4 Heating cycle

The heating cycle is activated as soon as the measured water temperature (T_{water}) falls below the threshold value (Tset). Tset can be adjusted using the control thermostat, for example position 3 (60°C).

The heating cycle runs in turn through the following states:

1. HEAT DEMAND;
2. IGNITION;

3. RUNNING;

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

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

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

8 Troubleshooting

8.1 Introduction

This chapter covers the following errors:

General errors

- Gas smell.
- Water leakage.
- Explosive ignition.
- Poor flame profile.
- Power Anode (optional)

• No hot water

• Insufficient hot water.

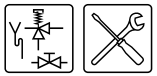
General errors cannot be displayed on the control panel, but these errors usually do not cause the hot water supply to fail, neither fully nor partially.

If the hot water supply should fail, this is termed an error state. See paragraph 6.1 Error states'.

If the hot water supplied is insufficient, this is usually caused by an incorrect setting or some temporary problem.

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

Warning
Maintenance should only be carried out by a qualified service and maintenance engineer.



8.2 Troubleshooting table for general errors

Table 8.1 General errors Page 1 of 2

Symptom	Cause	Solution	Remarks
Gas smell	Gas leak	**Warning** Immediately close the main gas valve. **Warning** Do not operate any switches. **Warning** No naked flames. **Warning** Ventilate the room where the water heater is located.	**Note** Immediately contact your installer or local gas company.
Water leakage	Leakage from a water connection (threaded).	Tighten the threaded connection.	If the leak has not been repaired, consult your installer.
	Leakage from another water water heater or pipe nearby.	Trace the leak.	
	Leakage from the water heater's hot water tank.	Consult the supplier and/or manufacturer.	
	Condensation	Before drawing off hot (too much) tap water, wait until the water in the heater has reached the set temperature.	

Warning
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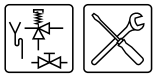

Table 8.1 General errors Page 2 of 2

Symptom	Cause	Solution	Remarks
Explosive ignition **Poor flame profile**	Incorrect supply pressure and/or burner pressure.	Set the correct supply pressure and/or burner pressure, see 3.12 Checking the supply pressure and burner pressure.	If ignition is not improved, consult your installer.
	Contaminated burner	Clean the burner. See 9.4.2 Cleaning the burners	
	Contaminated injector	Clean the injector. See 9.4.3 Cleaning the injectors	
	Inadequate air supply	Improve the air supply by better ventilating the room in which the water heater is located.	
Power Anode (optional) • **Indicator lamp is red**	• Anodes not making contact with the water; • Break in one of the cables; • Anode poorly earthed;	1. Check that the water heater is full of water; 2. Check that the Power Anode is properly connected, see 'appendix A DR-LP electrical diagram'; 3. Check to see that all connections are properly made; 4. Check all cables for breaks and replace if any are found.	If the error cannot be corrected, consult your installer.
• **Indicator lamp is off**	No power supply to the potentiostat;	Check the power supply	

Warning
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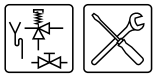


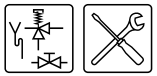
8.3 Troubleshooting table 'no hot water'

If the water heater fails to supply any hot water, there are several possible causes.
Consult the table Table 8.2 No hot water.

Table 8.2 No hot water

Symptom	Cause	Solution	Remarks
No ignition (Pilot flame LIT)	No power	1. Check that the isolator is ON. 2. Check the voltage across the isolator. The measured voltage must be 230V AC +15% -10%.	If ignition is not rectified, consult your installer
Pilot flame OUT	Pilot flame blown out	1. Start up the water heater. See paragraph 7.2 Starting up.	If the error cannot be resolved or is persistent, contact your installer.
	No Gas:	1. Check that the gas valve is open. 2. Check that gas control opens (clicking of the gas control). 3. Check the gas control wiring.	
	The safety thermostat has cut out	1. The safety thermostat has cut out correctly: - Check whether the control thermostat is working. - Check whether the high-limit thermostat is working. - Check that the circulation pump (if present) is working. 2. The safety thermostat has cut out without apparent reason: - Check whether the thermostat may be broken. - Check whether the thermostat sensor may be broken.	

Warning
Maintenance should only be carried out by a qualified service and maintenance engineer.



8.4 Troubleshooting table 'insufficient hot water'

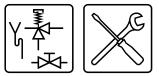
If the water heater fails to supply any hot water, there are several possible causes.
Consult the table Table 8.3 Insufficient hot water

Table 8.3 Insufficient hot water

Symptom	Cause	Solution	Remarks
Insufficient hot water	Water temperature setting (T_{set}) too low	Set the control thermostat to a higher setting. See paragraph 5.5 Control thermostat.	
	Hot water supply used up	1. Reduce the rate of hot water consumption. Allow the water heater enough time to heat up the water. 2. If this error occurs regularly, check whether the high-limit thermostat is cutting in/out. If so, check that the circulation- and/or top to bottom recirculation pumps are working properly.	If the error has not been rectified and no other cause can be found, isolate the water heater from the power supply, shut off the gas valve and alert your installer.

Warning

Maintenance should only be carried out by a qualified service and maintenance engineer.



9 Maintenance

9.1 Introduction

Caution
Maintenance may only by carried out by an approved service and maintenance engineer.

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

1. Preparing for maintenance;
2. Water-side maintenance;
3. Gas-side maintenance;
4. Finalising maintenance.

Note
Before ordering spare parts, take a moment to write down the water heater type and model and the full serial number of the water heater. Only with this information can you be sure to receive the correct spare parts. These details can be found on the rating plate.

9.2 Preparing for maintenance

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

1. Check the supply pressure and burner pressure and adjust these, where necessary. See paragraph 3.12 Checking the supply pressure and burner pressure. Also check that this is running properly during the warm-up cycle. See paragraph 7.4 Heating cycle.
2. Check that all components of the flue gas system are properly attached.
3. Test the operation of the expansion valve of the cold water supply arrangement. The water should spurt out.
4. Test the overflow operation of the T&P valve. The water should spurt out.
5. Check the wastewater pipes of the overflow valves and remove any scale deposits that may be present.
6. Drain the water heater. See paragraph 4.3 Draining the water heater.

9.3 Water-side maintenance

9.3.1 Introduction

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

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

9.3.2 Checking the anodes

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

Take care
The draught diverter and the cover may be hot.

1. Remove the flue gas thermostat connector from the connector on the unit.
2. Disconnect the draught diverter from the flue gas discharge.
3. Undo the screws on the draught diverter.
4. Remove the draught diverter from the water heater.
5. Undo the screws on the cover on the top of the water heater.
6. Remove the cover from the water heater.
7. Remove the sealing ring from the hot water tank.
8. Loosen the anodes using suitable tools (27 mm A/F).
9. Check the anodes and if necessary, replace them.
10. Now also check the flue baffles. Replace them, if necessary. See paragraph 9.4.4 Checking the flue baffles.
11. Fit a new sealing ring around the edge of the hot water tank and replace the cover.
12. Reconnect the flue gas thermostat connector to the connector on the unit.

Note
This unit is also appropriate for the use of Power Anodes. These are available as an accessory and can be ordered separately. Please check your Power Anode instructions for correct use or consult your installer.

9.3.3 Descaling and cleaning the heater

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

Take the rate of scale formation into account when deciding on maintenance frequency. Scale formation depends on the local water composition, the water consumption and the water temperature setting. A water temperature setting of maximum 60^{O}c is recommended for prevention of excessive scale buildup.

To guarantee a good, watertight seal around the cleaning opening, the gasket , O-ring ❼, spring washers, bolts and if necessary, the lid ❸ should be replaced with new parts before reassembly. See Figure 9.1. A special set is obtainable from State for this purpose.

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

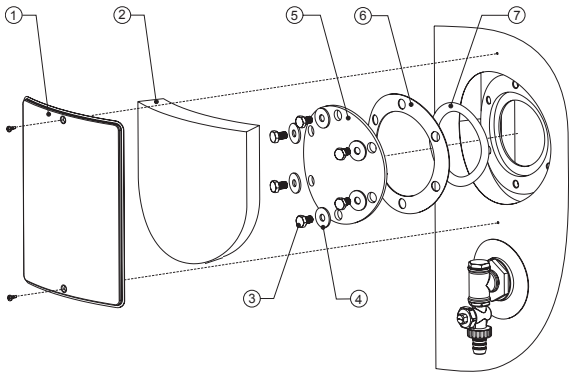


Figure 9.1 Cleaning opening

1. Remove the cover plate ❶ on the outer jacket. See Figure 9.1.
2. Carefully remove the insulation ❷ 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, then the appliance will need to be descaled using a suitable cleaner.
7. Close the cleaning opening. To avoid damage to the tank, the bolts that fasten the lid should be tightened with a torque no greater than 50 Nm. Use suitable tools for this. To properly seal the cleaning opening, we recommend tightening the bolts in the sequence shown in Figure 9.2.

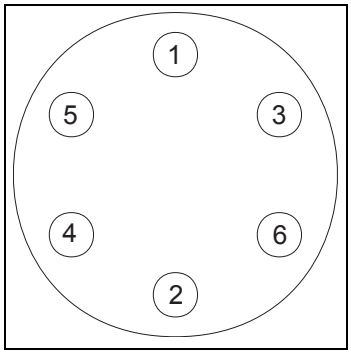


Figure 9.2 Bolt tightening sequence

9.4 Gas-side maintenance

9.4.1 Introduction

On the gas side the following steps should be carried out:

1. Cleaning the burners.
2. Cleaning the injectors.
3. Checking the flue baffles.

Take care
The burners may be hot.

9.4.2 Cleaning the burners

1. Detach the burners.
2. Carefully remove any contaimation present on the burners.
3. Re-attach the burners.

9.4.3 Cleaning the injectors

1. Detach the injectors.
2. Remove any contamination present in the injectors.
3. Re-attach the injectors.

9.4.4 Checking the flue baffles

Take care
The flue baffles may be hot.

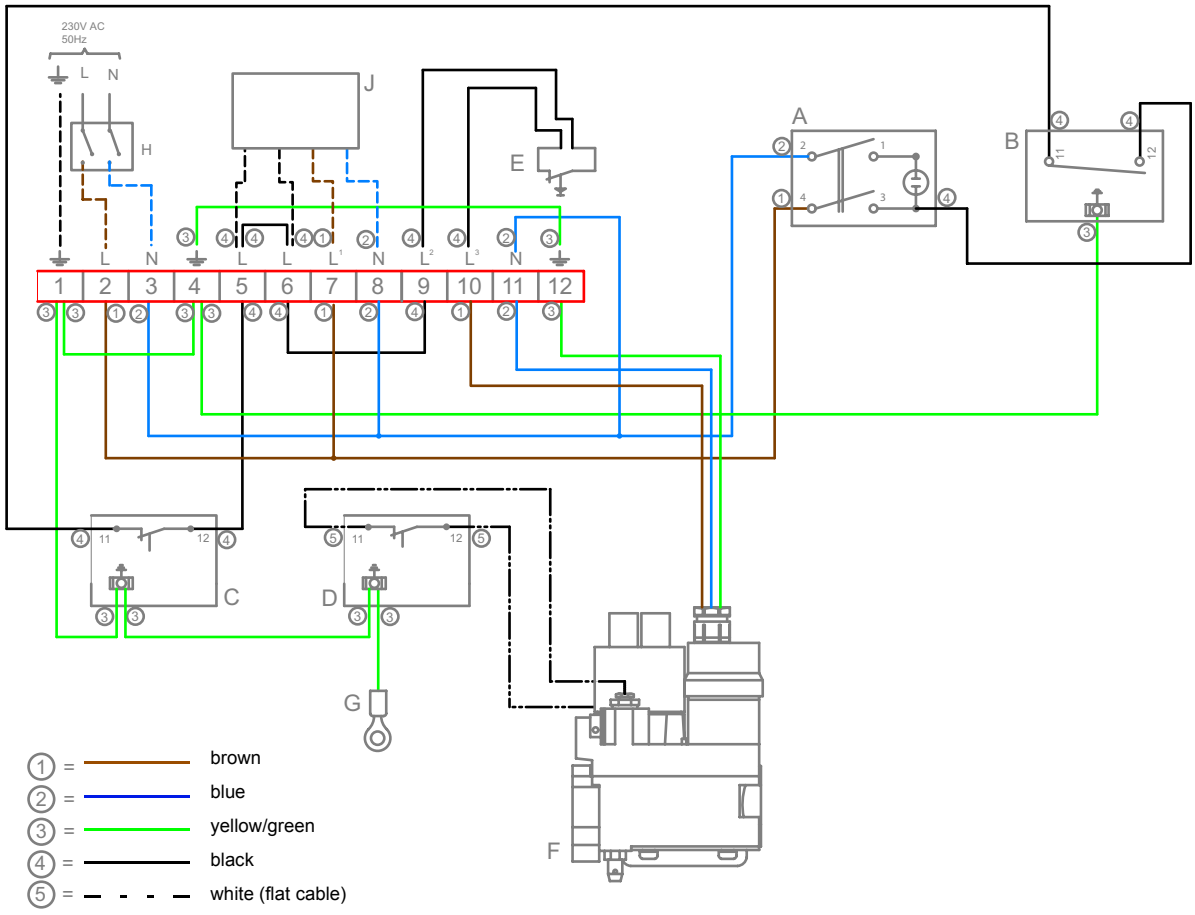
1. Complete steps 1 to 7 from paragraph 9.3.2 Checking the anodes.
2. Remove the flue baffles from the water heater.
3. Check the flue baffles for rust and remove any rust which is present.
4. Check the flue baffles for wear and replace any worn flue baffles.
5. Fit a new sealing ring around the edge of the hot water tank and replace the cover.
6. Reconnect the flue gas thermostat connector to the connector on the unit.

9.5 Finalising maintenance

To finalise the maintenance carry out the following steps:

1. Fill the water heater. See paragraph 4.2 Filling the water heater.
2. Re-start the water heater. See 7.2 Starting up.

A DR-LP electrical diagram



TERMINAL BLOCK CONNECTIONS:

⏚	Earth
N	Neutral
L^1	Phase input to week timer
L^2	Phase input to thermal non-return safety device
L^3	Phase input to main gas valve

COMPONENTS:

A	On/off switch
B	Control thermostat
C	High-limit thermostat
D	Safety thermostat
E	Thermal non-return safety device
F	Gas control
G	Eye terminal (for earthing to the Jacket)

OPTIONAL COMPONENTS:

H	Main power switch
J	Week timer

Figure A.1 SCT electrical diagram

DR-LP electrical diagram