Dorchester DR-RS Range of Hot Water Storage Heaters

Room Sealed, Direct Gas Fired Hot Water Storage Heaters with Automatic Ignition for Domestic Hot Water Installations

Installation, Commissioning and Servicing Instructions

DORCHESTER DR-RS 25, 40, 65, 85, 105 Models

NATURAL GAS I_{2H} *LPG* I_{3+}

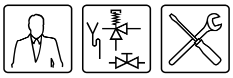
NOTE: THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE INSTALLING, COMMISSIONING, OPERATING OR SERVICING EQUIPMENT.

THIS WATER HEATER IS FOR USE ON GROUP H NATURAL GAS (2^{ND} FAMILY) I_{2H} OR LPG (3^{RD} FAMILY) I_{3+} (DR-RS 105 I_{3P}). PLEASE ENSURE RELEVANT INFORMATION REQUIRED WITHIN DOCUMENT IS FOUND RELATING TO SPECIFIC GAS TO BE FIRED BEFORE FIRING HEATER.

THIS WATER HEATER COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.

PUBLICATION NO. 500001138
ISSUE 'A'
OCTOBER 2013

Table of contents



1 Introduction

1.1 About the water heater

This manual describes how to install, service and use the DR-RS water heater. A DR-RS water heater is a gas-fired closed water heater with a fan in the air supply. Depending on the water heater type, the chimney connections are parallel or concentric. Installation types possible with this water heater are C_{13} and C_{33}. The information in this manual is applicable to water heater types: DR-RS 25, DR-RS 40, DR-RS 65, DR-RS 85 and DR-RS 105.

The manner of construction and features of the water heater are in conformance with the European standard for gas-fired storage water heaters for the production of domestic hot water (EN 89). The water heaters are compliant with the European Directive for Gas Appliances and have the right to bear the CE mark.

CE
0063

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

1.2 What to do if you smell gas

Warning
Whenever there is a **smell of gas**:

No naked flames! No smoking!

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

Shut off the mains gas supply!

Open windows and doors!

Warn occupants and leave the building!

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

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;
- installers;
- service and maintenance engineers.

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

Table 1.1 Target group symbols

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

1.5 Maintenance

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

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

Remark
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.

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

1.6 Forms of notation

The following notation is used in this manual:

Remark
Important information

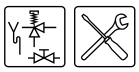
Note
Ignoring this information can lead to the water heater being damaged.

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

1.7 Overview of this document

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

Table 1.2 Contents of document

Chapter	Target groups	Description
2 Functioning of the water heater		This chapter describes how the water heater functions.
3 Installation		This chapter describes the installation activity to be completed before you actually start up the water heater. Instructions are also provided for the installation and/or service and maintenance engineer on converting the water heater to other types of gas.
4 Filling and draining		This chapter describes how to fill and drain the water heater.
5 Controls		This chapter describes the water heater's control panel and how to use it.
6 Status of the water heater		This chapter describes the status (mode or condition) that the water heater may have and possible actions to take.
7 Starting up and shutting down		This chapter describes how to start-up the water heater and how to shut it down for a brief or long period of time. The general heating cycle of the water heater is also described.
8 Troubleshooting		This chapter is mainly intended for the installer and the service and maintenance engineer. It describes water heater errors. These errors are indicated on the display. A troubleshooting table of possible causes and solutions is provided. End users may also refer to this chapter for additional information about the water heater.
9 Maintenance		This chapter sets out the maintenance tasks to be carried out during a service. **Remark** If the water heater is not regularly maintained, the warranty will become void.

2 Functioning of the water heater

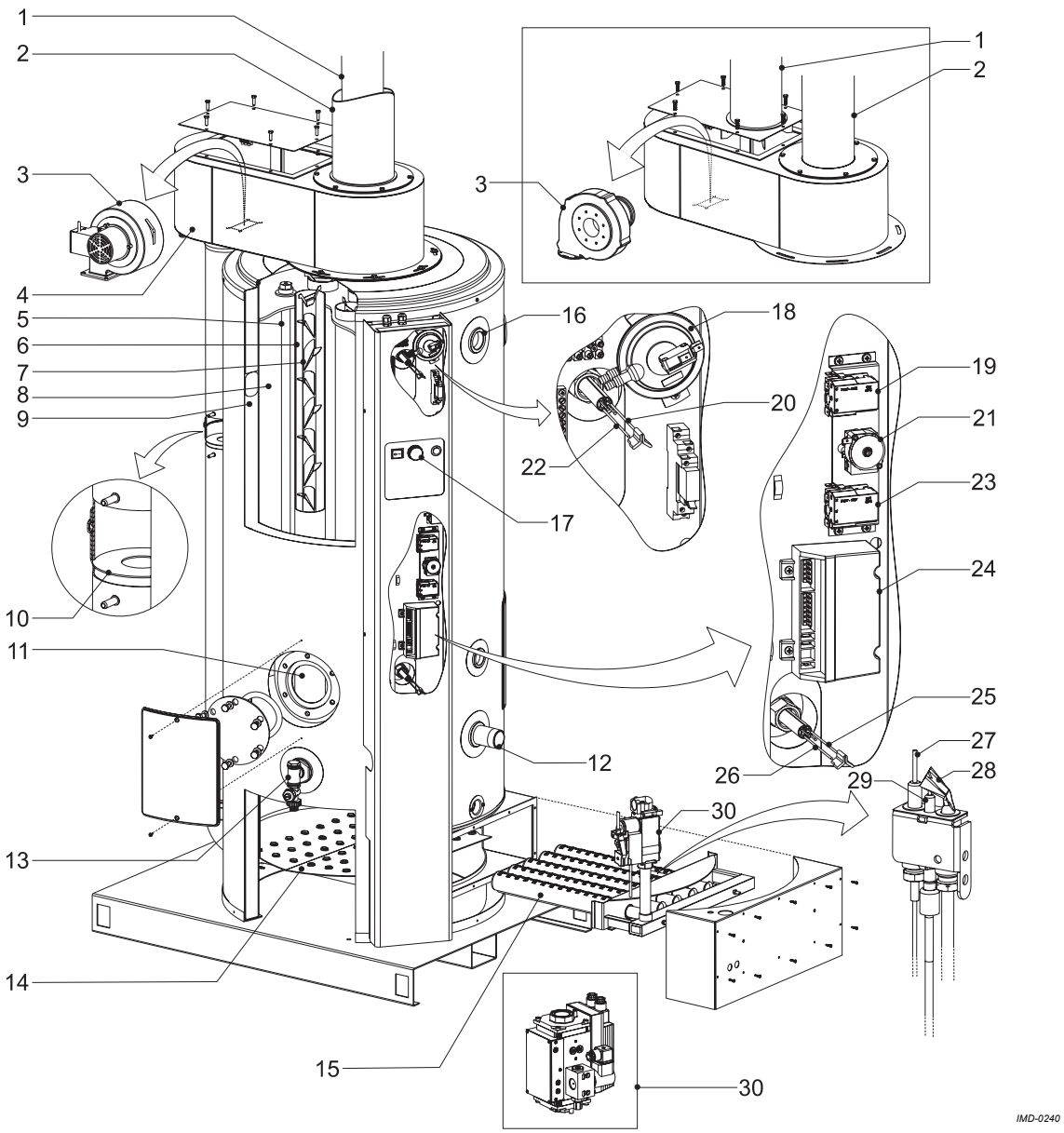
2.1 Introduction

Topics covered in this chapter:

- Functional description of the water heater;
- The water heater’s heating cycle;
- Protection for the water heater;
- Safety of the installation.

2.2 Functional description of the water heater

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



Legend:

(1) flue gas discharge
(2) air supply
(3) fan
(4) top box
(5) anodes
(6) flue tubes
(7) flue baffles
(8) hot water tank
(9) insulation layer
(10) air restrictor
(11) cleaning opening
(12) cold water inlet
(13) drain valve
(14) combustion chamber with air distribution plate
(15) bar burners/burner tray
(16) hot water outlet
(17) control thermostat
(18) air pressure switch
(19) high-limit thermostat
(20) high-limit thermostat sensor
(21) safety thermostat
(22) safety thermostat sensor
(23) frost thermostat
(24) burner control
(25) frost thermostat sensor
(26) control thermostat sensor
(27) flame probe
(28) pilot burner
(29) spark igniter
(30) gas control

Figure 2.1 Cut-away view of the water heater

In this water heater, the cold water enters the bottom of the it via the cold water inlet (12). The heat of combustion is transferred to the water through the combustion chamber (14) and flue tubes (6). The heated tap water leaves the heater via the hot water outlet (16). Once the water heater is completely filled with water, it remains constantly under water supply pressure. As hot water from the water heater is consumed, it is continuously replenished with cold water.

The air required for combustion is forcibly delivered to the combustion chamber by the fan. The gas required for combustion flows into the manifold via the gas control (30). The DR-RS 105 has a different gas control (see box). There are orifices in the manifold. The gas enters the bar burners (15) via these orifices. The bar burners together form the burner tray. As the gas is injected into the bar burners, the primary air required for combustion is also drawn in from the combustion chamber[1]. The ignition of the gas/air mixture takes place in two steps. The pilot flame is first ignited by a spark igniter. This pilot flame then ensures the complete ignition.

The flue gases generated by this combustion are led through the flue tubes (6). There are flue baffles (7) fitted inside the flue tubes. These slow down the flue gas exhaust, improving the heat transfer efficiency. The flue gases leave the water heater via the top box (4). A different top box is used on the DR-RS 85 and 105 (see box). Below the burner tray there is an air distribution plate (14), that also serves as a radiation shield. When condensation forms, the water runs off to the siphon via the air distribution plate.

The insulation layer (9) prevents heat loss. The inside of the hot water tank is enamelled to protect against corrosion. The anodes (5) provide additional protection.

2.3 The water heater's heating cycle

The water heater is controlled by the burner control (24) and the control thermostat (17) or frost thermostat (23). The control thermostat and frost thermostat both independently measure the water temperature (T_{water}). The water heater's heating cycle is activated as soon as T_{water} falls below the specified threshold value (T_{set}). The value for T_{set} depends on the status chosen for the water heater, see paragraph 6.2 Operating modes. If the water heater is in the 'OFF mode' (frost protection), then this value is determined by the frost thermostat (threshold value = 20°C). If the water heater is in the 'ON mode', then the threshold value is selectable via the control thermostat (40°C - 70°C).

As soon as T_{water} falls below T_{set}, the relevant thermostat (control or frost) will close and the burner control will register a heat demand. The gas control (30) will open and the gas will mix with the air it draws in. This mixture is ignited by the spark igniter (29) and the water becomes heated. A soon as T_{water} exceeds T_{set}, the thermostat will open once more. The heat 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

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

- the Water temperature protection;
- the flame probe;
- the Pressure switch.

1. *The narrow opening in the orifices accelerates the gas flow. This causes a partial vacuum. The effect of this partial vacuum is to draw the air into the flow (the Venturi effect).*

2.4.1 Water temperature protection

By means of the frost, high-limit and safety thermostats, the burner control monitors three temperatures related to safety. Table 2.1 explains the operation of the thermostats with sensors.

Table 2.1 Temperature protection

Protection	Description
Frost thermostat	If the frost thermostat sensor (25) detects a temperature of 20°C or lower, the water heater's heating cycle will start. See paragraph 2.3 The water heater's heating cycle.
High-limit thermostat	If the high-limit thermostat sensor (20) detects a temperature greater than 84°C, the high-limit thermostat will open. The heat demand will cease and the burner control will stop the heating cycle until the high-limit thermostat closes again. At that moment, the burner control resets the water heater and the heating cycle resumes. The high-limit safeguard serves to prevent overheating and/or excessive formation of scale in the water heater.
Safety thermostat	If the safety thermostat sensor (22) detects a temperature greater than 93°C, the safety thermostat will open. The heat demand will cease and the burner control will immediately stop the heating cycle. A lockout error of the burner control takes place. This must be manually reset, before the water heater can be put back into operation.

2.4.2 flame probe

To ensure that no gas can flow when there is no combustion, an flame probe (27) has been fitted. The burner control uses this rod for flame detection, by means of ionisation detection. The burner control cuts in immediately, as soon as it detects that gas is flowing, but there is no flame.

2.4.3 Pressure switch

The pressure switch guarantees the discharge of the flue gases and the supply of air. The default position of the pressure switch is open. If there is sufficient pressure difference across the air restrictor (10), the air pressure switch (18) will close. However, in the event of a fault, the pressure switch will be tripped open and the heating cycle will be interrupted.

Table 2.2 shows the trip point per water heater.

Table 2.2 Pressure switch trip points

Appliance	Pressure differential [Pa]	
	Closing	Opening
DR-RS 25	> 200	< 170
DR-RS 40	> 270	< 240
DR-RS 65	> 255	< 225
DR-RS 85	> 610	< 580
DR-RS 105	> 220	< 190

2.5 Safety of the installation

2.5.1 Unvented installation

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

2.5.2 Vented installation

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

2.5.3 Temparature and Pressure valve (T&P valve)

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

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

2.6 Indicators and Alarms

2.6.1 Volt Free Contacts

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

2.7 Options

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

2.7.1 LPG

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

2.7.2 Unvented Supply

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

2.7.3 Top to Bottom Circulation

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

3 Installation

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

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

Refer also to paragraph 1.3 Regulations and documents.

3.1 Introduction

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

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

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

3.2 Packaging

To avoid damaging the water heater, remove the packaging carefully. We recommend unpacking the water heater at or near its intended location.

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

3.3 Environmental conditions

The DR-RS water heater is a room-sealed water heater. Installation types possible with this water heater are C_{13} and C_{33}. This makes it possible to install the water heater in either a closed or an open boiler room.

3.3.1 Humidity and ambient temperature

The boiler room must be frost-free or be protected against frost. Table 3.1 shows the environmental conditions that must be adhered to, for correct functioning of the electronics present in the water heater to be guaranteed.

Table 3.1 Humidity and ambient temperature specifications

Humidity and ambient temperature	
Humidity	max. 90% RH at +40°C
Ambient temperature	Functional: 0 ≤t ≤60°C

3.3.2 Maximum floor loading

In connection with the water heater's weight, take account of the maximum floor loading, see Table 3.2.

Table 3.2 Weight specifications related to maximum floor loading

Weight of the water heater filled with water				
DR-RS 25	DR-RS 40	DR-RS 65	DR-RS 85	DR-RS 105
554 kg	557 kg	560 kg	585 kg	585 kg

3.3.3 Working clearances

For access to the water heater it is recommended that the following clearances are observed (see Figure 3.2):

- AA: around the water heater's control column and cleaning openings: 100 cm.
- BB: around the water heater itself: 50 cm.
- Above the water heater (room to replace the anodes):
  - 100 cm if using fixed anodes or
  - 50 cm if using flexible anodes.

If the available clearance is less than 100 cm, flexible magnesium anodes may be ordered from Hamworthy, the installer / supplier.

Remark

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

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

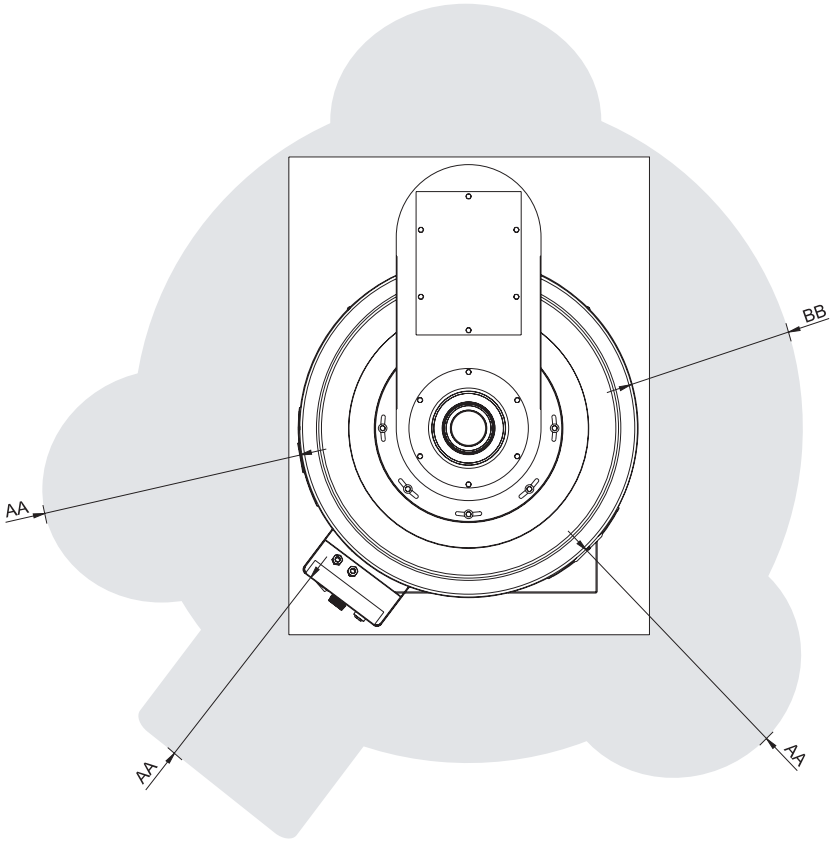


Figure 3.1 Working clearances

3.4 Technical specifications

The water heater is supplied without accessories. Check the dimensions and other specifications for the accessories to be used, based on Figure 3.2 and Table 3.3.

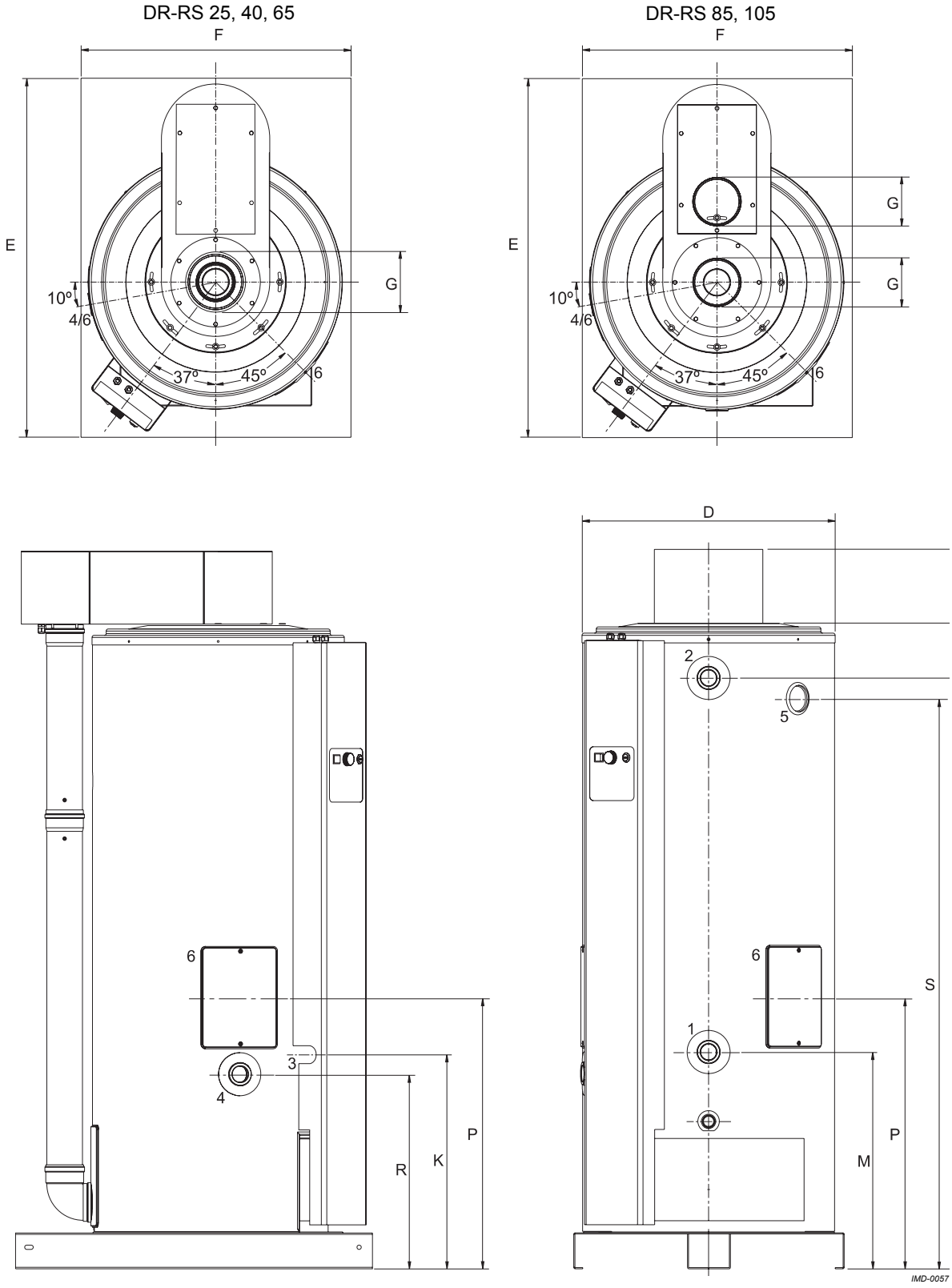


Figure 3.2 Plan and elevation of the water heater

Table 3.3 Dimensions

Dimension	Description	Unit	DR-RS 25	DR-RS 40	DR-RS 65	DR-RS 85	DR-RS 105
A	Total height	mm	2000	2000	2020	2020	2020
B	Height water heater top surface	mm	1800	1800	1820	1820	1820
D	Appliance diameter	mm	710	710	710	710	710
E	Depth	mm	1000	1000	1000	1000	1000
F	Width	mm	755	755	755	755	755
G	Diameter of flue gas discharge	mm	80/125	100/150	130/200	2x 130	2x 130
K	Height of gas connection	mm	600	600	600	600	760
M	Height of cold water supply	mm	600	600	590	590	590
N	Height of hot water outlet	mm	1640	1640	1655	1655	1655
P	Height of cleaning opening	mm	770	770	760	760	760
R	Height of drain valve connection	mm	550	550	540	540	540
S	Height of T&P valve connection	mm	1600	1600	1600	1600	1600
1	Cold water supply connection (external thread)	-	R$1^1/_2$	R$1^1/_2$	R$1^1/_2$	R$1^1/_2$	R$1^1/_2$
2	Hot water outlet connection (internal thread)	-	Rp$1^1/_2$	Rp$1^1/_2$	Rp$1^1/_2$	Rp$1^1/_2$	Rp$1^1/_2$
3	Gas control connection (internal thread)	-	Rp $^3/_4$	Rp $^3/_4$	Rp $^3/_4$	Rp $^3/_4$	Rp1
4	Drain valve connection (internal thread)	-	Rp$1^1/_2$	Rp$1^1/_2$	Rp$1^1/_2$	Rp$1^1/_2$	Rp$1^1/_2$
5	T&P valve connection (internal thread)	-			1" NPT		
6	Cleaning/inspection openings	mm	Ø 100	Ø 100	Ø 100	Ø 100	Ø 100

Table 3.4 General and electrical specifications

DESCRIPTION	Unit	DR-RS 25	DR-RS 40	DR-RS 65	DR-RS 85	DR-RS 105
Storage capacity	litres	324	312	265	265	265
Maximum operating pressure	bar	8	8	8	8	8
Maximum operating pressure unvented	bar	5.5	5.5	5.5	5.5	5.5
Nomimnal operating pressure unvented	bar	3.5	3.5	3.5	3.5	3.5
Empty weight	kg	265	275	340	350	350
Heating time $\Delta T = 45^{oC}$	minutes	35	25	12	9	8
Number of anodes	-	2	2	4	4	4

Table 3.4 General and electrical specifications (Continued)

DESCRIPTION	Unit	DR-RS 25	DR-RS 40	DR-RS 65	DR-RS 85	DR-RS 105
Number of bar burners/orifices	-	3	5	7	7	7
Number of flue tubes/flue baffles	-	5	7	16	16	16
Diameter of air restrictor	mm	36	42	54	48	64
Electrical power consumption	W	100	100	100	275	300
Supply voltage	VAC	230 (-15% +10%)				
Mains frequency	Hz	50				

Table 3.5 Gas data

Gas category data	Unit	DR-RS 25	DR-RS 40	DR-RS 65	DR-RS 85	DR-RS 105
Gas categories: DR-RS 25, 40, 65, 85: II_{2H3+} DR-RS 105: II_{2H3P}						
Specifications for natural gas: G20 - 20 mbar						
Orifice diameter	mm	2.60	2.50	2.70	3.20	3.30
Diameter of pilot flame orifice	mm	0.56 / 0.41	0.56 / 0.41	0.56 / 0.41	0.56 / 0.41	0.56 / 0.41
(1) = Flat plate (2) = Burner pressure regulator	1 or 2	2	2	2	2	2
Nominal heat input (gross)	kW	31.6	51.2	81.6	111.1	125.2
Nominal output	kW	25.9	41.5	66.2	89.0	100.3
Supply pressure	mbar	20	20	20	20	20
Burner pressure	mbar	12.5	12.9	12.9	12.5	14.0
Gas consumption (1)	m^3/h	3.1	5.0	7.9	10.8	12.2
Specifications for LP gas						
General						
Orifice diameter	mm	1.45	1.40	1.50	1.95	2.30
Diameter of pilot flame orifice	mm	0.25	0.25	0.25	0.25	0.25
(1) = Flat plate (2) = Burner pressure regulator	1 or 2	1	1	1	1	2
G30-30 mbar (butane)						
Nominal heat input (gross)	kW	30.9	48.9	79.7	108.4	N.A.
Nominal output	kW	25.9	40.6	66.2	89.0	
Supply pressure	mbar	30	30	30	30	
Burner pressure (2)	mbar	-	-	-	-	
Gas consumption (1)	kg/h	2.3	3.6	5.9	8.0	

1. Based on 1013.25 mbar and 15 °C.
2. 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.

Table 3.5 Gas data

Gas category data	Unit	DR-RS 25	DR-RS 40	DR-RS 65	DR-RS 85	DR-RS 105
G31 - 37 mbar (propane)(butane)						
Nominal heat input (gross)	kW	29.9	47.0	75.7	108.7	122.5
Nominal output	kW	25.0	38.9	62.6	89.0	100.3
Supply pressure	mbar	37	37	37	37	37
Burner pressure (2)	mbar	-	-	-	-	22.0
Gas consumption (1)	kg/h	2.2	3.4	5.5	7.9	8.9

1. Based on 1013.25 mbar and 15 °C.
2. 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.

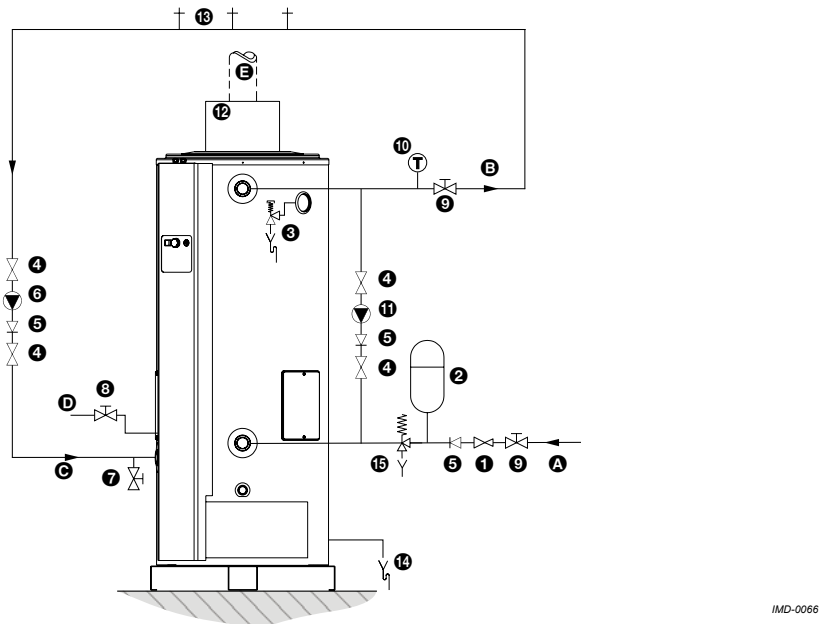
3.5 Installation diagram

Figure 3.3 shows the water and gas connection diagrams for unvented and vented installations. The following paragraphs, describing the connections in detail, make reference to these diagrams

Legend

- ❶ pressure-reducing valve (mandatory whenever the mains water pressure exceeds 8 bar)
- ❷ expansion vessel (mandatory)
- ❸ T&P valve (mandatory)
  ❸a) safety valve
- ❹ stop valve (recommended)
- ❺ non-return valve (mandatory)
  ❺a) non-return valve
- ❻ circulation pump (optional)
- ❼ drain valve
- ❽ gas valve (mandatory)
- ❾ stop valve (mandatory)
- ❿ temperature gauge (recommended)
- ⓫ top to bottom recirculation pump (optional)
- ⓬ top box
- ⓭ hot water draw-off points
- ⓮ condensation drainage
- ⓯ expension valve (mandatory)
- ⓰ water tank
- ⓱ float valve
- ⓲ 3-way venting valve ()
- ⓳ overflow pipe
- Ⓐ cold water supply
- Ⓑ hot water outlet
- Ⓒ circulation pipe
- Ⓓ gas supply
- Ⓔ flue gas discharge

UNVENTED



VENTED

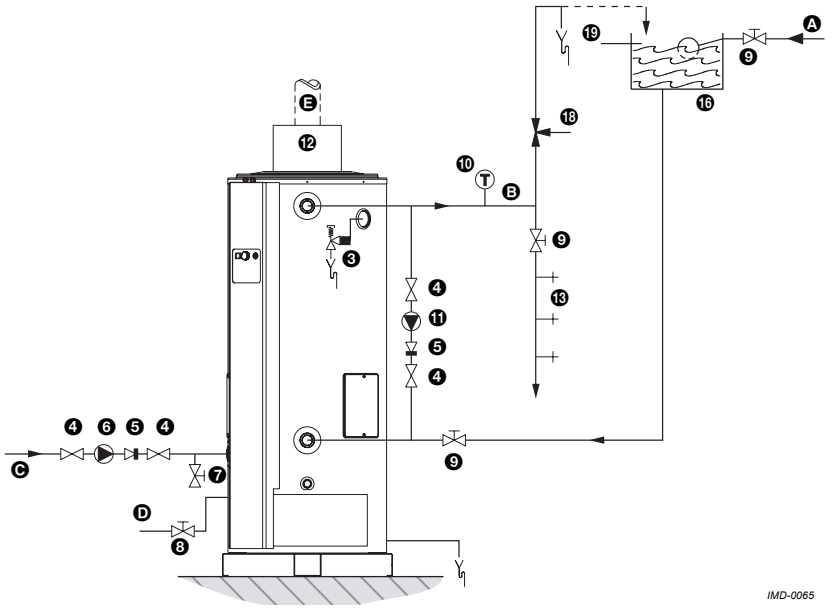


Figure 3.3 Installation diagrams

3.6 Water connections, Unvented

3.6.1 Cold water side

See ❹ in Figure 3.3.

1. Fit an approved stop valve ❾ on the cold water side as required by regulations.
   Refer also to paragraph 1.3 Regulations and documents.
2. Fit an approved pressure-reducing valve ❶.
3. Fit a non-return valve ❺ and an expansion vessel ❷.
4. Fit an expension valve ⓯ and connect the discharge to a drain via tundish.

3.6.2 Top to bottom recirculating pump

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

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

3.6.3 Hot water side

See ❸ in Figure 3.3.

Remark
Insulating long hot water pipes prevents unnecessary energy loss.

1. Optional: Fit a temperature gauge ⓾ to be able to check the temperature of the tap water.
2. Fit the T&P valve ❸.
3. Fit a stop valve ❾ in the hot water outlet pipe, for use when servicing.

3.6.4 Drain valve

1. Fit the standard drain valve supplied ❼.
2. If a circulation pipe is to be fitted, then refer to paragraph 3.6.5. Otherwise, fit the sealing nut and gasket supplied with the drain valve. See Figure 3.4.

3.6.5 Circulation pipe

See ❻ in Figure 3.3 and Figure 3.4.

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

1. Fit a circulation pump ❻ of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve ❺ behind the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves ❹ for service purposes.
4. Connect the circulation pipe to the T-piece on the drain valve ❼. See Figure 3.4.

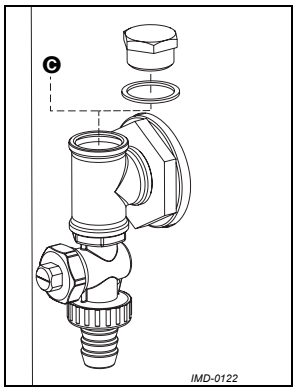


Figure 3.4 Drain valve

3.6.6 Condensation drainage

Fit a small drainpipe with fall to the appropriate connection for condensation drainage at the rear of the water heater and connect this further to the water drainage pipe.

Note
All piping behind the siphon must be condensation-resistant.

3.7 Water connections, Vented

3.7.1 Cold water side

See Ⓐ in Figure 3.3.

1. Fit an approved stop valve ❾ on the cold water side between the water tank ⓰ and the water heater, as required by regulations. Refer also to paragraph 1.3 Regulations and documents.

3.7.2 Top to bottom recirculating pump

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

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

3.7.3 Hot water side

See Ⓑ in Figure 3.3.

Remark
Insulating long hot water pipes prevents unnecessary energy loss.

1. Fit the safety valve ❸a.
2. Optional: fit a temperature gauge ⓾ to be able to check the temperature of the tap water.
3. Fit a stop valve ❾ in the hot water outlet pipe, for use when servicing.
4. If a circulation pipe is to be fitted, then refer to paragraph 3.7.4.

3.7.4 Circulation pipe

See Ⓒ in Figure 3.3.

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

1. Fit a circulation pump ❻ of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve ❺a downstream the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves ❹ for service purposes.
4. Connect the circulation pipe to the T-piece on the drain valve ❼. See Figure 3.4.

3.8 Gas connection

Warning
Gas installation may only be carried out by an authorised installer in compliance with the general regulations imposed by the gas company. Refer also to paragraph 1.3 Regulations and documents.

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

See ⓭ in Figure 3.3.

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

Warning
Check for leaks after fitting.

3.9 Air supply and flue gas discharge

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

3.9.1 Introduction

The connections for the air supply and the flue gas discharge of the DR-RS 25, 40 and 65 differ from those of the DR-RS 85 and 105.

3.9.2 Fitting flue gas discharge and air supply for DR-RS 25, 40, 65

The DR-RS water heaters are approved for installation types C_{13} and C_{33}.

This manual describes these installation types. If an explanation of other types of installation is required, please contact Hamworthy.

Note
Hamworthy prescribes the use of a roof or wall-mounted concentric terminal, of a type approved for the water heater.

The following requirements must be fulfilled:

- The maximum chimney length allowed (A+B+C) is 7 metres.
- The maximum number of 45° or 90° bends allowed is 2.
- If you make use of horizontal piping, then this must slope towards the water heater with a minimum of 5 mm per metre running length!
- Make sure that the chimney discharges into an area where this is permitted for this category of water heater.

See Figure 3.5 Wall flue terminal and Figure 3.6 Roof flue terminal for example installations.

3.9.2.1 Concentric wall flue terminal DR-RS 25, 40,65

Table 3.6 shows the wall flue terminal prescribed by Hamworthy (installation type C_{13}).

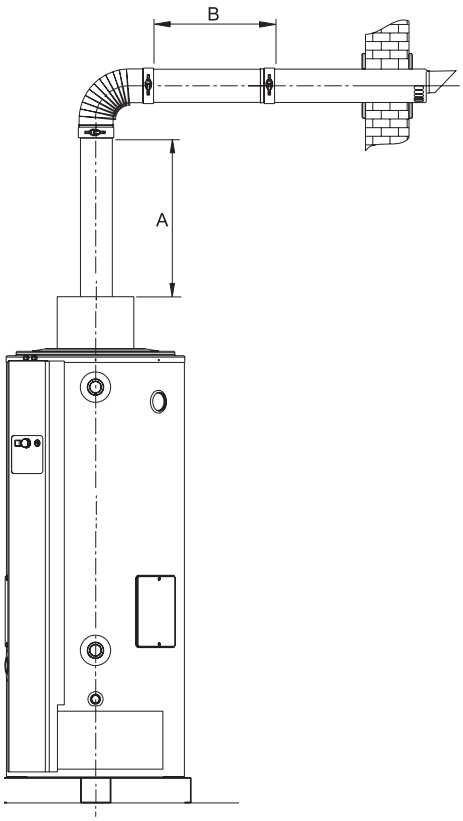


Figure 3.5 Wall flue terminal

Table 3.6 Concentric wall flue terminal specifications

Item		Description
Wall flue terminal(1)	Part No.	DR-RS 25: 562702039 DR-RS 40: 562702040 DR-RS 65: 562702041
	Construction	Concentric
Tube material	Construction	Concentric
	Flue gas discharge	Thick-walled aluminium with lipped sealing ring
	Air supply	Thin-walled galvanised sheet steel
Tube diameters	Flue gas discharge	DR-RS 25:Ø80 mm DR-RS 40: Ø100 mm DR-RS 65: Ø130 mm
	Air supply	DR-RS 25: Ø125 mm DR-RS 40: Ø150 mm DR-RS 65: Ø200 mm

1. *No other wall flue terminal is permitted. The wall flue terminal set can be ordered using this article number from Hamworthy, the manufacturer or from a trade supplier*

3.9.2.2 Concentric roof flue terminal for DR-RS 25, 40, 65

Hamworthy heating limited prescribes the roof flue terminal (installation type C_{33}) as specified in Table 3.7.

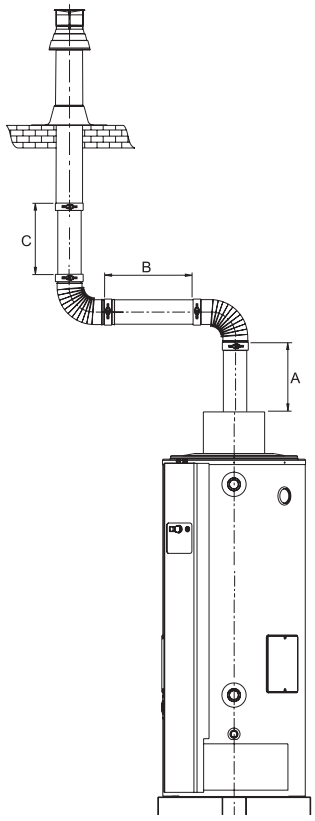


Figure 3.6 Roof flue terminal

Table 3.7 Concentric roof flue terminal specifications

Item		Description
Roof flue terminal(1)	Part No.	DR-RS 25: 562702043 DR-RS 40: 562702044 DR-RS 65: 562702045
	Construction	Concentric
Tube material	Construction	Concentric
	Flue gas discharge	Thick-walled aluminium with lipped sealing ring
	Air supply	Thin-walled galvanised sheet steel
Tube diameters	Flue gas discharge	DR-RS 25:Ø80 mm DR-RS 40: Ø100 mm DR-RS 65: Ø130 mm
	Air supply	DR-RS 25: Ø125 mm DR-RS 40: Ø150 mm DR-RS 65: Ø200 mm

1. *No other roof flue terminal is permitted. The roof flue terminal set can be ordered using this article number from Hamworthy, the manufacturer or from a trade supplier*

3.9.3 Fitting flue gas discharge and air supply for DR-RS 85 and 105

The air supply duct ❶ and flue gas discharge duct ❷ of the DR-RS 85 and 105 emerge separately from the top box, as shown in Figure 3.7. They must be connected to the concentric wall flue terminal (see Figure 3.8) or roof flue terminal (see Figure 3.9) via a transition piece.

❶ air supply
❷ flue gas discharge

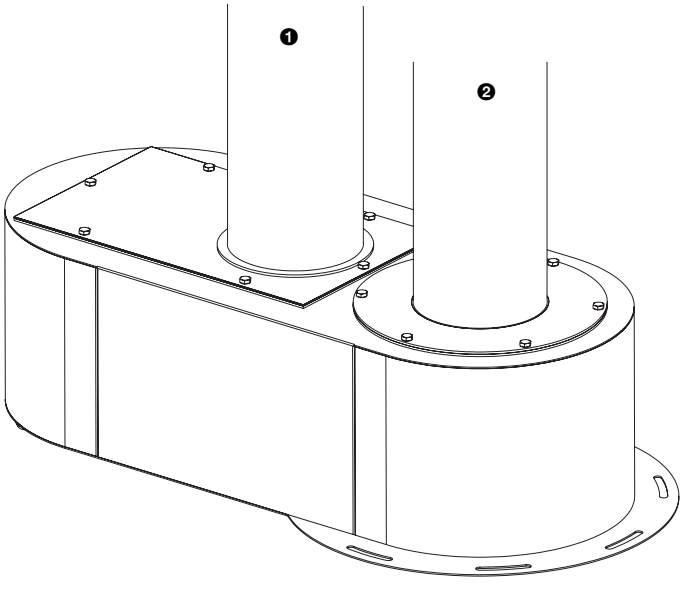


Figure 3.7 Parallel connections on DR-RS 85 and 105

Remark
Hamworthy prescribes the use of a roof or wall-mounted concentric terminal, of a type approved for the water heater. See paragraphs 3.9.3.1 Concentric wall flue terminal for DR-RS 85 and 105 and 3.9.3.2 Concentric roof flue terminal for DR-RS 85 and 105. Use of an incorrect roof or wall-mounted terminal can cause the installation to malfunction.

The following requirements must also be fulfilled:

- The maximum chimney length allowed (A+B+C) is 7 metres.
- The maximum number of 45° or 90° bends allowed is 2.
- If you make use of horizontal piping, then this must slope towards the water heater with a minimum of 5 mm per metre running length!
- The transition piece, to convert the air supply and flue gas discharge from parallel to concentric, must be placed immediately before the roof or wall flue terminal.
- The duct length of the air supply must be approximately the same as that of the flue gas discharge chimney.
- Make sure that the chimney discharges into an area where this is permitted for this category of water heater.

See Figure 3.8 Wall flue terminal and Figure 3.9 Roof flue terminal for example installations.

3.9.3.1 Concentric wall flue terminal for DR-RS 85 and 105

Table 3.8 shows the wall flue terminal prescribed by Hamworthy (installation type C_{13}).

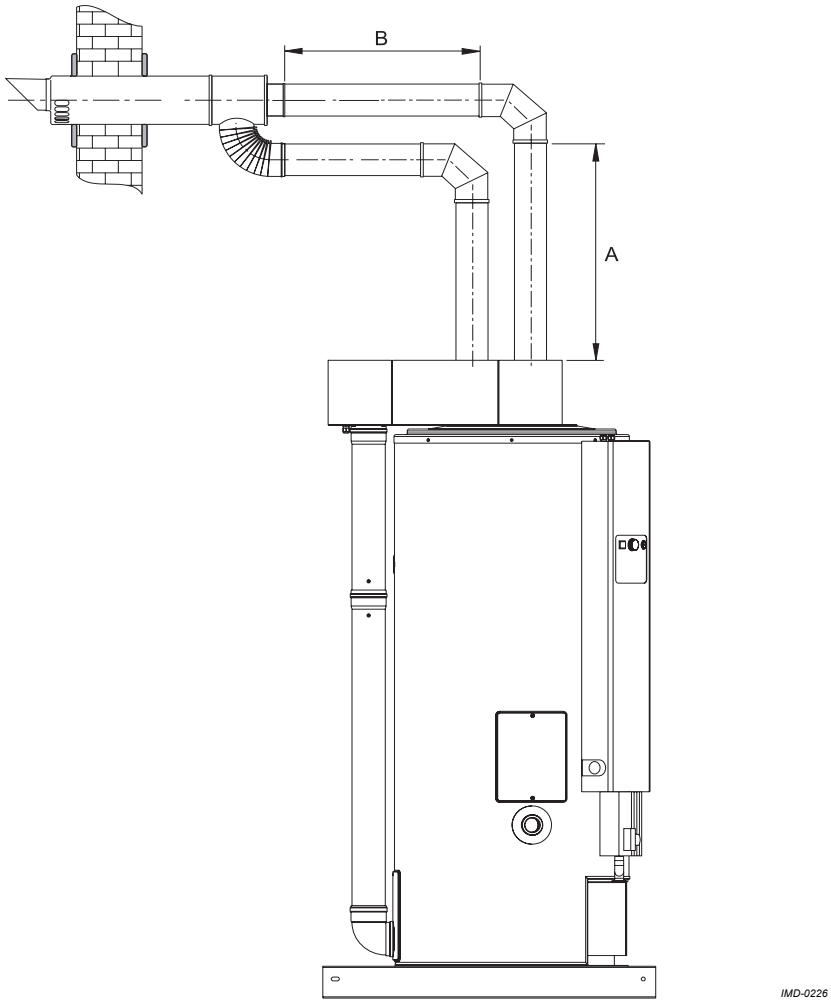


Figure 3.8 Wall flue terminal

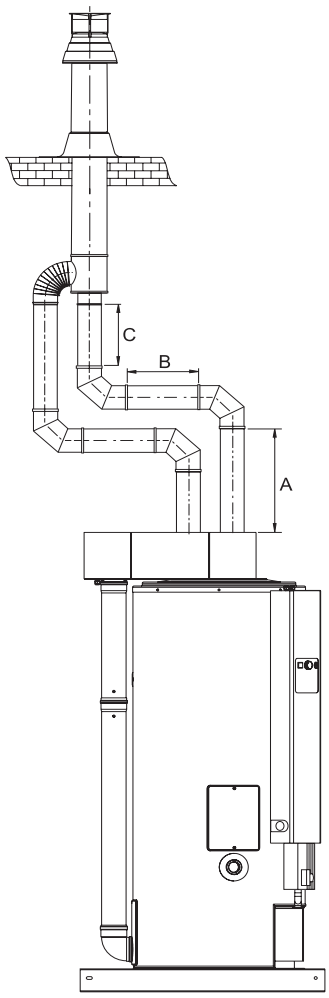
Table 3.8 Specifications for transition piece and concentric wall flue terminal

Item		Description
Wall flue terminal and transition piece(1)	Part No.	562702042
	Construction:	Concentric
Tube material	Construction	Parallel
	Flue gas discharge	Thick-walled aluminium with lipped sealing ring
	Air supply	Thick-walled aluminium with lipped sealing ring
Tube diameters	Flue gas discharge	Ø130 mm
	Air supply	Ø130 mm

1. *No other wall flue terminal is permitted. The wall flue terminal set can be ordered using this article number from Hamworthy, the manufacturer or from a trade supplier*

3.9.3.2 Concentric roof flue terminal for DR-RS 85 and 105

Hamworthy heating limited prescribes the roof flue terminal (installation type C_{33}) as specified in Table 3.9.



IMD-0239

Figure 3.9 Roof flue terminal

Table 3.9 Specifications for transition piece and concentric roof flue terminal

Item		Description
Roof flue terminal and transition piece(1)	Part No.	562702046
	Construction	Concentric
Tube material	Construction	Parallel
	Flue gas discharge	Thick-walled aluminium with lipped sealing ring
	Air supply	Thick-walled aluminium with lipped sealing ring
Tube diameters	Flue gas discharge	Ø130 mm
	Air supply	Ø130 mm

1. *No other roof flue terminal is permitted. The roof flue terminal set can be ordered using this article number from Hamworthy, the manufacturer or from a trade supplier*

3.10 Electrical connections

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

3.10.1 Introduction

Topics covered in this paragraph:

- 3.10.2 Preparation;
- 3.10.3 Mains;

3.10.2 Preparation

Figure 3.10 shows a front view of the electrical connection block. Table 3.10 shows the associated connections.

Table 3.10 Electrical connection block DR-RS

Mains power			**Volt Free contact Lock out**			**Volt Free contact Normal run**		
N	L	⏚	NO	P	NC	NO	P	NC
1	2	3	4	5	6	7	8	9

Close Control Thermostat			**Corex Anode power**		**Time clock power**		**Time clock connection**	
⏚	L	N	L	N	L	N	L	L
13	14	15	16	17	18	19	20	21

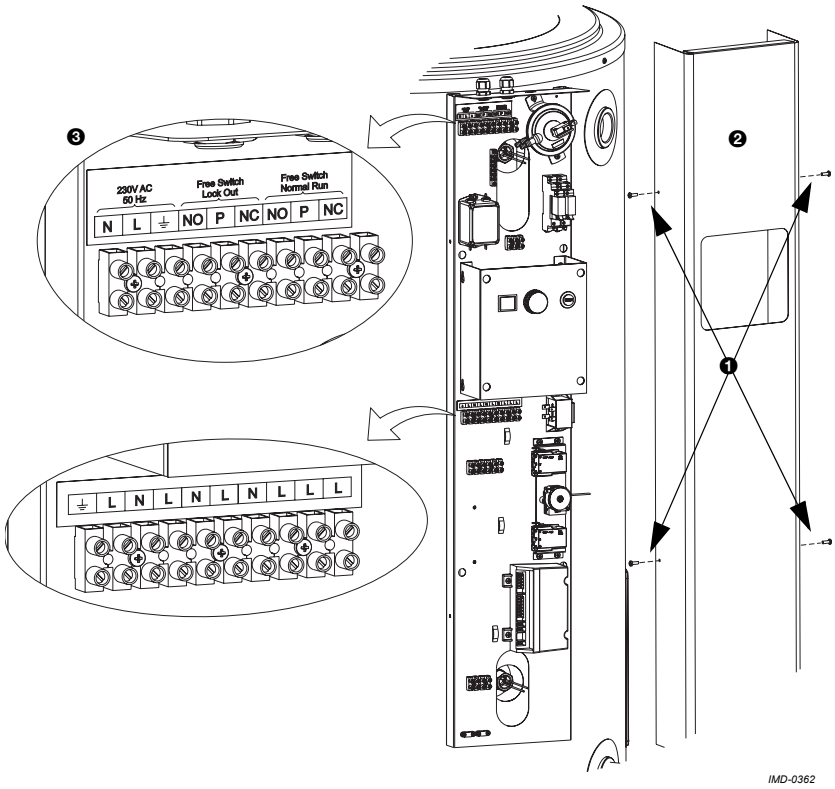


Figure 3.10 Connection block (connections 1 through 10 explained in Table 3.10)

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

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

Remark
Refer to A Electrical diagram DR-RS for the connection of electrical components.

3.10.3 Mains

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

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

1. Feed the power cable through the metric strain relief on the top of the control column.
2. Connect earth (⏚), phase (L_1) and neutral (N) of the power cable to terminals 1 through 3 of the connection block as indicated in Table 3.10.
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.

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

3.11 Checking the supply pressure and burner pressure

Note
Before you start up the water heater and/or begin to check the supply pressure and burner pressure, you must first fill the water heater. Please refer to paragraph 4.2 Filling the water heater for filling instructions.

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

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

If the water heater must operate on a gas category other than that for which the water heater has been set up at the factory (see rating plate), the water heater will first have to be converted. See paragraph 3.12 Conversion to a different gas category.

Legend:

❶ burner pressure regulator
❷ burner pressure control cap
❸ burner pressure control adjusting screw
❹ blank plate
❺ supply pressure test nipple
❻ gas control
❼ burner pressure test nipple

Gas control valve for DR-RS 25, 40, 65 and 85

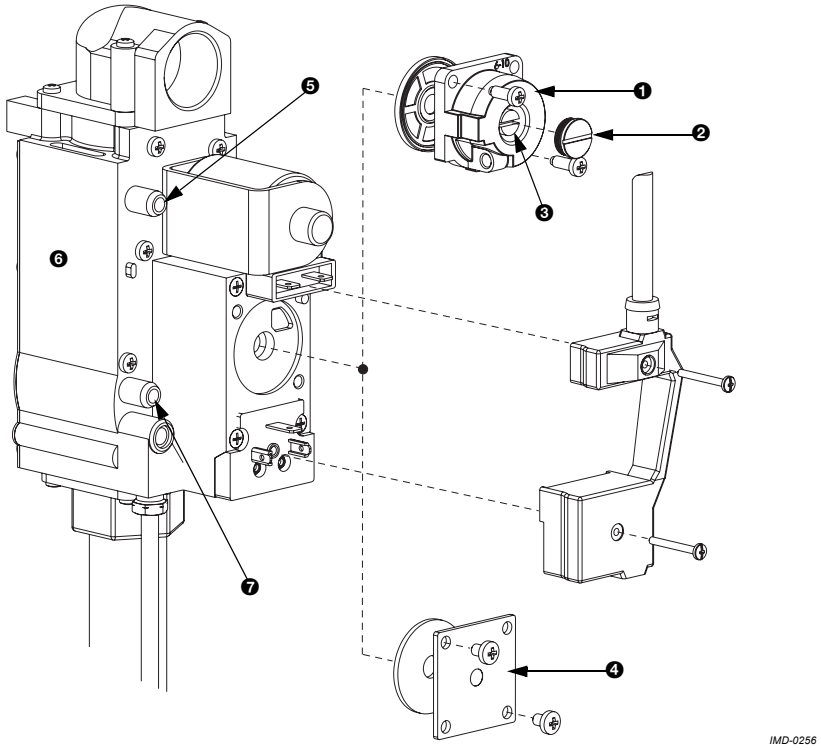


Figure 3.11 Gas control valve

Gas control valve for DR-RS 105

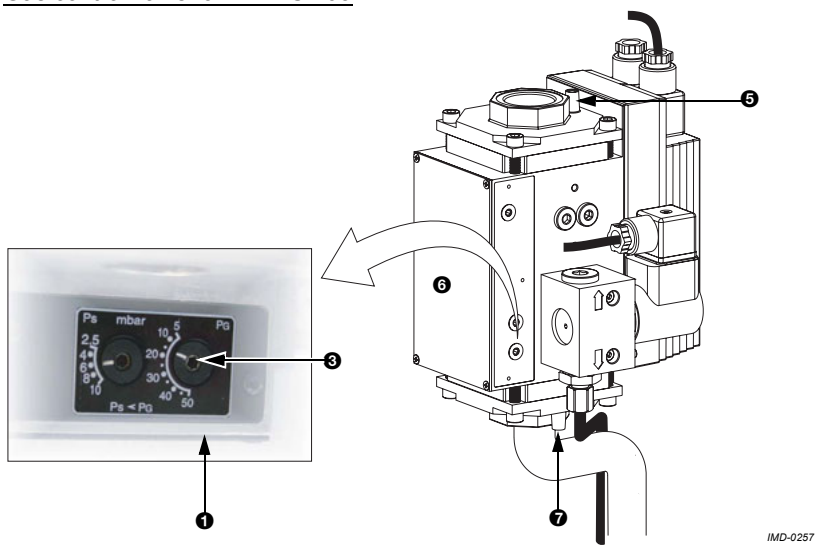


Figure 3.11 Gas control valve(Continued)

To check the supply pressure and burner pressure, proceed as follows:

1. Disconnect the water heater from the power supply. See paragraph 7.3.2 Isolate the water heater from the power supply.
2. There are two test nipples on the gas control (Figure 3.11):
   - supply pressure test nipple ❺;
   - burner pressure test nipple ❼.

   Sealing screws are located inside the test nipples. Loosen both sealing screws by a few turns. Do not loosen them completely; this makes them difficult to tighten again.
3. Connect a pressure gauge to burner pressure test nipple ❼.

Remark
All gas pipes should be vented and free of leakage.

4. Open the gas supply.
5. Connect a pressure gauge to test nipple ❺.
6. Switch on the power to the water heater using the isolator on the water heater.
7. Set the control thermostat to the highest position and start the water heater running by putting the On/Off switch to **position I**.
8. The heating cycle will start and the burner tray will ignite after a short time.
9. After the burner tray has ignited, wait for approximately 1 minute before you start reading the dynamic pressures.
10. Use the pressure gauge to read the supply pressure at the test nipple ❺. Refer to Table 3.5.

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

11. Use the pressure gauge to read the burner pressure at test nipple ❼. Refer to Table 3.5.

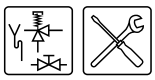
Remark
If the burner pressure is not correct and the water heater is fitted with a blank plate, you will not be able to adjust the pressure. In this case, consult your installer or supplier.
If the water heater is fitted with a burner pressure regulator, then the pressure can be adjusted by following steps 12 through 16.

12. **DR-RS 25, 40, 65 or 85**:
Adjust the burner pressure by turning burner pressure control adjusting screw ❸, depending on the correction required:
    - Adjusting screw anticlockwise: burner pressure decreases.
    - Adjusting screw clockwise: burner pressure increases.

13. **DR-RS 105**
Adjust the burner pressure by turning burner pressure control adjusting screw ❸ (Pg) using the supplied Allen key, depending on the correction required:
    - Adjusting screw anticlockwise: burner pressure increases.
    - Adjusting screw clockwise: burner pressure decreases.

Warning
Adjusting screw Ps regulates the starting pressure. This need never AND may never be adjusted!

14. Check the burner pressure against the value given in the table.
15. If the pressure setting is incorrect, then:
    - **For DR-RS 25, 40, 65 or 85** repeat steps 12 and 14 until the correct pressure is achieved.
    - **For DR-RS 105** repeat steps 13 and 14 until the correct pressure is achieved.
16. Shut down the water heater by putting the On/Off -switch to **position 0**.
17. Shut off the gas supply.
18. Disconnect the two pressure gauges and re-tighten the sealing screws in the test nipples.



3.12 Conversion to a different gas category

3.12.1 Introduction

If the water heater must operate on a family of gas (LP gas or natural gas) or other gas category than that for which the water heater has been set up at the factory, the water heater will have to be adapted using a special conversion kit.

Warning
The conversion may only by carried out by an authorised installer.

Warning
After conversion, check the supply pressure and the burner pressure.

3.12.2 Conversion

1. Disconnect the water heater from the mains. See paragraph 7.3.2 Isolate the water heater from the power supply.
2. Shut off the gas supply.
3. Referring to Table 3.5, compare the present gas category with the target gas category and ascertain whether the diameter of the pilot flame orifice is different. If this is the case, then the pilot flame orifice must be replaced. See paragraph ’3.11.3 Replace orifice’.
4. Referring to Table 3.5, compare the present gas category with the target gas category and ascertain whether the diameter of the main orifice is different. If this is the case, then the main orifices must be replaced. See paragraph 3.12.3 Replacing orifices.
5. Referring to Table 3.5, compare the present gas category with the target gas category and ascertain whether there is a different use of a flat plate or burner pressure regulator. If this is the case, then these must be exchanged. See paragraph 3.12.4 Replacing burner pressure regulator or flat plate (DR-RS 25-40-65-85).
6. Referring to Table 3.5, compare the present gas category with the target gas category and make the appropriate adjustments. See paragraph 3.11 Checking the supply pressure and burner pressure.

Remark
The present gas category is stated on the rating plate.

3.12.3 Replacing orifices

Legend:

❶ strain relief
❷ lead for spark electrode
❸ lead for flame probe
❹ burner control
❺ gas control connector(s)
❻ gas control
❼ gas coupling
❽ burner tray

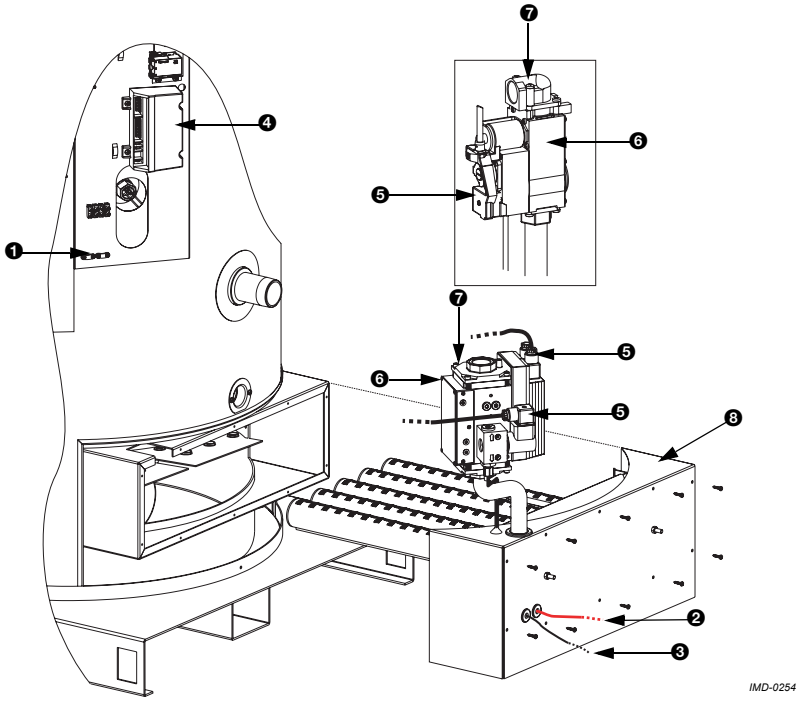


Figure 3.12 Disassembled gas control

1. Detach the protective cap van the control column:
   Loosen the 4 screws and remove the protective cap by lifting it upwards. The electrical section will now be visible.
2. Remove the strain relief ❶ and detach the leads of the spark electrode (❷ = red) and the flame probe (❸ = black) from the burner control ❹.
3. Unscrew the connector(s) ❺ of the gas control ❻.
4. Detach the gas coupling ❼ before the gas control.
5. Remove the ten screws holding the burner tray ❽ in place.
6. Withdraw the burner tray from the water heater.

Remark
When exchanging the pilot flame orifice and/of orifices:
Lay the burner tray on its side and approach it from the underside.

Legend:

❶ spark electrode
❷ flame probe
❸ pilot flame orifice socket
❹ pilot flame orifice
❺ main orifice

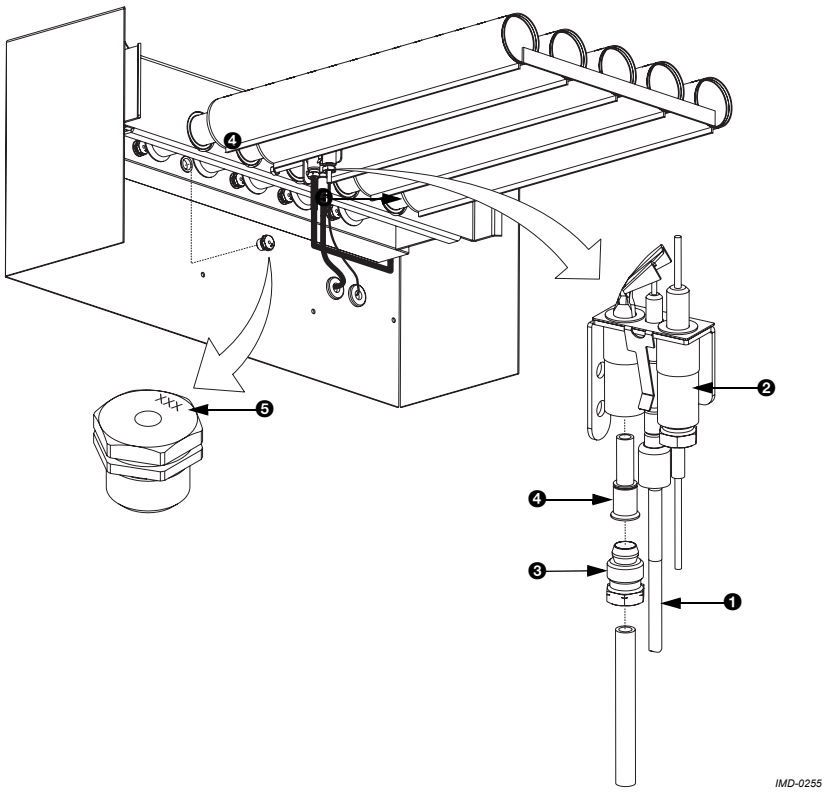


Figure 3.13 Gas control

7. If Table 3.5 Gas data indicates that the pilot flame orifice must be replaced:
   a. Detach the spark electrode ❶ from the retaining clip. This will give clearance to disassemble the pilot flame orifice.
   b. Turn the flame probe ❷ to loosen it from the bracket and give more room.
   c. Detach the pilot flame orifice socket ❸.
   d. Replace the pilot flame orifice ❹ with the pilot flame orifice of the correct diameter from the conversion kit.
   e. Fit the bracket, the flame probe and the spark electrode.
8. If Table 3.5 Gas data indicates that the main orifices of the burners must be replaced:
   a. Remove the main orifices ❺.
   b. Fit the main orifices from the conversion kit. You can check the required orifice diameter based on Table 3.5 Gas data. The orifice diameter is shown on the orifice by means of stamped figures.
9. If required, you must now also replace the burner pressure regulator or flat plate. See paragraph 3.12.4 Replacing burner pressure regulator or flat plate (DR-RS 25-40-65-85).
10. Return the burner tray to its place, tightening all the screws.
11. Re-fit the gas coupling before the gas control and screw the gas control connector(s) back in place.
12. Connect the leads of the spark electrode and the flame probe to the burner control and fit them in the strain relief.
13. Connect the gas.

14. Refit the protective cover.

Remark
Refer to A Electrical diagram DR-RS for the connection of electrical components.

3.12.4 Replacing burner pressure regulator or flat plate (DR-RS 25-40-65-85)

Referring to Table 3.5 Gas data, ascertain whether the gas control needs to be fitted with a burner pressure regulator or blank plate.
If necessary replace them:

1. Complete steps 7 through 9 of paragraph 3.12.3 Replacing orifices.
2. Detach the burner pressure regulator ❶ or flat plate ❹. See Figure 3.11 Gas control valve.
3. Fit the burner pressure regulator of flat plate from the conversion kit.
4. Complete steps 10 through 14 of paragraph 3.12.3 Replacing orifices.
5. Add a sticker to the Data Label.

Remark
When you have completed replacing the necessary components, you must adjust the supply pressure and burner pressure to match the target gas category. See paragraph 3.11 Checking the supply pressure and burner pressure.

4 Filling and draining

4.1 Introduction

Topics covered in this chapter:

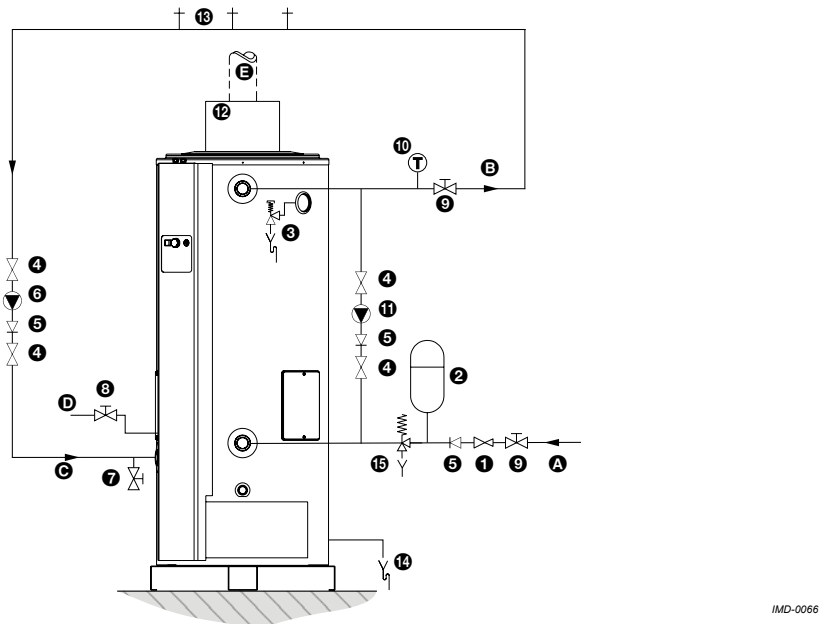
- Filling the water heater.
- Draining the water heater.

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

Legend

- ❶ pressure-reducing valve (mandatory if the mains water pressure exceeds 8 bar)
- ❷ expansion vessel (mandatory)
- ❸ T&P valve (mandatory)
  - ❸a) safety valve
- ❹ stop valve (recommended)
- ❺ non-return valve (mandatory)
  - ❺a) non-return valve
- ❻ circulation pump (optional)
- ❼ drain valve
- ❽ gas valve (mandatory)
- ❾ stop valve (mandatory)
- ❿ temperature gauge (recommended)
- ⓫ top to bottom recirculation pump (optional)
- ⓬ top box
- ⓭ hot water draw-off points
- ⓮ condensation drainage
- ⓯ expension valve (mandatory)
- ⓰ water tank
- ⓱ float valve
- ⓲ 3-way venting valve (optional)
- ⓳ overflow pipe
- Ⓐ cold water supply
- Ⓑ hot water outlet
- Ⓒ circulation pipe
- Ⓓ gas supply
- Ⓔ flue gas discharge

UNVENTED



VENTED

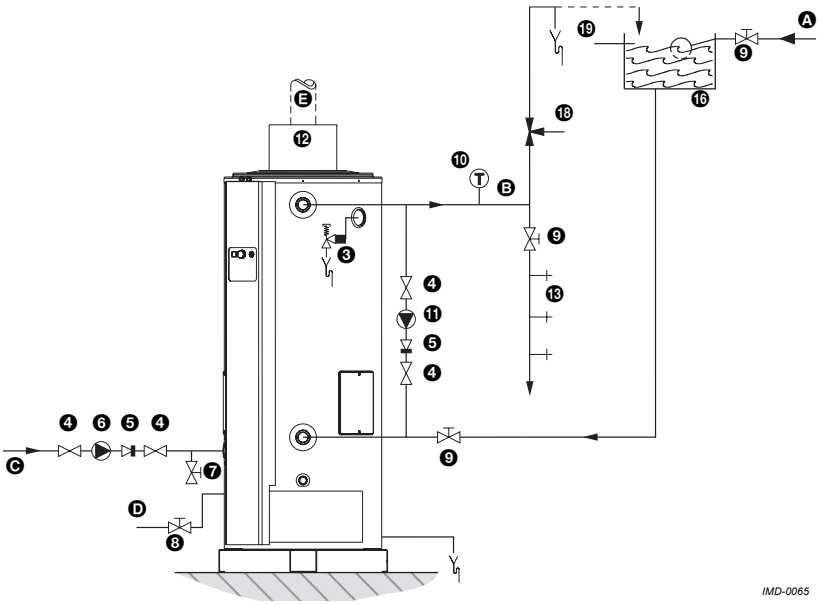


Figure 4.1 Installation diagrams

4.2 Filling the water heater

4.2.1 Filling unvented installations

To fill the water heater, proceed as follows.

1. Open the stop valve ❾ in the hot water pipe and, if present, the stop valves ❹ for the circulation pump.
2. Shut drain valve ❼.

3. Open the nearest hot water draw-off point ⓲.
4. Open the supply valve ❾ on the cold water side Ⓐ so that cold water flows into the water heater.
5. Completely fill the water heater (when cold water flows at normal pressure from the nearest hot water draw-off point, the water heater is full).
6. Vent the entire installation of air, for example by opening all hot water draw-off points.
7. The water heater is now under water supply pressure. There should be no water coming out of the expansion valve ⓯ nor the T&P valve ❸. If this does happen, the cause might be:
   - The water supply pressure is greater than the specified 3.5bar. Rectify this by fitting a pressure-reducing valve ❶.
   - The expansion valve in the protected cold supply setup is defective or incorrectly fitted.

4.2.2 Filling vented installations

To fill the water heater, proceed as follows.

1. Open the stop valve ❾ in the hot water pipe and, if present, the stop valves ❹ for the circulation pump.
2. Shut drain valve ❼.
3. Open the nearest hot water draw-off point ⓲.
4. Open the supply valve ❾ on the cold water side Ⓐ so that cold water flows into the water heater.
5. Completely fill the water heater (when cold water flows at normal pressure from the nearest hot water draw-off point, the water heater is full).
6. Vent the entire installation of air, for example by opening all hot water 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 ❸. If this does happen, the T&P valve might be defective or incorrectly fitted.

4.3 Draining the water heater

4.3.1 Draining unvented installations

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

1. Shut the water heater down by putting the On/Off switch to **position 0**.
2. Disconnect the water heater by putting switching the mains isolator off.
3. Shut off the gas supply ❽.
4. Close the stop valve ❾ in the hot water pipe.
5. Close the supply valve in the cold water supply Ⓐ.
6. Open the drain valve ❼.
7. Vent the water heater (or installation) so that it drains completely.

4.3.2 Draining vented installations

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

1. Shut the water heater down by putting the On/Off switch to **position 0**.
2. Switch the mains isolation off.
3. Shut off the gas supply ❽.

4. Close the stop valve ❾ in the hot water pipe.
5. Close the stop valve between the water tank and the cold water inlet.
6. Open the drain valve ❼.

5 Controls

5.1 Introduction

Topics covered in this chapter:

- 5.2 Control panel;
- 5.3 Explanation of the symbols;
- 5.4 ON/OFF switch;
- 5.5 Control thermostat;
- 5.6 Burner control reset button;

5.2 Control panel

Figure 5.1 shows the control panel The panel consists of:

- an ON/OFF switch;
- a reset button;
- a control thermostat with rotary knob;.

Figure 5.1 The control panel

5.3 Explanation of the symbols

Table 5.1 shows the meanings of the symbols on the control panel.

Table 5.1 Icons and their meaning

Symbol	Name	Explanation
	ON/OFF switch	'ON mode' / 'OFF mode'
	Reset button with error indicator	Reset burner control
	Temperature control	To set water temperature (T_{set})

5.4 ON/OFF switch

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

Remark
To electrically disconnect the water heater, you must use the isolator between the water heater and the mains power supply.

5.5 Control thermostat

Use the rotary knob on the control thermostat to set the desired water temperature to between 40°C and 70°C. The rotary knob is continuous, over a scale of 1 to 4. Table 5.2 shows the temperatures corresponding to each position.

Table 5.2 Temperature setting

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

5.6 Burner control reset button

An error can cause the burner control to lock out. When this happens, the red lamp in the reset button will light up. After eliminating the cause of the error, you can reset the water heater using the reset button.

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

To identify the various errors, refer to chapter 6 Status of the water heater. Chapter 8 Troubleshooting describes how to troubleshoot errors and problems.

6 Status of the water heater

6.1 Introduction

Topics covered in this chapter:

- 6.2 Operating modes;
- 6.3 Error conditions;

6.2 Operating modes

When running, the water heater has three basic operating modes, namely:

- **DISCONNECTED**

  In this mode the water heater is off and all components are electrically dead. The isolator (switch between the water heater and the power supply) is turned off. On the control panel, the ON/OFF switch is at **position 0**.

- **OFF**

  In this mode, the frost protection is activated. The isolator is set to position I. On the control panel, the ON/OFF switch is at **position 0**.

- **ON**

  In this mode the water heater continuously fulfils the demand for heat. On the control panel:

  - the ON/OFF switch is at **position I**;
  - The water temperature can be set by turning the rotary knob on the control thermostat, see paragraph 5.5 Control thermostat.

6.3 Error conditions

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

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

- **Lock out error in the burner control**
  When this happens, the red error lamp in the reset button will light up on the control panel. The burner control is locked out.
  After removing the cause, the reset button must be pressed to re-start the water heater.
- **The water heater cycles continuously**
  When this happens, the water heater continues to attempt to start-up, but an error is causing the heating cycle to fail.
  See paragraph 7.4 The water heater's heating cycle.
  After removing the cause, the water heater will start-up again by itself.
- **Blocking errors**
  You can recognise this condition by the fact that the water heater makes no attempt to start operation, despite the water temperature being lower than the control thermostat setting (see 5.5 Control thermostat). These errors disappear automatically once the cause of the error has been removed, after which the water heater resumes by itself.

The cause of the error cannot be seen on the control panel. For a detailed overview of error conditions, please refer to chapter 8 Troubleshooting.

6

Status of the water heater

If, as end-user, you find the water heater in an error condition, you may attempt to re-start the water heater by pressing the reset button once. However, should the error return or become persistent, you should contact your service and maintenance engineer.

7 Starting up and shutting down

7.1 Introduction

Topics covered in this chapter:

- Starting up;
- Shutting down;
- The water heater's heating cycle.

7.2 Starting up

Start-up the water heater as follows:

1. Fill the water heater. See chapter 4 Filling and draining.
2. Open the manual gas valve (see Figure 4.1 Installation diagrams).
3. Switch on the power to the water heater using the isolator between the water heater and the power supply.
4. Set the water heater in 'ON mode' by switching the ON/OFF switch on the control panel to **position I**.
5. Set the desired water temperature using the control thermostat. See paragraph 5.5 Control thermostat

If there is a heat demand, the water heater will run through a heating cycle. See paragraph 7.4 The water heater's heating cycle.

7.3 Shutting down

You can:

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

7.3.1 Shut the water heater down for a brief period ('OFF mode')

To shut the water heater down for a brief period, you must activate the frost protection. Refer also to paragraph 2.3 The water heater's heating cycle.

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

7.3.2 Isolate the water heater from the power supply

The water heater should only be isolated from mains power in the correct way. The correct procedure is as follows:

1. Shut the water heater down by switching the ON/OFF switch to **position 0**.
2. Isolate the water heater by switching the isolator between the water heater and the mains power supply to position 0.

7.3.3 Shut the water heater down for a longer period

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

7.4 The water heater's heating cycle

The water heater's heating cycle is activated as soon as the measured water temperature (T_{water}) falls below the threshold value (T_{set}). This threshold value depends on the currently selected water heater operating mode. For example, if the water heater is in the 'OFF mode' (frost protection), then this value is 20°C. If the water heater is in the 'ON mode', then this threshold value is selectable, for example, position 3 (60°C).

The heating cycle runs in turn through the following states:

1. Heat demand;
2. Zero state control by pressure switch;
3. Start fan;
4. Pressure difference in air supply;
5. Ignition of pilot flame;
6. Ignition of burner tray;
7. Running.

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

Remark
The water heater 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, e.g. 60°C, causing the control thermostat to close. The burner control now detects a heat demand and starts the heating cycle.
2. Once the heat demand is registered, the burner control runs a zero state control on the pressure switch and the fan begins drawing air.
3. Once the air supply is guaranteed to be sufficient, the pilot flame is ignited.
4. Following ignition, once the pilot flame is verified by ionisation detection, the burner tray is ignited: the water heater is now running. This means that actual heating has started.
5. When the water is up to temperature, the heat demand cuts out. The gas control closes and the pilot flame and the burner tray are extinguished.

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

8 Troubleshooting

8.1 Introduction

This chapter covers the following errors:

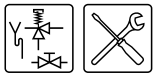
- Gas smell.
- Water leakage.
- Explosive ignition.
- Poor flame profile.
- No hot water
- Insufficient hot water.

If the water heater has gone into an error condition, then the heat demand will be (temporarily) ignored and no hot water will be supplied. The frost protection will also be out of operation. The error conditions are divided into three groups:

- **Lock out error in the burner control**
  When this happens, the red error lamp in the reset button will light up on the control panel. The burner control is locked out.
  After removing the cause, the reset button must be pressed to re-start the water heater.
- **The water heater cycles continuously**
  When this happens, the water heater continues to attempt to start-up, but an error is causing the heating cycle to fail.
  See paragraph 7.4 The water heater's heating cycle.
  After removing the cause, the water heater will start-up again by itself.
- **Blocking errors**
  You can recognise this condition by the fact that the water heater makes no attempt to start operation, despite the water temperature being lower than you have set with the control thermostat (see 5.5 Control thermostat). These errors disappear automatically once the cause of the error has been removed, after which the water heater resumes by itself.

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

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



8.2 Troubleshooting table for general errors

Table 8.1 General errors (Sheet 1 of 2)

Symptom	Cause	Solution	Remark
Gas smell	Gas leak	**Warning** Immediately close the main gas valve. **Warning** Do not operate any switches. **Warning** No naked flames. **Warning** Ventilate the boiler room.	**Remark** Immediately contact your installer or local gas company.
Water leakage	Leakage from one of the water connections (threaded).	Tighten the threaded connection.	If the leak persists, consult your installer.
	Leakage from another nearby water water heater or pipe segment.	Trace the leak.	
	Leakage from the water heater's hot water 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.	

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

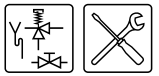


Table 8.1 General errors (Sheet 2 of 2)

Symptom	Cause	Solution	Remark
Explosive ignition **Poor flame profile**	Incorrect supply pressure and/or burner pressure.	Set the correct supply pressure and/or burner pressure, see 3.11 Checking the supply pressure and burner pressure.	If ignition is not improved, consult your installer.
	Contaminated burner	Clean the burner. See 9.4.2 Cleaning the burners	
	Contaminated orifice.	Clean the orifice. See 9.4.3 Cleaning the orifices	
	Contaminated air supply	Improve the air supply.	

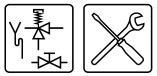
8.3 Troubleshooting table 'insufficient hot water'

If the water heater fails to supply any hot water, there are several possible causes.
Refer to Table 8.2 Insufficient hot water

Table 8.2 Insufficient hot water

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

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



8.4 Troubleshooting table 'no hot water'

If the water heater fails to supply any hot water, there are several possible causes.
Refer to table Table 8.3 No hot water.

Table 8.3 No hot water (Sheet 1 of 2)

Symptom	Cause	Solution	Remark
No attempt to start the heating cycle	No voltage from power supply.	1. Check that the isolator is ON. 2. Check the voltage across the isolator. 3. Check the voltage on the electrical connector block. 4. Check the voltage on the burner control. 5. Check the fuse in the burner control. The measured voltage must be 230 VAC +15% -10%.	See appendix A Electrical diagram DR-RS. If you cannot resolve the error, contact your installer.
No attempt to start the heating cycle (blocking error)	The air pressure switch does not close.	1. Blockage in the flue gas discharge or air supply: • Trace the blockage. • Remove the blockage. 2. Defective air pressure switch • Check the wiring of the air pressure switch. • Check that the air pressure switch is working properly.	If the error has been corrected, the water heater will automatically resume running when there is a heat demand. If the error cannot be resolved or is persistent, contact your installer.
	Break in the thermostat circuits.	1. Check that the control thermostat is switched (closed). 2. Check the leads and sensors of the control and high-limit thermostats.	
Repeated starting of the heating cycle (cycling of water heater)	Too much resistance in the flue gas discharge (the air pressure switch opens during heating).	1. Check that the chimney installation has been constructed in compliance with the directions. See paragraph 3.9 Air supply and flue gas discharge.	If the error cannot be resolved or is persistent, contact your installer.

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

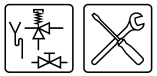
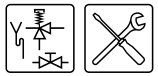


Table 8.3 No hot water (Sheet 2 of 2)

Reset button illuminated (lock out error in burner control)	There are 3 possible causes for this error: (a), (b) or (c). To determine the cause, you need to make the error recur while checking which phase of the heating cycle this happens in. 1. Reset the water heater by pressing the reset button 1x; 2. Cause (a) occurs between steps 4 and 5 of the heating cycle; 3. Cause (b) occurs in step 5 or 6; 4. Cause (c) occurs in step 7.		See paragraph 7.4 The water heater's heating cycle
	(a) Constant interruption in the safety circuit	1. Check whether the thermostat is defective. 2. Check whether the thermostat sensor is defective. 3. Check the wiring of the thermostat.	If the error cannot be resolved or is persistent, contact your installer.
	(b) Failed attempt to start	No gas: 1. Check that the gas valve is open. 2. Check that gas control opens (clicking of the gas control). 3. Check the gas control wiring.	If the error cannot be resolved or is persistent, contact your installer.
		No ignition: 1. Check whether the spark igniter sparks in the pilot flame cap. 2. Check the wiring of the hot surface igniter. 3. Check that the spark igniter is correctly fitted in the bracket.	
		No flame detection: 1. Check that the flame probe is not defective. 2. Check that the wiring to the flame probe is correctly connected.	
	(c) Interruption in the safety circuit during heating (the safety thermostat has cut out)	1. Check whether the control thermostat is working. 2. Check whether the high-limit thermostat is working. 3. Check that the circulation pump (if present) is working.	If the error cannot be resolved or is persistent, contact your installer.

Warning

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



9 Maintenance

9.1 Introduction

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

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

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

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

9.2 Preparing for maintenance

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

1. Put the ON/OFF switch on the control panel 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 heat demand, draw some hot water off to initiate a heat demand.
4. Check whether the heating cycle runs correctly. See paragraph 7.4 The water heater's heating cycle.
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 and adjust these, where necessary. See paragraph 3.11 Checking the supply pressure and burner pressure.
7. Check that all components of the flue gas system are properly attached.
8. Test the operation of the expansion valve of the cold supply setup. The water should spurt out.
9. Test the overflow operation of the T&P valve. The water should spurt out.
10. Check the drain pipes from the discahrge points of any valve and remove any lime buildup that may be present.
11. Drain the water heater. See paragraph 4.3 Draining the water heater.

9.3 Water-side maintenance

9.3.1 Introduction

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

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

9.3.2 Checking the anodes

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

1. Remove the chimney attachments from the top box.
2. Detach the lid of the top box.
3. Detach the fan leads and remover the lead from the strain relief.
4. Undo the screws of the top box.
5. Remove the top box from the water heater.
6. Undo the screws of the cover on the top of the water heater.
7. Remove the cover from the water heater.
8. Remove the sealing ring from the hot water tank.
9. Loosen the anodes using suitable tools (27 mm A/F).
10. Check the anodes and if necessary, replace them.
11. Now also check the flue baffles. Replace them, if necessary. See paragraph 9.4.4 Checking the flue baffles.
12. Fit a new sealing ring around the edge of the hot water tank and replace the cover.
13. Replace the top box.
14. Feed the fan lead through the strain relief and connect the lead to the fan. See appendix A Electrical diagram DR-RS.
15. Fit the lid back on the top box.

9.3.3 Descaling and cleaning the heater

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

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

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

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

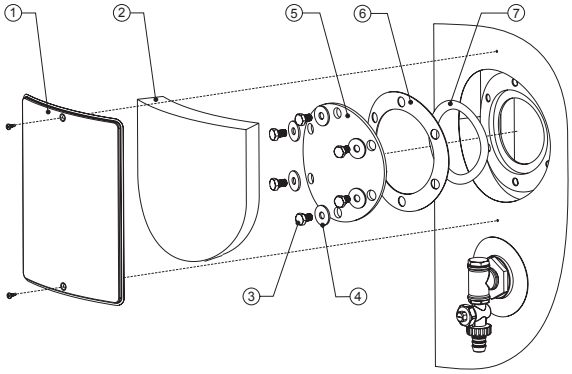


Figure 9.1 Cleaning opening

1. Remove the cover plate ❶ on the outer jacket. See Figure 9.1.
2. Carefully remove the insulation ❷ and set it to one side. This will be needed again later.
3. Undo the bolts.
4. Remove the lid, the gasket and the O-ring.
5. Inspect the tank and remove the loose scale deposits and contamination.
6. If the scale cannot be removed by hand, then the appliance will need to be descaled using a suitable cleaner.
7. Close the cleaning opening. To avoid damage to the tank, the bolts that fasten the lid should be tightened with a torque no greater than 50 Nm. Use suitable tools for this. To properly seal the cleaning opening, we recommend tightening the bolts in the sequence shown in Figure 9.2.

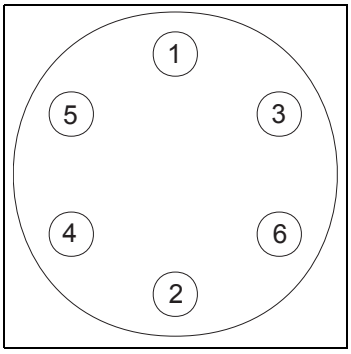


Figure 9.2 Bolt tightening sequence

9.4 Gas-side maintenance

9.4.1 Introduction

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

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

Take care
The burners may be hot.

9.4.2 Cleaning the burners

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

9.4.3 Cleaning the orifices

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

9.4.4 Checking the flue baffles

Take care
The flue baffles may be hot.

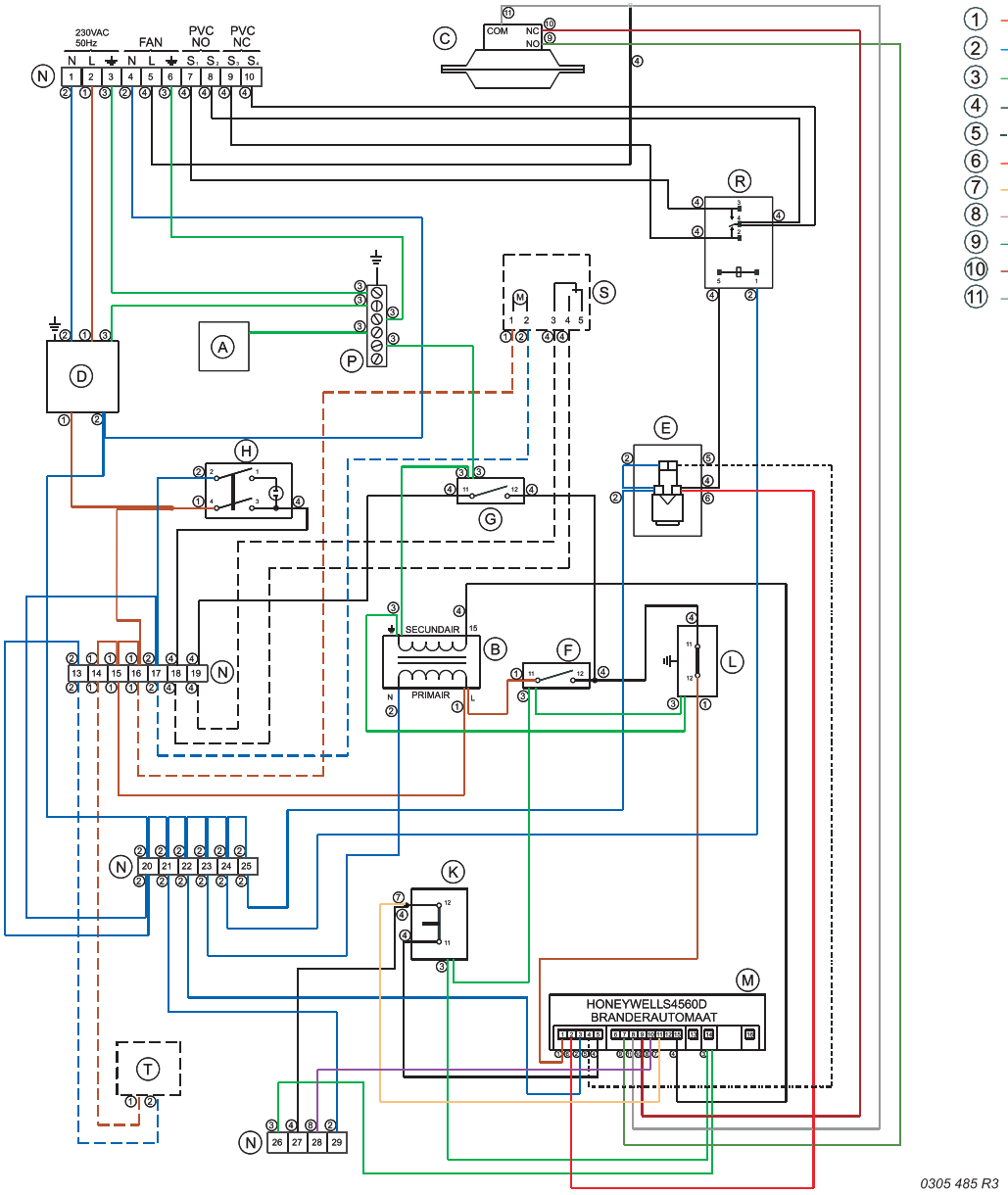
1. Complete steps 1 through 8 of paragraph 9.3.2 Checking the anodes.
2. Remove the flue baffles from the water heater.
3. Check the flue baffles for rust and remove any which is present.
4. Check the flue baffles for wear and replace any worn flue baffles.
5. Complete steps 12 through 15 of paragraph 9.3.2 Checking the anodes.

9.5 Finalising maintenance

To finalise the maintenance carry out the following steps:

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

A Electrical diagram DR-RS



1 Brown
2 Blue
3 Yellow / Green
4 Black
5 White
6 Red
7 White / Orange
8 White / Purple
9 Black / Green
10 Black / Red
11 Black / White

Legend

A Jacket
B Isolating transformer
C APDS (Air pressure differential switch)
D Filter
E Reset button
F Frost thermostat
G Control thermostat
H ON/ OFF switch
K Safety thermostat
L High-limit thermostat
M Burner control
N Connector clip strip
P Earthing strip
R Relay (Max. 250V, 10A)

OPTIONAL COMPONENTS:

S Clock
T Potentiostat

Figure A.1 Electrical diagram DR-RS