

Dorchester DR-LA Range of Hot Water Storage Heaters

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

**Installation, Commissioning
and Maintenance Instructions**

DORCHESTER DR-LA 30, 40, 45, 60, 75, 95, 110 Models

NATURAL GAS I_{2H} LPG I₃₊

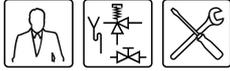
NOTE:

**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 (2ND FAMILY) I_{2H},
OR LPG (3RD FAMILY) I₃₊. 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.

PUBLICATION NO. 500001137
ISSUE: "B"
AUGUST 2014



Read this manual carefully



Warning

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

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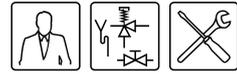
Although considerable care has been taken to ensure a correct and suitably comprehensive description of all relevant components, the manual may nonetheless contain errors and inaccuracies.

Should you detect any errors or inaccuracies in the manual, we would be grateful if you would inform us. This helps us to further improve our documentation.

More information

If you have any comments or queries concerning specific aspects related to the water heater, then please do not hesitate to contact the supplier.

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



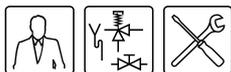


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1 Introduction

1.1 About the appliance

This manual describes how to install, service and use the DR-LA appliance. The DR-LA appliance is a gas-fired open boiler without fan. DR-LA appliances are equipped with a flue gas backflow safeguard.

The DR-LA is an appliance of type B_{11BS}.

The information in this manual applies to types: DR-LA 30, DR-LA 40, DR-LA 45, DR-LA 60, DR-LA 75, DR-LA 95 and DR-LA 110.

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



Warning

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

1.2 What to do if you smell gas

Warning

If you **smell gas**:

No naked flames! No smoking!

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

Open windows and doors!

Shut off the mains gas supply valve!

Warn occupants and leave the building!

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

1.3 Regulations and documents

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

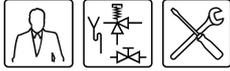
The three target groups for this manual are:

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

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

Target group symbols

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



Hand icon Caution

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

Hand icon Caution

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

1.5 Maintenance

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

Hand icon Note

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

Hand icon Note

Regular maintenance extends the service life of the water heater.

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

Hand icon Note

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

1.6 Notation conventions

The following notation is used in this manual:

Hand icon Note

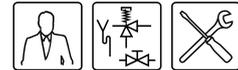
Important information.

Hand icon Caution

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

Hand icon Warning

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

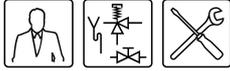


1.7 Overview of this document

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

Contents of this document

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



2 Working principle of the water heater

2.1 Introduction

This chapter covers the following topics:

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

2.2 General working principle of the water heater

In this appliance, the cold water enters the bottom of the tank through the cold water inlet (14). The heat of combustion is conducted to the water by the combustion chamber (8) and heat exchanger (11). The heated tap water leaves the tank through the hot water outlet (2). Once the appliance is completely filled with water, it will constantly be under mains water pressure. When hot water is drawn from the appliance, it is immediately replenished with cold water.

The gas required for combustion flows via the gas control valve (16) into the manifold. Orifices are mounted in the manifold. The gas is injected into the burner bars at pressure from these orifices (36). The burner bars together form the burner tray. The injection of gas into the burner bars also draws in the primary air required for combustion. The narrow opening in the orifice causes the gas flow to accelerate. This in turn causes a partial vacuum. It is this partial vacuum that draws in the air (the Venturi effect). Additional air is drawn in through the opening in the burner tray.

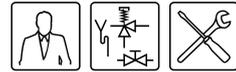
The hot surface igniter (20) ensures ignition of the gas/air mixture.

The flue gases released by this combustion are led through the flue tubes (part of 11). Flue baffles (part of 11) are mounted in the flue tubes. These retard the flow of the flue gases, thereby increasing the thermal efficiency of the appliance.

The flue gases are vented from the appliance via the draught diverter (33).

A radiation shield/condensation tray (35) is mounted below the burner tray. This prevents overheating of the floor area below the appliance, as well as serving as a collection tray for condensation water.

The insulation layer (24) prevents heat loss. The inside of the tank is enamelled to protect against corrosion. The anodes (9) offer extra protection.

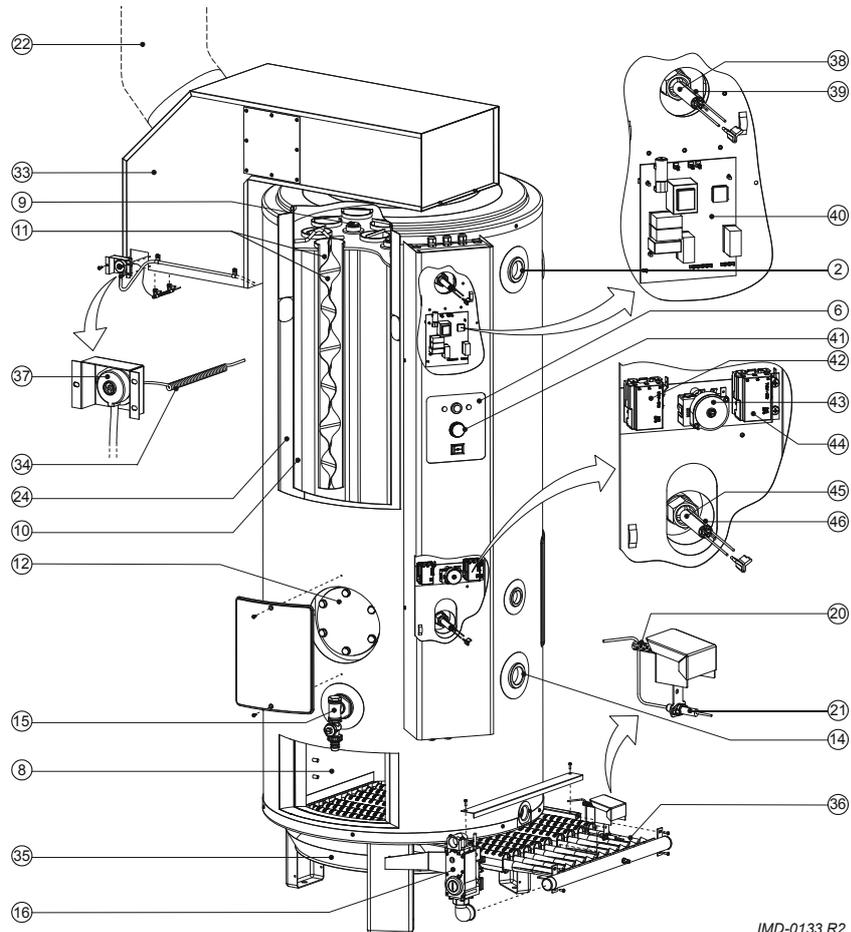


Cut-away view of the water heater

Legend

Unused numbers are not applicable

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



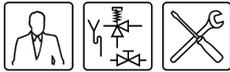
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2.3 Water heater operating cycle

The entire appliance is controlled by the burner control (40) and the control thermostat (41) or frost thermostat (44). The control thermostat and frost thermostat both independently measure the water temperature (T_{water}). The appliance's heating cycle is activated as soon as T_{water} falls below the specified threshold value (T_{set}). The value of T_{set} depends on the selected appliance operating mode (8.2 "Operating modes"). If the appliance is in the 'OFF' mode (frost protection), then this value is determined by the frost thermostat (threshold value = 20°C). If the appliance is in the 'ON' mode, then the threshold value is selectable via the control thermostat ($\pm 40^\circ\text{C}$ to $\pm 70^\circ\text{C}$).

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

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



2.4 Protection for the water heater

2.4.1 Introduction

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

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

2.4.2 Water temperature protection

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

Temperature protection

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

2.4.3 Flue gas backflow safeguard

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

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

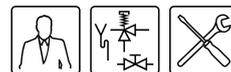
2.4.4 Flame probe

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

2.5 Safety of the installation

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

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



2.5.1 Inlet combination and pressure-reducing valve

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

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

2.5.2 Unvented installation

With an unvented installation, an expansion valve and expansion vessel prevent the buildup of excessive pressure in the tank. This prevents damage being caused to the enamelled coating (in the appliance) or to the tank. A non-return valve prevents excessive pressure buildup in the water supply system. This valve also prevents water from flowing backwards from the tank into the cold water supply system. The pressure reducing valve protects the installation against an excessively high water supply pressure (> 8 bar). These components are fitted to the cold water pipe ([3.6 "Vented water connections"](#)).

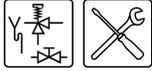
2.5.3 Vented installation

With vented installation, excess pressure is taken up by the open cold water head tank. The head height of the tank determines the working pressure in the water heater, which may not exceed 8 bar. The installation must also be fitted with a vent pipe from the hot water pipe ([3.6.3 "Hot water side"](#)), which opens into the cold water tank.

2.5.4 T&P valve

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

A T&P (Temperature and Pressure Relief) valve monitors the pressure in the tank and the water temperature at the top of the tank. If the pressure in the tank becomes excessive (> 10 bar) or the water temperature is too high (> 97°C), the valve will open. The hot water can now flow out of the tank. Because the appliance is under water supply pressure, cold water will automatically flow into the tank. The valve remains open until the unsafe situation has been rectified. The appliance is fitted standard with a connecting point for a T&P valve ([3.7.3 "Hot water side"](#)).



3 Installation

Warning

The installation should be carried out by a competent person in compliance with the general and locally applicable regulations imposed by the gas, water and power supply companies and the fire service.

The water heater may only be installed in a boiler room that complies with the requirements stated in national and local ventilation regulations ([1.3 "Regulations and documents"](#)).

3.1 Introduction

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

- [Packaging](#);
- [Ambient conditions](#);
- [Technical specifications](#);
- [Vented water connections](#);
- [Unvented water connections](#);
- [Gas connection](#);
- [Chimney flue](#);
- [Electrical connection](#);
- [Checking the supply pressure and burner pressure](#).

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

3.2 Packaging

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

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

Caution

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

3.3 Ambient conditions

Caution

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

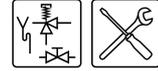
DR-LA appliances are open appliances and may only be installed in an open boiler room. They are type B_{11BS}.

3.3.1 Air humidity and ambient temperature

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

Air humidity and ambient temperature specifications

Air humidity and ambient temperature	
Air humidity	max. 93% RH at +25°C
Ambient temperature	functionality: $0 \leq T \leq 60^\circ\text{C}$



3.3.2 Maximum floor load

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

Weight of the appliance filled with water						
DR-LA 30	DR-LA 40	DR-LA 45	DR-LA 60	DR-LA 75	DR-LA 95	DR-LA 110
504 kg	578 kg	507 kg	573 kg	522 kg	523 kg	581 kg

3.3.3 Water composition

The appliance is intended for heating drinking water. The drinking water must comply with the regulations governing drinking water for human consumption. The table gives an overview of the specifications.

Water specifications

Water composition	
Hardness (alkaline earth ions)	> 1.00 mmol/l: <ul style="list-style-type: none"> • German hardness > 5.6° dH • French hardness > 10.0° fH • English hardness > 7.0° eH • CaCO₃ > 100 mg/l
Conductivity	> 125 µS/cm
Acidity (pH value)	7.0 < pH value < 9.5

Note

If the water specifications deviate from those stated in the table, then the tank protection cannot be guaranteed (13 "Guarantee").

3.3.4 Working clearances

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

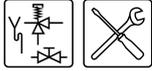
- AA: around the appliance's control column and cleaning openings: 100 cm.
- BB: all sides of the appliance: 50 cm.
- Above the appliance (room to replace the anodes):
 - 100 cm if using fixed anodes, or
 - 50 cm if using flexible anodes.

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

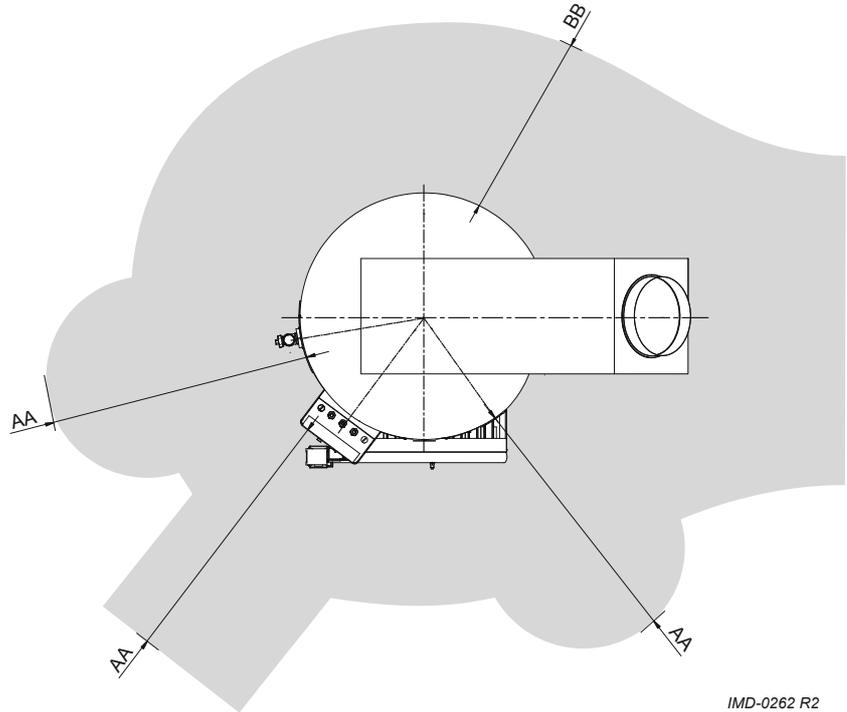
Note

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

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



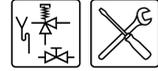
Working clearances



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3.4 Technical specifications

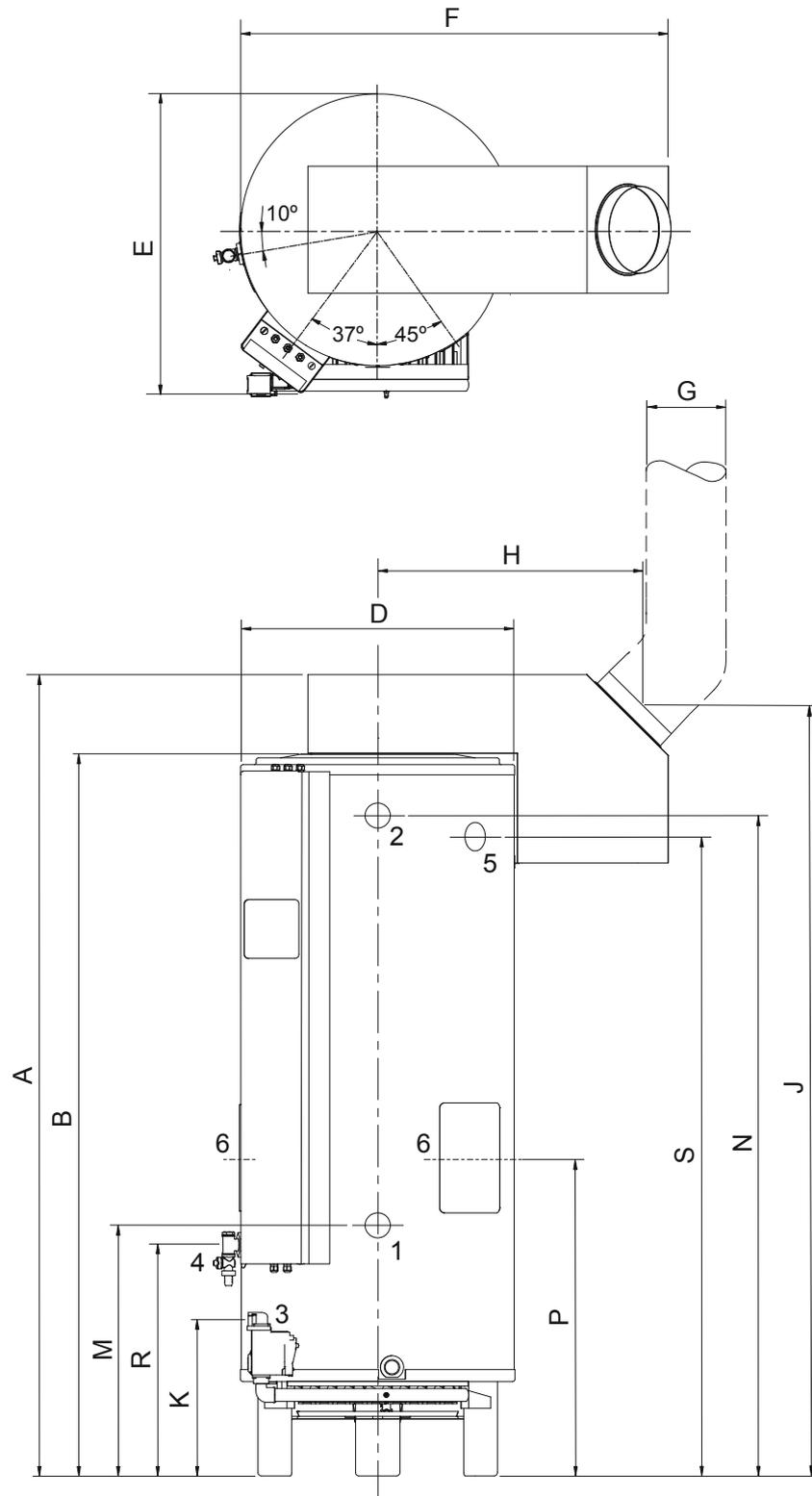
The water heater is supplied without accessories. Check the dimensions (3.4 "Technical specifications"), gas data (3.4.3 "Gas data") and other specifications (3.4.2 "General and electrical specifications") of any accessories you plan to use.



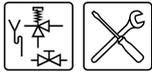
3.4.1 Dimensions of the water heater

Plan and elevation of the water heater

Legend
See the table.



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Dimensions (all measurements in mm unless otherwise indicated)

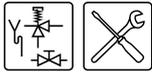
Size	Description	DR-LA 30	DR-LA 40	DR-LA 45	DR-LA 60	DR-LA 75	DR-LA 95	DR-LA 110
A	Total height	1900	2100	1900	2040	2000	2025	2085
W	Height of top of appliance	1760	1960	1760	1900	1795	1810	1870
D	Appliance diameter	710	710	710	710	710	710	710
E	Depth	800	800	800	800	800	800	800
F	Width	1100	1100	1100	1100	1105	1105	1105
G	Diameter of flue gas discharge	150	150	180	180	225	225	225
H	Heart appliance / heart chimney flue	660	660	660	660	675	675	675
J	Height of chimney flue	1840	2040	1840	1980	1935	1950	2010
K	Height of gas connection	400	400	400	340	400	340	205
M	Height of cold water supply	565	565	565	505	575	590	650
N	Height of hot water outlet	1605	1810	1605	1750	1640	1655	1715
P	Height of cleaning opening	730	730	730	670	740	765	855
R	Height of drain valve connection	500	515	500	455	525	540	595
S	Height of T&P valve connection	1550	1760	1550	1700	1595	1600	1660
1	Cold water supply connection (male)	R1 ^{1/2}						
2	Hot water outlet connection (female)	Rp1 ^{1/2}						
3	Gas control valve connection (female)	Rp ^{3/4}	Rp1					
4	Drain valve connection (female)	Rp1 ^{1/2}						
5	T&P valve connection (internal)	1 - 11.5 NPT	Rp1 ^{1/2}	Rp1 ^{1/2}	Rp1 ^{1/2}			
6	Cleaning/inspection opening	Ø 100						



3.4.2 General and electrical specifications

General and electrical specifications

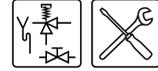
DESCRIPTION	Unit	DR-LA 30	DR-LA 40	DR-LA 45	DR-LA 60	DR-LA 75	DR-LA 95	DR-LA 110
Volume	litres	324	374	312	351	291	265	264
Maximum operating pressure	bar	8	8	8	8	8	8	8
Empty weight	kg	195	221	209	238	244	270	329
Heating-up time $\Delta T = 45^{\circ}\text{C}$	minutes	32	28	20	18	13	9	8
Number of anodes	-	2	2	2	3	3	4	4
Number of bar burners/orifices	-	3	4	5	7	7	9	6
Number of flue tubes/flue baffles	-	5	6	7	9	12	16	17
Electrical power consumption	W	30	30	30	30	30	30	60
Supply voltage (-15% +10% VAC)	volts	230	230	230	230	230	230	230
Mains frequency	Hz ($\pm 1\text{Hz}$)	50	50	50	50	50	50	50
IP class	-	30	30	30	30	30	30	30



3.4.3 Gas data

Gas data

Description H_2/H_3+	Unit	DR-LA 30	DR-LA 40	DR-LA 45	DR-LA 60	DR-LA 75	DR-LA 95	DR-LA 110
Gas category 2H: General								
Orifice diameter	mm	3.20	3.20	3.10	2.95	3.20	3.20	3.90
(1) = Blank plate (2) = Burner pressure regulator (3) = High/low regulator	1, 2 or 3	2	2	2	2	2	2	2
<i>Gas category G20 - 20 mbar</i>								
Nominal load (gross)	kW	41.4	55.4	65.2	81.0	96.4	124.2	140.5
Nominal capacity	kW	31.7	42.0	49.3	61.2	72.9	93.9	107.5
Supply pressure	mbar	20	20	20	20	20	20	20
Burner pressure	mbar	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Gas consumption (*)	m ³ /h	4.0	5.4	6.3	7.8	9.4	12.1	13.7
Gas category 3+: General								
Orifice diameter	mm	1.70	1.70	1.70	1.50	1.70	1.70	2.25
(1) = Blank plate (2) = Burner pressure regulator (3) = High-low control	1, 2 or 3	1	1	1	1	1	1	3
<i>Gas category G30 - 30 mbar (butane)</i>								
Nominal load (gross)	kW	40.9	54.2	66.9	79.2	94.3	121.2	135.7
Nominal capacity	kW	32.0	42.0	51.8	61.4	73.1	93.9	106.4
Supply pressure	mbar	30	30	30	30	30	30	30
Burner pressure (†)	mbar	30	30	30	30	30	30	30
Gas consumption (*)	m ³ /h	3.0	4.0	5.0	5.8	7.0	9.0	10.1
<i>Gas category G31 - 37 mbar (butane)</i>								
Nominal load (gross)	kW	37.6	50.1	62.1	76.2	87.8	110.9	127.6
Nominal capacity	kW	29.4	38.7	48.0	58.9	67.9	85.7	99.8
Supply pressure	mbar	37	37	37	37	37	37	37
Burner pressure (†)	mbar	37	37	37	37	37	37	37
Gas consumption (*)	kg/h	2.7	3.7	4.5	5.3	6.4	8.1	9.3
(*) Based on 1013.25 mbar and 15 °C.								
(†) If using a blank plate instead of a burner pressure regulator, it is assumed that the burner pressure is equal to the supply pressure. In practice, however, the burner pressure will be lower.								



3.5 Installation diagram

3.5.1 Installation

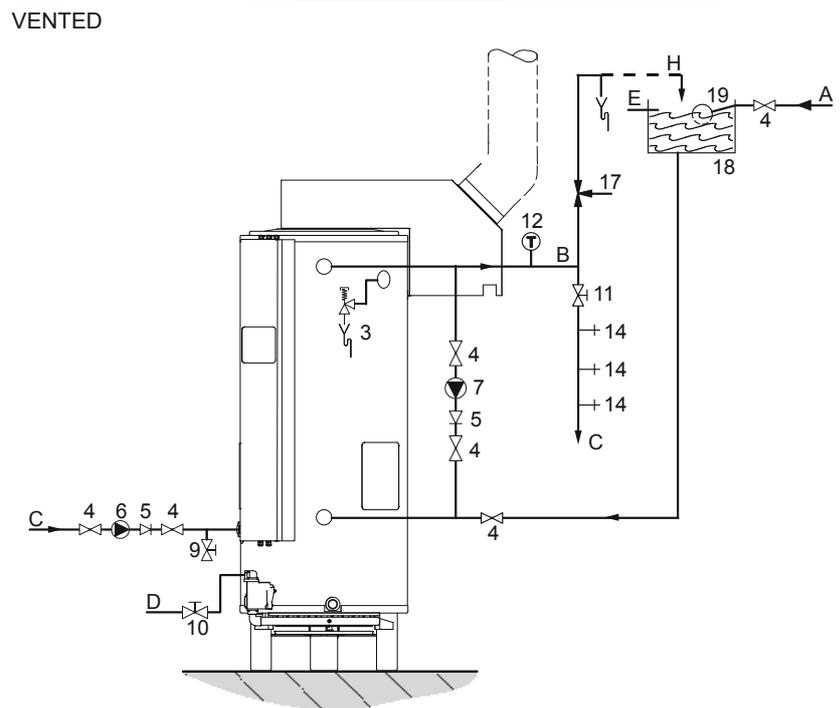
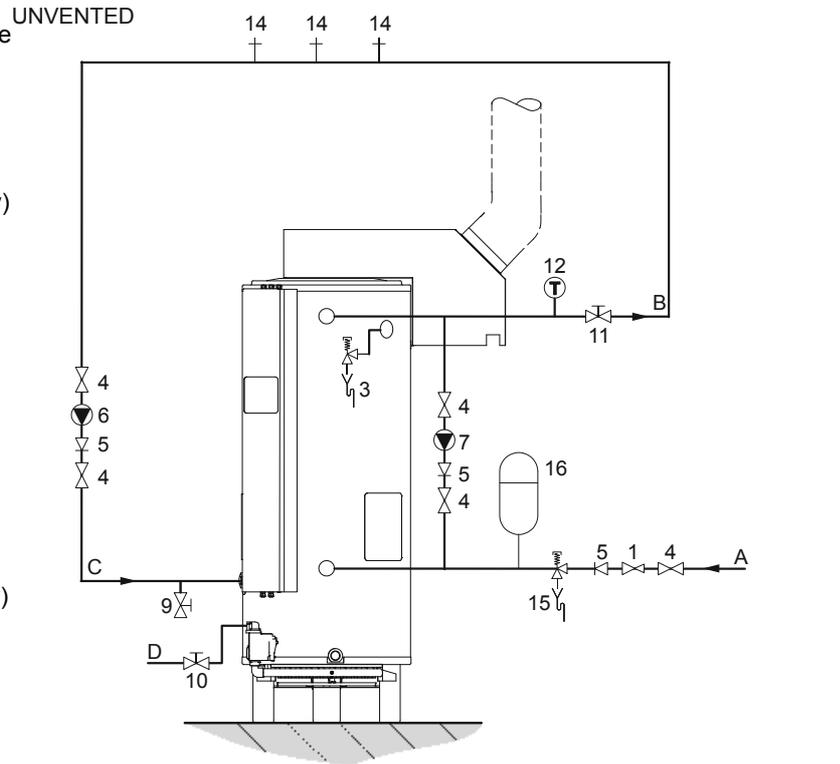
The figure shows the Installation diagram. This diagram is referred to in the sections describing the actual connection procedure.

Installation diagram

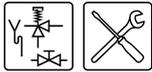
Legend

Unused numbers are not applicable

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



IMD-0466 R0



3.6 Vented water connections

Warning

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

3.6.1 Cold water side

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

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

3.6.2 Recirculation pipe

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

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

3.6.3 Hot water side

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

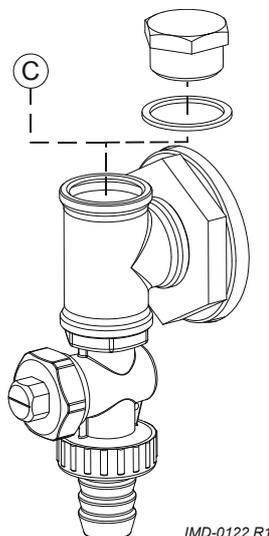
Note

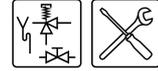
Insulating long hot water pipes prevents unnecessary energy loss.

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

3.6.4 Drain valve

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





3.6.5 Circulation pipe

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

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

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

3.7 Unvented water connections



Warning

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

3.7.1 Cold water side

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

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

3.7.2 Recirculation pipe

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

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

3.7.3 Hot water side

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



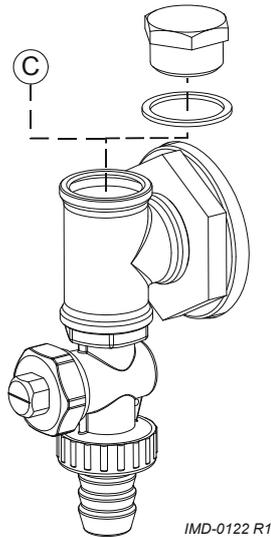
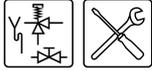
Note

Insulating long hot water pipes prevents unnecessary energy loss.

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

3.7.4 Drain valve

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



3.7.5 Circulation pipe

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

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

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

3.8 Gas connection

Warning

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

Caution

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

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

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

Warning

After fitting, check for leaks.

3.9 Chimney flue

Warning

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



3.9.1 Introduction

The separately-supplied draught diverter must be used when connecting the appliance to the chimney flue. The standard flue gas thermostat and sensor that are supplied must be fitted in the draught diverter.

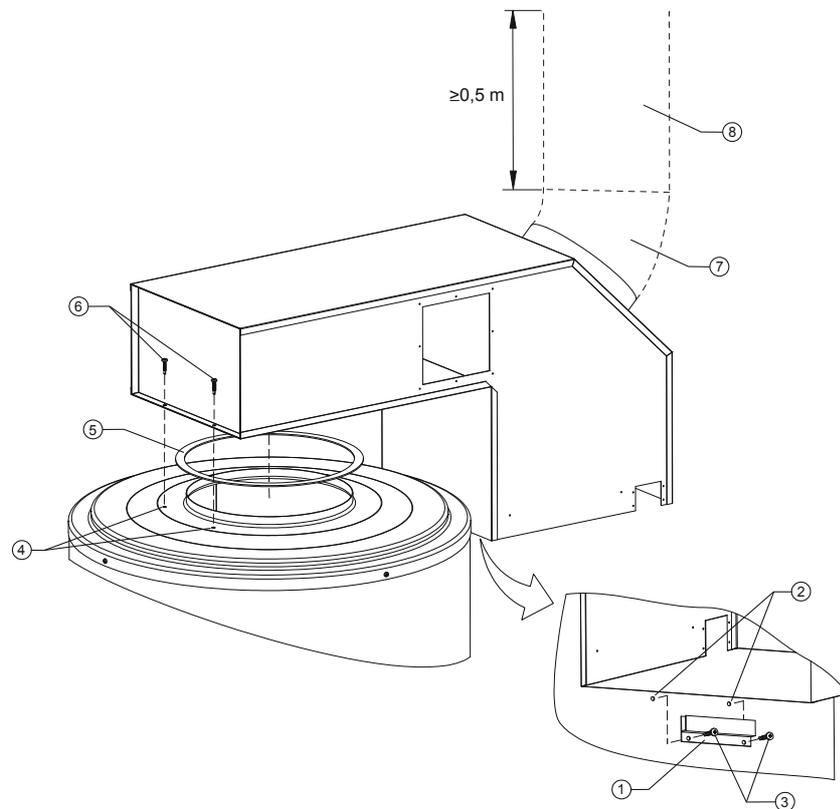
3.9.2 Fitting the draught diverter

The draught diverter can be positioned according to preference. Once it is positioned, the draught diverter is secured to the top of the appliance using two screws (6), while it is also supported on a mounting bracket (1) attached to the side of the appliance. The mounting bracket parts can be found in the plastic bag attached behind the control column. The assembly procedure is as follows:

Installing the draught diverter

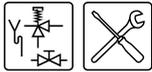
Legend

- 1 support bracket
- 2 holes to attach support bracket
- 3 screws for support bracket
- 4 holes to attach draught diverter
- 5 sealing ring
- 6 screws for draught diverter
- 7 45° bend
- 8 chimney pipe



IMD-0123 R1

1. Take the mounting bracket out of the bag.
2. Fit the mounting bracket (1) in such a way that it properly supports the draught diverter.
3. Drill two holes (2) (3.2 mm bit) for the mounting bracket screws.
4. Screw the mounting bracket tightly to the appliance.
5. Place the draught diverter in the mounting bracket, and mark the centres for the two holes (4) to be drilled in the top side of the appliance. Remove the draught diverter from the appliance.
6. Now drill two holes (4) into the top of the appliance (3.2 mm bit).
7. Place the sealing ring (5) on the appliance.
8. Screw the draught diverter tightly in place.



9. Fit:

- a 45° bend (7) onto the outlet of the draught diverter, followed by:
- a corrosion-resistant vertical chimney pipe (8) of at least 0.5 metres in length,
- the remaining flue components.

Note

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

Note

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

3.9.3 Flue gas thermostat assembly

At the top of the control column there is a plastic bag containing the flue gas thermostat with the sensor plus the associated fastenings. The cable from the sensor has already been connected to the control column. The thermostat/bracket and sensor have yet to be fitted inside the draught diverter.

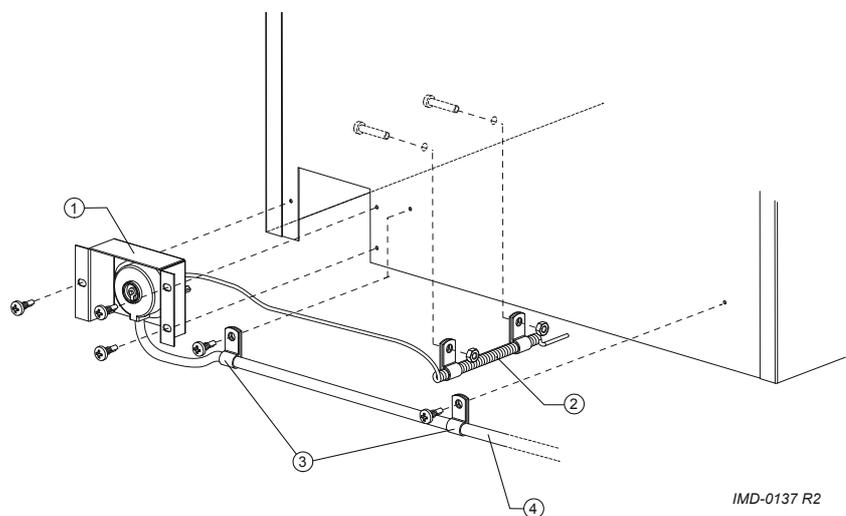
Warning

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.

Flue gas safety

Legend

- 1 bracket
- 2 sensor
- 3 attachment brackets
- 4 cable



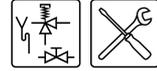
IMD-0137 R2

1. Fit the flue gas thermostat as follows:
2. Take the bracket (1) and flue gas sensor (2) from the packaging.
3. Place the bracket in the draught diverter and screw the bracket and the sensor firmly in place.
4. Bend the cable clips (3) around the flue gas thermostat lead (4).
5. Screw the cable clips (3) tightly into the draught diverter and the appliance.

Warning

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

3.10 Electrical connection



3.10.1 Preparation



Caution

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



Caution

Also there may not be **any potential difference** between neutral (N) and earth (\perp). If this is the case, then an isolating transformer must be used in the supply circuit.

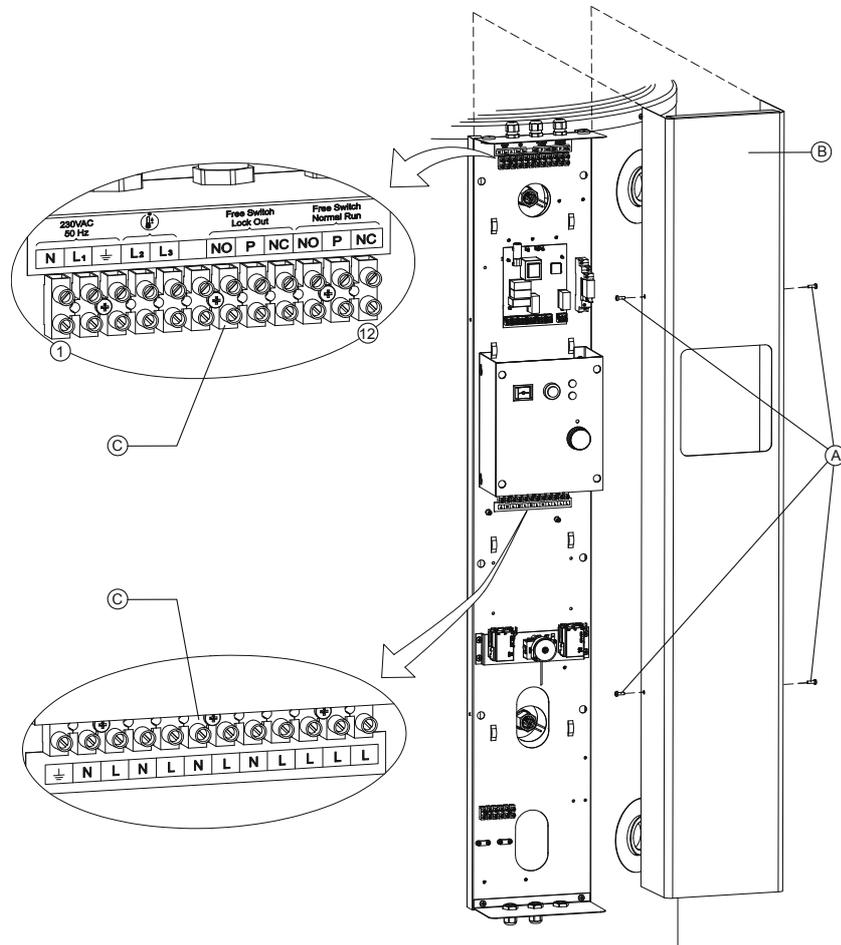
For more information or to order this isolating transformer, please contact Hamworthy.

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

Connector block

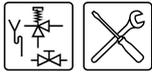
Legend

- A. screws
- B. cover
- C. terminal block



IMD-0360 R1

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



The connector block (C) is now visible.

Note

Please consult (14.2 "Electrical diagrams DR-LA") the appropriate electrical diagram for details of the connections of the electrical components.

Terminal block

Mains			Flue gas		-	Free switch, lock out			Free switch, normal run		
\perp	L ₁	N	L ₂	L ₃	-	NO	Phase	NC	NO	Phase	NC
1	2	3	4	5	6	7	8	9	10	11	12

3.10.2 Connecting the mains power

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

Note

In order to receive electrical power, the water heater has to be connected to the mains power by means of a permanent electrical connection. A double-pole isolator with a contact gap of at least 3 mm must be fitted between this permanent connection and the water heater. The power cable must have cores of at least 3 x 1.0 mm².

Warning

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

1. Feed the power cable through the metric strain relief in the top of the control column.
2. Connect the earth (\perp), live (L₁) and neutral (N) of the power cable to terminals 1 to 3 of the connection block according to the table.
3. Tighten the strain relief so that the cable is clamped.
4. If you do not need to make any more connections, then fit the protective cover back on the control column.
5. Connect the power cable to the isolator.

3.11 Checking the supply pressure and burner pressure

Note

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

Caution

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

Note

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

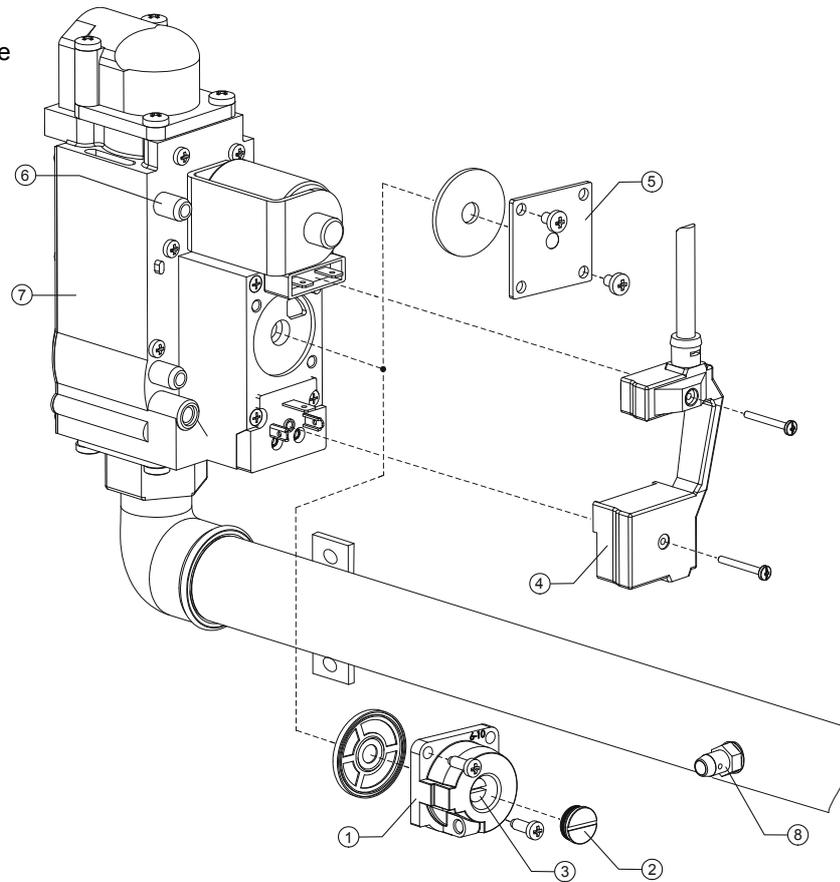


Gas control valve for DR-LA 30 through 95

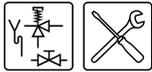
Legend

Unused numbers are not applicable

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



IMD-0127 R1

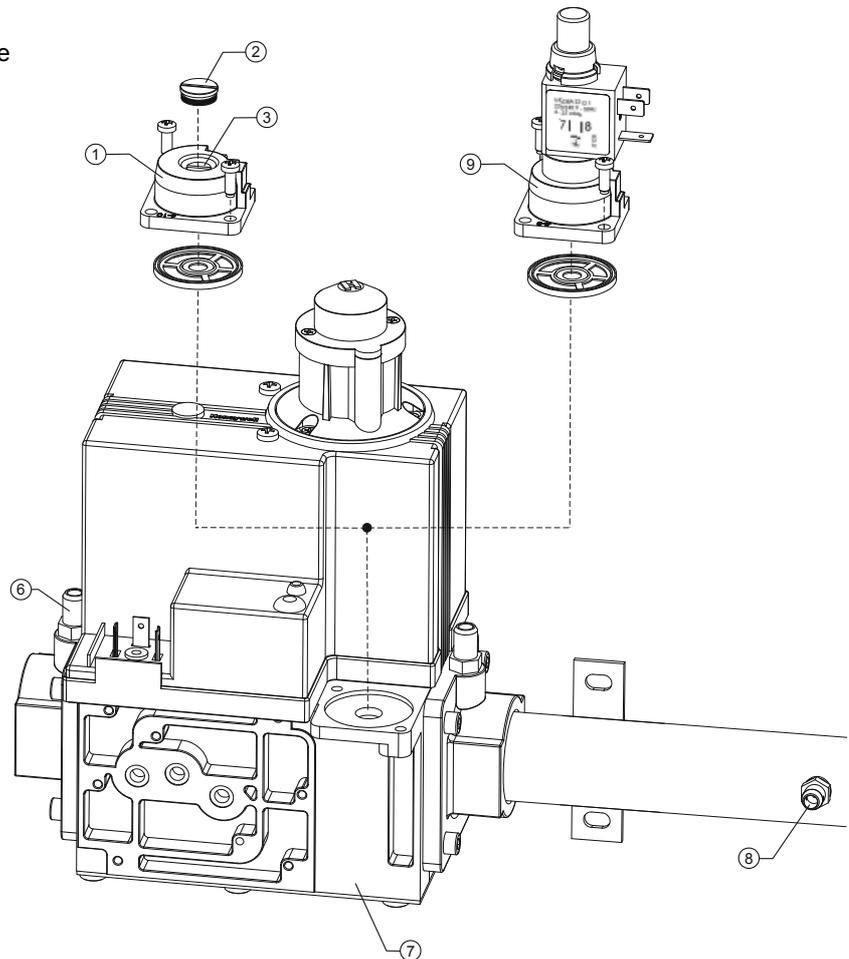


Gas control valve for DR-LA 110

Legend

Unused numbers are not applicable

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



IMD-0129 R1

3.11.1 Preparations

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



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

**Note**

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

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

**Note**

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

3.11.2 Adjusting the pressure

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

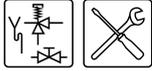
3.11.3 Finalising

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

**Note**

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

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



4 Conversion to a different gas category

 **Caution**

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

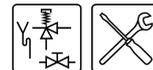
If the appliance has to operate on a different family of gases (liquid petroleum gas or natural gas) or other gas category, other than that for which the appliance has been configured at the factory, then the appliance will have to be adapted using a special conversion kit.

 **Caution**

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

This chapter covers the following:

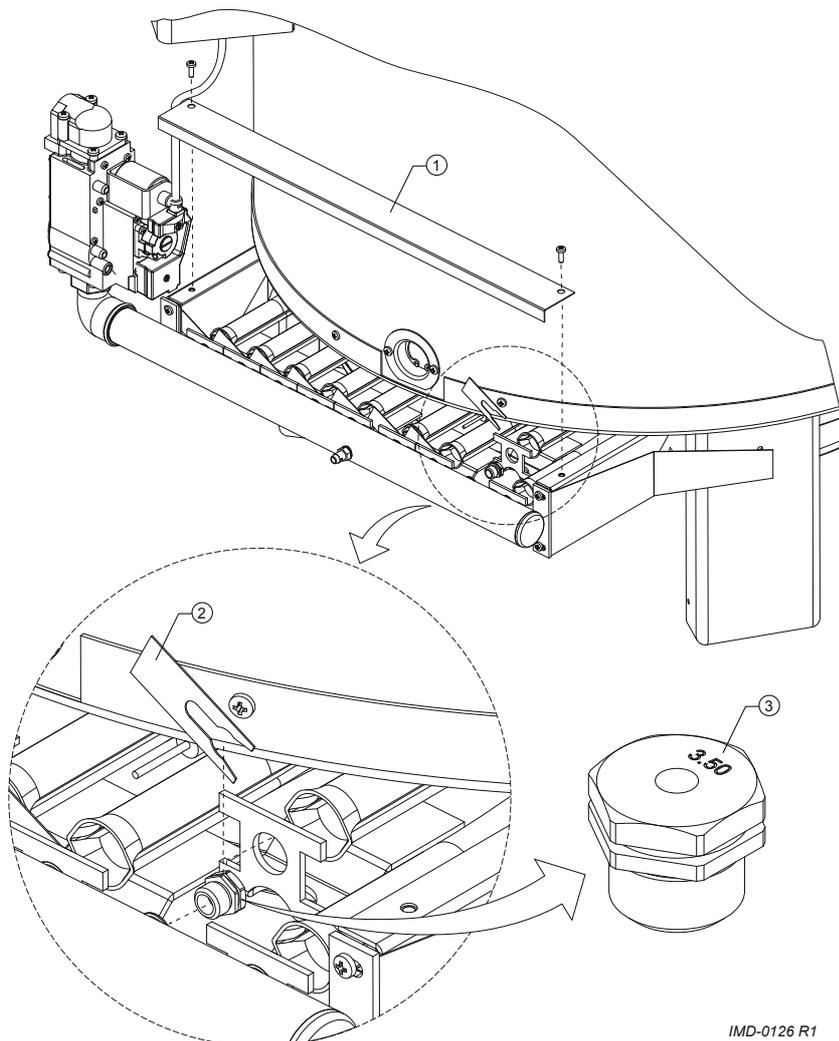
- Conversion to different gas category DR-LA 30 through 95.
- Conversion to different gas category DR-LA 110.



Exchanging orifices

Legend

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



IMD-0126 R1

4.1 Conversion to different gas category DR-LA 30 through 95

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

**Caution**

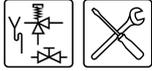
The burner can be hot.

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

**Note**

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

5. Remove the burners one by one from their brackets at the front. To do this, you first move them away from you and then downwards. The orifices will now be accessible
6. Remove the orifices.



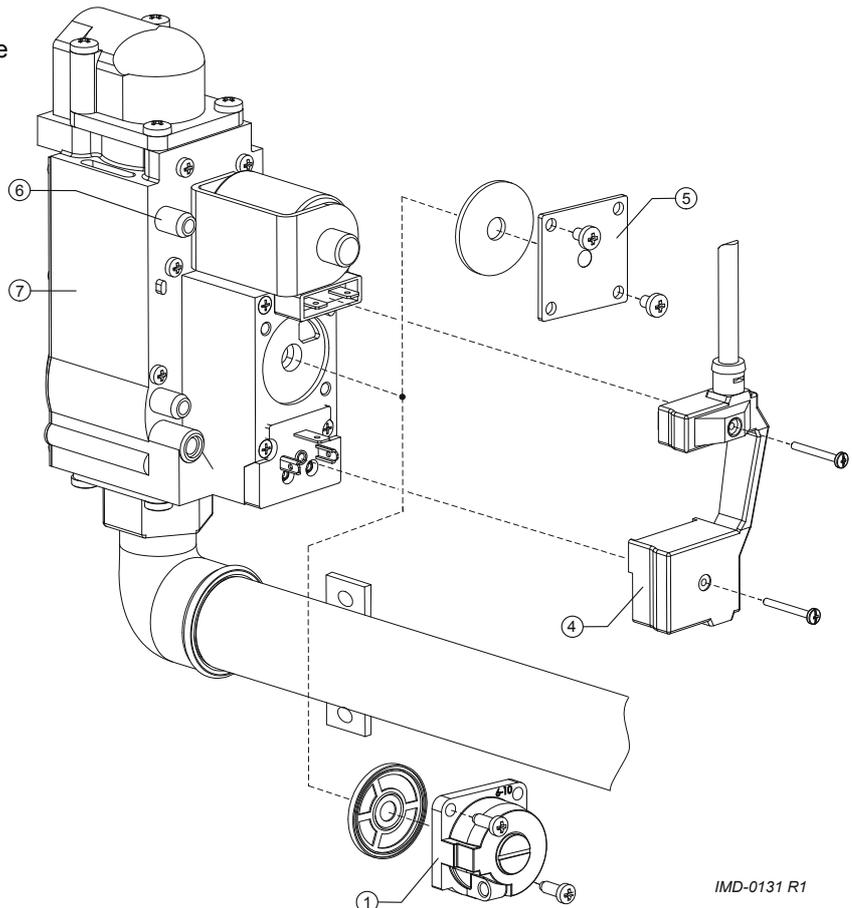
7. Select and fit the correct orifices from the conversion kit, based on the gas data table (3.4.3 "Gas data"). The orifice diameter is stamped on the orifice itself, see (3).
8. Re-fit the burners back in their original position.
9. Re-fit the retaining strips.
10. If the radiation shield / condensation tray was loosened, re-fasten it.

Conversion of gas control valve

Legend

Unused numbers are not applicable

1. burner pressure regulator
4. gas control valve connector
5. blank plate
6. supply pressure test nipple
7. gas control valve



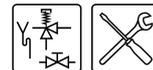
11. Check whether there is a burner pressure regulator (1) attached to the gas control valve, or simply a blank plate (5).

Note

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

12. If the blank plate or burner pressure regulator need to be replaced:

- Unscrew the connector (4) of the gas control valve.
- If necessary, remove the blank plate or burner pressure regulator (5) or burner pressure regulator (1).
- If necessary, fit the blank plate or burner pressure regulator supplied with the conversion kit.
- Fit the connector (4) of the gas control valve.



13. Check the supply pressure and burner pressure (3.11 "Checking the supply pressure and burner pressure").
14. Remove the sticker showing the new gas category from the conversion kit, and attach it below the appliance's rating plate. This clearly indicates that the appliance may no longer be run on the gas for which it was originally supplied.
15. Start the appliance (9 "Starting the water heater").

4.2 Conversion to different gas category DR-LA 110

4.2.1 Introduction

This paragraph describes:

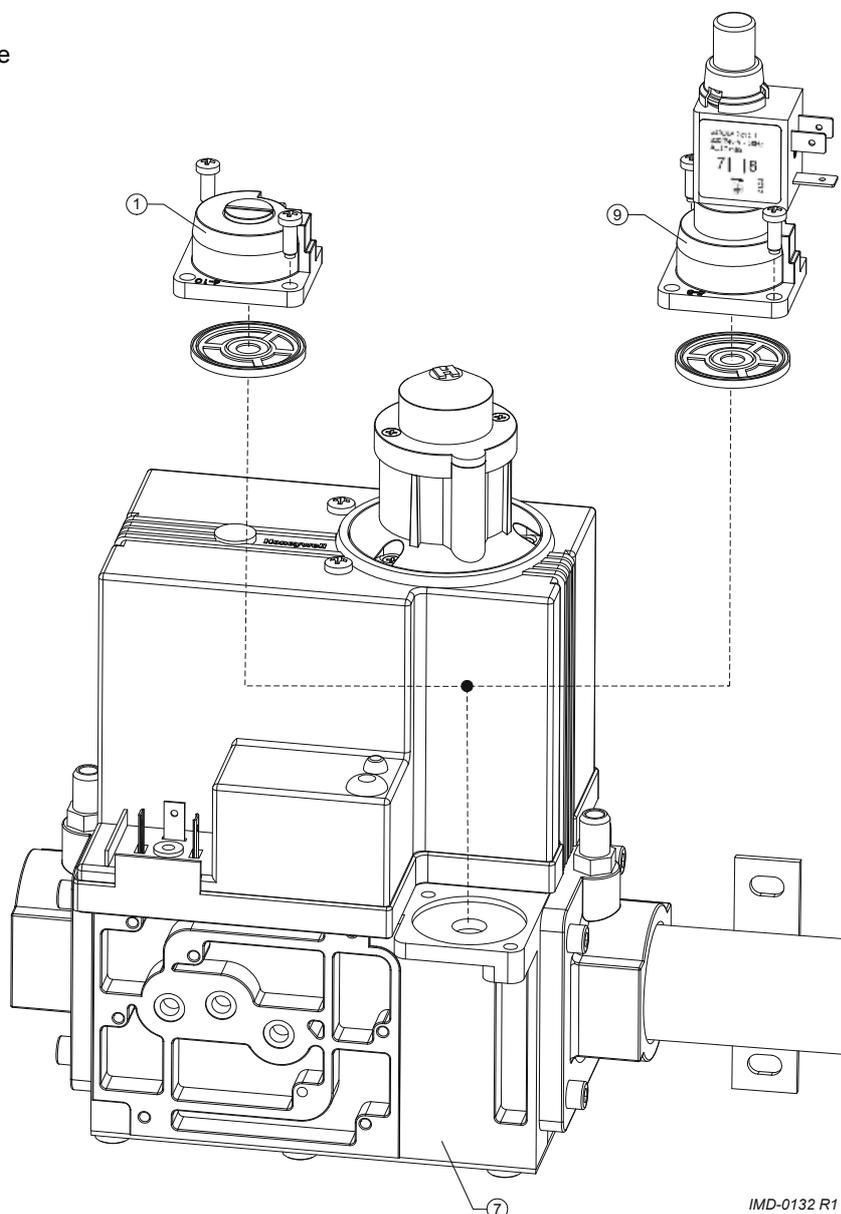
- Conversion from LP gas to natural gas
- Conversion from natural gas to LP gas

Conversion of gas control valve

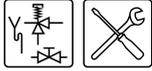
Legend

Unused numbers are not applicable

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



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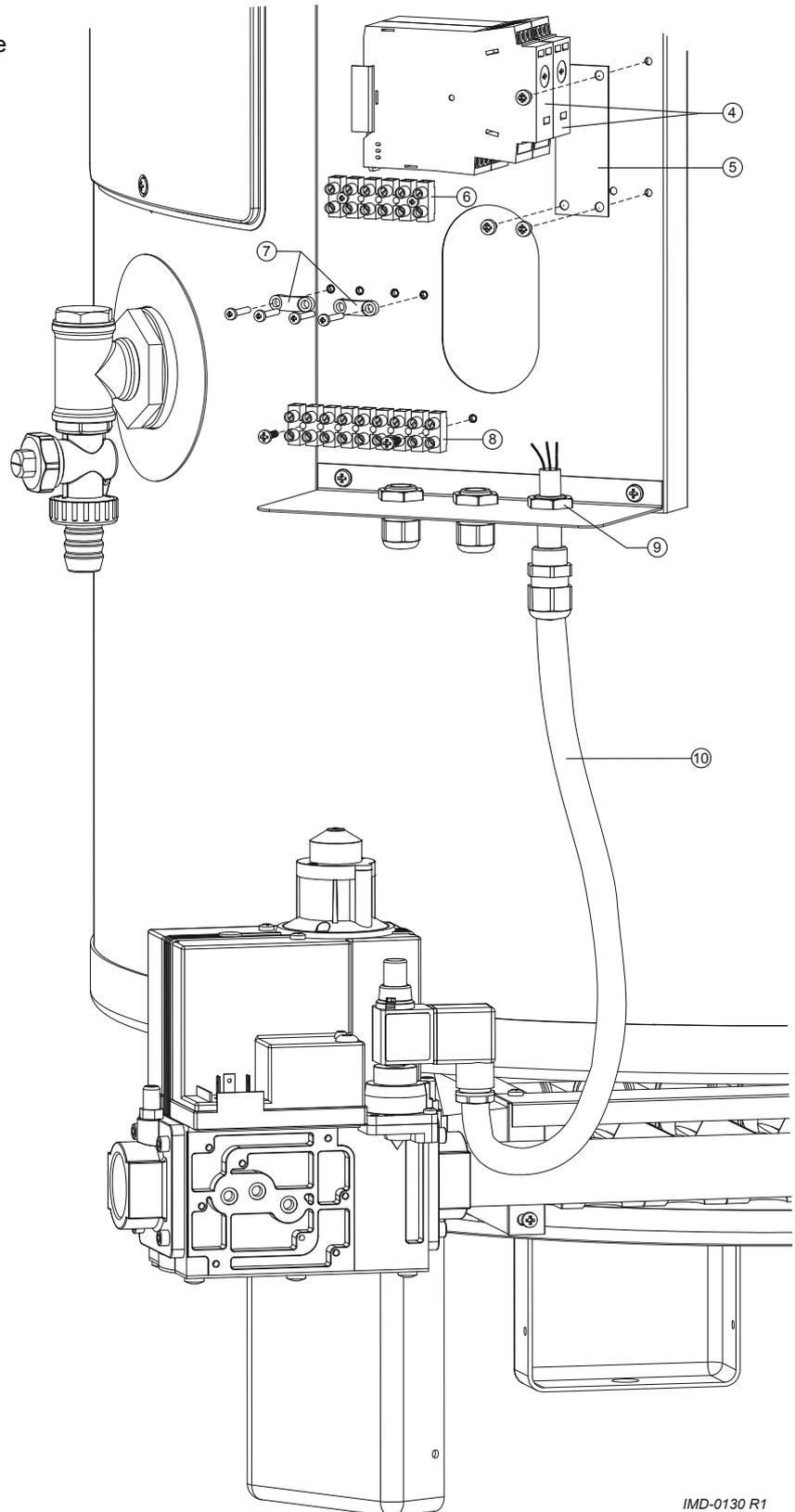
4.2.2 Conversion from LP gas to natural gas

Installing and removing add-on components

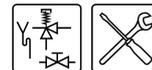
Legend

Unused numbers are not applicable

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



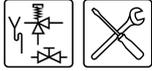
IMD-0130 R1



1. Carry out [\(4.1 "Conversion to different gas category DR-LA 30 through 95"\)](#) steps 1 through 10 .
2. Detach the high-low control (9).
3. Fit the burner pressure regulator (1) including the sealing gasket from the conversion kit. Attach the burner pressure regulator to the gas control valve using the two small screws supplied (7).
4. Detach the leads between the 6contact terminal strip(6) and the 9contact terminal strip (8). These are the leads for the timers, high-low control, gas control valve, hot surface igniter and flame probe.
5. Remove the timers (4), bracket (5), wiring harness (not shown) and 9contact terminal strip.
6. Turn the metric strain relief (9) with the high-low control lead (10) to loosen it. Remove this lead.
7. Fit the stop plug from the conversion set in the place of the metric strain relief.
8. Connect the cables of the gas control valve, the hot surface igniter and flame probe to the 6contact terminal strip as indicated in the electrical diagram [\(14.2 "Electrical diagrams DR-LA"\)](#).
9. Clamp the gas control valve cable in one of the supplied strain reliefs (7). Do the same for the leads of the hot surface igniter and flame probe.
10. Check the supply pressure and burner pressure [\(3.11 "Checking the supply pressure and burner pressure"\)](#).
11. Remove the sticker showing the new gas category from the conversion kit, and attach it below the appliance's rating plate. This clearly indicates that the appliance may no longer be run on the gas for which it was originally supplied.
12. Start the appliance [\(9 "Starting the water heater"\)](#).

4.2.3 Conversion from natural gas to LP gas

1. Carry out steps 1 through 10 [\(4.1 "Conversion to different gas category DR-LA 30 through 95"\)](#).
2. Detach the burner pressure regulator (1).
3. Fit the high-low controller (9) including the sealing gasket from the conversion set. Attach the high-low control to the gas control valve using two small screws.
4. Detach the leads from the gas control valve, the hot surface igniter and the flame probe to the 6contact connector strip (6) and the strain relief (7).
5. Fit the timers (4) including cable harness plus 9contact terminal strip (6) from the conversion kit to the control column.
6. Remove the stop plug (not shown) from the underside of the control column and replace this with the metric strain relief (9) from the conversion kit.
7. Draw the high-low control lead (10) through the strain relief and tighten the strain relief by turning it until the lead is clamped.
8. Connect the high-low control lead (10) plug to the high-low control (9).
9. Connect the cables from the timers, highlow control, gas control valve and the hot surface igniter as shown in the electrical diagram [\(14.2 "Electrical diagrams DR-LA"\)](#).
10. Check the supply pressure and burner pressure [\(3.11 "Checking the supply pressure and burner pressure"\)](#).

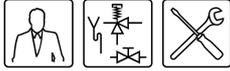


11. Remove the sticker showing the new gas category from the conversion kit, and attach it below the appliance's rating plate. This clearly indicates that the appliance may no longer be run on the gas for which it was originally supplied.
12. Start the appliance ([9 "Starting the water heater"](#)).

4

Conversion to a different gas category





5 Filling

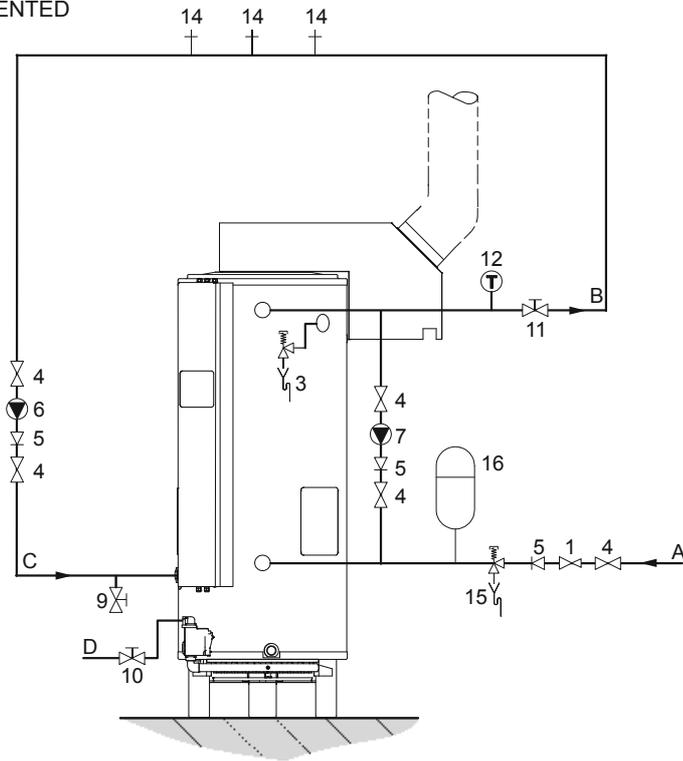
Installation diagram

Legend

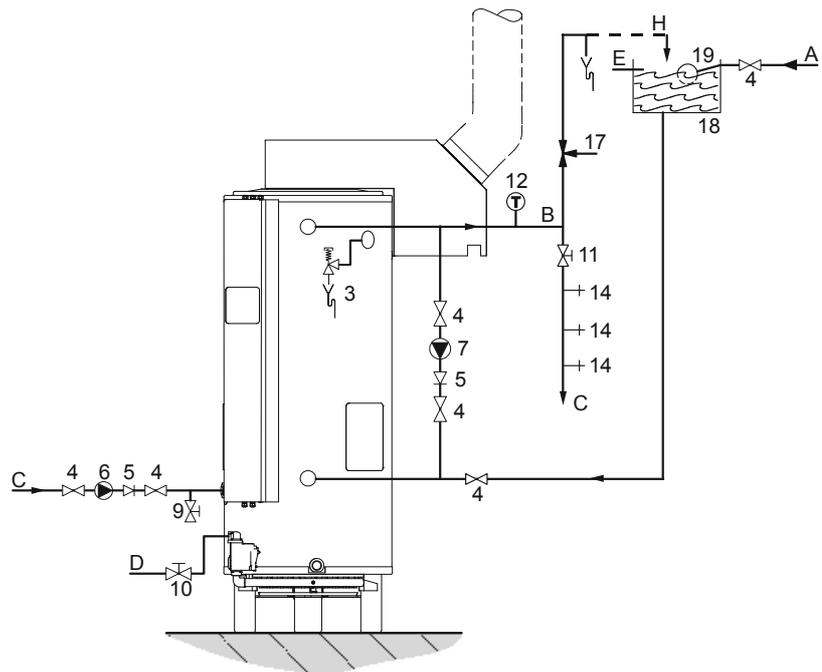
Unused numbers are not applicable

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

UNVENTED



VENTED



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5.1 Filling unvented installations

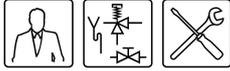
To fill the water heater, proceed as follows:

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

5.2 Filling vented installations

To fill the water heater, proceed as follows:

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



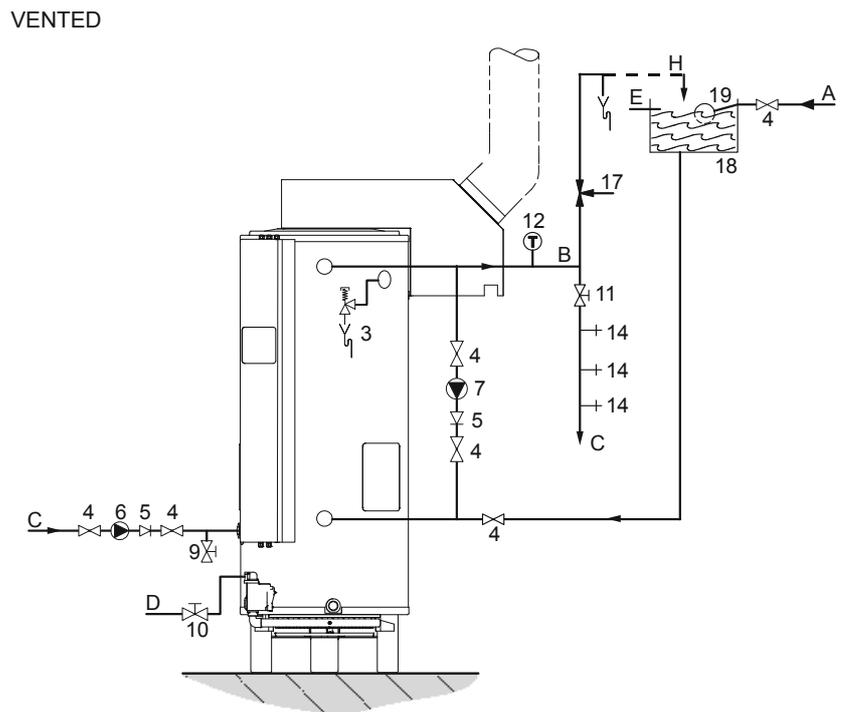
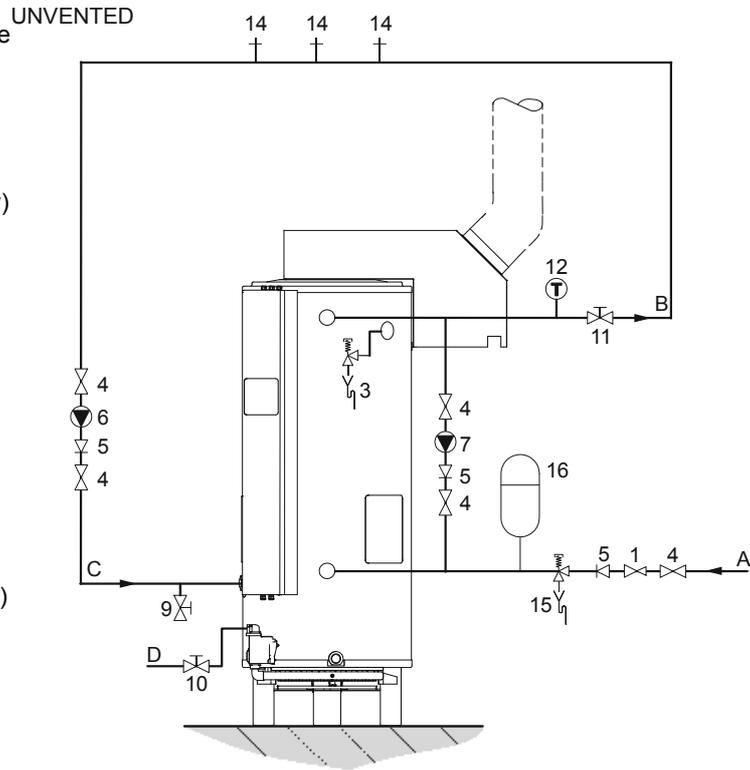
6 Draining

Installation diagram

Legend

Unused numbers are not applicable

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



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6.1 Draining unvented installations

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

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

6.2 Draining vented installations

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

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



7 The control panel

7.1 Introduction

Topics covered in this chapter, in sequence:

- [Control panel](#)
- [Explanation of icons](#)
- [ON/OFF switch](#)
- [Control thermostat](#)
- [Burner control reset button](#)
- [Flue gas thermostat reset button](#)

7.2 Control panel

The control panel comprises:

- an ON/OFF switch
- a reset button
- a control thermostat with rotary knob
- two status LEDs

7.3 Explanation of icons

The table explains the meanings of the icons.

Icons and their meaning

	Name	Explanation
	ON/OFF switch	'ON mode' / 'OFF mode'
	Temperature control	Set water temperature (Tset)
	Reset button	Reset burner control
	Power LED	Power indicator for burner control
	Error LED	Burner control lockout

7.4 ON/OFF switch

The ON/OFF switch is used to put the appliance in 'ON' mode or 'OFF' mode. The appliance remains live, even when in the OFF mode. This ensures that the frost protection remains activated.

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

7.5 Control thermostat

Use the rotary knob on the control thermostat to set the desired water temperature to between $\pm 40^{\circ}\text{C}$ and $\pm 70^{\circ}\text{C}$. The knob rotates over a scale of 1 to 4. The table shows the temperatures corresponding to each position.

Temperature setting

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

7.6 Burner control reset button

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

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

The appliance's error conditions ([8.3 "Error conditions"](#)) and how to resolve them are described in the error condition summary ([11 "Errors"](#)).

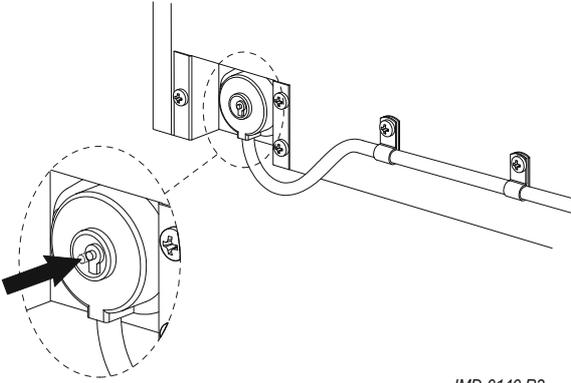
7.7 Flue gas thermostat reset button

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

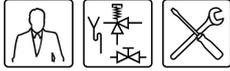
Note
The draught diverter may be hot.



Figure: Flue gas thermostat reset button



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8 Status of the water heater

8.1 Introduction

Topics covered in this chapter:

- [Operating modes](#);
- [Error conditions](#);

8.2 Operating modes

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

• ISOLATED

In this mode the appliance is off and all components are electrically dead. The isolator (switch between the appliance and the power supply) is turned off. On the control panel:

- the ON/OFF switch is in position 0;
- the green LED is off.

• OFF

In this mode, the frost protection is activated. The isolator is set to position I. On the control panel:

- the ON/OFF switch is in position 0;
- the green LED is illuminated.

• ON

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

- the ON/OFF switch is in position I;
- the water temperature can be set using the rotary button on the control thermostat ([7.5 "Control thermostat"](#));
- the green LED is illuminated.

8.3 Error conditions

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

• Lockout error from the flue gas thermostat

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

• Lockout error from the flue gas thermostat

When this happens, the red LED on the control panel will be illuminated. The burner control is locked out.

After eliminating the cause, the appliance must be returned to service by pressing the reset button ([7.6 "Burner control reset button"](#)).

• Blocking errors

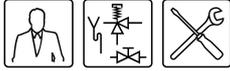
You can recognise this condition from the fact that the appliance does not start running even though the water temperature is lower than the setting that you have defined using the control thermostat ([7.5 "Control thermostat"](#)).

These errors disappear automatically once the cause of the error has been removed, after which the appliance resumes operation by itself.

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

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





9 Starting the water heater

9.1 Introduction

Topics covered in this chapter, in sequence:

- [Starting the appliance](#);
- [The appliance's heating cycle](#).

9.2 Starting the appliance

Start the water heater as follows:

1. Fill the water heater ([5 "Filling"](#)).
2. Open ([3.5 "Installation diagram"](#)) the manual gas valve.
3. Switch on the power to the water heater using the isolator between the water heater and the power supply.
4. Set the appliance in the 'ON' mode by setting the ON/OFF switch on the control panel to **position I**.
5. Set the desired water temperature using the control thermostat ([7.5 "Control thermostat"](#)).

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

9.3 The appliance's heating cycle

The appliance's heating cycle is activated when the measured water temperature (T_{water}) falls below the threshold value (T_{set}). This threshold value depends on the currently selected appliance operating mode. If the appliance is in the 'OFF' mode (frost protection), for example, this value is 20°C. If the appliance is in the 'ON' mode, this threshold value can be selected, for example, position 3 ($\pm 60^\circ\text{C}$).

The heating cycle runs successively through the following states:

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

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

Note

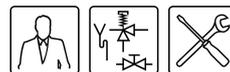
The appliance runs through an identical cycle when frost protection is activated.

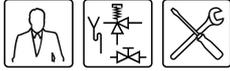
1. The control thermostat sensor measures the water temperature. The water temperature falls below the set temperature of (for example) 60°C, causing the control thermostat to close. The burner control now detects a demand and starts the heating cycle.
2. Following demand, the waiting time starts. This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

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

9

Starting the water heater





10 Shutting down

10.1 Introduction

Topics covered in this chapter:

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

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

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

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

10.3 Isolating the appliance from the mains

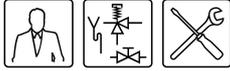
The appliance may only be isolated from mains power in the correct way. The correct procedure is as follows:

1. Shut down the appliance by putting the ON/OFF switch to position 0.
2. Isolate the appliance from the power supply by setting the isolator between the appliance and the mains power supply to position 0.

10.4 Shutting the appliance down for a long period

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





11 Errors

11.1 Introduction

This chapter deals with the following problems with the appliance:

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

11.2 Error conditions

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

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

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

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

When this happens, the red LED on the control panel will be illuminated. The burner control is locked out.

After eliminating the cause, the appliance must be returned to service by pressing the reset button ([7.6 "Burner control reset button"](#)).

- **Blocking errors**

You can recognise this condition from the fact that the appliance does not start running even though the water temperature is lower than the setting that you have defined using the control thermostat ([7.5 "Control thermostat"](#)).

These errors disappear automatically once the cause of the error has been removed, after which the appliance resumes operation by itself.

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

 **Note**

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

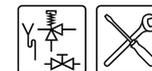


11.3 Troubleshooting table for general errors

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

General faults and failures

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



11.4 Troubleshooting table - no hot water

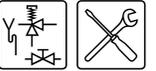
Warning

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

No hot water

Symptom	Cause	Precautions	Comment
Green LED OFF and Red LED ON	No supply voltage present	<ol style="list-style-type: none"> 1. Check whether the isolator is ON. 2. Check whether there is power to the isolator 3. Check whether there is power to the electrical connector block 4. Check whether there is power to the burner control 5. Check fuse in the burner control <p>The measured voltage must be 230 V_{AC} (-15%, +10%)</p>	See the electrical diagram (14 "Appendices"). If the error cannot be rectified, contact your installation engineer
Green LED ON and Red LED OFF	Blockage in the flue gas discharge (the flue gas thermostat has cut out)	<ol style="list-style-type: none"> 1. Trace the blockage 2. Remove the blockage 3. Reset flue gas thermostat (7.7 "Flue gas thermostat reset button"). 	When a demand is detected, the appliance will restart

Symptom	Cause	Precautions	Comment
Green LED ON and Red LED ON	There are three possible causes for this error. In order to determine the cause, you must cause the error to appear again:	<ol style="list-style-type: none"> 1. Reset the appliance by pressing the reset button 1x 2. If nothing happens, then the reset button has been pressed too often (maximum 5 times in a single heating cycle). Disconnect the appliance from the mains and then restart it. See <u>Isolating the appliance from the mains</u> and steps 3 through 5 of <u>Starting the appliance</u>. 3. Decide which type of cause (a) or (b) describes the situation. (see tables below) 	If the error cannot be resolved or is persistent, contact your installation engineer



Symptom	Cause	Precautions	Comment
	(a) three unsuccessful start attempts in a row	<ol style="list-style-type: none"> 1. No gas: <ul style="list-style-type: none"> - Check that the gas valve is open - Check whether the gas control valve is opening (clicking of the gas control valve) - Check the leads of the gas control valve 2. No ignition: <ul style="list-style-type: none"> - Check whether the hot surface igniter lights up - Check the electrical supply to the hot surface igniter. - Check the leads of the glow igniter 3. No flame detection: <ul style="list-style-type: none"> - Check that the Phase (L) and Neutral (N) are correctly connected (from the mains) to the appliance - Check whether the flame probe is defective - Check that the flame probe leads are properly connected 	If the error cannot be resolved or is persistent, contact your installation engineer

Symptom	Cause	Precautions	Comment
	(b) The safety thermostat has cut out	<ol style="list-style-type: none"> 1. The safety thermostat has cut out correctly: <ul style="list-style-type: none"> - Reset the appliance - 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: <ul style="list-style-type: none"> - Check whether the thermostat is defective - Check whether the sensor of the thermostat is defective 	If the error cannot be resolved or is persistent, contact your installation engineer



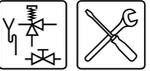
11.5 Troubleshooting table - 'insufficient hot water'

Warning

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

Insufficient hot water

Symptom	Cause	Precautions	Comment
Insufficient hot water	Water temperature setting (T_{set}) is too low	Set the control thermostat (<u>7.5 "Control thermostat"</u>) to a higher value	
	Hot water supply is used up	<ol style="list-style-type: none"> 1. Reduce hot water consumption and give the water heater time to heat up. 2. If this error persists, check whether the high-limit thermostat is switching. If this is the case, check that the circulation and/or top to bottom circulation pump are working. 	If the error has not been rectified, and no other cause can be found, isolate the appliance from the mains (<u>10.3 "Isolating the appliance from the mains"</u>), shut off the manual gas valve and alert your installation engineer.





12 Performing maintenance

12.1 Introduction

Caution

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

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

1. [Water-side maintenance](#)
2. [Water-side maintenance](#)
3. [Gas-side maintenance](#)
4. [Finalising maintenance](#)

Note

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

12.2 Preparation for maintenance

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

1. On the control panel, set the ON/OFF switch to **position 0**.
2. Set the control thermostat (note the original setting) to the highest position, and put the ON/OFF switch back to **position I**.
3. If there is no demand, draw some hot water off to create demand.
4. Check whether the heating cycle ([9.3 "The appliance's heating cycle"](#)) is running correctly .
5. Set the control thermostat back to the original setting, and put the ON/OFF switch back to **position I**.
6. Check the supply and burner pressures ([3.11 "Checking the supply pressure and burner pressure"](#)) and adjust them where necessary.
7. Check that all components of the chimney flue system are properly attached.
8. Test the operation of the overflow valve of the protected cold supply setup. The water should spurt out.
9. Test the overflow operation of the T&P valve. The water should spurt out.
10. Test the overflow operation of the T&P valve. The water should spurt out with a strong jet.
11. Check the drainpipes from the discharge points of all valves and remove any scale deposits that may be present.
12. Drain the appliance ([6 "Draining"](#)).



12.3 Water-side maintenance

12.3.1 Introduction

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

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

12.3.2 Checking the anodes

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



Warning

The draught diverter and the cover may be hot.

1. Remove the protective cover from the control column by unscrewing the 4 screws in the cover.
2. Detach the wiring for the flue gas thermostat from the connector block and remove the cable from the strain relief.
3. Remove the cable clamps holding the flue gas thermostat cable.
4. Disconnect the draught diverter from the flue gas discharge.
5. Undo the screws on the draught diverter.
6. Remove the draught diverter from the appliance.
7. Undo the screws of the lid in the top side of the appliance.
8. Remove the lid from the appliance.
9. Remove the sealing ring from the appliance.
10. Loosen the anodes using suitable tools.
11. Check the anodes, and replace them if necessary.
12. Now also check the flue baffles ([12.4.4 "Checking the flue baffles"](#)). If necessary, replace them.
13. Place a new sealing ring on the rim of the tank and re-fit the lid.
14. Fit the draught diverter ([3.9.2 "Fitting the draught diverter"](#)).
15. Feed the cable of the flue gas thermostat through the strain relief and attach the wiring to the connector block ([14.2 "Electrical diagrams DR-LA"](#)).
16. Refit the cable clamps to the appliance and draught diverter.
17. Re-fit the protective cover.

12.3.3 Descaling and cleaning the tank

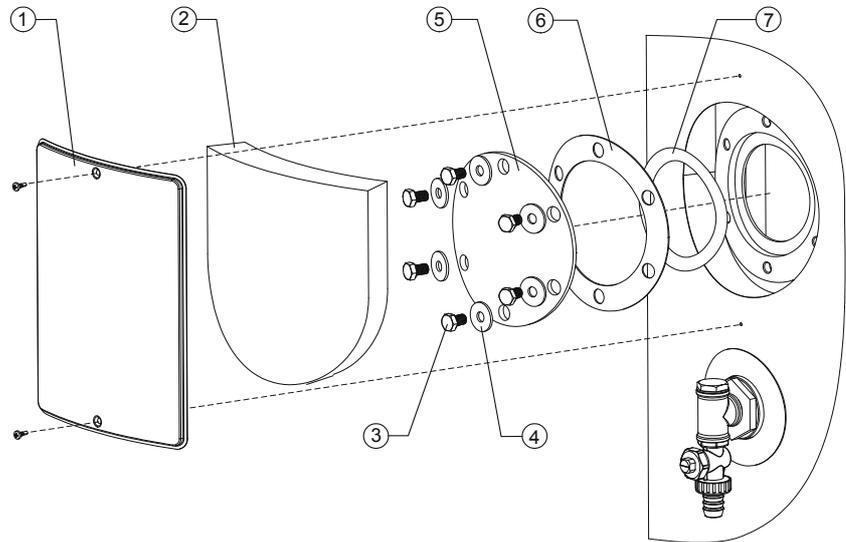
Scale and lime build-up prevent effective conduction of the heat to the water. Periodic cleaning and descaling prevents build-up of these deposits. This increases the service life of the water heater, and also improves the heating process.

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

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

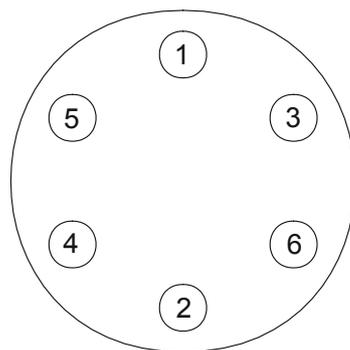


To simplify descaling and cleaning of the tank, the appliance is equipped with two cleaning openings.



IMD-0235 R2

1. Remove the cover plate (1) on the outer jacket (see the figure).
2. Carefully remove the insulation (2) and set it to one side. This will be needed again later.
3. Undo the bolts.
4. Remove the lid, the gasket and the O-ring.
5. Inspect the tank and remove the loose scale deposits and contamination.
6. If the scale cannot be removed by hand, descale the appliance with a descaling agent. Contact the supplier/manufacturer for advice on what descaling agent to use.



IMD-0282 R1

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



12.4 Gas-side maintenance

12.4.1 Introduction

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

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

12.4.2 Clean the burner(s)

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

12.4.3 Clean the orifice(s)

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

12.4.4 Checking the flue baffles



Warning

The flue baffles can be hot.

1. Remove the flue baffles from the appliance.
2. Check the flue baffles for the presence of corrosion, removing this if necessary.
3. Check the flue baffles for wear, and replace the flue baffles if necessary.
4. Place a new sealing ring on the rim of the tank and re-fit the lid.
5. Fit the draught diverter ([3.9.2 "Fitting the draught diverter"](#)).
6. Feed the cable of the flue gas thermostat through the strain relief and attach the wiring to the connector block ([14.2 "Electrical diagrams DR-LA"](#)).
7. Refit the cable clamps to the appliance and draught diverter.
8. Re-fit the protective cover.

12.5 Finalising maintenance

To finalise the maintenance, carry out the following steps:

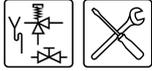
1. Fill the appliance ([5 "Filling"](#)).
2. Start the appliance up ([9 "Starting the water heater"](#))



13 Guarantee

Please contact your supplier for the warranty conditions.





14 Appendices

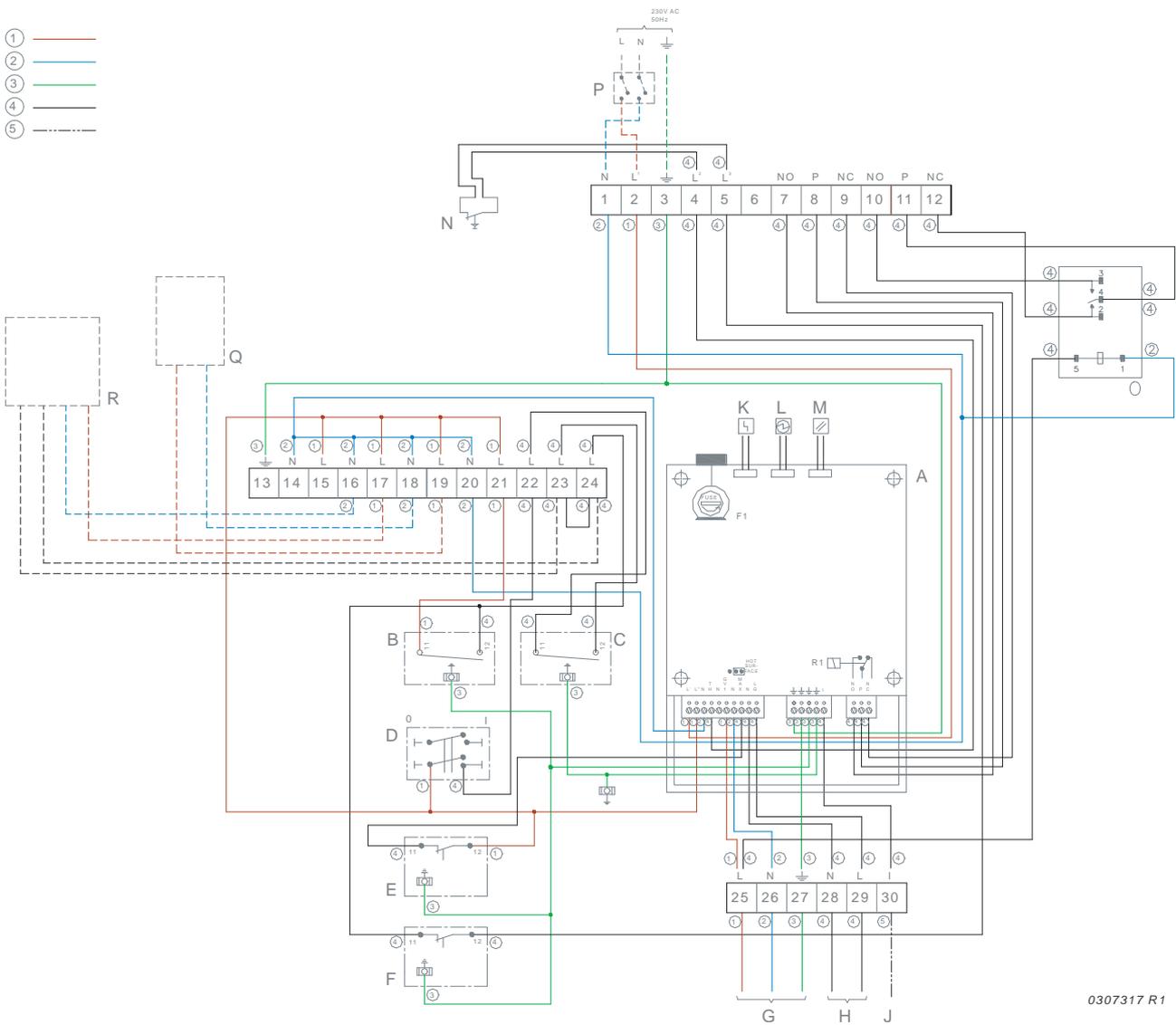
14.1 Introduction

This section gives the electrical diagrams for:

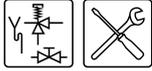
- Electrical diagram for DR-LA 30 to 110 natural gas and 30 to 95 LPG
- Electrical diagram DR-LA110 - LPG

14.2 Electrical diagrams DR-LA

14.2.1 Electrical diagram for DR-LA 30 to 110 natural gas and 30 to 95 LPG



1 = brown, 2 = blue, 3 = yellow/green, 4 = black, 5 = white (flat cable)



TERMINAL STRIP CONNECTIONS:

⏏	Earth
N	Neutral
L ¹	Phase input of controller
L ²	Phase input of flue gas thermostat
L ³	Phase output of flue gas thermostat
NO ₍₇₎	Normally open port of the extra error sensor
P ₍₈₎	Phase input of the extra error sensor
NC ₍₉₎	Normally closed port of the extra error sensor
NO ₍₁₀₎	Normally open port of relay
P ₍₁₁₎	Phase input of relay
NC ₍₁₂₎	Normally closed port of relay

COMPONENTS:

A	Burner Controller
B	Frost thermostat
C	Control thermostat
D	Controller 0/I switch
E	Safety thermostat
F	High-limit thermostat
G	Gas Control Valve
H	Hot surface igniter
J	Flame probe
K	"Error" signalling
L	"Operational" signalling
M	RESET button
N	Flue gas thermostat
O	Relay (max. 250 V, 10 A)

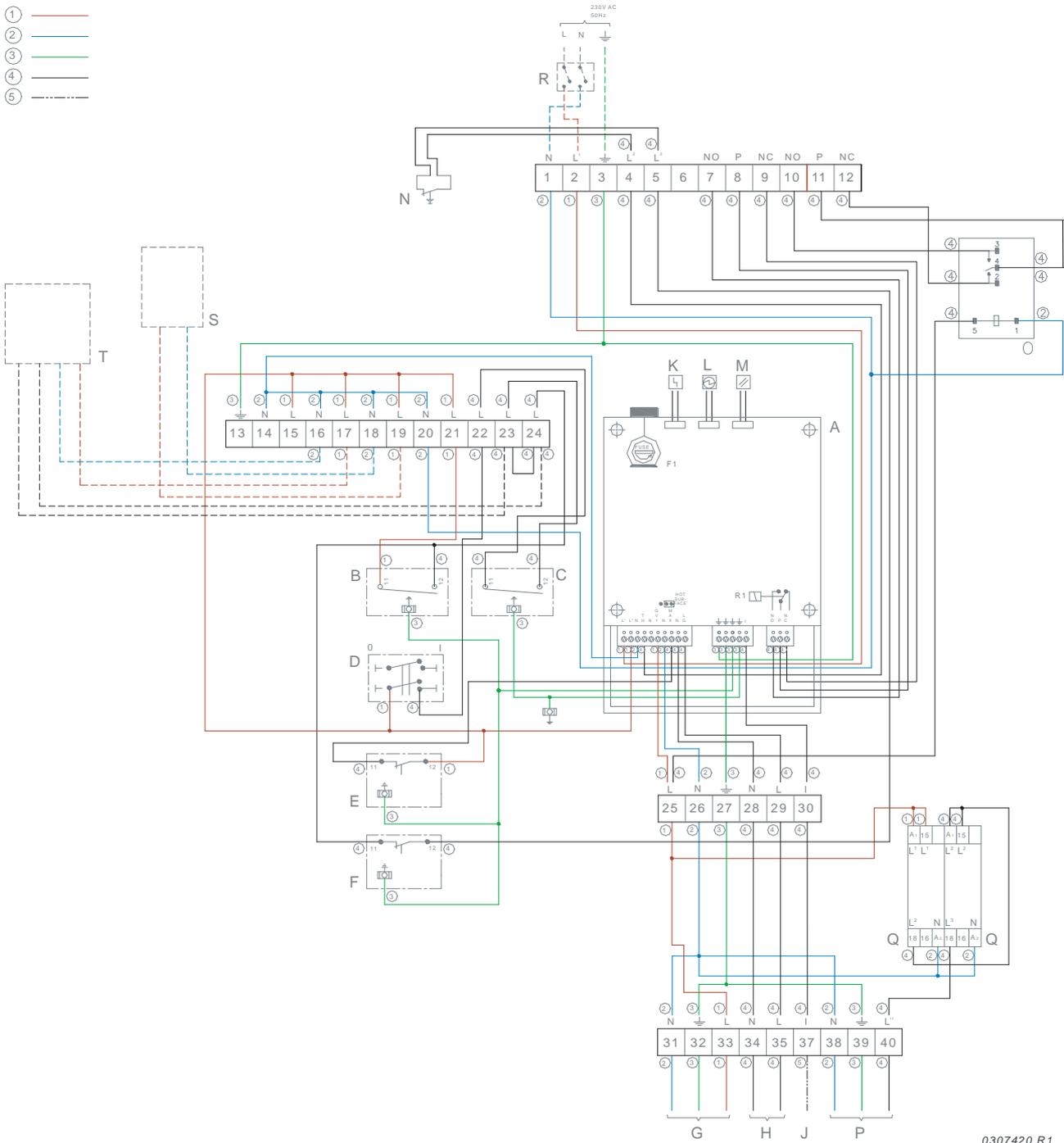
OPTIONAL COMPONENTS:

P	Main switch control
Q	Potentiostat (for powered anodes)
R	Week timer

CONTROLLER CONNECTIONS:

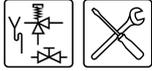
N1	Neutral
⏏	Earth
L'	Phase input of controller
L''	Phase output to safety circuit and thermostat circuit
TH	Phase input of thermostat circuit
GV1	Phase output to gas control valve
MAX	Phase input to safety thermostat
LG	Phase output to hot surface igniter
I	Detection of ionisation signal
NO	Normally open port of extra error signal
P	Phase input of extra error signal
NC	Normally closed port of extra error signal
F1	Fuse

14.2.2 Electrical diagram DR-LA110 - LPG



0307420 R1

1 = brown, 2 = blue, 3 = yellow/green, 4 = black, 5 = white (flat cable)



TERMINAL STRIP CONNECTIONS:

⏚	Earth
N	Neutral
L ¹	Phase input of controller
L ²	Phase input of flue gas thermostat
L ³	Phase output of flue gas thermostat
NO ₍₇₎	Normally open port of the extra error sensor
P ₍₈₎	Phase input of the extra error sensor
NC ₍₉₎	Normally closed port of the extra error sensor
NO ₍₁₀₎	Normally open port of relay
P ₍₁₁₎	Phase input of relay
NC ₍₁₂₎	Normally closed port of relay

COMPONENTS:

A	Burner Controller
B	Frost thermostat
C	Control thermostat
D	Controller 0/I switch
E	Safety thermostat
F	High-limit thermostat
G	Gas Control Valve
H	Hot surface igniter
J	Flame probe
K	"Error" signalling
L	"Operational" signalling
M	RESET button
N	Flue gas thermostat
O	Relay (max. 250 V, 10 A)
P	High/Low regulator
Q	Timer

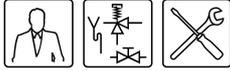
OPTIONAL COMPONENTS:

R	Main switch control
S	Potentiostat (for powered anodes)
T	Week timer

CONTROLLER CONNECTIONS:

N1	Neutral
⏚	Earth
L'	Phase input of controller
L''	Phase output to safety circuit and thermostat circuit
TH	Phase input of thermostat circuit
GV1	Phase output to gas control valve
MAX	Phase input to safety thermostat
LG	Phase output to hot surface igniter
I	Detection of ionisation signal
NO	Normally open port of extra error signal
P	Phase input of extra error signal
NC	Normally closed port of extra error signal
F1	Fuse





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