

Innovo

Condensing High Efficiency Water Heater

**IR 12-160/12-200/20-160/20-200/24-245/
24-285/32-245/32-285/32-380**

Installation, User and Service Manual





Data is subject to change

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Preface

Copyright

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A.O. Smith Water Products Company reserves the right to modify specifications in this manual.

Trademarks

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

Warranty

Refer to the appendix [Warranty](#) (see 13.6) for the warranty provisions.

Liability

User

A.O. Smith accepts no liability when the water heater is not used correctly and requires the user to:

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

Installation engineer

A.O. Smith accepts no liability when the water heater is not used correctly and requires the installation engineer to:

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

Supplier

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

A.O. Smith accepts no liability for claims from third parties when:

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

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

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

Compliance

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

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

Refer to the appendix Declaration of conformity (see 13.5).

Regulations

It is law that all gas appliances are installed by competent persons, in accordance with The Gas Safety (Installation and Use) Regulations 1998. 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 equipment **MUST** be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations and the bylaws of the local water undertaking.

In addition, the installation should follow the relevant guidance offered in the following documents. It is not practical to list all relevant information due to continuous changes but emphasis is placed on the following documents, as failure to comply with the guidance given will almost certainly result in an unsatisfactory installation:

- Institute of Gas Engineers and Managers (IGEM) Publications
- CIBSE Guides
- Clean Air Act
- H.S.E Guidance

If the Innovo water heater is to be used in an unvented system installation, the system should follow the guidance given in BS 6700, BS 8558 and must comply with the Building Regulations 1992: Part G3, in England and Wales, P5 in Northern Ireland and P3 in Scotland and the Water Supply (Water Fittings) Regulations 1999, The Water Supply (Water Quality) Regulations (Northern Ireland) 2017 and the Public Water Supplies (Scotland) Amendment Regulations 2017.

A kit of parts is available from A.O. Smith.



Note

Manufacturer's notes must not be taken in any way as overriding statutory obligations.

Contact information

If you have any comments or questions, please contact:

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In the event of problems with your gas, electricity or water supply connections, contact your (energy/water) supplier.

About this manual

Scope

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



Caution

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

The purpose of this manual is to:

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

This manual has two parts:

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

Target group

The information in this manual applies to three target groups:

- users
- installation engineers
- service and maintenance engineers

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

Notation conventions

This manual uses the following text conventions:

- Numbers between parentheses e.g. (1), refer to elements in a figure that are described by the text.
- Texts displayed on the user interface always are shown similar to the characters in the display, for example parameter *i2B* or *oFF*.
- Buttons are always shown between brackets, for example: [**Δ**], [**ENTER**], [**RESET**].
- Cross-references to sections, tables, figures etc. are underlined and written as (see section "..."). In the digital version, the cross-references function as hyperlinks that can be used to navigate through the manual by clicking on them. Example: Safety (see 2).

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



Note

A note gives more information on a topic.



Caution

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



Warning

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

Document identification

Article number	Language	Version
0312266	EN	5.2

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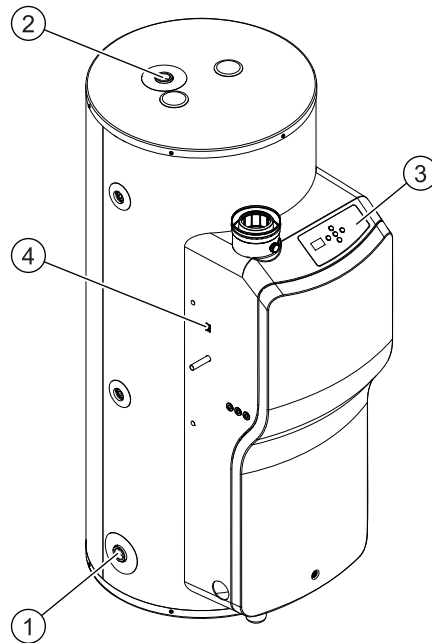
User part

1 Introduction

The Innovo water heater stores and heats water for sanitary purposes.

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

Fig. Innovo water heater



- 1. Water inlet
- 2. Water outlet
- 3. Operator interface
- 4. Control switch

2

Safety

A.O. Smith cannot be held responsible for damages or injuries which can be lead back to:

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

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



Warning

If you smell gas:

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



Caution

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

Caution

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

Caution

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

Caution

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



Note

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

3 Interface

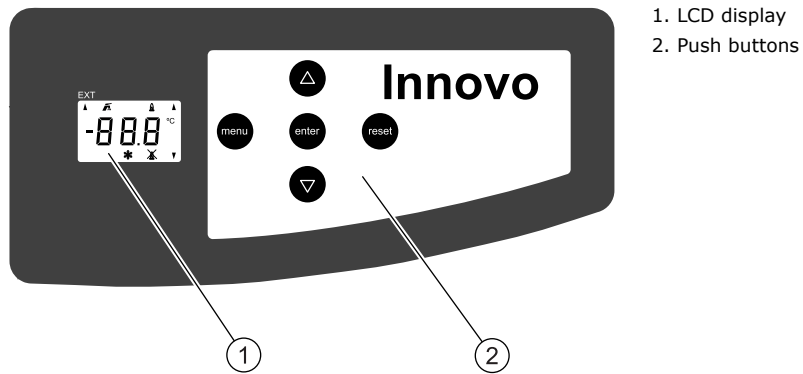
3.1 Operator interface

The operator interface consists of:

- a control switch (see 3.1.1) on the left side of the water heater
- 5 push buttons (see 3.1.2) to navigate through the menu
- a LCD-display (see 3.1.3) that shows settings, functions, values and errors.

The operator interface is parameter driven and enables the user to change parameters and to verify the status and history of the water heater.

Fig. Operator interface



3.1.1 Control Switch

With the control switch you can activate and deactivate the controller of the water heater.



Warning

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

When the control switch is set to **I**, the display first shows *In I* for some seconds. After that, the display shows *aFF*.

Fig. Display



3.1.2

Buttons

The 5 buttons on the operator panel give access to the menu of the water heater.

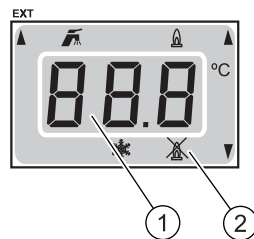
Button	Function
[Δ]	Scroll up / Raise
[▽]	Scroll down / Lower
[ENTER]	Enter / Confirm
[RESET]	Reset / Cancel
[MENU]	Go to menu

3.1.3

LCD display







The LCD display shows 7 different symbols around the outer edge of the display and 3 characters in the center of the display. The characters represent parameters.

Fig. LCD display



1. Characters
2. Symbols

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

Symbol	Explanation
	Heat demand present
	Water heater in operation
	Water heater not in operation - ERROR
	Frost protection is activated
	Scroll through menu Shown on the right side corners of the display
	External ON mode is activated Shown on the upper left side corner

The user menu parameters are:

Parameter	Description	Unit/Value	Adjustable	Range	Default
001	Turn the water heater on or off.	oFF oN	Yes	oFF - water heater off (OFF mode) oN - water heater on (ON mode)	oFF
002	Setpoint ON mode	°C	Yes	40...max setpoint (1)	65
003	Hysteresis	°C	Yes	2... 15	10
004	Turn setpoint EXT mode (005) on or off.	EnR d 15	Yes	EnR - Enable d 15 - Disable	d 15
005 (2)	Setpoint EXT mode	°C	Yes	40...max. setpoint (1)	70

1 - The maximal setpoint (parameter 207) is factory set at 70. A qualified engineer can modify this value.

2 - Parameter 005 will only be accessible when parameter 004 is set on EnR.

3.2 Status of the water heater

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

3.2.1 Operating modes

The Innovo has 3 operating modes:

- [OFF mode](#) (see 3.2.1.1)
- [ON mode](#) (see 3.2.1.2)
- [External ON mode \(EXT mode\)](#) (see 3.2.1.3)

3.2.1.1 OFF mode

Use parameter 001 to switch the water heater to **OFF mode**.

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

Fig. **OFF mode** display



Fig. Frost protection is activated



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

3.2.1.2 ON mode

Use parameter 001 to switch the water heater to **ON mode**.

In the **ON mode** the water heater continuously responds to the heat demand.

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

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

Fig. Actual water temperature



Fig. Setpoint



Fig. Standby



3.2.1.3 External ON mode

In the external **ON mode**, the water heater will respond to a heat demand when the relay switch is closed. Use parameter 004 to switch on the setpoint (parameter 005) of the external **ON mode**.

3.2.2

Error conditions

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

Fig. Error code display



Note

When the display shows an error code, try to reset the water heater. Contact your service and maintenance engineer or supplier when the water heater does not restart or when the display shows the error code again.

3.2.3

Service conditions

When the display shows *SrC* the water heater functions normally but requires periodical service. Contact your service and maintenance engineer.

Fig. Service required display



Note

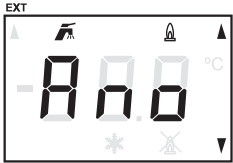
Regular maintenance extends the service life of the water heater.

3.2.4

Anode warning

An anode protects the tank against corrosion. When the anode protection is not active, the display shows *Ano*. Contact your service and maintenance engineer.

Fig. Anode warning display



Note

If you ignore the anode warning, the tank protection cannot be guaranteed. The warranty will be void.

4 Use

4.1 Set a parameter value

To set a parameter value:

1. Press **[MENU]** to access the user menu.
2. Press **[Δ]** or **[▽]** to scroll to the concerning parameter, refer to [Parameters](#) (see 3.1.3).
3. Press **[ENTER]** to select.
4. Use **[Δ]** or **[▽]** to change the parameter value.
 - a) Press **[ENTER]** to confirm.
 - b) Press **[RESET]** to go back to the main menu.
5. Press **[RESET]** to leave the user menu.

4.2 Turn on the water heater

To start the water heater:

1. Make sure the water heater connects to the mains power supply.
2. Set the control switch on the side of the water (see 1) heater to **I**.
The display will show *h i* for about 10 seconds.
3. When the display shows *oFF* the water heater is ready to use.

4.2.1 Switch to ON mode

To switch to **ON mode** (see 3.2.1.2), change parameter *00 i* to *oN*, refer to [Set a parameter value](#) (see 4.1).

4.2.2 Set the water temperature

To change the temperature setpoint:

- Adjust parameter *002*, refer to [Set a parameter value](#) (see 4.1), or
- Directly from **ON mode**:
 - a) Directly use **[Δ]** or **[▽]** to set the temperature value.
 - b) Press **[ENTER]** to confirm.

4.3 Turn off the water heater

4.3.1 Turn off for a short period

To turn off the water heater for less than 2 months, change parameter *00 i* to *oFF*, refer to [Set a parameter value](#) (see 4.1).

The water heater will switch to **OFF mode** (see 3.2.1.1) and the frost protection is on.



Caution

The anode protection remains active when the **OFF mode** is selected.



Note

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

4.3.2

Isolate from the mains

To isolate the water heater from the mains:

1. Set parameter `001` to `OFF`, refer to [Set a parameter value](#) (see 4.1).
2. Wait 1 minute to make sure that the water heater stopped operating.
3. Set the control switch to **0**.
4. Disconnect the water heater from the mains by turning the isolator.

4.3.3

Turn off for a long period

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

Installation, Maintenance and Service part

5 Introduction

5.1 About the water heater

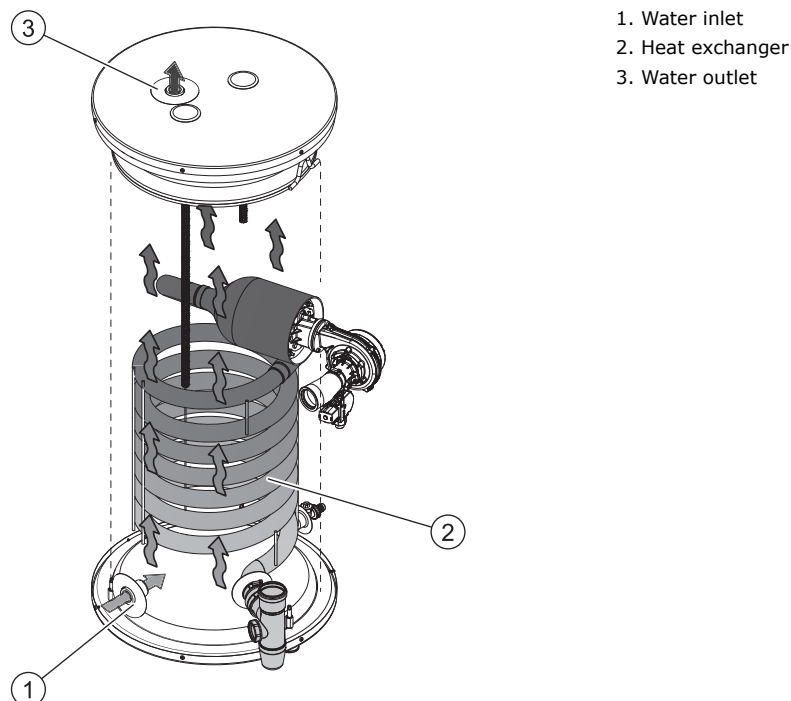
The Innovo water heater is intended for heating water for sanitary purposes.

The Innovo is a condensing gas-fired storage water heater with a fan in the air intake. The flue gasses transfer their heat to the water through an efficient heat exchanger. The water heater has a concentric venting connector and can function as an open or as a room-sealed water heater.

5.2 Working principle

Cold water enters the bottom of the tank through the water inlet (1). A heat exchanger (2) transfers the heat from the flue gasses to the water and the hot water leaves the tank through the water outlet (3) at the top of the tank. The tank of the water heater has to be completely filled during operation. The tank at least must remain under mains water supply pressure at any time. Fresh cold water is immediately added when hot water is drawn from the water heater. A temperature sensor measures the water temperature.

Fig. Innovo water heater



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

1. The controller detects a "heat demand". The icon "Heat demand present" is shown on the display of the water heater.
2. The fan starts pre-purging.
3. The air proving switch closes when the air pressure differential is sufficient.
4. The hot surface igniter starts pre-ignition.

5. The gas control valve opens and the gas/air mixture is ignited.
6. The water heater heats the water in the tank. The icon "Water heater in operation" is shown on the display of the water heater.
7. When the water temperature reaches the setpoint, the heat demand ends and the controller stops the operating cycle.
The icons "Heat demand present" and "Water heater in operation" on the display turn off.
8. The fan starts post-purging.

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

6

Safety

6.1

Safety instructions

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



Warning

Installation, maintenance and service must be carried out by a qualified engineer in compliance with the general and local regulations imposed by the gas, water and power supply companies and the fire brigade. The appliance may only be installed in a room that complies with the requirements stated in national and local ventilation [regulations](#) (on page 4).

Warning

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

**Caution**

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

Caution

Use of an incorrect roof or wall-mounted flue terminal can cause the water heater to malfunction.

Caution

During installation, obey the instructions delivered with the sets of air supply components and the flue gas discharge components. Make sure that the venting system does not exceed the maximum number of 45° and 90° bends and the maximum pipe length.

Caution

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

Caution

Make sure that the condensate drain is connected to the waste water discharge using an open connection.

Caution

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

Caution

After installation, maintenance or service, you must always check that the appliance is gas tight and make sure that the gas supply pressure, the CO₂ value and the air pressure differential are correct.

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

Caution

To prevent that you damage the components of the water heater, make sure that it is completely stopped operation before you turn off the water heater (see 4.3). Wait 1 minute after you switch the water heater to **OFF mode**, before you switch the control switch to **0**.

Caution

The anode protection remains active when the water heater is in **OFF mode** and the control switch is set to **0**.

**Note**

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

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









6.2**Instructions on the water heater**

The water heater has some safety instructions on its cover:

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

Also the packaging has some safety instructions:

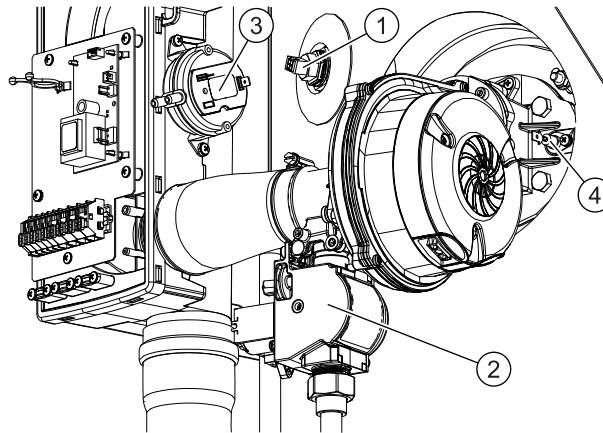
- The text "Read the installation instructions before installing the appliance".
- The text "Read the user instructions before putting the appliance into operation".
- The text "The appliance may only be installed in a room that meets the required ventilation regulations".
- Some safety pictograms:

	CE approved
	this way up
	fragile
	keep dry
	maximum stacking height is 1
	do not use a trolley
	do not use a clamp truck
	recycled packaging

6.3

Safety devices

Fig. Safety devices



1. Temperature sensor
2. Gas control valve
3. Air proving switch
4. Flame probe

Safety devices of the water heater:

Temperature sensor (1)	The water heater controls the water temperature using a temperature sensor: <ul style="list-style-type: none"> - $T < 5\text{ }^{\circ}\text{C}$, frost protection is activated. - $T > 90\text{ }^{\circ}\text{C}$, max. temperature. - $T > 97\text{ }^{\circ}\text{C}$, for extra safety.
Gas control valve (2)	The gas control valve controls the gas supply to the burner.
Air proving switch (3)	The air proving switch guarantees the air supply differential during pre-purging.
Flame probe (4)	The flame probe detects if there is a flame in the burner.

Safety devices of the installation:

Expansion vessel	The expansion vessel stores temporarily expansion water to keep the pressure in the installation at the right level.
Expansion valve	The expansion valve prevents excessive pressure in the tank of the water heater.
Pressure-reducing valve	The pressure-reducing valve reduces the water mains pressure, if necessary.
Temperature and pressure relief valve (T&P valve) (1)	The T&P valve prevents excessive pressure and temperature in the tank.

1 - All installations have a T&P valve connection. A T&P valve is mandatory for unvented installations.

Note

This manual only discusses unvented installations.



6.4 Environmental aspects

6.4.1 Recycling



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

6.4.2 Disposal



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

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

7

Water heater

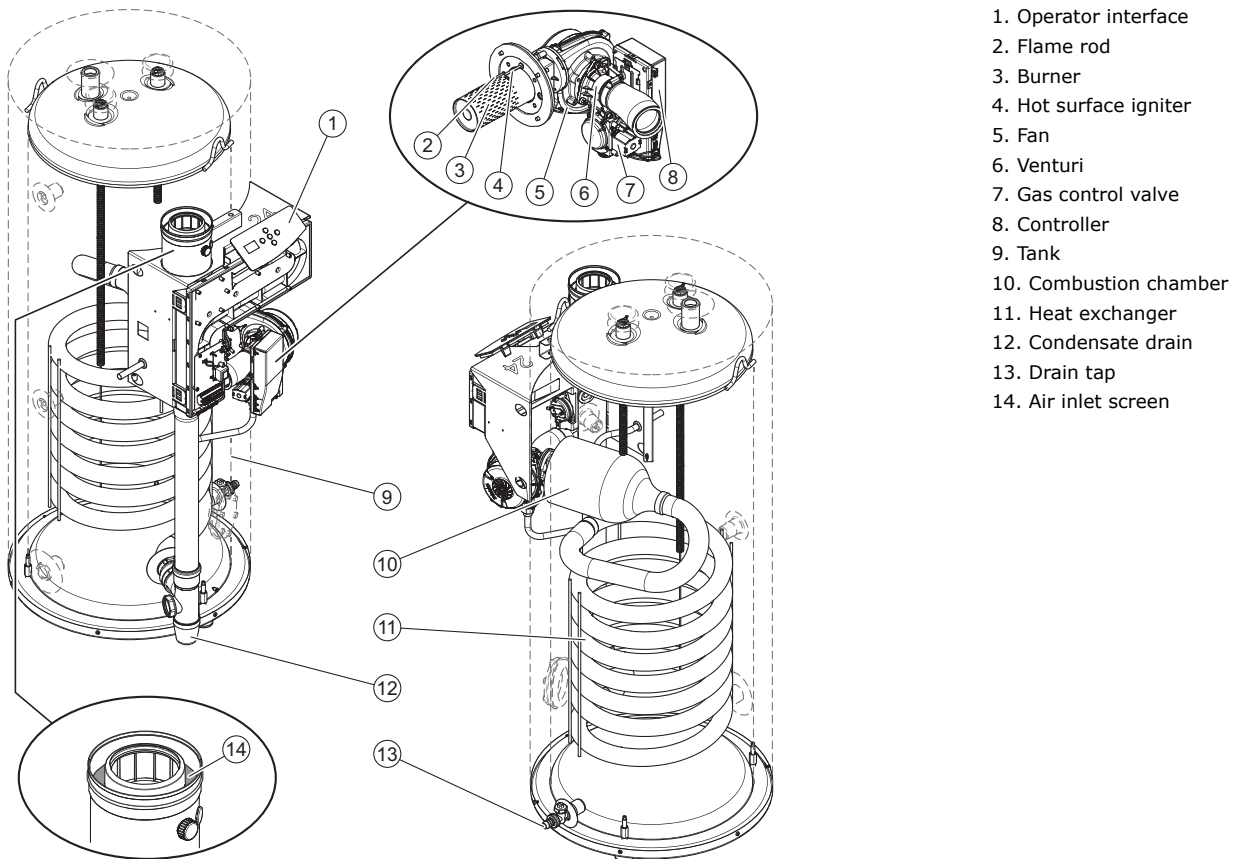
7.1

Structure of the water heater

The water heater has the following main components:

Controller (8)	The controller monitors and manages all internal processes of the water heater for a safe operation.
Operator interface (1)	To control the water heater and to verify the status, the operator interface has 5 buttons and a 3-character display. Refer to Operator interface (see 3.1).
Tank (9)	The water is stored and heated up in the tank.
Burner engine (2-8)	The burner engine ignites the air and gas mixture to heat up the water.

Fig. Components water heater



8 Installation



Warning

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



Caution

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

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

8.1 Packaging

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

8.2 Conditions

The water heater is suitable for room-sealed and for open combustion. For these types of combustion, you must comply with the local applicable directives and ventilation regulations.

8.2.1 Ambient conditions

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

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

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

8.2.2 Maximum floor load

Refer to the building construction engineer and the general specifications in the appendices (see 13) to make sure that the maximum floor load is sufficient for the weight of the water heater.

8.2.3

Water composition

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

Water composition	
Water hardness	> 1.00 mmol/l: - German hardness > 5.6° dH - French hardness > 10.0° fH - English hardness > 7.0° e - CaCO ₃ > 100 ppm
Conductivity	> 125 µS/cm
Acidity (pH value)	7.0 - 9.5



Note

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

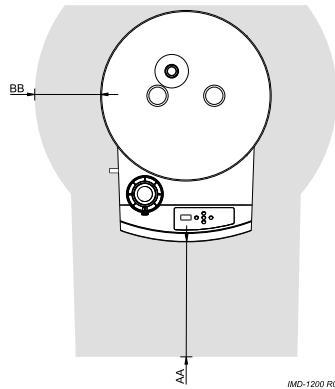
8.2.4

Working clearances

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

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

Fig. Working clearances



8.2.5

Level the water heater

Make sure that the water heater is level, before installation:

- Use a wrench to turn the nut (1) on the adjustable leg clockwise to move the water heater up.
- Use a wrench to turn the nut (1) on the adjustable leg anticlockwise to move the water heater down.

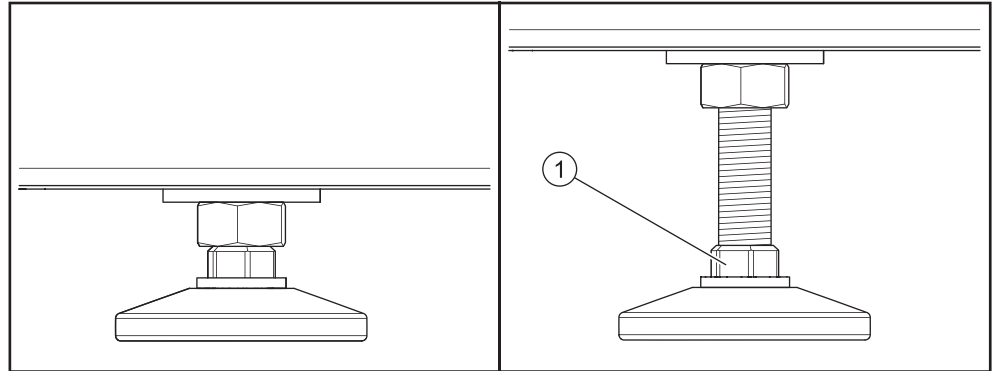
The water heater can move up maximal 20 mm.



Note

Make sure that the working clearance at the top of the water heater does not become smaller than 100 cm.

Fig. Adjustable leg water heater



8.3

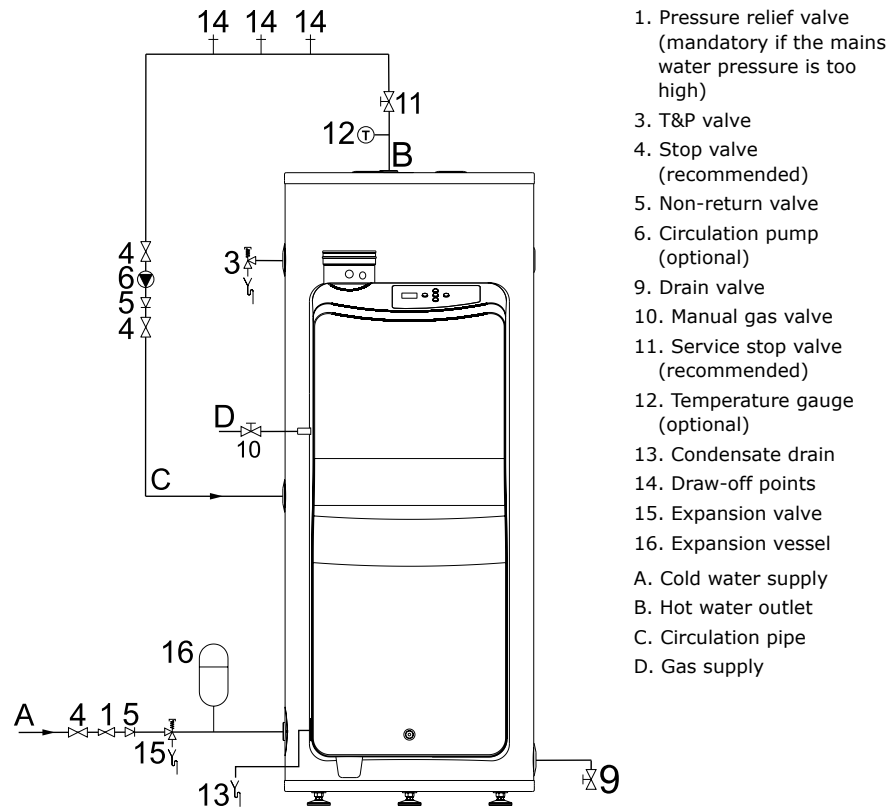
Installation diagram



Note

This manual only discusses unvented installations.

Fig. Installation diagram





Note

Use this installation diagram when you:

- install the water connections (see 8.4)
 - install the condensate drain (see 8.5)
 - install the gas connection (see 8.6)
 - fill the water heater (see 8.9.1)
 - drain the water heater (see 8.10.2)
-

8.4

Water connections

8.4.1

Cold water connection

Install the cold water connection:

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

8.4.2

Hot water connection



Note

Insulate long hot water pipes to prevent unnecessary energy loss.

Install the hot water connection:

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

8.4.3

Circulation connection

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



Note

Use the special connection for the circulation pipe on the water heater for a more efficient use of the water heater.

Note

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

Install a circulation pump:

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

8.5

Condensate drain

**Caution**

When the condensate drain is not connected to the waste water discharge by an open connection, this can cause faults.

Caution

Do not change the condensate drain or cause any blockage in the condensate drain.

Install the condensate drain:

1. Install a drain pipe to the condensate drain (13) for condensate drainage.
 2. Make sure that the slope of the drain pipe is 5 mm/m.
 3. Connect the drain pipe through an open connection to the waste water discharge.
-

**Note**

Always make sure that the condensate drain is filled with water after maintenance activities and before you turn on the water heater. The condensate drain must be filled with condensate/water at all times. This will prevent that the flue gasses go through the condensate drain and will ensure that the water heater functions correctly.

8.6

Gas connection

**Caution**

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

Caution

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

Caution

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

Install the gas connection:

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

8.7

Venting system

There are several alternatives for installation of the air inlet and flue gas outlet:

Installation type	Version	Description
B23	Open	Air for combustion is drawn from installation room and flue gas outlet via a horizontal wall or vertical roof terminal.
C13	Closed	Concentric and/or parallel venting system, with horizontal air inlet and flue gas outlet, in same pressure zone.
C33	Closed	Concentric and/or parallel venting system, with vertical air inlet and flue gas outlet, in same pressure zone.

Installation type	Version	Description
C43	Closed	Water heaters on common air inlet and flue gas outlet (concentric and/or parallel) in a multiple floor building.
C53	Closed	Separate air inlet and flue gas outlet terminal types mixed. Air inlet and flue gas outlet termination may be in different pressure zone.
C63	Closed	Water heaters supplied without venting materials. These water heaters must be installed in compliance with local regulations. The water heater is intended to be connected to a separately approved and marketed venting system.

This manual does not discuss installation type B23. When you need a B23 system, contact A.O. Smith for more information.



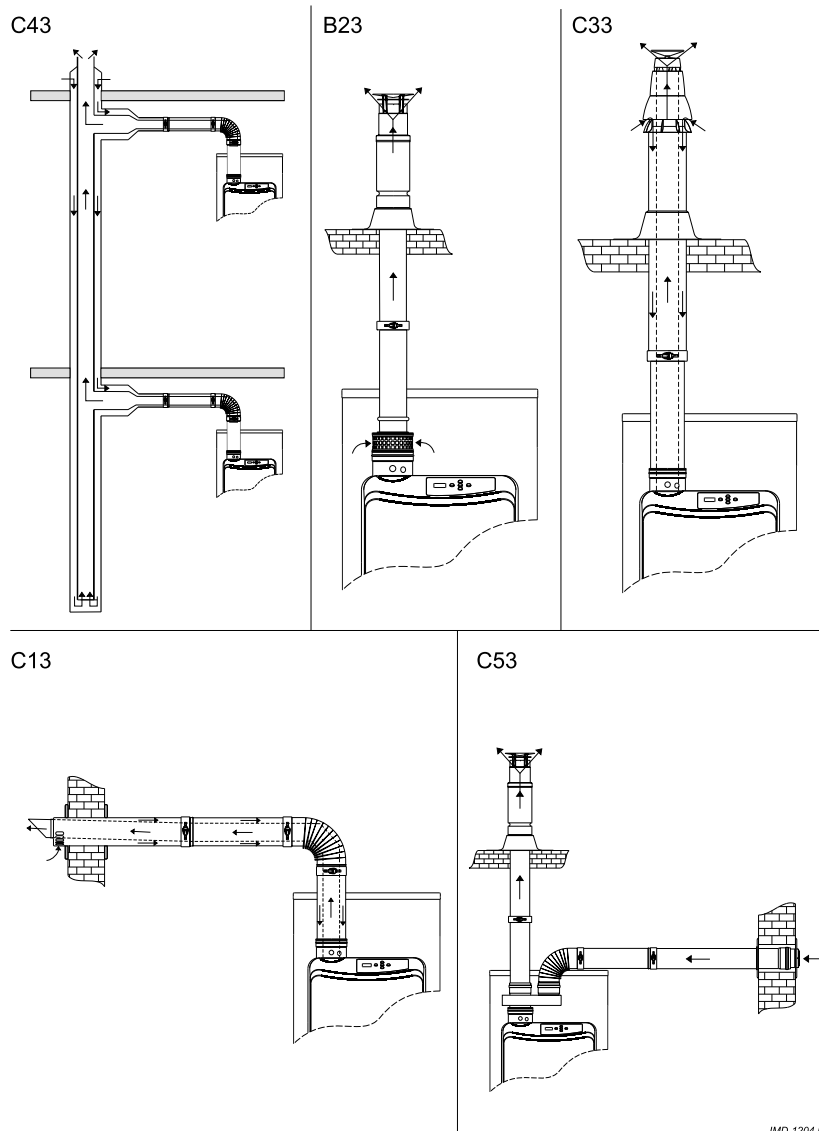
Caution

Always make sure that the venting system is mounted into an area suitable for the correct type of installation.

Caution

The use of a different wall or roof terminal can result in incorrect functioning of the water heater. Use the part number from the table to order a terminal set from your supplier or the manufacturer.

Fig. Venting systems



IMD-1204 R1

8.7.1

C13/C33 concentric systems

Use a wall terminal set or a roof terminal set to install a C13 or a C33 concentric venting system.

Description Concentric Venting material	Venting material PP	Venting material Alu
Manufacture venting material	Muelink & Grol	Muelink & Grol
Construction	Concentric	Concentric
Material flue gas outlet	PP - Temp. Class T120	Thick walled aluminum
Material air inlet	Thin walled galvanized steel	Thin walled galvanized steel

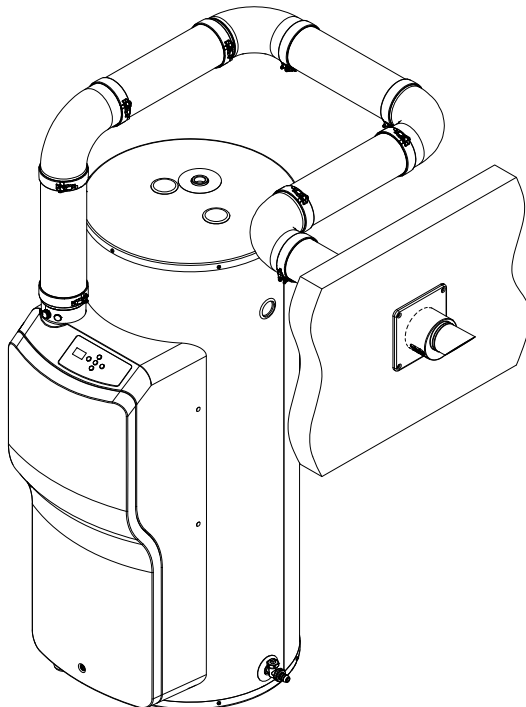
Diameter flue gas outlet	80 $+0,6/-0,6$ mm	80 $+0,3/-0,7$ mm
Diameter air inlet	124 $+0,5/-1$ mm (Dn 125)	124 $+0,5/-1$ mm (Dn 125)
Description parts	A.O. Smith Part number	A.O. Smith Part number
Wall terminal set A wall terminal (1), a 500 mm concentric pipe and a 90° bend	0310759	0302515
Wall terminal	0310757	0302516
Roof terminal set A roof terminal (2), a 1000 mm concentric pipe and a roof plate	0310755	0305042
Roof terminal	0310753	0304983
Concentric pipe 250 mm	0310740	-
Concentric pipe 500 mm	0310741	0302510
Concentric pipe 1000 mm	0310742	0311448
Concentric pipe 1500 mm	-	0311449
Concentric pipe 2000 mm	0310743	-
Concentric pipe telescopic (3)	0310744	-
Concentric pipe to cut	0310745	-
Concentric bend 45°	0310734	0302514
Concentric bend 90°	0310735	0302513

1 - supplied with wall flange and clamping ring

2 - supplied with clamping ring

3 - use this part to connect the air inlet and flue gas outlet to the water heater

Fig. Example concentric venting system



**Caution**

During installation, obey the instructions delivered with the sets of air supply components and the flue gas discharge components. Make sure that the venting system does not exceed the maximum number of 45° and 90° bends and the maximum pipe length.

Caution

Use a run-off of 50 mm per meter towards the water heater.

Refer to the table for the correct pipe dimensions of the C13 and C33 concentric systems.

Description	Unit	IR-12-160 to IR 20-200	IR 24-245 to IR 32-380
Diameter flue discharge/ air inlet	mm/mm	80/125	80/125
Maximum length	m	40	40
Maximum number of 45° and 90° bends	-	8	8

8.7.2**C13/C33 parallel systems**

Use a wall terminal set or a roof terminal set to install a C13 or a C33 parallel venting system.

Description Parallel Venting material	Venting material PP	Venting material Alu
Manufacture venting material	Muelink & Grol	Muelink & Grol
Construction	Parallel	Parallel
Material flue gas outlet	PP - Temp. Class T120	Thick walled aluminum
Material air inlet		
Diameter flue gas outlet	80 ^{+0,6} / _{-0,6} mm	80 ^{+0,3} / _{-0,7} mm
Diameter air inlet		
Description parts	A.O. Smith Part number	A.O. Smith Part number
Wall terminal set A wall terminal (1), an adapter, a 500 mm parallel pipe and a 90° bend	0310730	-
Wall terminal	0310708	0305016
Roof terminal set A roof terminal (2), an adapter, a 1000 mm parallel pipe and a roof plate	0310712	-
Roof terminal	0310728	0305041
Adapter box concentric to parallel - terminal side	-	0307177
Adapter box concentric to parallel - water heater side	0312209	0312209
Parallel pipe 250 mm	0310718	-
Parallel pipe 500 mm	0310719	0307179
Parallel pipe 1000 mm	0310720	0307180
Parallel pipe 1500 mm	-	0307181
Parallel pipe 2000 mm	0310721	-
Parallel pipe telescopic (3)	0310722	-

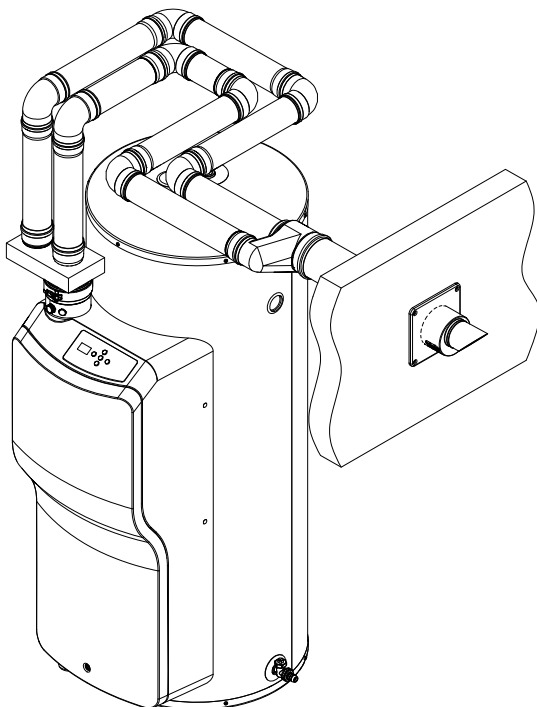
Description parts	A.O. Smith Part number	A.O. Smith Part number
Parallel bend 45°	0310701	0307182
Parallel bend 90°	0310702	0307183

1 - supplied with wall flange and clamping ring

2 - supplied with clamping ring

3 - use this part to connect the air inlet and flue gas outlet to the water heater

Fig. Example parallel venting system



Refer to the table for the correct pipe dimensions of the C13 or a C33 parallel venting systems.

Description	Unit	IR-12-160 to IR 20-200	IR 24-245 to IR 32-380
Diameter flue discharge/air inlet	mm/mm	80/80	80/80
Maximum length air inlet	m	50	75
Maximum length flue gas outlet	m	50	75
L _{equivalent} 45°-bend	m	1,1	1,1
L _{equivalent} 90°-bend	m	3,9	3,9



Caution

Always make sure the installation is in compliance with the requirements stated in this table.

Caution

Use a special adapter box to convert the concentric connection on the water heater to a parallel connection. This adapter box converts the 80/125 mm to two times 80 mm. This adapter (0312209) can be ordered at your supplier or wholesaler. The use of a different adapter box may cause the water heater to malfunction.

Calculate the maximum length of the air inlet and the flue gas outlet separately:

1. Sum the lengths of the different pipe sections without bends. Ignore the length of the adaptor box.
2. Sum the lengths of the bends. Ignore the bend in the adapter box:
 - Sum $L_{\text{equivalent}}$ for each 45° bend.
 - Sum $L_{\text{equivalent}}$ for each 90° bend.
3. Sum the lengths of the pipe sections and the lengths of the bends to calculate the overall length of the air inlet and the flue gas outlet.
4. Adjust the length of the air inlet and/or the flue gas outlet when the overall length exceeds the maximum length as stated in the table.

8.7.3

C43/C53/C63 systems

The length of the air inlet and flue gas outlet is the same for C43, C53 and C63 systems as for C13 and C33 systems:

- Refer to [C13/C33 concentric systems](#) (see 8.7.1) for the maximum pipe lengths of concentric systems.
- Refer to [C13/C33 parallel systems](#) (see 8.7.2) for the maximum pipe lengths of parallel systems and non-concentric systems.



Note

Only use a C43 venting system when the common duct is a natural draught chimney. The common duct is part of the building, not a part of the system.

Note

In a C53 venting system the flue gas terminal must be CE approved and must comply to the EN 1856-1 requirements.

Note

Connect a C63 venting system to a separately approved and marketed system for the supply of combustion air and discharge of flue gasses.

The flue gas terminal must comply to the EN 1856-1 requirements. The maximum allowable recirculation rate is 10% under wind conditions.

Contact A.O. Smith for more information and/or part numbers of the C43, C53 and C63 venting systems.

Concentric systems

Refer to the table for the correct pipe dimensions of the C43, C53 and C63 concentric systems.

Description	Venting material PP	Venting material Alu
Manufacture venting material	Muelink & Grol	Muelink & Grol
Construction	Concentric	Concentric
Material flue gas outlet	PP - Temp. Class T120	Thick walled aluminum
Material air inlet	Thin walled galvanized steel	Thin walled galvanized steel
Diameter flue gas outlet	80 $+0,6/-0,6$ mm	80 $+0,3/-0,7$ mm
Diameter air inlet	124 $+0,5/-1$ mm (Dn 125)	124 $+0,5/-1$ mm (Dn 125)

Refer to [C13/C33 concentric systems](#) (see 8.7.1) for the A.O. Smith part numbers. The same parts can be used for the C43, C53 and C63 concentric systems.

Parallel and non-concentric systems

Refer to the table for the correct pipe dimensions of the C43, C53 and C63 parallel systems.

Description	Venting material PP	Venting material Alu
Manufacture venting material	Muelink & Grol	Muelink & Grol
Construction	Parallel	Parallel
Material flue gas outlet	PP - Temp. Class T120	Thick walled aluminum
Material air inlet		
Diameter flue gas outlet	80 ^{+0,6} / _{-0,6} mm	80 ^{+0,3} / _{-0,7} mm
Diameter air inlet		

Refer to [C13/C33 parallel systems](#) (see 8.7.2) for the A.O. Smith part numbers. The same parts can be used for the C43, C53 and C63 parallel systems.

Use the "adapter box concentric to parallel - water heater side" (part number 0312209) for C63 parallel systems.

8.8

Electrical connections



Warning

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



Caution

The water heater is phase-sensitive. It is absolutely essential to connect the mains live (L) to the live of the water heater and the mains neutral (N) to the neutral of the water heater. The water heater can handle a potential difference between live (L) and neutral (N), but the potential difference between live (L) and earth has its restrictions, refer to [displayed errors](#) (see 12.1.2), error *F 19*.

8.8.1

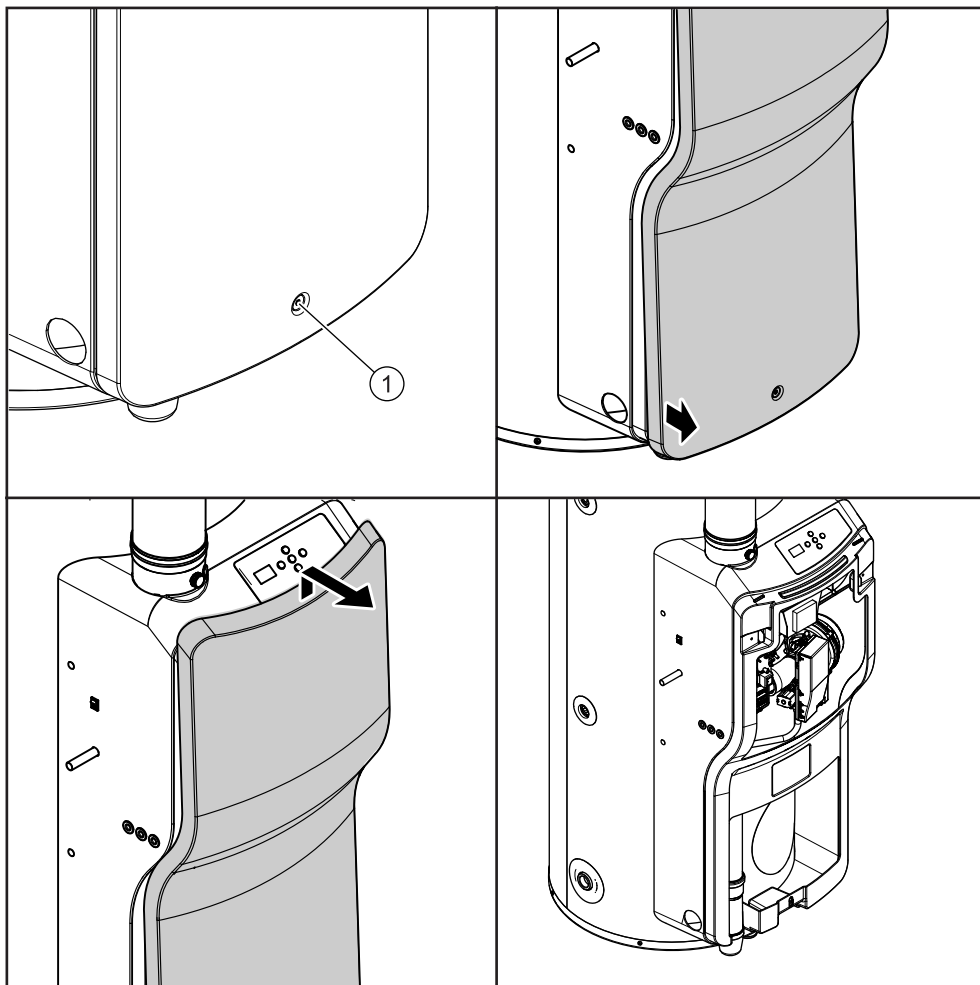
Preparation

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

1. Use a hex driver to remove the screw (1) at the cover.

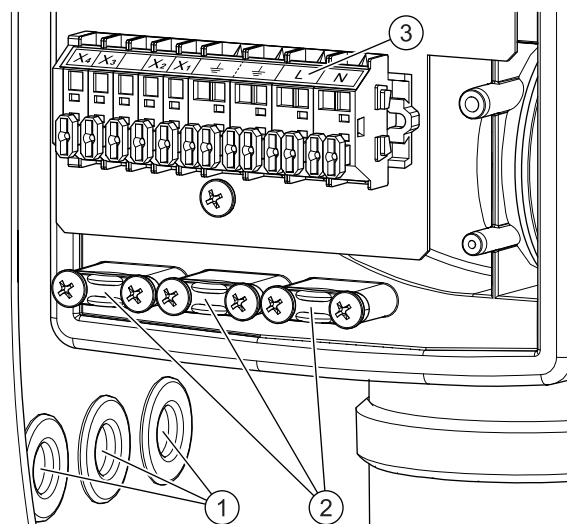
2. Hold the cover at the sides.
3. Move the cover to the front and lift it from the water heater.

Fig. Remove the cover



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

Fig. Terminal block



1. Tulles
2. Pull relieves
3. Connections

8.8.2

Mains power



Note

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

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

Connect the water heater to the mains power supply:

1. Pull the power cable through the tulle.
2. Connect the mains neutral core to N, the mains live core to L and the mains earth core to \perp .
3. Install the power cable in the pull relief under the electrical section.
4. Connect the power cable to the double pole isolator.

8.8.3

Optional electrical connections

Optionally, it is possible to:

- Connect an isolating transformer (see 8.8.3.1).
- Connect an external ON mode switch (see 3.2.1.3).
- Connect an additional error signal to the water heater.

8.8.3.1 Isolating transformer

For more information about an isolating transformer, or to order an isolating transformer, please contact A.O. Smith.

8.8.3.2 External ON mode switch

Install an external ON mode switch:

1. Pull the cables through the tulle.
2. Connect the cables to X3 and X4.
3. Install the cables in a pull relief under the electrical section.
4. Set the appropriate settings in the interface.



Note

Use parameter 002 or 005 to set the **ON mode** setpoint. The parameter to be used depends on the value of parameter 004, refer to the table below.

Control switch	ON mode/ OFF mode (parameter 001)	External ON mode switch	Setpoint EXT mode (parameter 004)	Result
Position 0 (OFF)	-	-	-	No functionality (Anode protection active)
Position I (ON)	OFF mode	Open	-	Frost protection
		Closed	Disabled (d #5)	EXT mode (set setpoint with parameter 002)
			Enabled (EnR)	EXT mode (set setpoint with parameter 005)
	ON mode	Open	-	ON mode (set setpoint with parameter 002)
		Closed	Disabled (d #5)	EXT mode (set setpoint with parameter 002)
			Enabled (EnR)	EXT mode (set setpoint with parameter 005)

8.8.3.3 Additional error signal



Note

The water heater has a relay contact that can be used when an error occurs. The relay contact is potential-free (maximal 5 A).

Note

There is a 1 minute delay between the switching of the relay contact and the error message on the display.

Install an additional error signal:

1. Pull the power cable through the tulle.
2. Connect the cables to X1 and X2.
3. Install the cables in a pull relief under the electrical section.

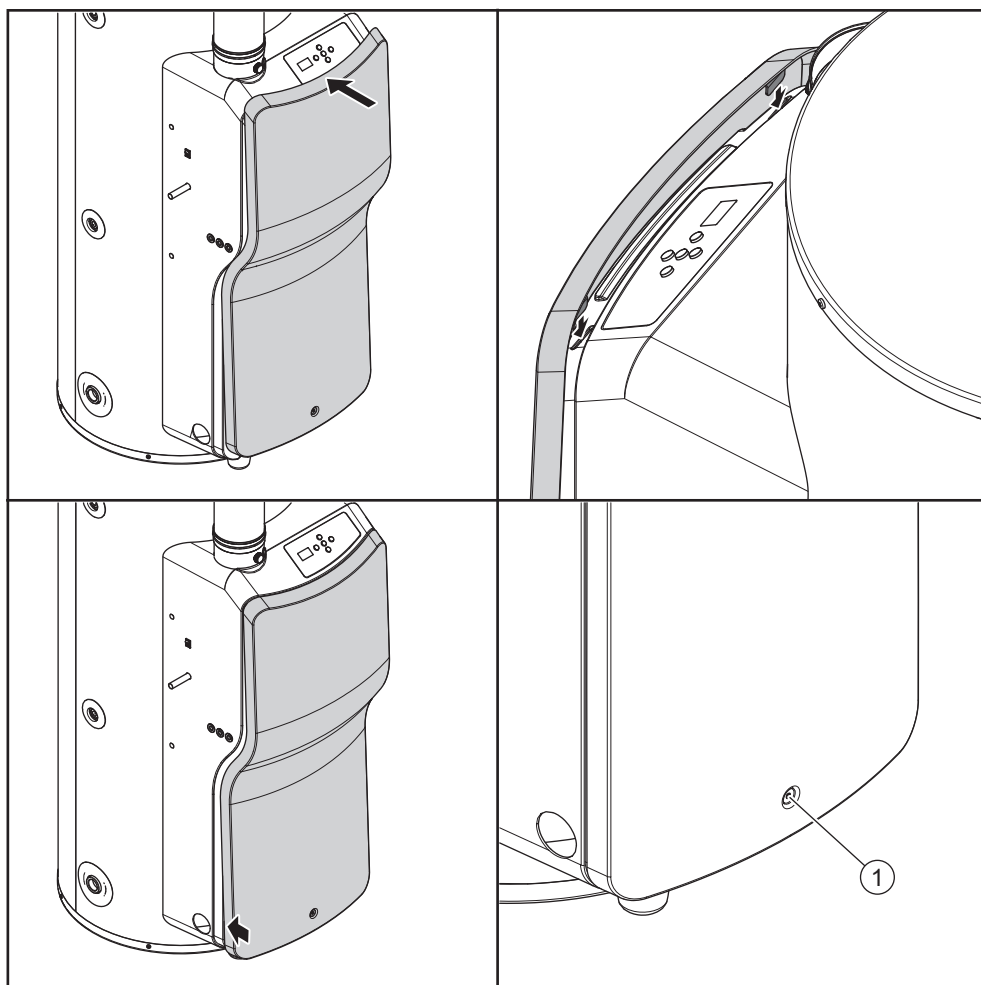
8.8.4

Finalization

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

1. Place the cover on the water heater.
2. Use a hex driver to tighten the screw at the front of the cover.

Fig. Install the cover



8.9

Commissioning

To commission the water heater:

1. Fill the water heater (see 8.9.1)
2. Check the air pressure differential (see 8.9.2)
3. Check the gas supply pressure (see 8.9.3)
4. Check the CO₂ value (see 8.9.4)
5. Turn on the water heater (see 8.9.5)

8.9.1

Filling

Refer to the installation diagram (see 8.3) when you fill the water heater:

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

8.9.2

Air pressure differential

Check the air pressure differential across the air pressure switch:

1. Disconnect hose **H** of the air proving switch and connect this side of the hose to the **+** of the pressure gauge.
2. Disconnect hose **L** of the air pressure switch and connect this side of the hose to the **-** of the pressure gauge.
3. Turn the water heater on and set the water heater in **OFF mode**, refer to Turn on the water heater (see 4.2).



Note

Make sure that the water heater is not in **ON mode** or in External ON mode.

4. Set parameter ΔP to FR_n , refer to Settings (see 10).
5. Read the pressure value from the meter.
6. Compare the measured value to the value from the table.



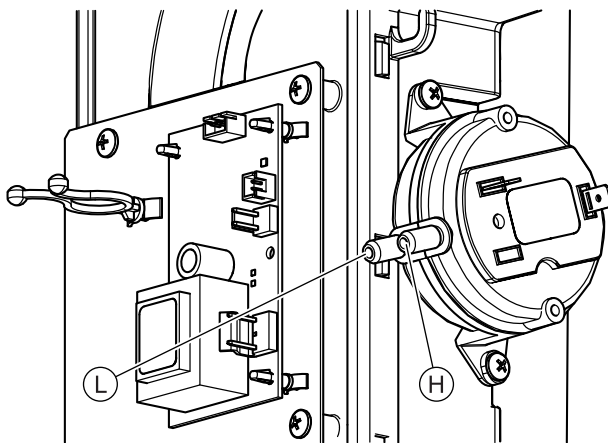
Note

When the air pressure differential is not correct, refer to Displayed errors (see 12.1.2), error $F03$.

7. Set parameter ΔP to $d15$, refer to Settings (see 10).
8. Press **[RESET]**. The water heater goes into **OFF mode**.
9. Set the control switch on the side of the water heater to **0** to turn off the water heater.

10. Disconnect the pressure gauge.
11. Reconnect the hoses of the air proving switch and the gas valve.

Fig. Air pressure differential



8.9.3

Gas supply pressure

Check the gas supply pressure:

1. Loosen the sealing screw (4) of the test nipple by a few turns.



Note

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

2. Open the gas supply to vent the gas pipes through the test nipple.
3. Connect a pressure gauge to the test nipple as soon as you smell gas.
4. Turn on the water heater (see 4.2).
5. Set parameter ΔT to h , refer to Settings (see 10).
6. If necessary, create a heat demand:
 - Use a hot water draw-off point to tap water, or
 - Raise the setpoint of the water temperature, refer to Set the water temperature (see 4.2.2).
7. Wait about 1 minute.
8. Use the pressure gauge to read the supply pressure and compare it with the value from the appendix Gas details.



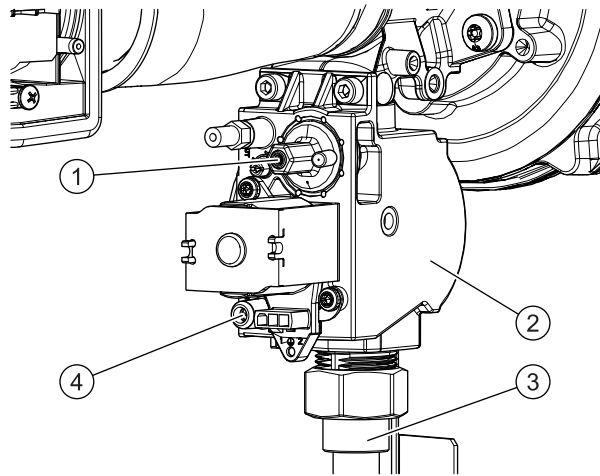
Note

Consult the mains gas supply company if the supply pressure is not correct. Take the water heater out of service until the supply pressure is correct, refer to section Decommissioning (see 8.10).

9. Set parameter ΔT to d , refer to Settings (see 10).
10. Press **[RESET]**. The water heater goes into **OFF mode**.
11. Set the control switch on the side of the water heater to **0** to turn off the water heater.
12. Shut off the gas supply.

13. Disconnect the pressure gauge.
14. Tighten the sealing screw in the test nipple.

Fig. Gas supply pressure



1. Adjuster screw
2. Gas control valve
3. Gas supply pipe
4. Sealing screw

8.9.4

CO₂ value

Check the CO₂ value:

1. Open the gas supply.
2. Remove the cap (1) from the test nipple (2) of the flue gas outlet pipe.
3. Place the measurement probe of the CO₂ meter in the test nipple of the flue gas outlet pipe.
4. Turn on the water heater, refer to [Turn on the water heater](#) (see 4.2).
5. Set parameter ΔT to h , refer to [Settings](#) (see 10).
6. If necessary, create a heat demand:
 - Use a hot water draw-off point to tap water, or
 - Raise the setpoint of the water temperature, refer to [Set the water temperature](#) (see 4.2.2).
7. Wait until the measured value on the CO₂ meter remains stable for some time. This can take several minutes.
8. Compare the full load measured value to the value from the appendix Gas details. The CO₂ value at full load must be within ± 1.0 vol% of the CO₂ value stated in the table.



Caution

When the CO₂ value is not correct, refer to [General errors](#) (see 12.1.1), CO₂ value (at full load) is not correct.

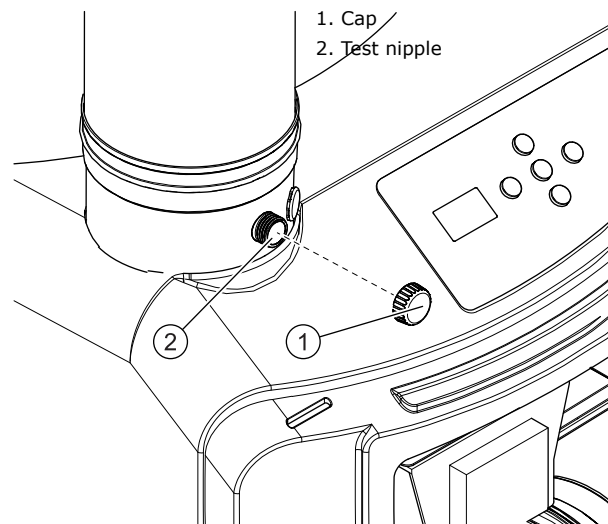
Do not use the water heater when the CO₂ value is not correct and this is not caused by the restrictor, venturi, venting system or gas category:

- Switch off the appliance.
- Turn off the gas supply.
- Put the cover back on the water heater.
- Contact your supplier.

9. Set parameter ΔT to L_0 , refer to section [Settings](#) (see 10).
10. Wait until the measured value on the CO₂ meter remains stable for some time. This can take several minutes.
11. Compare the measured value to the value measured under full load. The CO₂ value at partial load must be within ± 0.3 vol% of the CO₂ value measured under full load.
12. If necessary, use a hex driver to adjust the adjuster screw until the CO₂ value is correct.
 - a) Turn the screw clockwise for a higher CO₂ value.
 - b) Turn the screw anticlockwise for a lower CO₂ value.

13. If applicable, set the temperature value back to the original value (parameter 002).
14. Set parameter 201 to 45, refer to [Settings](#) (see 10).
15. Press **[RESET]**. The water heater goes into **OFF mode**.
16. Set the control switch on the side of the water heater to **0** to turn off the water heater.
17. Remove the measurement probe of the CO₂ meter from the test nipple and place the cap (1) back on the nipple (2).
18. Shut off the gas supply.

Fig. CO₂ value



8.9.5 Turn on the water heater

Refer to the procedure in the user part to [Turn on the water heater](#) (see 4.2).

8.10 Decommissioning

To decommission the water heater:

1. [Turn off the water heater](#) (see 8.10.1)
2. [Drain the water heater](#) (see 8.10.2)

8.10.1 Turn off the water heater

Refer to the procedure in the user part to [Turn off the water heater](#) (see 4.3) and isolate the water heater from the mains power supply.

8.10.2 Draining

Refer to the [installation diagram](#) (see 8.3) when you drain the water heater:

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

9

Conversion of gas type



Caution

Conversion of the water heater may only be carried out by a qualified person.

Use a special conversion kit to convert the water heater when:

- The water heater has to operate on a different family of gases (liquid petroleum gas or natural gas).
- The water heater has to operate on a gas category other than that for which the water heater has been configured at the factory.

You can order the conversion kit you need from the supplier of your water heater. The conversion kit contains all the parts needed to do the conversion and a description of how to do the conversion.

The following conversions are possible:

- Conversion from natural gas to LPG.
- Conversion from LPG to natural gas.
- Conversion from natural gas to natural gas.



Caution

After the conversion, make sure that the water heater is gas-tight. Make sure that the supply pressure, the gas control valve pressure, the CO₂ value and the switching pressure have the correct value.

10 Settings

10.1 Operator interface

The operator interface is parameter driven and enables the user to change parameters and to verify the status and history of the water heater.

When you press **[MENU]** once, parameters 001 to 102 can be accessed. All other parameters can be accessed when you press **[MENU]** for 10 seconds.

For more information about how to use the operator interface, refer to [Operator interface](#) (see 3.1) and [Set a parameter value](#) (see 4.1).

10.2 Parameters

Parameter	Description	Unit/Value	Adjustable	Range	Default
001	Turn the water heater on or off.	oFF oN	Yes	oFF - water heater off (OFF mode) oN - water heater on (ON mode)	oFF
002	Setpoint ON-mode	°C	Yes	40...max setpoint (1)	65
003	Hysteresis	°C	Yes	2...15	10
004	Turn setpoint EXT-mode (005) on or off.	EnR d15	Yes	EnR - Enable d15 - Disable	d15
005 (2)	Setpoint EXT-mode 2	°C (2)	Yes	40...max. setpoint (1)	70
101/ 102	Actual water temperature	°C	No	0...99	-
109	Actual Ionisation signal	µA	No	0...15	-
112	Status EXT contact	oPE cLo	No	oPE - EXT contact open cLo - EXT contact closed	-
113	Status air proving switch	oPE cLo	No	oPE - air proving switch open cLo - air proving switch closed	-
115	Actual fan speed	x10 rpm	No	0...990	-

Parameter	Description	Unit/Value	Adjustable	Range	Default
116	Status burner	Initialization Reset Stand-by Pre-purge (1) Pre-Purge (2) Pre-Ignition Ignition Flame check Burn Post-Burn Post-Purge (1) Post-Purge (2) Blocking Lockout Warning Burner Boot	No	0 - Initialization 1 - Reset 2 - Stand-by 3 - Pre-purge (part 1) 4 - Pre-Purge (part 2) 5 - Pre Ignition 6 - Ignition 7 - Flame check 8 - Burn 9 - Post Burn 10 - Post Purge (part 1) 11 - Post Purge (part 2) 12 - Blocking 13 - Lockout 14 - Warning 15 - Burner Boot	-
117	Actual error number	#	No	002...513 --- - no error	-
120	Time left till service reminder appears on display	Months Days	No	≥ 1 Month = 01 - 36 < 1 Month = 01d - 31d	12
201	Test cycle	d15 FRn Lo IGN h1 rEG	Yes	d15 - leave test cycle FRn - pre-purge on ignition speed Lo - burn on partial load IGN - burn on ignition speed h1 - burn on full load rEG - t.b.d.	
202	Turn the power anode warning on or off.	oFF oN	Yes	oFF - power anodes deactivated oN - power anodes activated	oN
203	Minimum fan speed	×10 rpm	No	0...990	-
204	Ignition fan speed	×10 rpm	No	0...990	-
205	Maximum fan speed	×10 rpm	No	0...990	-
207	Maximum setpoint	°C	Yes	40...85	70
208	Minimum load	%	Yes	0...50 0 and 1 = minimum load 50 = 50% between minimum load and maximum load	0
209	Anti legionella setpoint	°C	Yes	40...DHW max. (par. 207)	65
210	Anti legionella on or off	oFF oN	Yes	oFF anti legionella deactivated oN anti legionella activated	oFF
211	Service reminder	oFF oN r5t	Yes	oFF - service reminder off oN - service reminder on r5t - reset service reminder	oN
212	Setting service interval	Months	Yes	0...36	12

Parameter	Description	Unit/Value	Adjustable	Range	Default
270	Last lock-out error	#	No	002...514 --- - no error	-
271	Interval between last lock-out and read-out.	Minutes Hours Days Weeks	No	00n...59n = 0 till 59 minutes 0 h...23h = 1 till 23 hours 0 d...06d = 1 till 6 days 0 i...63 = 1 till 63 weeks	-
272	Last blocking error	#	No	002...514 --- - no error	-
273	Interval between last blocking error and read-out.	Minutes Hours Days Weeks	No	00n...59n = 0 till 59 minutes 0 h...23h = 1 till 23 hours 0 d...06d = 1 till 6 days 0 i...63 = 1 till 63 weeks	-
274	Number of flame failures	#	No	0...990	-
275	Number of successful ignitions	×100	No	0...990	-
276	Number of failed ignitions	#	No	0...990	-
277	Total of actual days that control is active	×10 days	No	0...990	-
278	Total of actual burning days	×10 days	No	0...990	-
281	Selection code	#	No	0...990	-

1 - The maximal setpoint (parameter 207) is factory set at 70. A qualified engineer can modify this value.

2 - Parameter 005 will only be accessible when parameter 004 is set on *EnR*.



Note

When parameter 202 is set to *oFF*, the anode warning *RnD* will not be shown on the display. Also when there is a problem with the anode protection, this warning will not be shown. The tank protection cannot be guaranteed. The warranty will be void.

10.3

Hysteresis

The water heater does not start immediately when the water temperature is below the temperature setpoint. To prevent that the water heater switches on and off too often, there is a margin; the hysteresis.

The standard hysteresis is 10 °C. Thus, the water heater starts to heat up when the water temperature is 10 °C below the temperature setpoint. Use parameter 003 to change the hysteresis.

10.4 Error history

The control unit automatically stores data of occurred errors and failed actions of the water heater. The error history can be used to analyse the water heater and to find the causes of the errors and failed actions.

Use parameters 270 till 273 to read the errors. Use parameters 274 till 277 to read the appliance history, refer to [Parameters](#) (see 10.2).

10.5 Test cycle

The test cycle can be used to activate the test modes. These test modes can, for example, be used to set the CO2 value at full and at partial load or to check the air pressure differential.

Use parameter 201 to activate the test cycle.

The test cycle is shown on the display. Each test setting can be recognized by the first letter on the display.

Fig. Example h i-setting test cycle



Fig. Example L0-setting test cycle



10.6 Legionella prevention

Use parameter 210 to activate the legionella prevention. When the anti legionella program is activated, the water heater heats the water to the anti legionella setpoint. When the anti legionella setpoint is reached, the temperature may not decrease more than 3 °C below the anti legionella setpoint for 60 minutes. The anti legionella setpoint can be set with parameter 209.

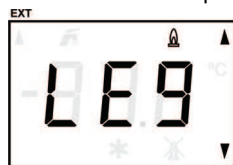
The anti legionella program has 2 functionalities:

- "start-up" functionality: The anti legionella program starts when the water temperature did not exceed the anti legionella setpoint within 2 hours after the water heater is turned on.
- "normal" functionality: The anti legionella program starts when the water temperature did not exceed the anti legionella setpoint for 7 days (168 hours).



Note

When you activate the anti legionella program, parameter 002 (setpoint ON mode) will be overruled. The display will show the text LEG when the anti legionella mode is activated.



Note

When the water heater is heating the water, the current water temperature and the anti legionella setpoint is shown alternately on the display.

11

Maintenance

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

On the operator interface, the maintenance interval can be set as a reminder. The display shows $5rc$ when the pre-set interval has elapsed.

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



Note

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

Note

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

Do the following maintenance activities:

- [Performance check](#) (see 11.1)
 - [Water side maintenance](#) (see 11.3)
 - [Gas side maintenance](#) (see 11.4)
 - [Finalization](#) (see 11.5).
-

**Note**

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

11.1

Performance check

Check if the performance of all components is correct:

1. Make sure that the water heater operates the operating cycle correctly.
 2. Make sure that the color of the flame is blue.
 3. If applicable, make sure that the T&P valve operates correctly.
Open the T&P valve pressure relief and make sure that water spurt out.
-

**Warning**

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

4. Make sure the pressure relief connection of the inlet security group operates correctly.
Open this pressure relief and make sure that water spurt out.
5. Remove the cover from the water heater, refer to [Installation](#) (see 8.8.1).
6. Make sure that the condensate drain operates correctly.
If necessary, remove any contamination.
7. Make sure that there are no leaks in the venting system.
8. Make sure the air pressure differential is correct, refer to [Air pressure differential](#) (see 8.9.2).

9. Make sure the gas supply pressure is correct, refer to Gas supply pressure (see 8.9.3).
10. Make sure the CO₂ value is correct, refer to CO₂ value (see 8.9.4).

11.2 Preparation

Isolate the water heater from the mains (see 4.3.2) before you start maintenance tasks.

11.3 Water-side maintenance

To do water side maintenance:

- Descale the tank (see 11.3.1)
- Clean the condensate drain (see 11.3.2)

11.3.1 Descale the tank



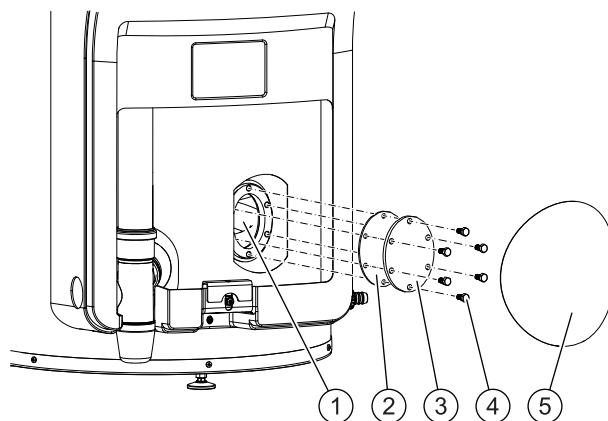
Note

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

To descale and clean the tank:

1. Decommission the water heater (see 8.10).
2. Remove the cover plate (5) on the bottom of the front of the tank.
3. Remove the isolating material to see the cleaning opening.
4. Loosen the 6 bolts (4).
5. Remove the cleaning opening cover (3).
6. Remove the gasket (2).
7. Inspect the tank and remove the loose scale deposits and contamination:
 - a) Remove the scale and contamination by hand.
 - b) If necessary use a descaling agent to remove the scale and contamination. Contact the supplier of your water heater for advice on what descaling agent to use.
8. Replace the gasket.
9. Close the cleaning opening.
Use a torque wrench to tighten the bolts with a maximal torque of 50 Nm to prevent damage to the tank
10. Fill the water heater (see 8.9.1).

Fig. Cleaning opening



1. Cleaning opening
2. Gasket
3. Cleaning opening cover
4. Bolts
5. Magnetic cover plate

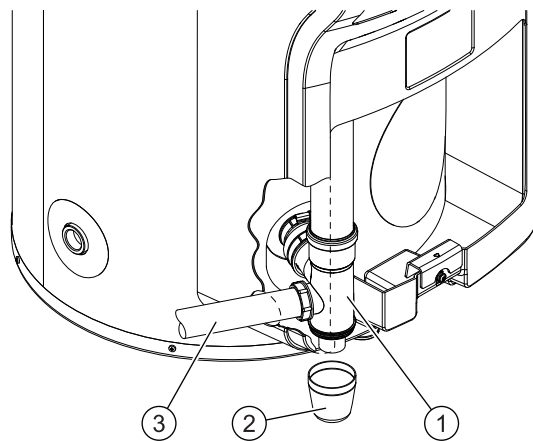
11.3.2

Clean the condensate drain

To clean the condensate drain:

1. Place a tray or towels under the condensate drain to collect water leakage.
2. Remove the condense trap at the bottom of the condensate drain.
3. Empty the condense trap and clean it with water.
4. Make sure that there is no grit or other blockages in the condense trap.
5. Make sure that there is no grit or other blockages in the condensate drain.
6. Make sure that there is no grit or other blockages in the drain pipe.
7. Make sure that the slope of the drain pipe is correct; 5 mm/m.
8. Install the condense trap onto the condensate drain.

Fig. Condensate drain



1. Condensate drain
2. Condense trap
3. Drain pipe

11.4

Gas-side maintenance

Do gas side maintenance when the water heater does not operate correctly, the air pressure differential is not correct and/or the CO₂ value is not correct.

To do gas side maintenance:

- Clean the burner (see 11.4.1)
- Clean the combustion chamber (see 11.4.2)

11.4.1

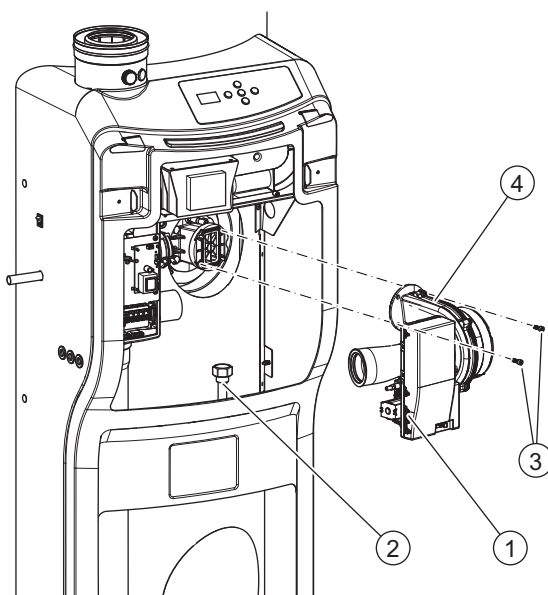
Clean the burner

Remove the burner engine:

1. Close the gas control valve, refer to Installation diagram (see 8.3).
2. Disconnect all plugs from the burner engine (1).
3. Disconnect the gas supply pipe (2).

4. Loosen the two bolts (3) to disconnect the burner engine (4) from the adapter.
5. Take the burner engine out of the water heater.

Fig. Remove the burner engine



1. Plugs on burner engine
2. Gas supply pipe
3. Bolts
4. Burner engine

Remove the burner:

6. Loosen the four nuts (5) to disconnect the burner assembly (6) from the combustion chamber (7).
7. Take the burner assembly out of the combustion chamber.



Caution

Be careful, the burner can be hot.

Caution

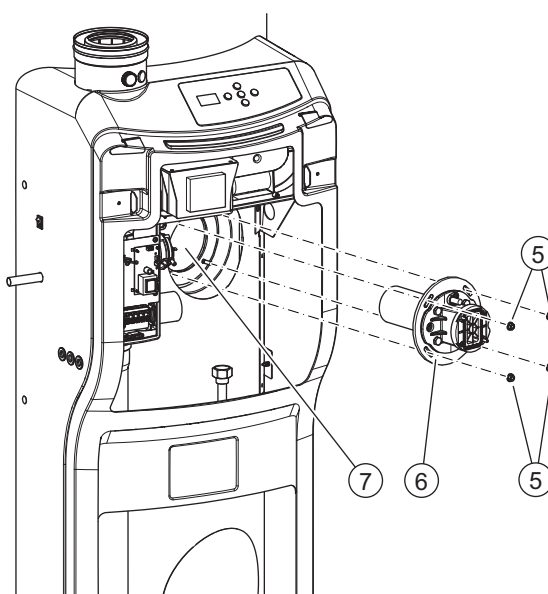
Always replace the seal after removal of the burner.



Note

Mind the ground cable!

Fig. Remove the burner assembly

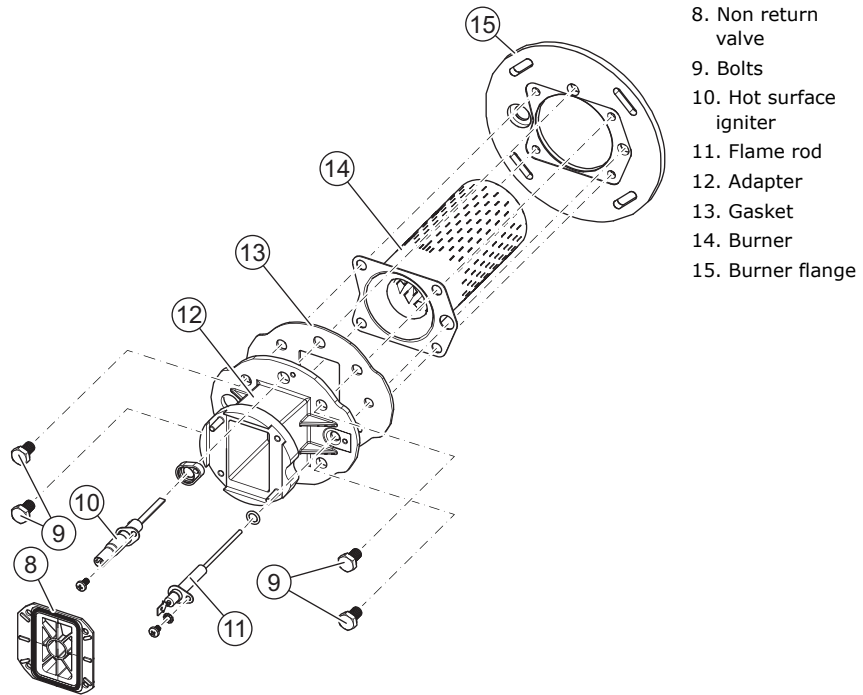


5. Nuts
6. Burner assembly
7. Combustion chamber

Disassemble the burner:

8. Remove the flame rod (11) from the adapter (12). Do a visual check on the flame rod.
9. Remove the hot surface igniter (10) from the adapter. Do a visual check on the hot surface igniter.
10. Make sure that there is no tear on the non-return valve (8) and that this valve is not deformed.
11. Loosen the four bolts (9) to disconnect the adapter from the burner flange (15).
12. Take out the burner (14) from the burner flange.

Fig. Disassemble the burner assembly



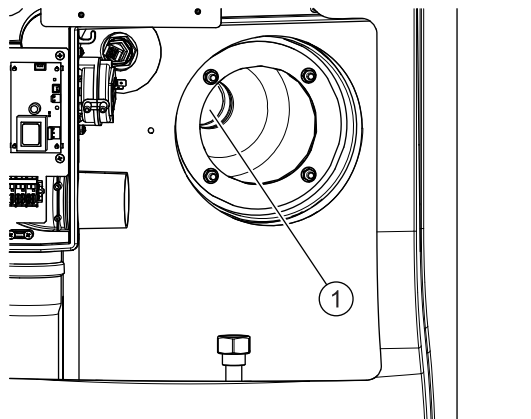
Use compressed air to remove all contamination from the outside to the inside of the burner.

11.4.2

Clean the combustion chamber

Use a vacuum cleaner and a soft brush to clean the combustion chamber (1) of the heat exchanger.

Fig. Combustion chamber



11.4.3

Assemble the burner

Assemble the burner again when the burner and the combustion chamber both are cleaned.



Note

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

Note

If necessary, replace the cleaning opening cover with gasket and bolts. You can order a clean out service kit at your supplier. Look at the data plate for the correct ordering information.

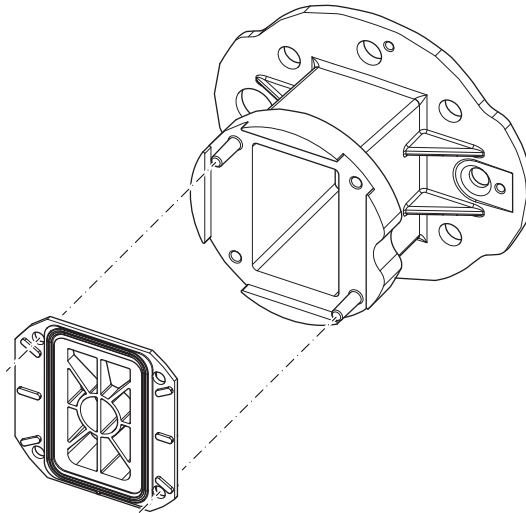
Refer to the figures in [Clean the burner](#) (see 11.4.1) to assemble the burner:

1. Place the burner in the burner flange.
2. Connect the adapter with four bolts to the burner flange.
3. Install the hot surface igniter and the flame rod on the adapter.
4. Install the burner assembly with four nuts onto the combustion chamber.
5. Place the non return valve on the adapter.



Note

Make sure that you install the non return valve upright.



-
6. Install the burner engine with two bolts to the adapter.
 7. Connect the gas supply pipe to the burner engine.
 8. Connect the flexible air connector to the air inlet box.
 9. Connect all control box plugs.
 10. Open the gas control valve, refer to [Installation diagram](#) (see 8.3).

11.5

Finalization

When all maintenance activities are done, place the cover back on the water heater:

1. Place the cover on the water heater.
2. Use a hex driver to tighten the screw at the front of the cover.

After that:

1. [Fill the water heater](#) (see 8.9.1).
2. Make sure the air pressure differential is correct, refer to [Air pressure differential](#) (see 8.9.2).
3. Make sure the gas supply pressure is correct, refer to [Gas supply pressure](#) (see 8.9.3).
4. Make sure the CO₂ value is correct, refer to [CO₂ value](#) (see 8.9.4).

5. Turn on the water heater (see 4.2).
6. Set parameter 211 to r5t, refer to Settings (see 10).
7. Press **[RESET]**.
The water heater goes to **OFF mode**.

12 Troubleshooting

12.1 Errors and warnings

The water heater can have three different kinds of errors and warnings:

- General errors (see 12.1.1), which are not displayed
- Displayed errors (see 12.1.2), which are divided in two different groups:
 - Lock out errors: when the cause is removed, you can reset the error to resume operation. The displayed code and the back-light of the display blink.
 - Blocking errors: when the cause is removed, the error resets automatically to resume operation. The code is displayed continuously and the back-light of the display blinks.
- Displayed warnings (see 12.1.3)



Note

It is possible to view the error history of the water heater, refer to Error history (see 10.4).

12.1.1 General errors



Note

For the coding of the connections, refer to the Electrical wiring diagram (see 13.4).

Indication	Cause	Measure
Gas smell	There is a gas leak	<ul style="list-style-type: none"> - Close the mains gas valve at once. - Do not operate any switches. - No naked flames. - Ventilate the boiler room. - Immediately contact your installation engineer or your local gas company.
The display is off	The water heater is off.	<u>Turn on the water heater</u> (see 4.2).
	There is no supply voltage.	Make sure that: <ul style="list-style-type: none"> - the control switch is set to I. - the isolator is in ON position. - there is power on the isolator. - there is power to the electrical connector block. The measured voltage must be 230 V _{AC} (-15%, +10%).
	Defective fuse(s)	Replace the fuse(s).

Indication	Cause	Measure
Water leakage	There is a leakage from a threaded water connection.	Tighten the threaded connection.
	There is a condensate leakage	Make sure that the condensation water discharge is working properly. If necessary, correct the water discharge.
	There is a leakage from another nearby water heater or pipe segment.	Trace the leakage.
	There is a leakage from the water heater tank.	Contact the supplier of your water heater.
Explosive ignition	The gas supply pressure is incorrect.	Check the gas supply pressure, refer to <u>Gas supply pressure</u> (see 8.9.3).
	The CO ₂ value is incorrect.	Check the CO ₂ value, refer to <u>CO₂ value</u> (see 8.9.4).
	The burner is contaminated.	Clean the burner, refer to <u>Gas-side maintenance</u> (see 11.4).
	There is an air leakage between the venturi and the flexible air connector.	Make sure that: <ul style="list-style-type: none"> - the flexible air connector is not damaged. If necessary, replace the flexible air connector. - the flexible air connector is correctly connected to the venturi. If necessary, tighten the clamp.
Insufficient or no hot water	The water heater is off.	<u>Turn on the water heater</u> (see 4.2).
	There is no supply voltage.	Make sure that: <ul style="list-style-type: none"> - the control switch is set to I. - the isolator is in ON position. - there is power on the isolator. - there is power to the electrical connector block. The measured voltage must be 230 V _{AC} (-15%, +10%).
	The hot water supply is used up.	Reduce the hot water consumption. Wait until the water heater heats up.
	The controller is in the OFF mode.	<u>Set the controller in the ON mode</u> (see 4.2.1).
	The temperature (T _{set}) is set too low.	<u>Set the temperature (T_{set}) to a higher value</u> (see 4.2.2).

Indication	Cause	Measure
CO₂ value (at full load) is not correct	The unit is not set for the correct gas type	<ul style="list-style-type: none"> - Make sure that the gas type corresponds with the information on the rating plate - Make sure if the venturi restrictor has the correct diameter, refer to Gas details.
	Contaminated venturi	Remove any contamination from the venturi inlet.
	Leakage between venturi and flexible venturi connector	<ul style="list-style-type: none"> - Make sure that the flexible venturi connector is not damaged. If necessary replace the flexible venturi connector - Make sure that the flexible venturi connector is correctly connected. If necessary, tighten the clamp.
	Recirculation of flue gases	<ul style="list-style-type: none"> - Make sure that the CO₂-value measured in the flue gas outlet is correct, refer to <u>CO₂ value</u> (see 8.9.4). - Make sure that the CO₂ value measured in the air inlet is below 0.5 vol%. - If necessary, reconnect the venting system and change the necessary seals.

12.1.2

Displayed errors



Note

For the coding of the connections, refer to the [Electrical wiring diagram](#) (see 13.4).

Note

Contact your service and maintenance engineer if the error persists.

Code and description	Cause	Measure
c02 (lock out error) Control error Error message from the controller	<ul style="list-style-type: none"> - Incorrect reference voltage from the AD converter. - EEPROM read error. - 50 Hz error. - Internal communication error. - Gas control valve relay error. - Safety relay error. - Ignition relay error. - RAM error. - EEPROM error. - EEPROM content does not match the software version. - Processor software error. - Ionisation circuit error 	<ul style="list-style-type: none"> - Make sure that the wiring/flame probe are not damaged. If necessary, replace the wiring/flame probe. - Make sure that the flame probe is not bend. If necessary, replace the flame probe. - Reset the controller. - If the error reappears, make sure that the frequency of the power supply is 50 Hz (-1, +1 Hz). - If the frequency is not correct, contact your service and maintenance engineer. - If the frequency is correct and the error reappears, replace the controller.
c03 (blocking error) Control error	More then 7 resets detected in a short period.	Wait for the error to disappear (maximal 1 hour). If the error does not disappear, replace the controller
c04 (blocking error) Control error	This error appears when the controller and/or display is replaced. Incorrect selection of the water heater.	Turn the water heater OFF and ON. When the error reappears contact your supplier.
c05 (blocking error) Control error	Content EEPROM not correct.	Reset the controller. If the error reappears, contact your supplier.
E01 (blocking error) Temperature error	The temperature in the tank is above 90°C.	<ul style="list-style-type: none"> - Tap off water, so the temperature drops in the water heater. - Reset the controller. - Make sure that there is no scale on the temperature sensor. If necessary, replace the sensor.
E03 (lock out error) Temperature error	Temperature difference, between sensor 1 and sensor 2, is more then 10°C, for at least 60 seconds.	Make sure that the sensor wiring is connected and not damaged. Reset the controller. If necessary replace the sensor and/or wiring if the error reappears.

Code and description	Cause	Measure
E05 (lock out error) Control error	Control was in a blocking error for at least 20 hours.	<ul style="list-style-type: none"> - Press [RESET] to reset the water heater. <p>If the error reappears:</p> <ul style="list-style-type: none"> - Find the cause of the blocking error (parameter 272). - Remove the blockage and reset the controller. <p>If the error reappears, replace the controller.</p>
F01 (blocking error) Control error	Live and neutral are connected the wrong way around.	Make sure that the live and neutral are connected correctly and rectify if necessary.
F02 (lock out error) Fan error Fan does not run on correct speed	Damaged or disconnected wiring.	<ul style="list-style-type: none"> - Make sure that the wiring between the fan and the controller is connected and not damaged. - If necessary, replace the wiring. Reset the controller when the wiring is reconnected
	Contaminated or blocked fan.	<ul style="list-style-type: none"> - Make sure that the motor and/or rotor of the fan are not dirty or blocked. - If necessary remove the dirt and/or blockage. - Reset the controller. - Make sure that the rotor of the fan can rotate freely and reset the controller.
	Due to a drop in supply voltage, the fan will not run at the correct speed.	<ul style="list-style-type: none"> - Make sure that the supply voltage is correct and reset the controller. The measured voltage must be 230 V_{AC} (-15%, +10%) - Contact you maintenance and service engineer when the supply voltage is not correct.
	Defective motor and/or rotor.	<ul style="list-style-type: none"> - Make sure that the motor and/or rotor are not defective and reset the controller. - Replace the fan when the motor and/or rotor are defective and reset the controller.
F03 (lock out error) Air proving switch error Switch is closed when fan is not running.	Damaged wiring/closed circuit.	<ul style="list-style-type: none"> - Make sure that the wiring, between the air proving switch and the control, is connected and not damaged. - If necessary replace the wires or reconnect the wires. Reset the controller, when wires are replaced or reconnected.
	Air proving switch defect.	<ul style="list-style-type: none"> - Make sure that the air proving switch works properly. - If necessary, replace the air proving switch. - When the air proving switch is replaced and reconnected, reset the controller.

Code and description	Cause	Measure
<p>F03 (lock out error) Air proving switch error</p> <p>Switch is not closed when fan is running during pre-purge.</p>	<p>Hoses are damaged.</p>	<ul style="list-style-type: none"> - Make sure that the hoses, between the air proving switch and fan and the air proving switch and gas control valve are not damaged and reset the controller. - If necessary replace the hose(s) - When the hose(s) are replaced and reconnected, reset the controller.
	<p>Wiring is damaged.</p>	<ul style="list-style-type: none"> - Make sure that the wiring, between the air proving switch and the control, is connected and not damaged. - If necessary, replace the wires or reconnect the wires. - When wires are replaced or reconnected, reset the controller.
	<p>Leakage of air between venturi and flexible air connector.</p>	<ul style="list-style-type: none"> - Make sure that the flexible air connector is not damaged. If necessary, replace the flexible air connector. - Make sure that the hose is properly connected to the venturi. If necessary, tighten the clamp.
	<p>Non return valve, between fan and burner, is stuck.</p>	<p>Make sure that the non return valve can move freely. If necessary replace the non return valve.</p>
	<p>Not enough pressure differential across the air proving switch, due to:</p> <ul style="list-style-type: none"> - venting system - malfunctioning condensation discharge - dirty burner - blocked heat exchanger 	<p>Check, after each fix, if the error reappears. If the error reappears continue in finding the cause.</p> <ul style="list-style-type: none"> - Measure the pressure differential across the air proving switch, refer to Air pressure differential (see 8.9.2). <p><u>Venting system</u> (see 8.7):</p> <ul style="list-style-type: none"> - Make sure if the venting system is compliant. - Make sure that the venting system has no blockages. - Make sure if the air inlet screen has no blockages. <p>Condensation discharge:</p> <ul style="list-style-type: none"> - Make sure the condensate drain has no blockages. - Make sure that the condensate drain is connected to the waste water discharge by an open connection. <p>Burner:</p> <ul style="list-style-type: none"> - Make sure that the the burner is <u>clean</u> (see 11.4.1). - Measure the pressure differential across the air proving switch again. If the pressure differential is insufficient, clean the heat exchanger. - Make sure that the air proving switch is closing, by using a multimeter.

Code and description	Cause	Measure
F04 (lock out error) Ignition error Three unsuccessful ignition attempts.	No gas.	<ul style="list-style-type: none"> - Make sure that the main gas supply valve is open. If necessary, open the valve. - Make sure that the manual gas supply valve, before the gas control valve, is open. If necessary, open the valve. - Make sure that the gas supply pressure to the gas control valve is correct, refer to <u>Gas supply pressure</u> (see 8.9.3).
	Air in the gas pipes.	<ul style="list-style-type: none"> - Bleed the air out of the gas pipe. - Make sure that the gas supply pressure to the gas control valve is correct, refer to <u>Gas supply pressure</u> (see 8.9.3).
	Defect in the hot surface igniter circuit.	<ul style="list-style-type: none"> - Make sure that the hot surface igniter is installed correctly. - Make sure that the wiring of the hot surface igniter is not damaged. - Measure the resistance across the hot surface igniter. This must be between the 36 and 72 Ohm (at room temperature). - Make sure that the hot surface igniter lights up during ignition. <p>If necessary, replace the hot surface igniter.</p>
	Defect in the ionisation circuit.	<ul style="list-style-type: none"> - Make sure that the flame probe is installed correctly. - Make sure that the wiring of the flame probe is not damaged. - Measure the ionisation current. This current must be a minimum of 3 µA (parameter #9). <p>If necessary, replace the wiring and/or flame probe.</p>
	Supply voltage too low.	<ul style="list-style-type: none"> - Make sure that the supply voltage on the controller is correct. - If the supply voltage is below the stated tolerance and the error persists, contact your maintenance and service engineer. - Install an isolating transformer.
	Bent flame probe is in contact with metal surface.	<ul style="list-style-type: none"> - Make sure that the flame probe is not bend. - If necessary, replace flame probe.
	Ceramic part, of the flame probe, is broken or cracked.	<ul style="list-style-type: none"> - Make sure that the ceramic part of the flame probe is not broken or cracked in the vicinity of the burner. - If necessary, replace flame probe.

Code and description	Cause	Measure
F05 (lock out error) Flame error Too many flame failures are detected	Recirculating flue gases due too incorrect roof or wall flue terminal.	<ul style="list-style-type: none"> - Make sure the flue terminal is installed correctly, refer to <u>Venting system</u> (see 8.7). If necessary, connect the correct flue terminal. - Make sure that the terminal is installed correctly, refer to <u>Venting system</u> (see 8.7). If necessary connect the flue terminal correctly. - Make sure that there are no flue gas leaks to the rest of the venting system.If necessary reconnect the venting system and replace any damaged seals. - Make sure that the flue terminal discharges into a permitted area. - Make sure that the CO₂-value measured in the flue gas outlet is correct, refer to <u>CO₂ value</u> (see 8.9.4). - Make sure that the CO₂ value measured in the air inlet is below 0.5 vol%. - If necessary, reconnect the venting system and change the necessary seals.
	No sufficient gas supply.	Make sure that the gas supply pressure is correct.
	Supply voltage too low.	<ul style="list-style-type: none"> - Make sure that the supply voltage on the controller is correct. - If the supply voltage is below the stated tolerance and the error persists, contact your maintenance and service engineer. - Install an isolating transformer.
F07 (lock out error) Ionisation error Ionisation measured after the gas control valve was closed	Defective gas control valve.	<ul style="list-style-type: none"> - Make sure that there is no flame after the gas control valve has closed. - If there is a flame, the gas control valve must be replaced.
F08 (lock out error) Ionisation error Ionisation measured before the gas control valve was opened	Defective safety relay.	<ul style="list-style-type: none"> - Reset the controller. - If error appears again, replace the controller.
F09 (lock out error) Temperature error	Temperature, in the tank is above the 97°C.	<ul style="list-style-type: none"> - See measure of error <u>E01</u>. - Make sure that the wiring between 1 and 7 of J9 is connected and not damaged. - If necessary, replace or reconnect the wiring. - When the wiring is reconnected, reset the controller.

Code and description	Cause	Measure
F11 (blocking error) Ionisation error Ionisation measured with a closed gas control valve	Defective gas control valve.	<ul style="list-style-type: none"> - Make sure that there is no flame after the gas control valve has closed. - If there is a flame, the gas control valve must be replaced.
F19 (blocking error) Supply voltage error Three unsuccessful ignition attempts.	There is not enough or too much supply voltage during 60 seconds. The measured voltage between live and neutral must be 230 V _{AC} (-15%, +10%). The supply voltage between live and earth must be between 110 V _{AC} and 230 V _{AC} (-15%, +10%)	<ul style="list-style-type: none"> - Make sure that the supply voltage on the controller is correct. - If the supply voltage is above or below the stated tolerance and the error persists, contact your maintenance and service engineer. - Install an isolating transformer.
F21 (lock out error) Air proving switch error Switch is not closed, while fan runs during post purge	Damaged wiring/open circuit.	See measure of error F03 - Switch is not closed when fan is running during pre-purge.
502 (blocking error) Sensor error Open circuit from sensor 1 of the temperature sensor	Sensor is not (correctly) connected.	<ul style="list-style-type: none"> - Make sure that the connector is connected to J3. - Make sure that the wire is connected to the sensor.
	Damaged wiring and/or defective sensor.	Replace the wiring and/or sensor.
503 (blocking error) Sensor error Open circuit from sensor 2 of the temperature sensor	Sensor is not (correctly) connected.	<ul style="list-style-type: none"> - Make sure that the connector is connected to J3. - Make sure that the wire is connected to the sensor.
	Damaged wiring and/or defective sensor.	Replace the wiring and/or sensor.
512 (blocking error) Sensor error Short circuit in sensor 1 of the temperature sensor	Short circuit in the sensor circuit.	Replace the wiring and/or sensor.
513 (blocking error) Sensor error Short circuit in sensor 2 of the temperature sensor	Short circuit in the sensor circuit.	Replace the wiring and/or sensor.

12.1.3

Warnings



Note

For the coding of the connections, refer to the [Electrical wiring diagram](#) (see 13.4).

Indication	Cause	Remark
5rc Service is required	The water heater exceeded the pre-set service interval.	The water heater operates, but displays this warning. Periodic maintenance is a part of the Warranty (on page 3). When you do not obey this condition, the warranty will void.
Anode Anode protection is not working	The water heater runs, but there is no anode protection for the tank.	Proper functioning of the anode protection is a part of the conditions for installation and use as stated in the Warranty (on page 3). When you do not obey this condition, the warranty will void.
	The red and the green LED of the anode controller are off: - There is no power to the potentiostat.	Make sure that there is power to the potentiostat.
	The red LED of the anode controller is blinking and the green LED is off: - The cables between the potentiostat and the anode(s) are loose or connected incorrectly. - The earth connection, of the anode(s), is loose. - The water heater is not filled with water. - There is short circuit between the anode(s) and the tank. - There is low conductivity of the water.	Make sure that: - The cable between the anode controller and the anode(s) are connected. If necessary connect the wires correctly. - The water heater is filled with water. If necessary, fill the water heater (see 8.9.1). - The anode is in contact with the tank. If necessary, replace the anode(s). - Make sure that the water conductivity is correct, refer to Water composition (see 8.2.3).
	Note There is 1 minute delay between detection of the cause and the blinking of the red LED.	
	The red and the green LED of the anode controller are on: - The cable between the potentiostat and the display are damaged or not connected.	Make sure that the cable between the potentiostat and the display is not damaged and connected If necessary, replace the wiring or reconnect cable.



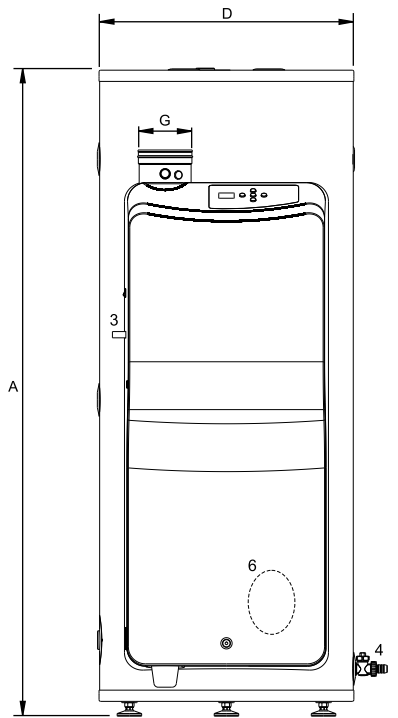
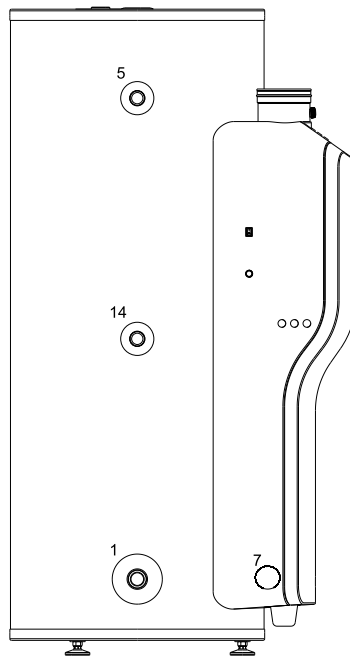
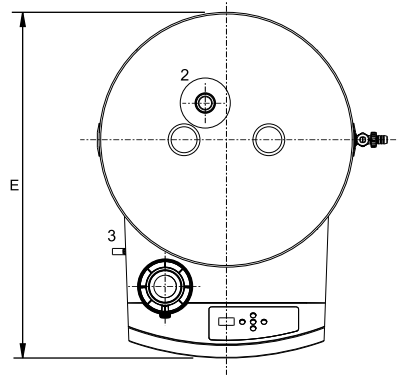
13 Appendices

13.1 Technical details

Description	Unit	IR-12-160 IR-20-160	IR-12-200 IR-20-200	IR-24-245 IR-32-245	IR-24-285 IR-32-285	IR-32-380
General						
Capacity	l	160	200	245	285	380
Empty Weight	kg	95	106	120	136	155
Maximum floor load	kg	255	306	365	421	535
Maximum working pressure	kPa (bar)	800 (8)	800 (8)	800 (8)	800 (8)	800 (8)
Control thermostat - adjustment range	°C	40...85	40...85	40...85	40...85	40...85
Control thermostat - default value	°C	65	65	65	65	65
Hysteresis upwards - adjustment range	°C	2...15	2...15	2...15	2...15	2...15
Hysteresis upwards - default value	°C	10	10	10	10	10
Number of (electrical) anodes	-	1	1	2	2	2
Minimum measured air pressure differential across the pressure switch	Pa	≥ 210	≥ 210	≥ 460	≥ 460	≥ 460
Setpoint pressure switch	Pa	175	175	400	400	400
Heating time $\Delta T = 45\text{ °C}$	min.	28 (12-160) 18 (20-160)	43 (12-200) 28 (20-200)	26 (24-245) 20 (32-245)	33 (24-285) 25 (32-285)	32
Electrical						
Electrical power consumption (peak)	W	85	85	105	105	105
Electrical power consumption (nominal)	W	25 (12-160) 36 (20-160)	25 (12-200) 36 (20-200)	51 (24-245) 85 (32-245)	51 (24-285) 85 (32-285)	85
Supply voltage/Main frequency	VAC / Hz	230 (-15%, +10%) / 50 (\pm 1)				
IP-class	-	IP20				

13.2 Dimensions

Size	Description	Unit	IR-12-160 IR-20-160	IR-12-200 IR-20-200	IR-24-245 IR-32-245	IR-24-285 IR-32-285	IR-32-380
Dimensions water heater							
	Height (1) A	mm	1270	1545	1545	1745	1745
D	Width	mm	560	560	610	610	675
E	Depth	mm	780	780	830	830	890
G	Flue gas outlet/Air inlet	mm/mm	80/125	80/125	80/125	80/125	80/125
Dimensions connections							
1	Cold water supply connection (female)	-	Rp 3/4	Rp 3/4	Rp 1	Rp 1	Rp 1
2	Hot water outlet connection (female)	-	Rp 3/4	Rp 3/4	Rp 1	Rp 1	Rp 1
3	Gas control valve connection (male)	mm	15	15	15	15	15
4	Drain valve connection (female)	-	Rp 3/4	Rp 3/4	Rp 3/4	Rp 3/4	Rp 3/4
5	T&P-valve connection (female)	-	Rp 3/4	Rp 3/4	Rp 1	Rp 1	Rp 1
	Cleaning/inspection opening	mm	95x70	95x70	95x70	95x70	95x70
7	Condensation drainage connection (female)	mm	Ø 40	Ø 40	Ø 40	Ø 40	Ø 40
14	Circulation connection (female)	-	Rp 3/4	Rp 3/4	Rp 3/4	Rp 3/4	Rp 3/4



IMD-1201b R1

13.3 Gas details

Description	Unit	IR-12-160 IR-12-200	IR-20-160 IR-20-200	IR-24-245 IR-24-285	IR-32-245 IR-32-285 IR-32-380
Gas category 2H (G20)					
Diameter of the venturi restrictor	mm	3.95	3.95	3.95	3.95
Nominal Load (gross)	kW	12.1	20.0	24.4	32.2
Nominal output	kW	11.7 (12-160) 11.9 (12-200)	19.1	23.5 (24-245) 23.8 (24-285)	30.7 (32-245) 31.0 (32-285) 31.3 (32-380)
Supply pressure	mbar	20.0	20.0	20.0	20.0
CO ₂ (full load)	vol%	9.3 ± 1.0	9.3 ± 1.0	9.3 ± 1.0	9.3 ± 1.0
O ₂ (full load)	vol%	4.3 ± 1.8	4.3 ± 1.8	4.3 ± 1.8	4.3 ± 1.8
Gas consumption (1)	m ³ /h	1.2	1.9	2.3	3.1
NO _x -emission	mg/kWh GCV	22	30	33	37
Mass flow rate flue gases (minimal load)	kg/h	9.1	9.1	9.1	9.1
Mass flow rate flue gases (nominal load)	kg/h	19.0	31.4	38.4	50.7
Flue gas temperature (nominal load)	°C	42	61	57	65
Gas category 3P (G31)					
Diameter of the venturi restrictor	mm	3.05	3.05	3.05	3.05
Nominal Load (gross)	kW	11.8	19.6	23.9	31.5
Nominal output	kW	11.4 (12-160) 11.6 (12-200)	18.7	23.0 (24-245) 23.3 (24-285)	30.1 (32-245) 30.4 (32-285) 30.7 (32-380)
Supply pressure	mbar	37.0...50.0	37.0...50.0	37.0...50.0	37.0...50.0
CO ₂ (full load)	vol%	10.0 ± 1.0	10.0 ± 1.0	10.0 ± 1.0	10.0 ± 1.0
O ₂ (full load)	vol%	5.7 ± 1.5	5.7 ± 1.5	5.7 ± 1.5	5.7 ± 1.5
Gas consumption	kg/h	0.8	1.4	1.7	2.3
NO _x -emission	mg/kWh GCV	23	30	33	37
Mass flow rate flue gases (minimal load)	kg/h	8.8	8.8	8.8	8.8
Mass flow rate flue gases (nominal load)	kg/h	20.0	33.1	40.5	53.3
Flue gas temperature (nominal load)	°C	39	56	55	59

13.3.1

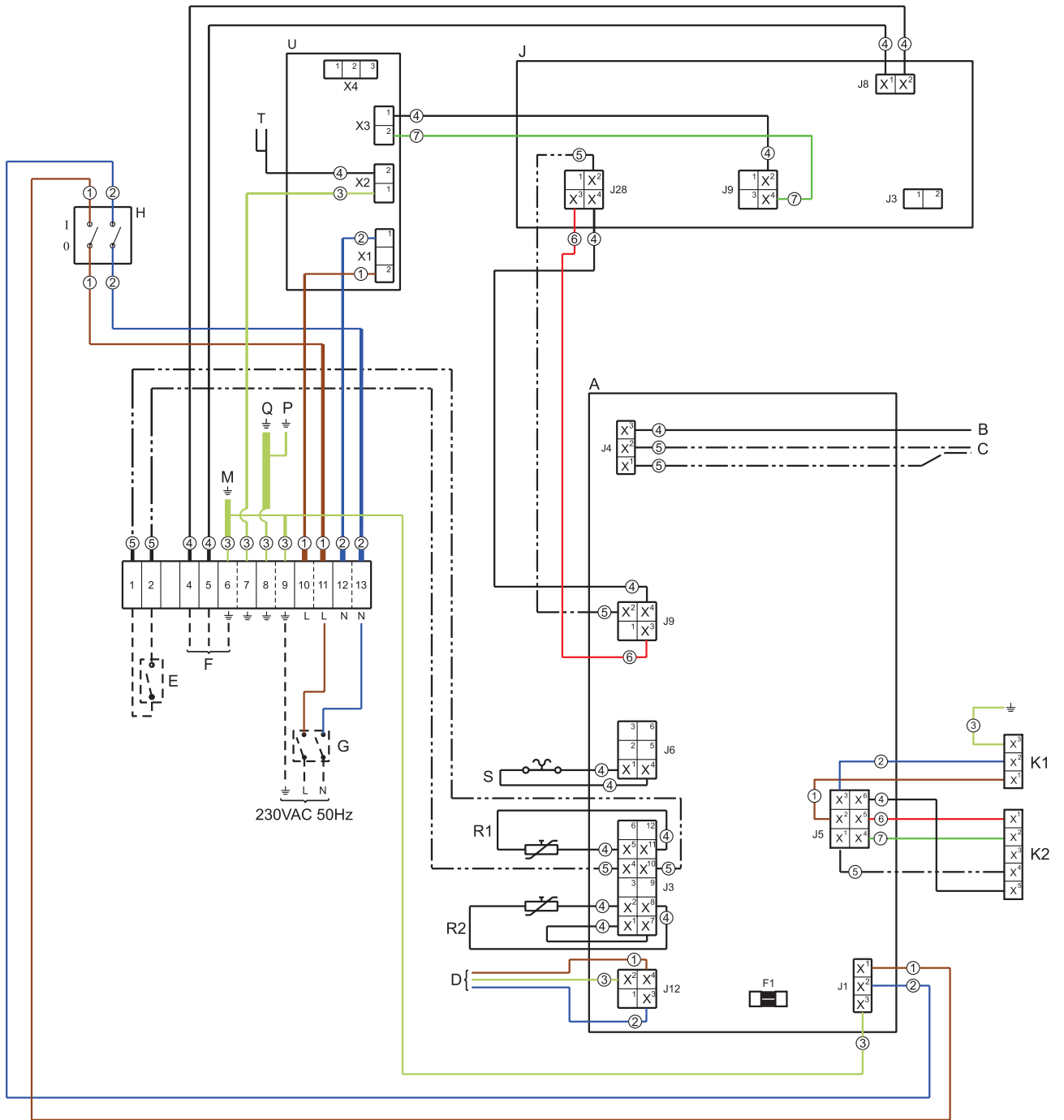
Energy labeling

Description	Unit	IR-12-160	IR-12-200	IR-20-160	IR-20-200
Declared load profile					
Load profile	-	XL	XL	XL	XL
Energy efficiency class (Energy label)	-	A	A	A	A
Energy efficiency	%	92	94	92	91
Daily electricity consumption	kWh	0.175	0.181	0.172	0.182
Daily fuel consumption	kWh GCV	20.526	19.924	20.661	20.853
Mixed water 40°C (V40)	l	272	372	772	1111
Additional load profile					
Load profile	-	-	-	-	XXL
Energy efficiency class (Energy label)	-	-	-	-	A
Energy efficiency	%	-	-	-	90
Daily electricity consumption	kWh	-	-	-	0.191
Daily fuel consumption	kWh GCV	-	-	-	26.761
Mixed water 40°C (V40)	l	-	-	-	382

Description	Unit	IR-24-245	IR-24-285	IR-32-245	IR-32-285	IR-32-380
Declared load profile						
Load profile	-	XXL	XXL	XXL	XXL	XXL
Energy efficiency class (Energy label)	-	A	A	A	A	A
Energy efficiency	%	92	91	92	90	90
Daily electricity consumption	kWh	0.192	0.207	0.201	0.219	0.204
Daily fuel consumption	kWh GCV	26.210	26.414	26.255	26.638	26.748
Mixed water 40°C (V40)	l	599	682	1976	2282	3372
Additional load profile						
Load profile	-	-	-	-	-	3XL
Energy efficiency class (Energy label)	-	-	-	-	-	-
Energy efficiency	%	-	-	-	-	92
Daily electricity consumption	kWh	-	-	-	-	0.256
Daily fuel consumption	kWh GCV	-	-	-	-	50.428
Mixed water 40°C (V40)	l	-	-	-	-	548

13.4

Electrical wiring diagram



Cable colors

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

Terminal block connections

- ⊕ Earth
- N. Neutral
- L. Phase input

Components

- A. Control
- B. Flame rod
- C. Hot surface igniter
- D. Gas control valve
- E. External ON mode switch
- F. Additional error signal (max. 5A)
- G. Isolating transformer

- H. Control switch
- J. Display
- K1. Fan (power supply)
- K2. Fan (control)
- M. Earth connection mounting plate
- P. Earth connection burner flange
- Q. Earth connection housing
- R1. Temperature sensor 1
- R2. Temperature sensor 2
- S. Pressure switch
- T. Electrical anodes
- U. Potentiostat
- F1. Fuse (T5A-250V)

13.5

Declaration of conformity



Declaration of Conformity

Supplier: A.O. Smith Water Products Company b.v.
De Run 5305
5503 LW Veldhoven
The Netherlands

hereby declares that the following products:

Product description: Condensing high efficiency appliance
Product family name: Innovo
Product models: IR-12-160, IR-12-200, IR-20-160, IR-20-200, IR-24-245, IR-24-285, IR-32-245,
IR-32-285, IR-32-380

on the assumption that the installation instructions have been followed are compliant to:

Gas Appliance Regulations (GAR) - 2016/426
- EN 89:2015

Low Voltage Directive (LVD) - 2014/35/EU
- EN 60335-1:2012
- EN 60335-2-102:2017

Electromagnetic Compatibility Directive (EMC) - 2014/30/EU
- EN 55014-1:2017
- EN 55014-2:2015
- EN 61000-3-2:2014
- EN 61000-3-3:2013

ECO Design Directive (ErP) - 2009/125/EG
- Commission regulation No. 814/2013 based on notices 2014/C - 207/03

as stated in the EC type-examination report, 151002037, by KIWA Gastec Certification b.v., The Netherlands.

Company:
A.O. Smith Water Products Company b.v.

Date:
March 3, 2022

Signature:

T. van der Hamsvoort
Managing Director



Declaration of Conformity

Supplier: A.O. Smith Water Products Company b.v.
De Run 5305
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Product models: IR-12-160, IR-12-200, IR-20-160, IR-20-200, IR-24-245, IR-24-285, IR-32-245,
IR-32-285, IR-32-380

on the assumption that the installation instructions have been followed are compliant to:

Gas Appliances (Enforcement) and Miscellaneous Amendments Regulations 2018 (UK SI 2018 No. 389)
- EN 89:2015

Electrical Equipment (Safety) Regulations 2016 (UK SI 2016 No. 1101)
- EN 60335-1:2012
- EN 60335-2-102:2017

Electromagnetic Compatibility Regulations 2016 (UK SI 2016 No. 1091)
- EN 55014-1:2017
- EN 55014-2:2015
- EN 61000-3-2:2014
- EN 61000-3-3:2013

Ecodesign for Energy-Related Products Regulations 2010 (UK SI 2010 No. 2617)
- Commission regulation No. 814/2013 based on notices 2014/C - 207/03

as stated in the EC type-examination report, 151002037, by KIWA Gastec Certification b.v., The Netherlands.

Company:
A.O. Smith Water Products Company b.v.

Date:
July 1, 2022

Signature:

T. van der Hamsvoort
Managing Director

13.6

Warranty

To register your water heater, you can complete and return the enclosed warranty card. You can also register your water heater on-line through the A.O. Smith website.

Article 1: General warranty

If, after verification and at the sole discretion of A.O. Smith, a component or part (with exclusion of the glass lined steel tank) of a water heater supplied by A.O. Smith proves within two years of the original installation date to be defective or fails to function correctly due to manufacturing and/or material defects, then A.O. Smith shall repair or replace this component or part.

Article 2: Tank warranty

If, after inspection and at the sole discretion of A.O. Smith, the glass-lined steel tank of a water heater supplied by A.O. Smith proves within 3 years of the original installation date to be leaking due to rust or corrosion occurring on the water side, then A.O. Smith shall offer to replace the defective water heater with an entirely new water heater of equivalent size and quality. The warranty period given on the replacement water heater shall be equal to the remaining warranty period of the original water heater that was supplied.

Notwithstanding that stated earlier in this article, in the event that unfiltered or softened water is used, or allowed to stand in the water heater, the warranty shall be reduced to one year from the original installation date.

Article 3: Conditions for Installation and Use

The warranty set out in Articles 1 and 2 will apply solely under the following conditions:

- The water heater is installed under strict adherence to A.O. Smith installation instructions for the specific model, and the relevant government and local authority installation and building codes, rules and regulations in force at the time of installation.
- The water heater remains installed at the original site of installation.
- The water heater is used exclusively with drinking water, which at all times can freely circulate (a separately installed heat exchanger is mandatory for heating saline water or corrosive water).
- The tank is safeguarded against harmful scaling and lime build-up by means of periodic maintenance.
- The water temperatures in the heater do not exceed the maximum setting of the thermostats, which form a part of the water heater.
- The water pressure and/or heat load do not exceed the maximum values stated on the water heater rating plate.
- The water heater is installed in a non-corrosive atmosphere or environment.
- The water heater is connected to a protected cold water supply arrangement, which is approved by the relevant authority; with sufficient capacity for this purpose; supplying a water pressure not greater than the working pressure stated on the water heater; and where applicable by a likewise approved temperature and pressure relief valve; fitted in accordance with installation instructions of A.O. Smith applying to the specific model of water heater, and further in compliance with the government and local authority installation and building codes, rules and regulations.
- The water heater is at all times fitted with cathodic protection. If sacrificial anodes are used for this, these must be replaced and renewed when, and as soon as, they are 60% or more consumed. When power anodes are used, it is important to ensure that they continue to work properly.

Article 4: Exclusions

The warranty set out in Articles 1 and 2 will not apply in the event of:

- damage to the water heater caused by an external factor;
- misuse, neglect (including frost damage), modification, incorrect and/or unauthorised use of the water heater and any attempt to repair leaks;
- contaminants or other substances having been allowed to enter the tank;
- the conductivity of the water being less than 125 $\mu\text{S}/\text{cm}$ and/or the hardness (alkaline earth ions) of the water being less than 1.00 mmol/litre (see 8.2.3);

- unfiltered, recirculated water flowing through or being stored in the water heater;
- any attempts at repair to a defective water heater other than by an approved service engineer.

Article 5: Scope of the warranty

The obligations of A.O. Smith by virtue of the warranty provided do not extend beyond delivery free of charge from the warehouse of the parts or components or water heater to be replaced; transport, labour, installation and other costs associated with the replacement shall not be borne by A.O. Smith.

Article 6: Claims

A claim on grounds of the specified warranty must be submitted to the dealer from whom the water heater was purchased, or to another authorised dealer for A.O. Smith Water Products Company products. Inspection of the water heater as referred to in Articles 1 and 2 shall take place in one of the laboratories of A.O. Smith Water Products Company.

Article 7: Obligations of A.O. Smith

A.O. Smith grants no other warranty or guarantee over its water heaters nor the (assemblies or parts of) water heaters supplied for replacement, other than the warranty expressly set out in these Articles.

Under the terms of the supplied warranty, A.O. Smith is not liable for damage to persons or property caused by (assemblies or parts, or the glass-lined steel tank of) a (replacement) water heater that it has supplied.

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