

Twister

Condensing Stainless Steel Water Heater

TWI 35-200/45-200

Installation, User and Service Manual





Data is subject to change

A.O. Smith Europe
De Run 5305
PO Box 70
5500 AB Veldhoven
The Netherlands

T : +31 (0)40 294 2500
info@aosmith.com
www.aosmithinternational.com



Preface

Copyright

Copyright © 2018 A.O. Smith Water Products Company

All rights reserved.

Nothing from this publication may be copied, reproduced and/or published by means of printing, photocopying or by whatsoever means, without the prior written approval of A.O. Smith Water Products Company.

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 13.7) 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 Twister 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 Twister 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.

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:

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

If the Twister 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:

A.O. Smith Water Products Company

Address: PO Box 70
5500 AB Veldhoven
The Netherlands

Telephone: +31 (0)40 294 25 00

E-mail: info@aosmith.com

Website: www.aosmithinternational.com

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.
- Buttons are always shown between brackets, for example: **[ACCEPT]**, **[BACK]**.
- Cross-references to sections, tables, figures etc. are underlined and written as (see "..."). In the digital version, the cross-references function as hyperlinks that can be used to navigate through the manual by clicking on them. Example: Safety (see 2).

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



Note

A note gives more information on a topic.



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 |
|----------------|----------|---------|
| 0313279 | EN | 2.6 |

Table of Contents

| | |
|--------------------------------------|-----------|
| Preface | 3 |
| Copyright..... | 3 |
| Trademarks..... | 3 |
| Warranty..... | 3 |
| Liability..... | 3 |
| Compliance..... | 4 |
| Regulations..... | 4 |
| Contact information..... | 5 |
| About this manual | 7 |
| Scope..... | 7 |
| Target group..... | 7 |
| Notation conventions..... | 7 |
| Document identification..... | 8 |
| User part | 13 |
| 1 Introduction | 15 |
| 2 Safety | 17 |
| 3 Interface | 19 |
| 3.1 Operator interface..... | 19 |
| 3.1.1 Control Switch..... | 19 |
| 3.1.2 Display..... | 19 |
| 3.1.3 Display buttons..... | 20 |
| 3.2 Status of the water heater..... | 21 |
| 3.2.1 Operating modes..... | 22 |
| 3.2.2 Error conditions..... | 22 |
| 4 Use | 23 |
| 4.1 Turn on the water heater..... | 23 |
| 4.1.1 Switch to ON mode..... | 23 |
| 4.1.2 Set the water temperature..... | 23 |

| | | |
|-------|----------------------------------|----|
| 4.2 | Turn off the water heater..... | 24 |
| 4.2.1 | Turn off for a short period..... | 24 |
| 4.2.2 | Isolate from the mains..... | 24 |
| 4.2.3 | Turn off for a long period..... | 24 |

Installation, Maintenance and Service part..... 25

| | | |
|----------|---------------------------------------|-----------|
| 5 | Introduction..... | 27 |
| 5.1 | About the water heater..... | 27 |
| 5.2 | Working principle..... | 27 |
| 6 | Safety..... | 29 |
| 6.1 | Safety instructions..... | 29 |
| 6.2 | Instructions on the water heater..... | 30 |
| 6.3 | Safety devices..... | 31 |
| 6.4 | Environmental aspects..... | 33 |
| 6.4.1 | Recycling..... | 33 |
| 6.4.2 | Disposal..... | 33 |
| 7 | Water heater..... | 35 |
| 7.1 | Structure of the water heater..... | 35 |
| 8 | Installation..... | 37 |
| 8.1 | Packaging..... | 37 |
| 8.2 | Conditions..... | 37 |
| 8.2.1 | Ambient conditions..... | 37 |
| 8.2.2 | Maximum floor load..... | 37 |
| 8.2.3 | Water composition..... | 38 |
| 8.2.4 | Working clearances..... | 38 |
| 8.3 | Installation diagram..... | 38 |
| 8.4 | Water connections..... | 39 |
| 8.4.1 | Cold water connection..... | 39 |
| 8.4.2 | Hot water connection..... | 40 |
| 8.4.3 | Circulation connection..... | 40 |
| 8.5 | Condensate drain..... | 40 |
| 8.6 | Gas connection..... | 40 |
| 8.7 | Venting system..... | 41 |
| 8.7.1 | C13/C33 concentric systems..... | 43 |
| 8.7.2 | C13/C33 parallel systems..... | 45 |
| 8.7.3 | C43/C53/C63 systems..... | 47 |
| 8.8 | Electrical connections..... | 48 |

| | | |
|-----------|---|-----------|
| 8.8.1 | Preparation..... | 48 |
| 8.8.2 | Mains power..... | 49 |
| 8.8.3 | External ON mode switch (optional)..... | 49 |
| 8.8.4 | Finalization..... | 49 |
| 8.9 | Commissioning..... | 49 |
| 8.9.1 | Filling..... | 49 |
| 8.9.2 | Air pressure differential..... | 50 |
| 8.9.3 | Gas supply pressure..... | 50 |
| 8.9.4 | CO ₂ value..... | 51 |
| 8.9.5 | Turn on the water heater..... | 52 |
| 8.10 | Decommissioning..... | 52 |
| 8.10.1 | Turn off the water heater..... | 53 |
| 8.10.2 | Draining..... | 53 |
| 9 | Conversion of gas type..... | 55 |
| 10 | Settings..... | 57 |
| 10.1 | Display..... | 57 |
| 10.2 | Temperatures..... | 57 |
| 10.2.1 | Temperatures..... | 58 |
| 10.2.2 | Hysteresis..... | 58 |
| 10.3 | Appliance Status..... | 59 |
| 10.4 | Display settings..... | 59 |
| 10.4.1 | Set the display brightness..... | 59 |
| 10.4.2 | Set the backlight delay..... | 60 |
| 10.4.3 | Set the language..... | 60 |
| 10.5 | Appliance information..... | 61 |
| 10.5.1 | Use external enable..... | 61 |
| 10.5.2 | Ignition attempts..... | 61 |
| 10.6 | Error history..... | 62 |
| 10.7 | Error occurrence..... | 63 |
| 10.8 | Restore default..... | 63 |
| 10.9 | Service menu..... | 64 |
| 10.9.1 | Set the service mode..... | 64 |
| 10.9.2 | Set the fan speed..... | 65 |
| 11 | Maintenance..... | 67 |
| 11.1 | Performance check..... | 67 |
| 11.2 | Preparation..... | 68 |
| 11.3 | Water-side maintenance..... | 68 |
| 11.3.1 | Descale the tank..... | 68 |

| | | |
|-----------|---------------------------------|-----------|
| 11.3.2 | Clean the condensate drain..... | 68 |
| 11.4 | Gas-side maintenance..... | 69 |
| 11.4.1 | Clean the burner..... | 69 |
| 11.4.2 | Assemble the burner..... | 70 |
| 11.4.3 | Clean the air inlet filter..... | 70 |
| 11.5 | Finalization..... | 71 |
| 12 | Troubleshooting..... | 73 |
| 12.1 | Errors and warnings..... | 73 |
| 12.1.1 | General errors..... | 73 |
| 12.1.2 | Displayed errors..... | 75 |
| 12.1.3 | Warnings..... | 79 |
| 13 | Appendices..... | 81 |
| 13.1 | Technical details..... | 81 |
| 13.2 | Dimensions..... | 82 |
| 13.3 | Gas details..... | 84 |
| 13.4 | Energy labeling..... | 85 |
| 13.5 | Electrical wiring diagram..... | 86 |
| 13.6 | Declaration of conformity..... | 87 |
| 13.7 | Warranty..... | 88 |
| | Index..... | 91 |

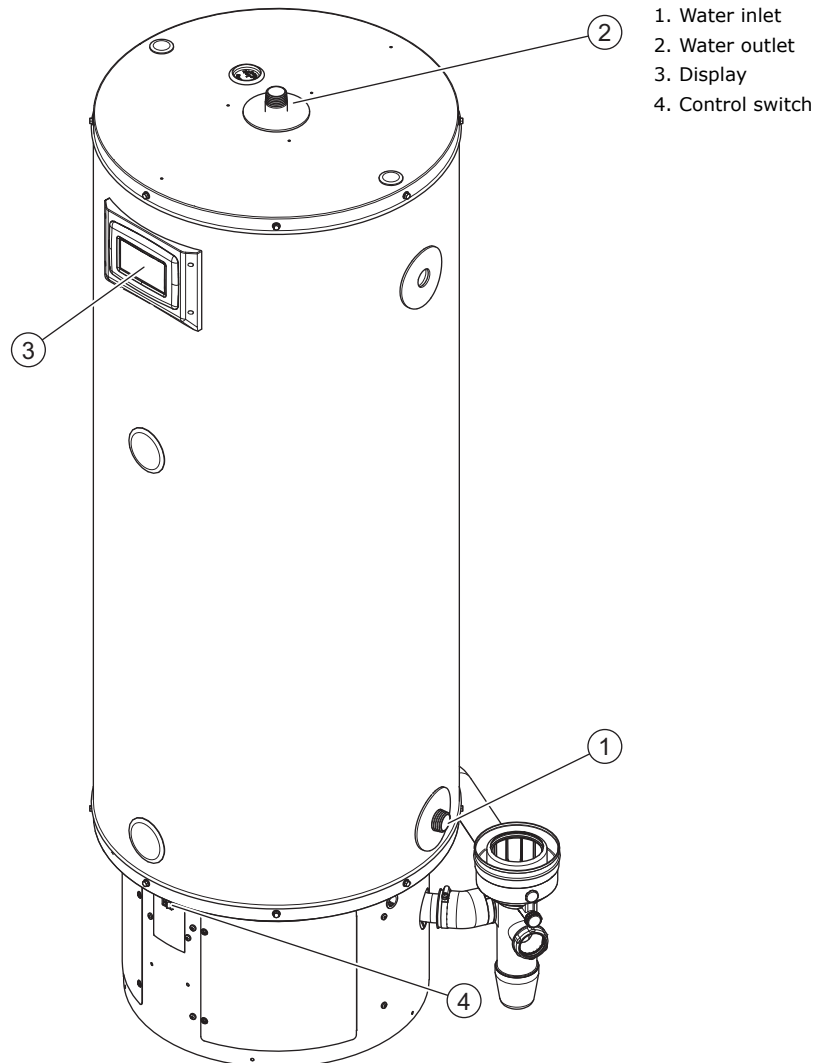
User part

1 Introduction

The Twister 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. Twister water heater



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 front side of the water heater, between the doors.
- a (touchscreen) display (see 3.1.2) to navigate through the menu and on which settings, functions, values and errors can be viewed and entered.

The display is completely menu-driven and enables the user to change settings and to verify the status and history of the water heater.

3.1.1 Control Switch

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



Warning

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

3.1.2 Display

The display can show two different types of screens:

- A home screen that shows texts and symbols to indicate the actual status of the water heater.
- A control screen where more information of the the water heater is shown and where you can change settings.

Fig. Display - Home screen

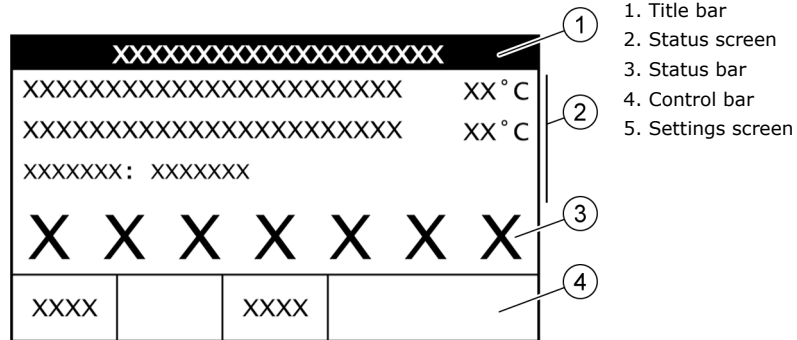
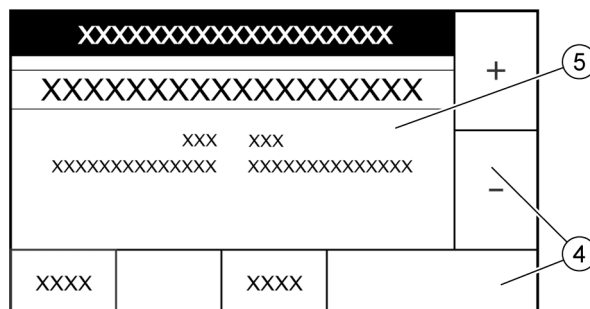














Fig. Display - Control screen



3.1.2.1 Symbols on the display

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

| Symbol | Explanation |
|---|---|
|  | Water heating is disabled |
|  | End of water heating (stand-by) |
|  | Water temperature drops (during water heating and when in stand-by) |
|  | Water temperature rises (during water heating and when in stand-by) |
|  | There is a heat demand |
|  | (Pre- and post-) purge |
|  | Air pressure switch is closed |
|  | A flame is detected |
|  | Gas control valve is open |
|  | Spark plug is activated / enabled |
|  | Error |
|  | Warning |

3.1.3

Display buttons

With the buttons on the display, the menu of the water heater can be accessed.

| Button | Function |
|----------|---|
| [MENU] | Go to menu |
| [BACK] | One step back in menu Changed settings will not be saved |
| [ACCEPT] | Save changed settings |
| [+] | Value up |
| [-] | Value down |
| [>] | Enter the submenu |


| Button | Function |
|--------|---------------------|
| [▲] | Scroll up / Raise |
| [▼] | Scroll down / Lower |

3.2

Status of the water heater

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

Fig. Display

| | |
|---|--|
| Tank Temperature 60 °C | |
| Operating Setpoint 60 °C | |
| Status: Stand-by | |
|  | |
| MENU | |

The following status texts can appear on the display:

| Status text | Explanation |
|---------------------------------------|---|
| Stand-by | The water heater is not heating because there is no heat demand. |
| OFF | Stand-by (water temperature drops). The control switch is set to 0 . |
| Pre-Purge | The ventilator ventilates the combustion chamber. |
| Spark plug activated | The spark plug starts to spark. |
| Gas valve on | The gas valve is open. |
| Flame verification | A flame is detected. |
| Inter-Purge | After ignition has failed and before a new attempt, the combustion chamber is ventilated. |
| Heating | The water heater is heating up water. |
| Post-Purge | The combustion chamber is ventilated after a heating cycle. |
| Error | The controller has detected an error. |
| Error - Water heating disabled | The heating cycle is stopped because the controller has detected an error |
| Error - Post-Purge | An error is detected and the combustion chamber is ventilated. |

| Status text | Explanation |
|------------------------|--------------------------------|
| Heat demand | There is a heat demand. |
| External switch | The external switch is active. |

3.2.1

Operating modes

The Twister 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

In the **OFF mode** the water heater is de-activated. The control switch is set in the position **0**.

3.2.1.2 ON mode

In the **ON mode** the water heater responds to the heat demand. The control switch is set in the position **I**.

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 the menu to enable the external ON mode switch (see 10.5.1).

3.2.2

Error conditions

If there is an error, the display shows the status text **Error** including the exclamation mark.

Fig. Error status

| | |
|---|---|
| Tank Temperature | 35 °C |
| Operating Setpoint | 60 °C |
| Status: Error | |
|  |  |
| MENU | |



Note

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

4

Use

4.1

Turn on the water heater

4.1.1

Switch to ON mode

To start the water heater:

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



Note

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

Note

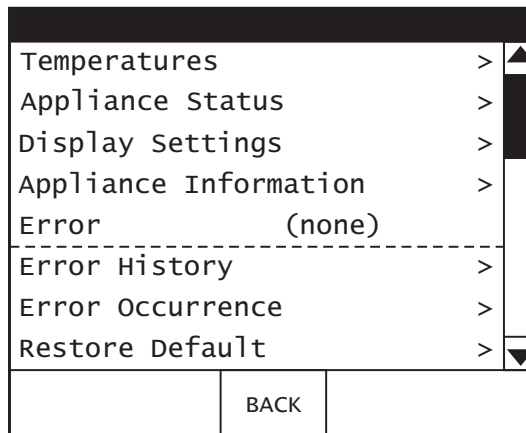
If necessary, set the water temperature (see 4.1.2).

4.1.2

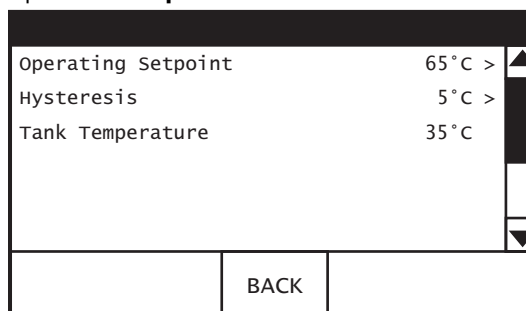
Set the water temperature

To change the temperature setpoint:

1. Press **[Menu]** to access the main menu.



2. Open the **Temperatures** submenu.



- Open the **Operating Setpoint** control screen.

| Setpoint | | | |
|--------------|--------------|------|---|
| 60 °C | | | + |
| MIN 40 °C | MAX 85 °C | | - |
| ACCEPT | | BACK | |

- Change the water temperature setpoint:
 - Use **[+]** to increase the setpoint.
 - Use **[-]** to decrease the setpoint.
- Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

4.2

Turn off the water heater

4.2.1

Turn off for a short period

To turn off the water heater for less than 2 months, set the control switch on the front of the water heater (see 1) to **0**.



Warning

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



Note

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

4.2.2

Isolate from the mains

To isolate the water heater from the mains:

- Set the control switch to **0**.
- Disconnect the water heater from the mains by turning the isolator.

4.2.3

Turn off for a long period

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

Installation, Maintenance and Service part

5 Introduction

5.1 About the water heater

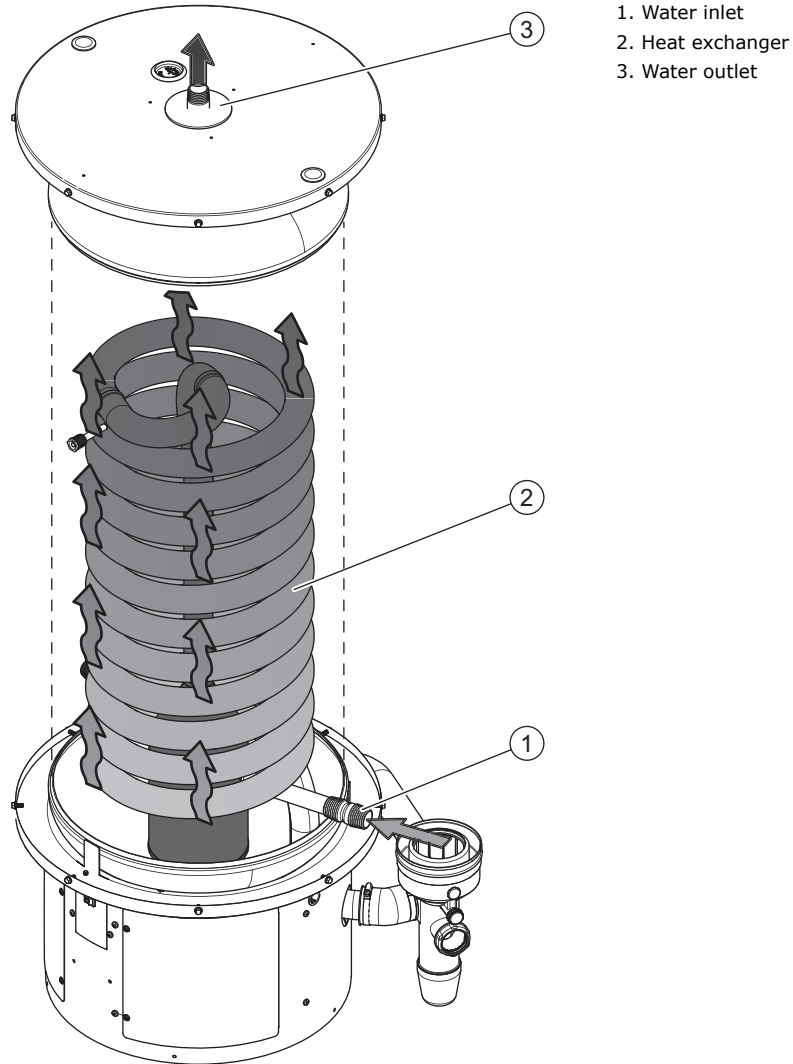
The Twister water heater is intended for heating water for sanitary purposes.

The Twister 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. Twister water heater



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

1. The controller detects a "heat demand".
2. The fan starts pre-purging.
3. The air proving switch closes when the air pressure differential is sufficient.
4. The spark plug is activated.
5. The gas control valve opens and the gas/air mixture is ignited.
6. The water heater heats the water in the tank.
7. When the water temperature reaches the setpoint, the heat demand ends and the controller stops the operating cycle.
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 isolate the water heater from the mains (see 4.2.2). Wait 1 minute after you switch the water heater to **OFF mode**.

**Note**

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

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






6.2**Instructions on the water heater**

The water heater has some safety instructions on its cover:

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

Also the packaging has some safety instructions:

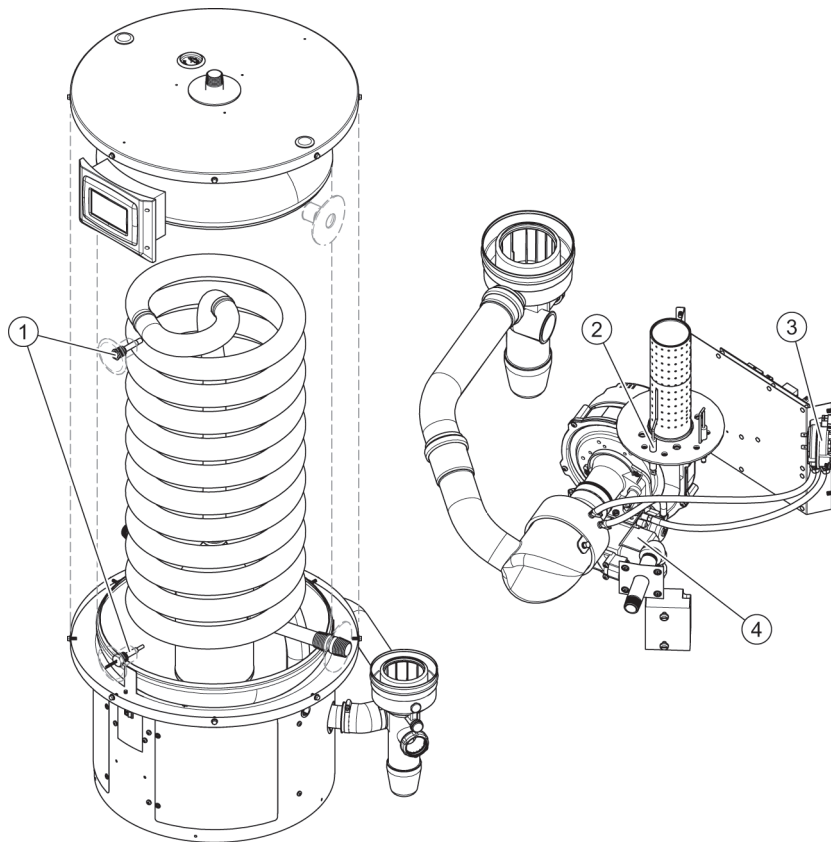
- The text "Read the installation instructions before installing the appliance".
- The text "Read the user instructions before putting the appliance into operation".
- The text "The appliance may only be installed in a room that meets the required ventilation regulations".
- Some safety pictograms:

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

6.3

Safety devices

Fig. Safety devices



1. Temperature sensor
2. Air proving switch
3. Gas control valve
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">- $T > 90\text{ °C}$ (blocking error), max. temperature.- $T > 95\text{ °C}$ (lock out error), for safety. |
| Gas control valve (2) | The gas control valve controls the gas supply to the burner. |
| Air proving switch (3) | The air proving switch checks the air pressure differential during post- and pre-purging. This guarantees that there is sufficient air supply. |
| Flame probe (4) | The flame probe detects if there is a flame. |

Safety devices of the installation:

Inlet security group An inlet security group has a stop valve, a non return valve and a pressure relief valve. The inlet security group prevents excessive pressure in the tank and back flow of expansion water into the cold water main supply.

Pressure-reducing valve The pressure-reducing valve reduces the water mains pressure, if necessary.

T&P valve
(Temperature and pressure relief valve) (1) The T&P valve (97°C and 10 bar) prevents excessive pressure and temperature in the tank.

1 - All water heaters have a T&P valve connection. A.O. Smith recommends to use a WRAS approved T&P valve.

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.

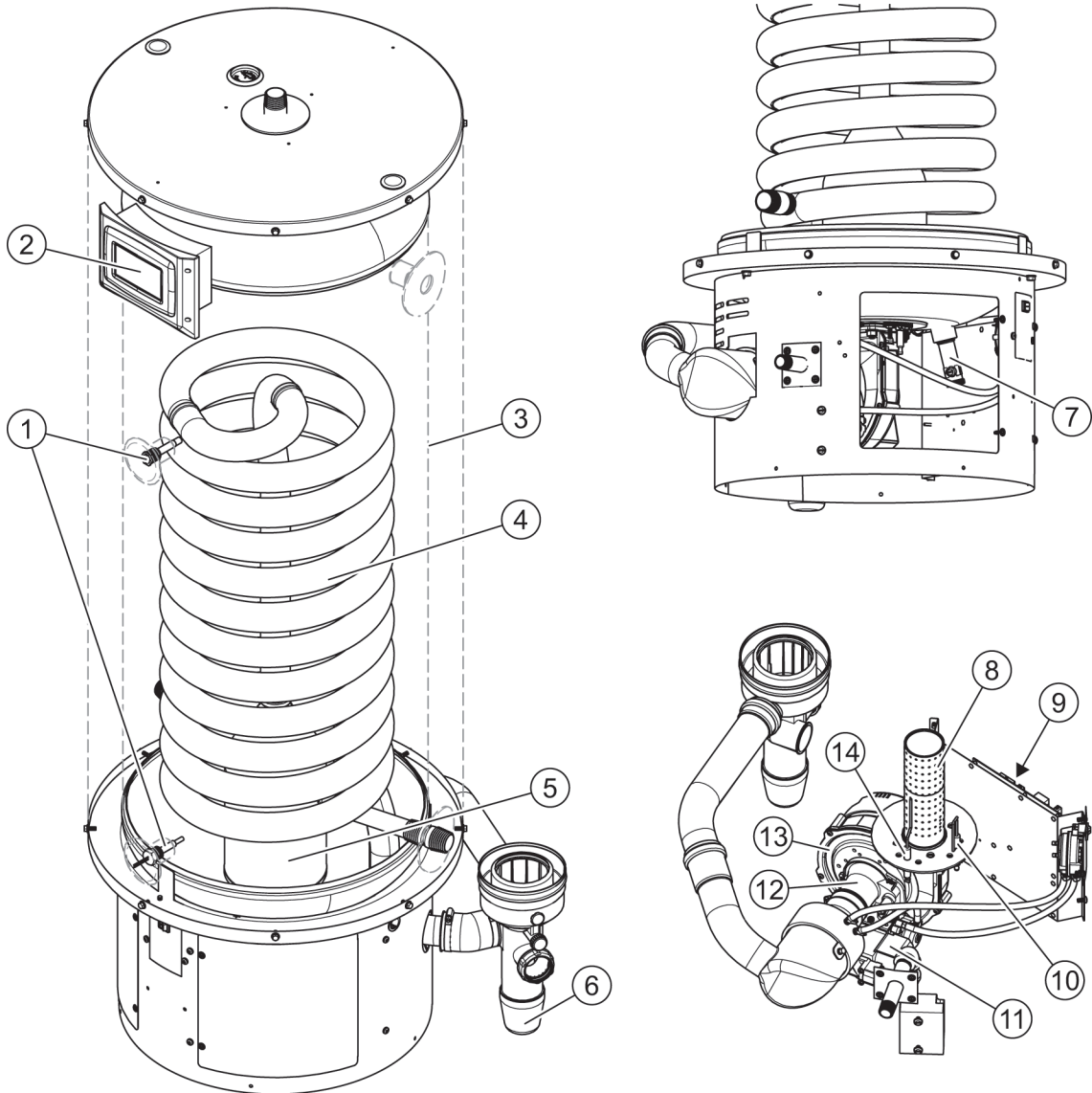
7 Water heater

7.1 Structure of the water heater

The water heater has the following main components:

| | |
|-----------------------|---|
| Controller (9) | The controller monitors and manages all internal processes of the water heater for a safe operation. |
| Display (2) | To control the water heater and to verify the status, the touchscreen display has several buttons to operate the water heater. Refer to Operator interface (see 3.1). |
| Tank (3) | The water is stored and heated up in the tank. |

Fig. Components water heater



- | | |
|-----------------------|-----------------------|
| 1. Temperature sensor | 9. Controller |
| 2. Display | 10. Spark plug |
| 3. Tank | 11. Gas control valve |
| 4. Heat exchanger | 12. Venturi |
| 5. Combustion chamber | 13. Fan |
| 6. Condensate drain | 14. Flame probe |
| 7. Drain valve | |
| 8. Burner | |

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 | < 2.05 mmol/l: - German hardness < 11.5° dH - French hardness < 12.5° fH - English hardness < 14.3° e - CaCO ₃ < 205 ppm |
| Chlorides | < 200 ppm |
| Acidity (pH value) | 6.5 - 8.0 |



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.

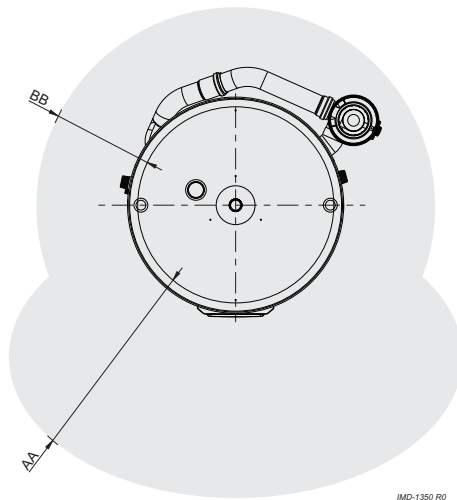
8.2.4

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).

Fig. Working clearances



8.3

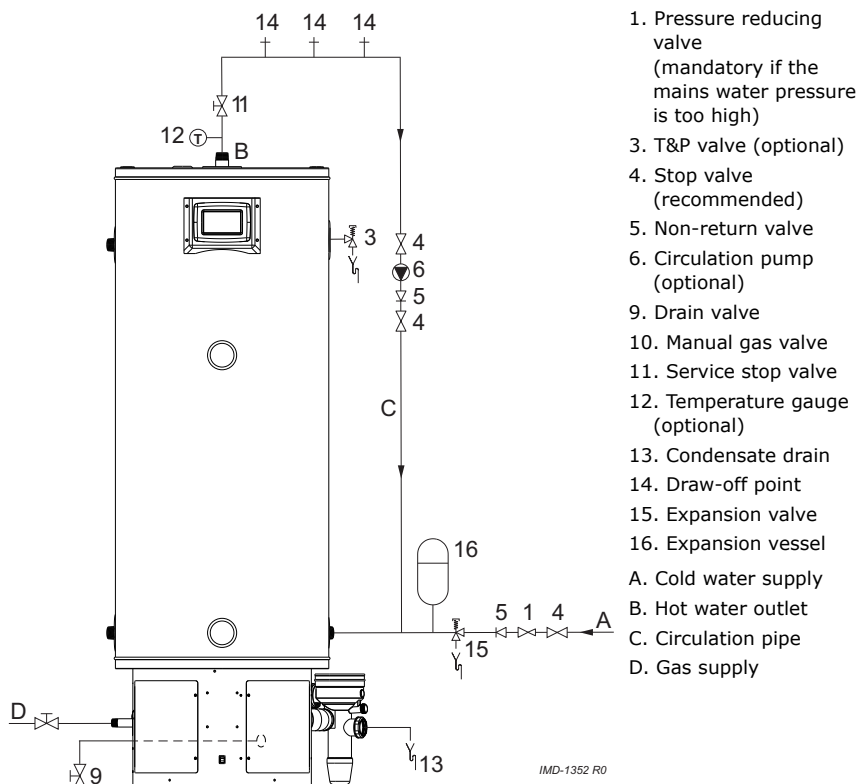
Installation diagram



Note

This manual only discusses unvented installations.

Fig. Installation diagram



1. Pressure reducing valve (mandatory if the mains water pressure is too high)
3. T&P valve (optional)
4. Stop valve (recommended)
5. Non-return valve
6. Circulation pump (optional)
9. Drain valve
10. Manual gas valve
11. Service stop valve
12. Temperature gauge (optional)
13. Condensate drain
14. Draw-off point
15. Expansion valve
16. Expansion vessel
- A. Cold water supply
- B. Hot water outlet
- C. Circulation pipe
- D. Gas supply



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 WRAS approved T&P valve (3).

8.4.3

Circulation connection

**Note**

Use the cold water inlet as a connection of the circulation pipe on 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. |
| 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.

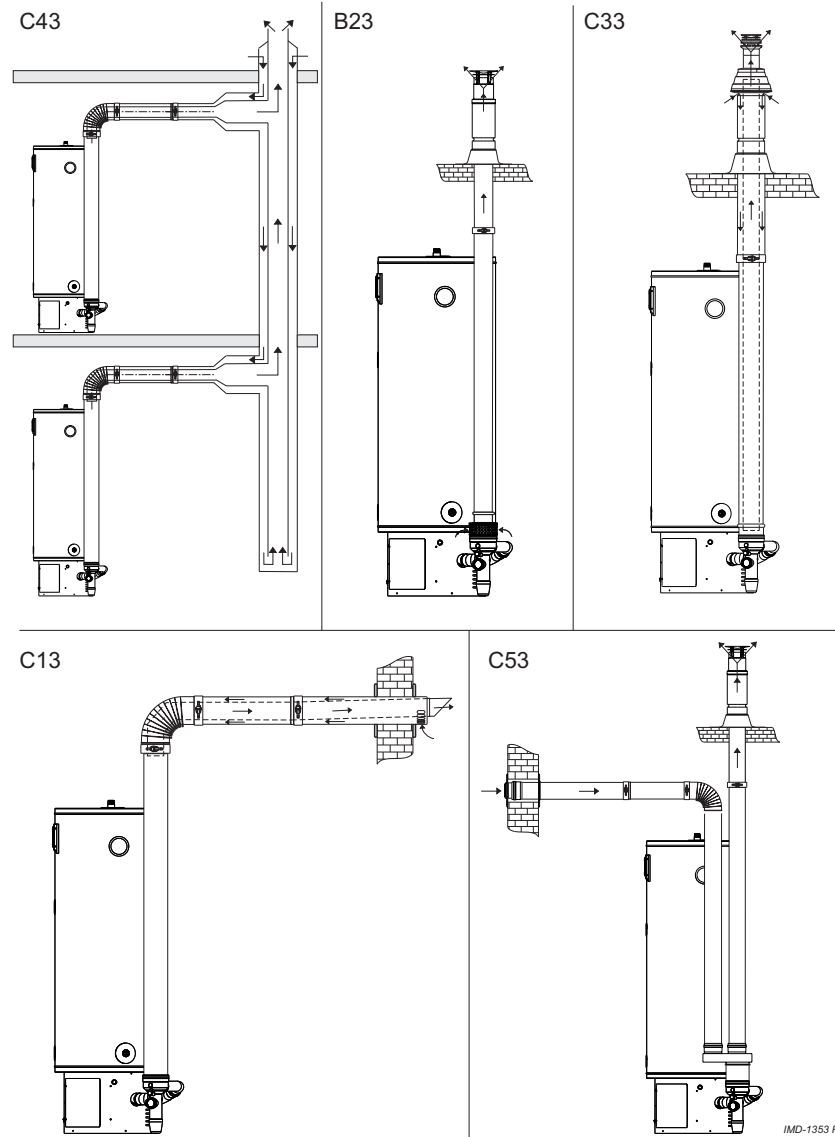
**Caution**

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



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.

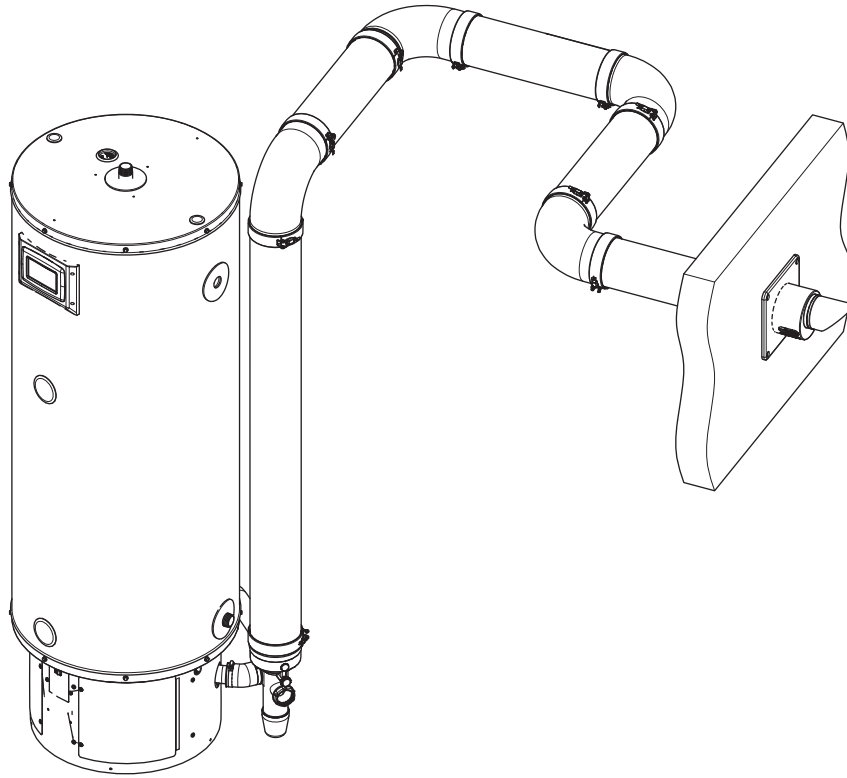
| Description Concentric Venting material | Venting material PP | Venting material Alu |
|--|---|---|
| Manufacture venting material | Muelink & Grol | Muelink & Grol |
| Construction | Concentric | Concentric |
| Material flue gas outlet | PP - Temp. Class T120 | Thick walled aluminum |
| Material air 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 | TWI 35-200 TWI 45-200 |
|--|-------|--------------------------|
| Diameter flue discharge/ air inlet | mm/mm | 80/125 |
| Maximum length | m | 20 |
| Maximum number of 45° and 90° bends | - | 5 |

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.

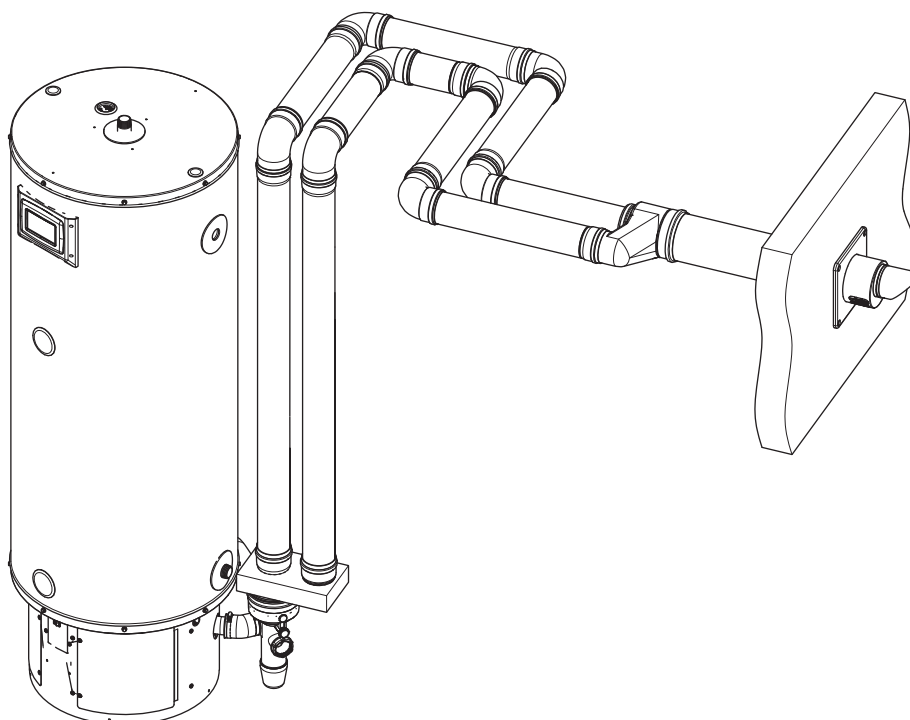
| Description Parallel Venting material | Venting material PP | Venting material Alu |
|--|---|---|
| Manufacture venting material | Muelink & Grol | Muelink & Grol |
| Construction | Parallel | Parallel |
| Material flue gas outlet | PP - Temp. Class T120 | Thick walled aluminum |
| Material air inlet | | |
| 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 | - |
| 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 | TWI 35-200 TWI 45-200 |
|---------------------------------------|-------|--------------------------|
| Diameter flue discharge/ air inlet | mm/mm | 2 x 80 |
| Maximum length air inlet | m | 50 |
| Maximum length flue gas outlet | m | 50 |
| L _{equivalent} 45°-bend | m | 1,1 |
| L _{equivalent} 90°-bend | m | 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 adaptor box:
 - Sum L_{equivalent} for each 45° bend.
 - Sum L_{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.

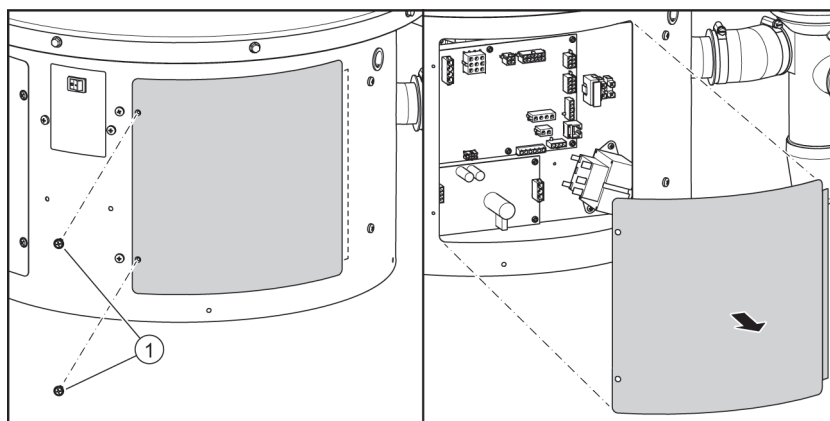
8.8.1

Preparation

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

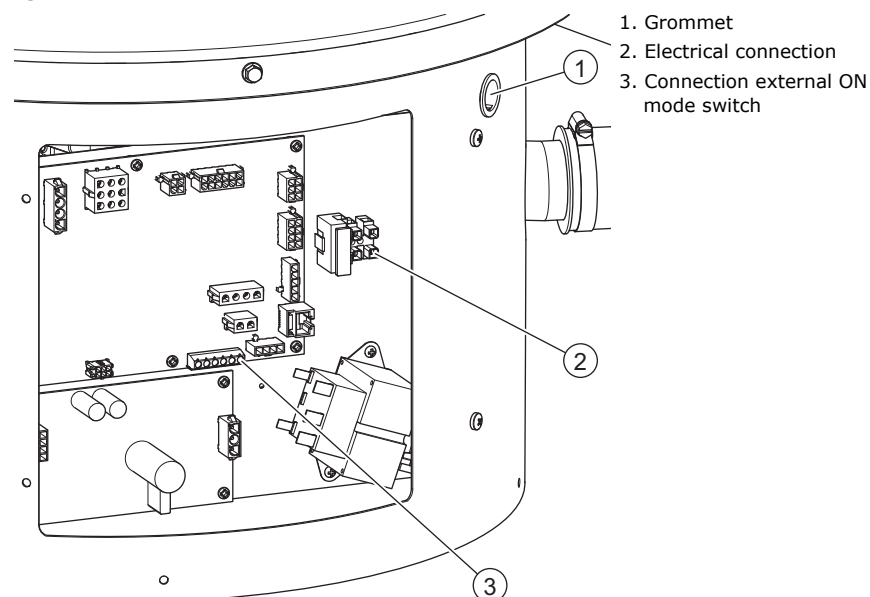
1. Use a screw driver to remove the screws at the right side cover (1).
2. Hinge the cover towards the front.
3. Take the cover from the water heater.

Fig. Remove the covers



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

Fig. Terminal block



8.8.2

Mains power



Note

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

Use a power cable with cores of at least 3 x 0,75 mm² and a double-pole isolator with a contact gap of at least 3 mm.

Connect the water heater to the mains power supply:

1. Pull the power cable through the grommet.
2. Connect the mains neutral core to N, the mains live core to L and the mains earth core to \pm .
3. Connect the power cable to the double pole isolator.



Note

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

8.8.3

External ON mode switch (optional)

Install an external ON mode switch:

1. Pull the cables through the grommet.
2. Connect the cables to the two left connections on [J17](#). (see 13.5)
3. [Set the appropriate settings in the interface](#) (see 10.5.1).

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 screw driver to tighten the screws at the front of 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 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 on the water heater (see 4.1).
4. Read the pressure value from the pressure gauge while the water heater is pre-purging.
5. Compare the measured value to the value from the table (see 13.1).

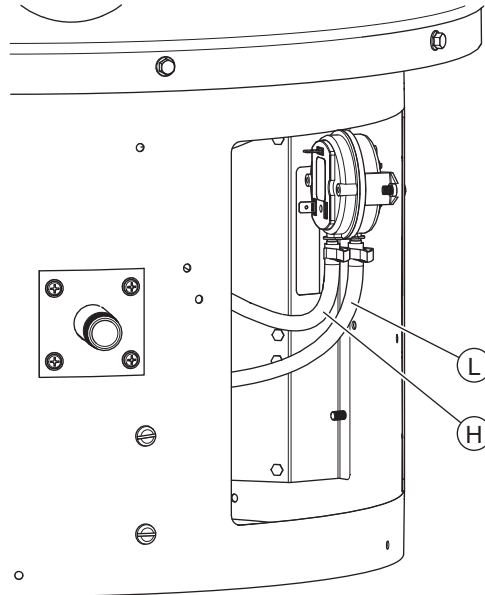


Note

When the air pressure differential is not correct, refer to Displayed errors (see 12.1.2), error LDS with code XAC-XXXX.

6. Set the control switch on the front of the water heater to **0** to turn off the water heater.
7. Disconnect the pressure gauge.
8. 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 (2) of the test nipple by a few turns.



Note

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

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

7. Use the pressure gauge to read the supply pressure and compare it with the value from the appendix Gas details (see 13.3).

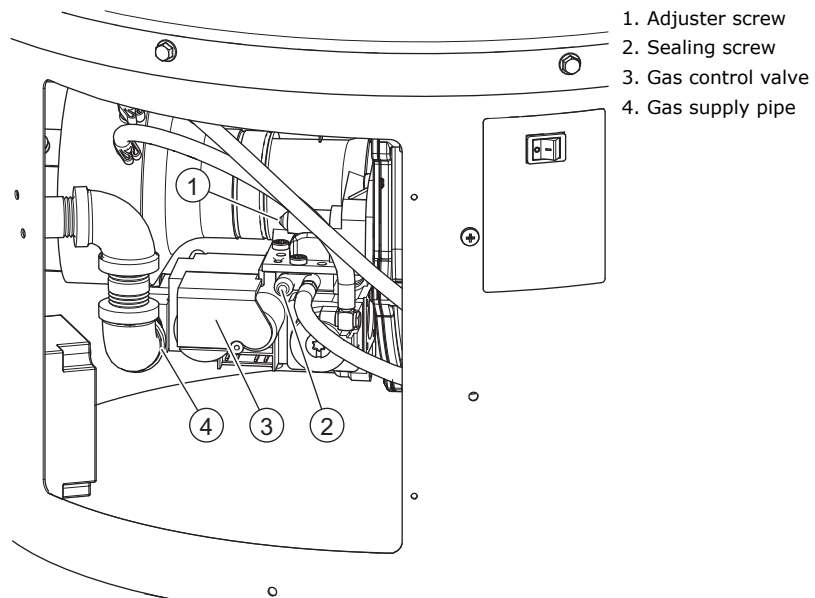


Note

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).

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

Fig. Gas supply pressure



8.9.4

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 (see 4.1).
5. If necessary, create a heat demand:
 - Use a hot water draw-off point to tap water, or
 - Raise the setpoint of the water temperature, refer to Set the water temperature.

6. Wait until the measured value on the CO₂ meter remains stable for some time. This can take several minutes.
7. Compare the full load measured value to the value from the appendix Gas details (see 13.3).
The CO₂ value at full load must be within ±1.0 vol% of the CO₂ value stated in the table.



Caution

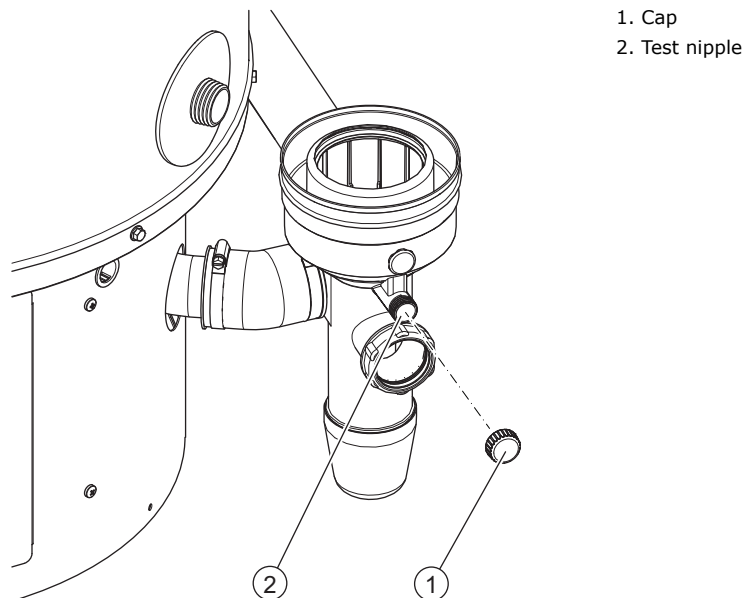
When the CO₂ value is not correct, refer to General errors (see 12.1.1), CO₂ value (at full load) is not correct.

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.
-

8. If necessary, use a hex driver to adjust the adjuster screw until the CO₂ value is correct.
 - a) Turn the screw anticlockwise for a higher CO₂ value.
 - b) Turn the screw clockwise for a lower CO₂ value.
9. If applicable, set the temperature value back to the original value.
10. Set the control switch on the front of the water heater to **0** to turn off the water heater.
11. Remove the measurement probe of the CO₂ meter from the test nipple and place the cap (1) back on the nipple (2).
12. 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 4.1).

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 4.2) and isolate the water heater from the mains power supply.

8.10.2 Draining

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

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

9

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

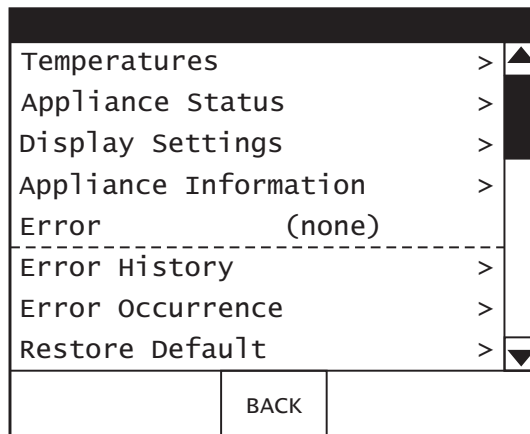
10.1 Display

The display is completely menu-driven and enables the user to change settings and to verify the status and history of the water heater.

For more information about how to use the display, refer to [Operator interface](#) (see 3).

On the display, press **[MENU]** to enter the main menu.

Fig. Main menu



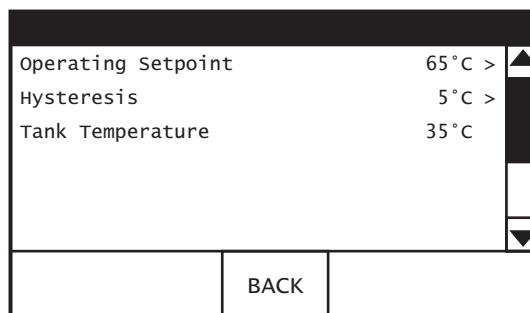
The main menu consists of 8 submenus. Use the scroll bar on the right side to scroll through the menu.

Press on a line with a **[>]** to open that specific submenu. Press **[BACK]** to return to the previous screen.

10.2 Temperatures

The **Temperatures** submenu shows the temperature setpoint, the set hysteresis and the actual water temperature in the water heater.

Fig. Temperature submenu



Press on a line with a **[>]** to set the operating setpoint or to set the hysteresis. Press **[BACK]** to return to the previous screen.

10.2.1

Temperatures

To change the temperature operating setpoint:

1. From the **Temperatures** submenu open the **Operating Setpoint** control screen.

| Setpoint | | | |
|--------------|--------------|------|---|
| 60 °C | | | + |
| MIN 40 °C | MAX 85 °C | | - |
| ACCEPT | | BACK | |

2. Change the water temperature setpoint:
 - a) Use **[+]** to increase the setpoint.
 - b) Use **[-]** to decrease the setpoint.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

10.2.2

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 setting for the hysteresis is 5 °C. The operating cycle starts when the water temperature drops to 5 °C below the SETPOINT and ends when the water reaches the SETPOINT.

To change the hysteresis:

1. From the **Temperatures** submenu open the **Hysteresis control** screen.

| Hysteresis | | | |
|-------------|--------------|------|---|
| 5 °C | | | + |
| MIN 2 °C | MAX 10 °C | | - |
| ACCEPT | | BACK | |

2. Change the setting:
 - a) Use **[+]** to increase the hysteresis.
 - b) Use **[-]** to decrease the hysteresis.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

10.3 Appliance Status

The **Appliance Status** submenu shows detailed information on several parts of the appliance.

Fig. Appliance status submenu

| | | |
|-------------------------|------------------------|---|
| Status: | Water Heating Disabled | ▲ |
| Max Temperature Contact | Disabled | |
| Air Proving Switch | Disabled | |
| Igniter on | No | |
| Gas Valve on | No | |
| Flame Detected | No | |
| Target Blower RPM | 0rpm | |
| Blower RPM | 0rpm | ▼ |
| BACK | | |

10.4 Display settings

The **Display Settings** submenu shows the settings for the display brightness, the backlight delay and the language.

Fig. Display settings submenu

| | | |
|-----------------|----------------|---|
| Brightness | 4 > | ▲ |
| Backlight Delay | 30s > | |
| Language | English (GB) > | |
| BACK | | |

Press on a line with a [>] to change the settings.

10.4.1 Set the display brightness

To change the display brightness:

- From the **Display Settings** submenu open the **Brightness** control screen.

| Brightness | | |
|------------|-----------|---|
| 4 | | + |
| MIN 0 | MAX 10 | - |
| ACCEPT | BACK | |

- Change the setting:
 - Use **[+]** to increase the brightness.
 - Use **[-]** to decrease the brightness.
- Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

10.4.2

Set the backlight delay

To change the backlight delay:

1. From the **Display Settings** submenu open the Backlight Delay control screen.

| Backlight Delay | | |
|-----------------|-------------------|---|
| 30s | | + |
| MIN 30s | MAX 240s (Aan) | - |
| ACCEPT | BACK | |

2. Change the setting:
 - a) Use **[+]** to increase the time that the backlight is on.
 - b) Use **[-]** to decrease the time that the backlight is on.



Note

When the backlight delay is set to 240 s (maximum value), the backlight will be continuously on.

3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

10.4.3

Set the language

To change the language:

1. From the **Display Settings** submenu open the **Language** control screen.

| Language | | |
|--------------------|---------------------|---|
| English (GB) | | + |
| MIN French (FR) | MAX English (EN) | - |
| ACCEPT | BACK | |

2. Use **[+]** and **[-]** to change the language setting.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

10.5

Appliance information

From the main menu, you can open the **Appliance Information** submenu. The **Appliance Information** submenu shows information about the operating history of the water heater.

Fig. Display - Appliance Information

| | | |
|---------------------------|------------------|---|
| Elapsed Time | 44Day 19Hr 51Min | ▲ |
| Burning Time | 11Hr 12Min | |
| Use External Enable | No | > |
| External Enable Activated | No | |
| Ignition Attempts | 3 tries | > |
| Total Cycles Counter | 44 | |
| ----- | | |
| CCB Version | 3.32 | |
| Config CRC | 0x0709 | |
| UIM Version | 4.03.03 | ▼ |
| BACK | | |

Use the **Appliance Information** submenu to activate or deactivate the external ON mode switch and to set the ignition attempts.

10.5.1

Use external enable

To change the status of the external ON mode switch:

- From the **Appliance Information** submenu open the **Use External Enable** control screen.

| Use External Enable | | |
|---------------------|------------|------|
| NO | | + |
| MIN No | MAX Yes | - |
| ACCEPT | | BACK |

- Change the setting:
 - Use **[+]** to activate the external ON mode switch.
 - Use **[-]** to deactivate the external ON mode switch.
- Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

10.5.2

Ignition attempts

To set the number of ignition attempts before the water heater shows an error:

- From the **Appliance Information** submenu open the **Ignition Attempts** control screen.

| Ignition Attempts | | |
|-------------------|--------------|------|
| 3 tries | | + |
| MIN 3 tries | MAX 1 try | - |
| ACCEPT | | BACK |

2. Change the setting:
 - a) Use **[+]** to increase the number of attempts.
 - b) Use **[-]** to decrease the number of attempts.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

10.6 Error history

From the main menu, you can open the **Error History** submenu. The **Error History** submenu shows the 9 most recent errors of the water heater and the point of time of these errors. Press **[>]** to open the information about that specific error.

Fig. Display - Error History

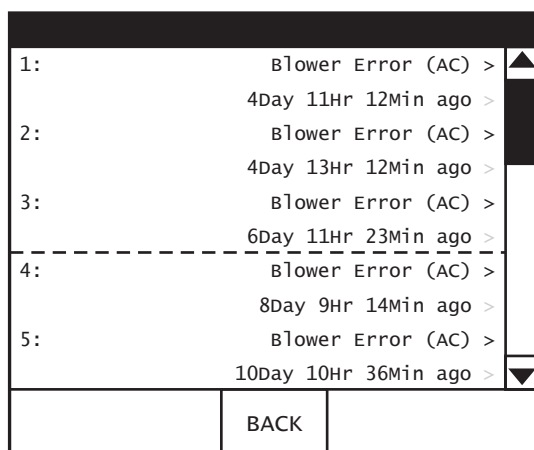
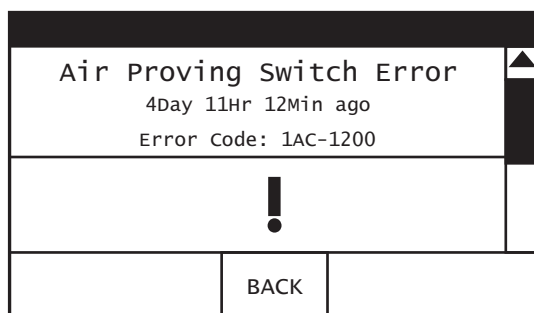


Fig. Display error information



Press **[BACK]** to return to the previous screen.

10.7 Error occurrence

From the main menu, you can open the **Error Occurrence** submenu. The **Error Occurrence** submenu shows the amount of occurred errors of the water heater.

Fig. Display - Error Occurrence

| | | |
|---------------------------|---|---|
| Ignition Error | 0 | ▲ |
| High-Limit Thermostat | 0 | |
| Air Proving Switch | 0 | |
| Flame Detection Error | 0 | |
| Top Temperature Sensor | 0 | |
| Bottom Temperature Sensor | 0 | |
| Power Supply Error | 0 | |
| CCB-hardware | 0 | |
| Model Error | 0 | |
| CCB-communication | 0 | ▼ |
| BACK | | |

Press **[BACK]** to return to the previous screen.

10.8 Restore default

From the main menu, you can open the **Restore Default** submenu. On the **Restore Default** submenu you can restore the settings to the factory default settings.

Fig. Display - Restore default

| | | |
|---|--|----|
| <h3>Restore Defaults</h3> <p>Are you sure you want to restore the system to the factory defaults?</p> | | |
| Yes | | No |

Press **[Yes]** to confirm or **[No]** to return to the previous screen.

10.9

Service menu

The service menu is used to activate the service mode. This service mode can, for example, be used to set the CO₂-value at full and at partial load or to check the air pressure differential.

Use the "invisible" button on the home screen. Press this button for 10 seconds and the service menu will be visible.

Fig. Location invisible service menu button

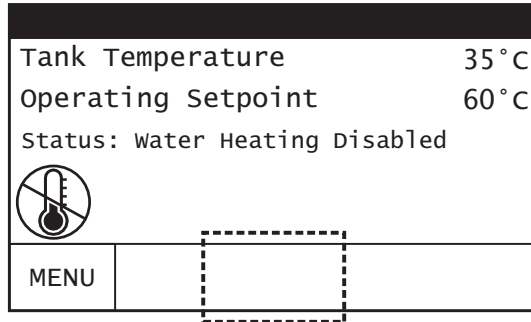
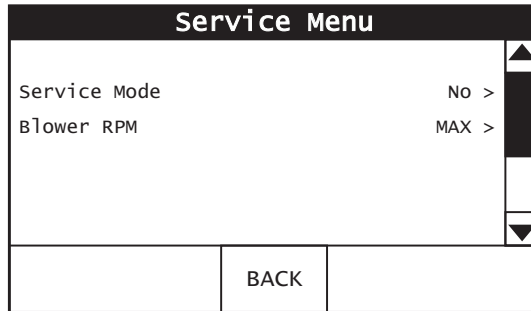


Fig. Service menu screen



The service menu consists of two submenus. Use the scroll bar on the right side to scroll through the menu. Press on a line with a [>] to open the specific submenu. Press [**BACK**] to return to the previous screen.

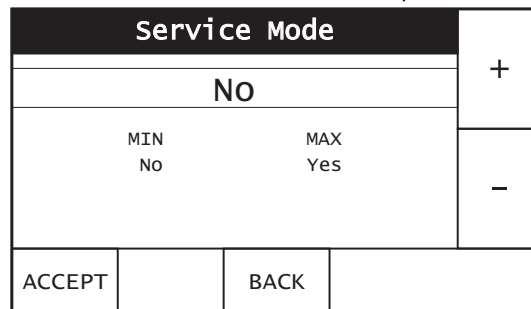
In order to stop the Service Mode, the setting of the Service Mode, must be set to **No**.

10.9.1

Set the service mode

To change the service mode:

1. From the **Service Menu** submenu open the **Service Mode** control screen.



2. Use [**+**] and [**-**] to change the service mode setting.
3. Press [**ACCEPT**] to confirm the value or press [**BACK**] to return to the previous screen.

The fan will be activated and starts according to the setting of the blower RPM (full load when MAX and Partial Load when MIN)

10.9.2

Set the fan speed

To change the fan speed:

1. From the **Service Menu** submenu open the **Blower RPM** control screen.

| Blower RPM | | | |
|------------|--|------|---|
| Max | | | + |
| MIN | | MAX | - |
| MIN | | MAX | |
| ACCEPT | | BACK | |

2. Use **[+]** and **[-]** to change the blower RPM setting.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

The fan will now operate according to the new setting.



Note

The fan will reduce speed when going from Full Load (MAX) to Partial Load (MIN) and will gain speed when going from Partial Load (MIN) to Full Load (MAX).

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.

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.



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. If applicable, make sure that the T&P valve operates correctly.
Open the T&P valve pressure relief and make sure that water spurt out.



Warning

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

3. Make sure the pressure relief connection of the inlet security group operates correctly.
Open this pressure relief and make sure that water spurt out.
4. Remove the covers from the water heater, refer to Installation.
5. Make sure that the condensate drain operates correctly.
If necessary, remove any contamination.
6. Make sure that there are no leaks in the venting system.
7. Make sure the air pressure differential is correct, refer to Air pressure differential.
8. Make sure the gas supply pressure is correct, refer to [Gas supply pressure](#) (see 8.9.3).
9. 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 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).

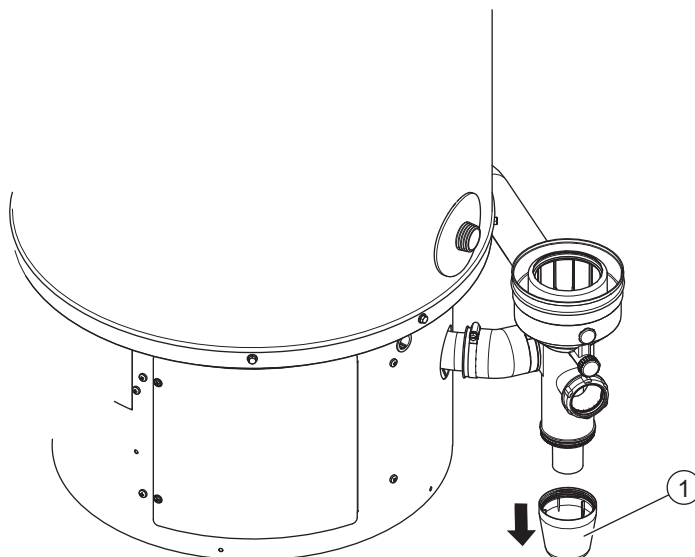
If necessary, use a descaling agent to remove the scale and contamination from the tank. Contact A.O. Smith for advice on what descaling agent to use.

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 are no blockages in the condense trap.
5. Make sure that there are no blockages in the condensate drain.
6. Make sure that there are no 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. Condense trap

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

11.4.1

Clean the burner



Caution

Be careful, the burner can be hot

Caution

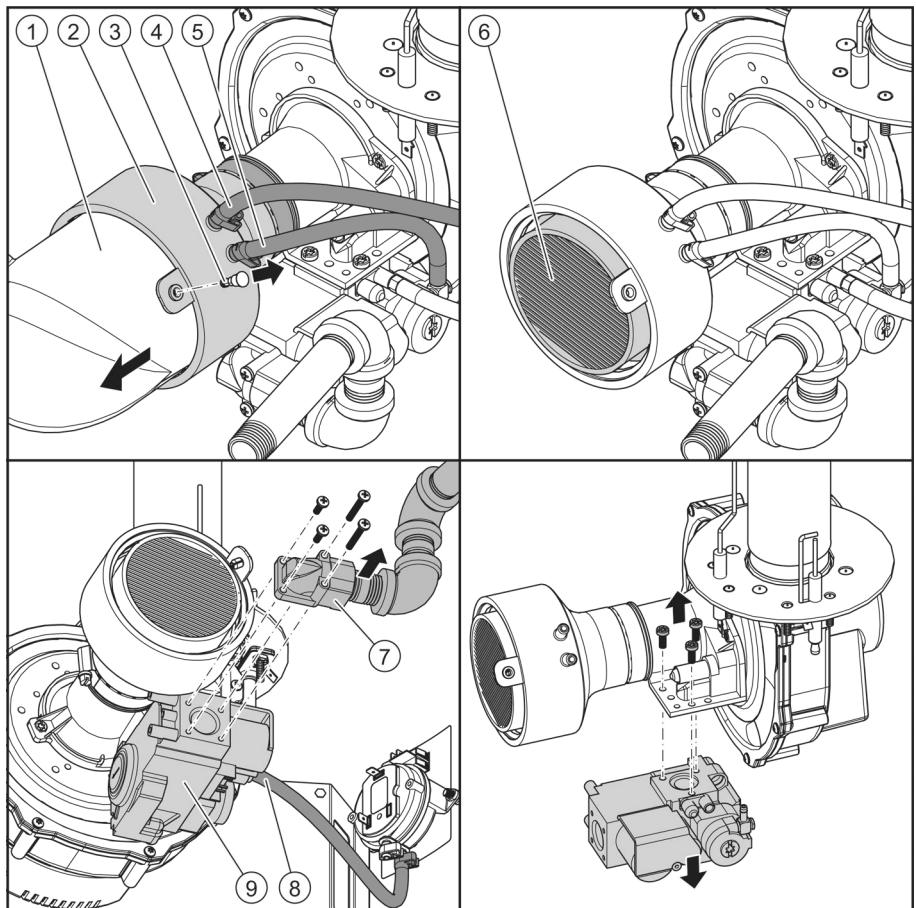
Always replace the seal after removal of the burner

**Note**

Mind the ground cable!

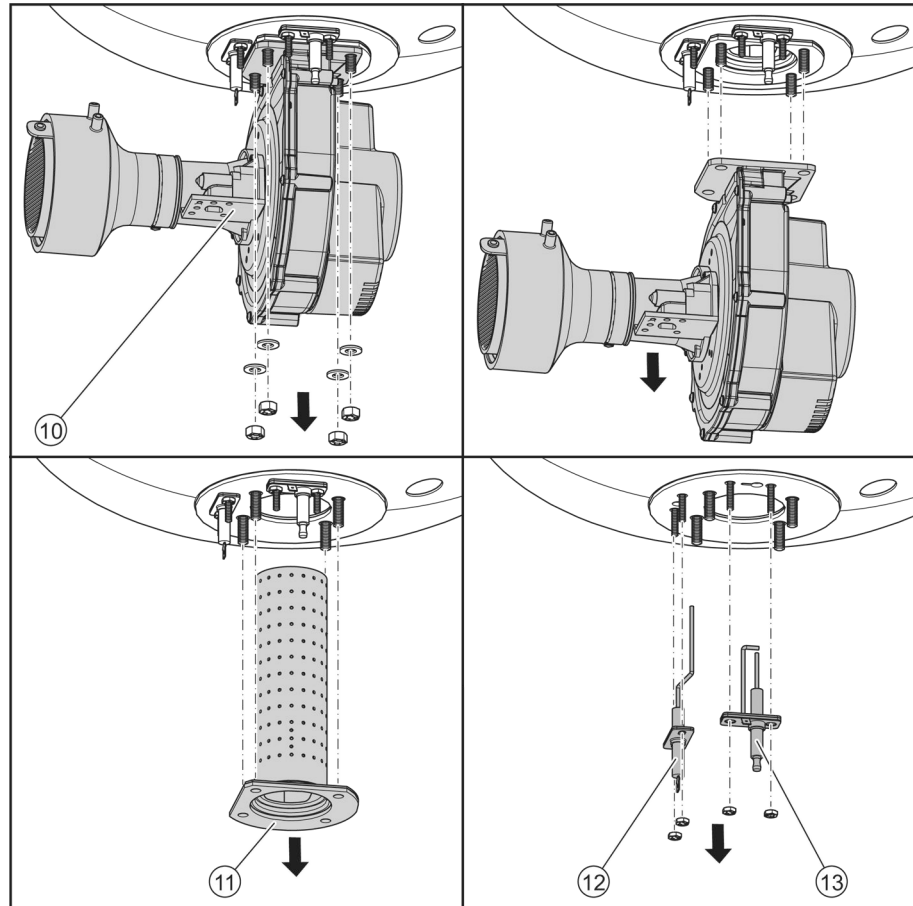
Remove the burner:

1. Close the gas control valve, refer to Installation diagram (see 8.3).
2. Disconnect the hoses (4, 5) from the air inlet pipe.
3. Remove the secure pin (3) to disconnect the air supply pipe.
4. Pull the air supply pipe (1) out of the water heater.
5. Loosen the 4 screws and disconnect the gas supply pipe (7).
6. Disconnect the hose (8) from the gas control valve (9).
7. Loosen the three bolts (7) to disconnect the gas control valve (9).
8. Take the gas control valve out of the water heater.



9. Loosen the four nuts to disconnect the fan (10) and the burner (11).

10. Take the fan and burner out of the combustion chamber.
11. Remove the flame rod (12). Do a visual check on the flame rod.
12. Remove the spark plug (13). Do a visual check on the spark plug.



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

11.4.2

Assemble the burner

Assemble the burner again when the burner is 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.

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

1. Install the spark plug and the flame rod onto the combustion chamber.
2. Install the burner and fan with four nuts onto the combustion chamber.
3. Install the gas control valve.
4. Connect the hose to the gas control valve.
5. Connect the gas supply pipe to the gas control valve.
6. Install the air inlet filter.
7. Install the air supply pipe.
8. Place the secure pin.
9. Connect the hoses to the air inlet pipe.
10. Open the gas control valve, refer to [Installation diagram](#) (see 8.3).

11.4.3

Clean the air inlet filter

Clean the air inlet filter:

1. Remove the secure pin (3) to disconnect the air supply pipe (1).

2. Pull the air supply pipe out of the water heater.
3. Remove the filter (4) out of the rubber socket (2).
4. Use a vacuum cleaner to clean the filter.
5. Replace the filter in the rubber socket.
6. Install the air supply pipe back onto the water heater.
7. Place the secure pin.



Caution

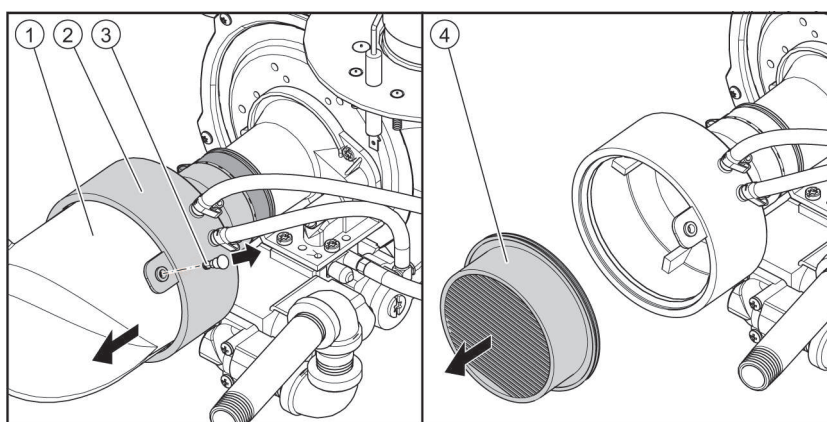
The filter must be placed back into the rubber socket at all times. When the filter is not placed in the rubber socket it can cause the water heater to malfunction.



Note

Make sure that the gas supply pressure is correct, refer to gas supply pressure (see 8.9.3).

Fig. Air inlet filter



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 screw driver to tighten the screws 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.
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 4.1).

12 Troubleshooting

12.1 Errors and warnings

The water heater can have three different kinds of errors:

- 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 code is displayed continuously and the exclamation mark blinks.
 - Blocking errors: when the cause is removed, the error resets automatically to resume operation. The code is displayed continuously and the exclamation mark 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 10.6).

12.1.1 General errors



Note

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

| Indication | Cause | Measure |
|---------------------------|-----------------------------|---|
| Gas smell | There is a gas leak | <ul style="list-style-type: none">- Close the mains gas valve at once.- Do not operate any switches.- Avoid open flames.- Ventilate the boiler room.- Immediately contact your installation engineer or your local gas company. |
| The display is off | There is no supply voltage. | Make sure that: <ul style="list-style-type: none">- 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 air connector. | Make sure that: <ul style="list-style-type: none"> - the air connector is not damaged. If necessary, replace the air connector. - the air connector is correctly connected to the venturi. If necessary, tighten the clamp. |
| | The air inlet filter is contaminated. | <u>Clean the air inlet filter</u> (see 11.4.3). |
| Insufficient or no hot water | The water heater is off. | <u>Turn on the water heater</u> (see 4.1). |
| | There is no supply voltage. | Make sure that: <ul style="list-style-type: none"> 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. | Set the controller in the ON mode. |
| | The setpoint is set too low. | Set the setpoint to a higher value. |
| | The external ON mode switch is not enabled. | <u>Set the "External use Enabled" to Yes.</u> (see 10.5.1) |

| Indication | Cause | Measure |
|--|---|--|
| CO₂ value 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 (see 13.3). |
| | Contaminated venturi | Remove any contamination from the venturi inlet. |
| | Leakage between venturi and venturi connector | <ul style="list-style-type: none"> - Make sure that the venturi connector is not damaged. If necessary replace the venturi connector - Make sure that the 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 CO₂ value (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.

Note

Contact your service and maintenance engineer if the error persists.

Note

Each error has a code and a description. The code has 7 characters: XXX-XXXX. When the water heater has an error, the two digits before the dash (XXX-XXXX) are important to pinpoint the error.

| Code and description | Cause | Measure |
|--|---|---|
| X47-XXXX (blocking error) Sensor error Open circuit of temperature sensor | Sensor is not (correctly) connected. | <ul style="list-style-type: none"> - Make sure that the connector is connected to J9. - Make sure that the wire is connected to the sensor. |
| | Damaged wiring and/or defective sensor. | Replace the wiring and/or the sensor. |
| X45-XXXX (blocking error) Sensor error Short circuit of the temperature sensor | Short circuit in the sensor circuit. | Replace the wiring and/or the sensor. |

| Code and description | Cause | Measure |
|---|--|--|
| XA5-XXXX (lock out error) Temperature error High temp limit exceeded | The temperature in the tank is above 95°C. | Refer to indication X54-XXXX (see 12.1.3). <ul style="list-style-type: none"> - Make sure that the wiring between 1 and 4 of J9 is connected and not damaged. - If necessary, replace or reconnect the wiring. - When the wiring is reconnected, reset the controller. |
| X48-XXXX (blocking error) Sensor error Open circuit of temperature sensor | Sensor is not (correctly) connected. | <ul style="list-style-type: none"> - Make sure that the connector is connected to J10. - Make sure that the wire is connected to the sensor. |
| | Damaged wiring and/or defective sensor. | Replace the wiring and/or the sensor. |
| X46-XXXX (blocking error) Sensor error Short circuit of temperature sensor | Short circuit in the sensor circuit. | Replace the wiring and/or the sensor. |
| X57-XXXX (lock out error) Short circuit flame sensor | Electrical connection between flame sensor and tank or burner. | <ul style="list-style-type: none"> - Make sure that the flame sensor does not touch the tank. - If necessary, replace the flame sensor. - Make sure that the combustion chamber is dry. - Make sure that the cables of the flame sensor are correctly connected. - If necessary, replace the connector of the flame sensor to the correct connection. |
| XAC-XXXX (blocking error) Air proving switch error Switch is not closed when fan is running during pe-purge | Hoses are damaged. | <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. |
| | Wiring is damaged. | <ul style="list-style-type: none"> - Make sure that the wiring, between the air proving switch and the controller, is connected and not damaged. - If necessary, replace the wiring or reconnect the wires. - When wires are replaced or reconnected, reset the controller. |
| | Leakage of air between venturi and air connector. | <ul style="list-style-type: none"> - Make sure that the air connector is not damaged. If necessary, replace the air connector. - Make sure that the hose is properly connected to the venturi. If necessary, tighten the clamp. |

| Code and description | Cause | Measure |
|--|---|---|
| | <p>Not enough pressure differential across the air proving switch, due to:</p> <ul style="list-style-type: none"> - venting system - malfunction 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. <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"> - <u>Make sure that the the burner is 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. - Use a multimeter to make sure that the air proving switch is closed. |
| <p>XAC-XXXX (blocking error) Fan error</p> <p>Switch is closed when fan is not running.</p> | <p>Damaged wiring/closed circuit.</p> | <ul style="list-style-type: none"> - Make sure that the wiring, between the air proving switch and the controller, is connected and not damaged. - If necessary replace the wires or reconnect the wires. Reset the controller, when wires are replaced or reconnected. |
| | <p>Air proving switch defect.</p> | <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 |
|--|---|---|
| XB2-XXXX (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 spark igniter circuit. | <ul style="list-style-type: none"> - Make sure that the spark igniter is installed correctly. - Make sure that the wiring of the spark igniter is not damaged. If necessary, replace the spark igniter. |
| | 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 60 µA. If necessary, replace the wiring and/or flame probe. |
| | 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. |
| | 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. |
| XAF-XXXX (lock out error) Control error Hardware failure | Too many resets. | Turn off the power for 10 seconds. |
| XC9-XXXX (lock out error) Control error Hardware failure | Disconnect the selection key. | <ul style="list-style-type: none"> - Make sure that the selection is connected to J12. - If necessary, replace the selection key. |

12.1.3

Warnings



Note

For the coding of the connections, refer to the [Electrical wiring diagram](#) (see 13.5).

| Indication | Cause | Remark |
|---|---|--|
| X54-XXXX Temperature warning | 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.- Make sure that there is no scale on the temperature sensor. If necessary, replace the sensor.- Make sure that no water enters the tank through the outlet.- Make sure that the water heater is not fed with water >90°C. |

13 Appendices

13.1 Technical details

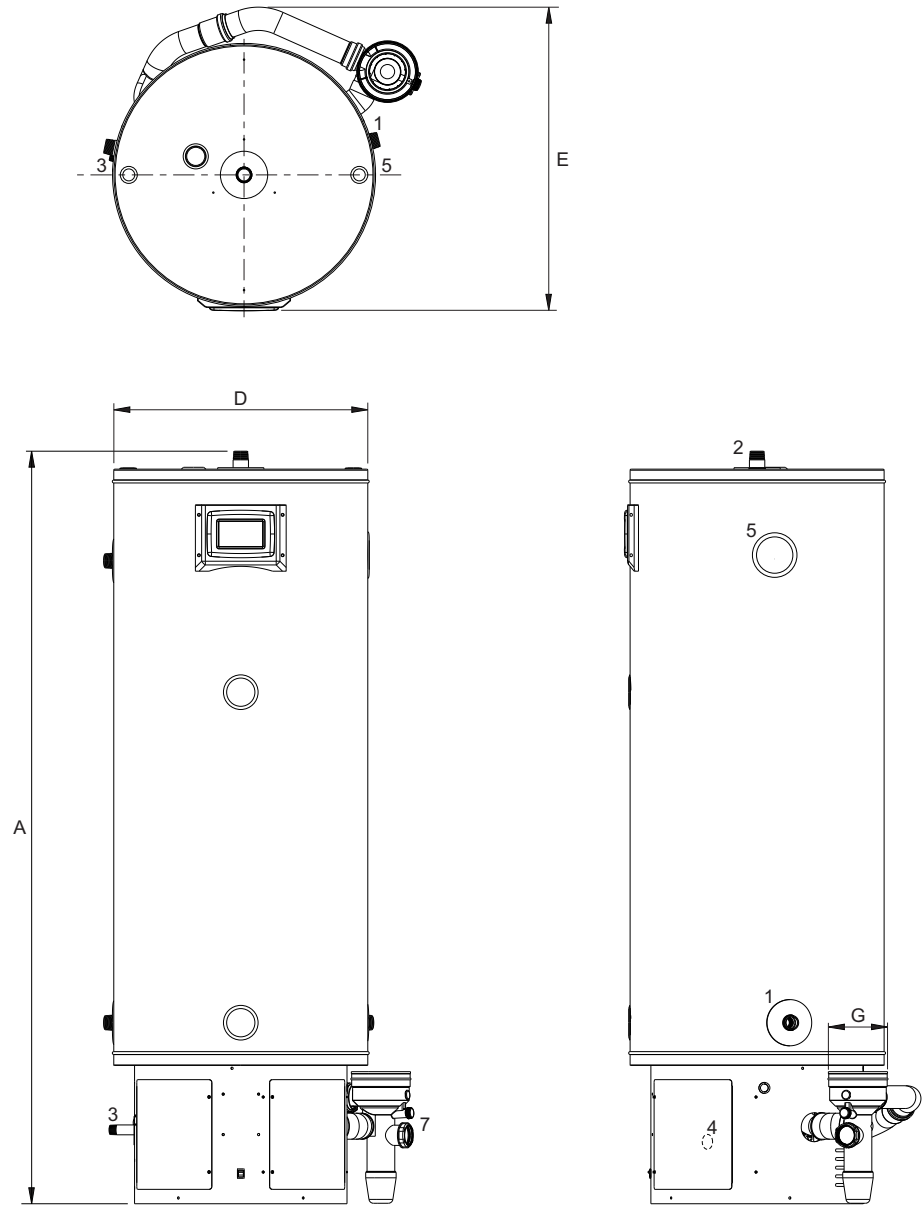
| Description | Unit | TWI 35-200 | TWI 45-200 |
|---|-----------|------------|------------|
| General | | | |
| Capacity | l | 182 | 182 |
| Empty Weight | kg | 79 | 79 |
| Maximum floor load | kg | 261 | 261 |
| Maximum working pressure | kPa (bar) | 800 (8.0) | 800 (8.0) |
| Control thermostat - adjustment range | °C | 40 - 85 | 40 - 85 |
| Control thermostat - default value | °C | 65 | 65 |
| Hysteresis upwards - adjustment range | °C | 0 | 0 |
| Hysteresis upwards - default value | °C | 0 | 0 |
| Hysteresis downwards - adjustment range | °C | 2 - 10 | 2 - 10 |
| Hysteresis downwards - default value | °C | 5 | 5 |
| Number of (electrical) anodes | - | 0 | 0 |
| Fan speed at ignition | rpm | 5000 | 5000 |
| Fan operating speed | rpm | 7200 | 9200 |
| Minimum measured air pressure differential across the pressure switch | Pa | > 420 | > 420 |
| Setpoint pressure switch | Pa | 370 | 370 |
| Heating time $\Delta T = 45^{\circ}\text{C}$ | min. | 17 | 13 |
| Electrical | | | |
| Electrical power consumption | W | 160 | 230 |

| Description | Unit | TWI 35-200 | TWI 45-200 |
|---------------------------------|----------|-------------------------------|------------|
| Supply voltage / Main frequency | VAC / Hz | 230 (-15%, +10%) / 50 (+/- 1) | |
| IP-class | - | IP30 | |

13.2 Dimensions

| Size | Description | Unit | TWI 35-200 | TWI 45-200 |
|--------------------------------|---|-------|------------|------------|
| Dimensions water heater | | | | |
| A | Height | mm | 1655 | 1655 |
| D | Width | mm | 560 | 560 |
| E | Depth | mm | 730 | 730 |
| G | Flue gas outlet/ Air inlet | mm/mm | 80/125 | 80/125 |
| Dimensions connections | | | | |
| 1 | Cold water supply connection (male) | - | 1" | 1" |
| 2 | Hot water outlet connection (male) | - | 1" | 1" |
| 3 | Gas control valve connection (male) | - | 3/4" | 3/4" |
| 4 | Drain valve connection (female) | - | 3/4" | 3/4" |
| 5 | T&P-valve connection (female) | - | 3/4" NPT | 3/4" NPT |
| 7 | Condensation drainage connection (female) | mm | Ø 40 | Ø 40 |

Fig. Dimensions



IMD-1349b R0

13.3 Gas details

| Description | Unit | TWI 35-200 | TWI 45-200 |
|--|-------------------|------------|------------|
| Gas category 2H (G20) | | | |
| Diameter of the venturi restrictor | mm | - | - |
| Nominal Load (gross) | kW | 37.8 | 48.9 |
| Nominal output | kW | 34.9 | 45.1 |
| Supply pressure | mbar | 20 | 20 |
| CO ₂ (full load) | vol% | 9.0 ± 0.5 | 9.0 ± 0.5 |
| O ₂ (full load) | vol% | 4.8 ± 0.9 | 4.8 ± 0.9 |
| Gas consumption ⁽¹⁾ | m ³ /h | 3.6 | 4.7 |
| NO _x emission | mg/kWh GCV | 53 | 53 |
| Mass flow rate flue gases (minimal load) | kg/h | 42 | 42 |
| Mass flow rate flue gases (nominal load) | kg/h | 61 | 79 |
| Flue gas temperature (nominal load) | °C | 65 | 75 |
| Gas category 3P (G31) | | | |
| Diameter of the venturi restrictor | mm | 6.00 | 6.00 |
| Nominal Load (gross) | kW | 37.0 | 47.8 |
| Nominal output | kW | 34.9 | 45.4 |
| Supply pressure | mbar | 37 | 37 |
| CO ₂ (full load) | vol% | 10.0 ± 0.5 | 10.0 ± 0.5 |
| O ₂ (full load) | vol% | 5.7 ± 0.8 | 5.7 ± 0.8 |
| Gas consumption | kg/h | 2.6 | 3.4 |
| NO _x emission | mg/kWh GCV | 61 | 61 |
| Mass flow rate flue gases (minimal load) | kg/h | 43 | 43 |
| Mass flow rate flue gases (nominal load) | kg/h | 63 | 81 |
| Flue gas temperature (nominal load) | °C | 65 | 75 |

1 - Based on 1013.25 mbar and 15°C.

13.4 Energy labeling

| Description | Unit | TWI 35-200 | TWI 45-200 |
|--|---------|------------|------------|
| Declared load profile | | | |
| Load profile | - | XXL | XXL |
| Energy efficiency class (Energy label) | - | A | A |
| Energy efficiency | % | 93 | 91 |
| Daily electricity consumption | kWh | 0.249 | 0.277 |
| Daily fuel consumption | kWh GCV | 25.816 | 26.274 |
| Mixed water 40 °C (V40) | l | ∞ | ∞ |
| Additional load profile | | | |
| Load profile | - | - | - |
| Energy efficiency class (Energy label) | - | - | - |
| Energy efficiency | % | - | - |
| Daily electricity consumption | kWh | - | - |
| Daily fuel consumption | kWh GCV | - | - |
| Mixed water 40 °C (V40) | l | - | - |



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: Twister
Product models: TWI 35-200, TWI 45-200

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, 180100356, 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
5503 LW Veldhoven
The Netherlands

hereby declares that the following products:

Product description: Condensing high efficiency appliance
Product family name: Twister
Product models: TWI 35-200, TWI 45-200

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, 180100356, 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

13.7

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 stainless steel tank) of a water heater supplied by A.O. Smith proves within 1 (one) year 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 stainless steel tank of a water heater supplied by A.O. Smith proves within 5 (five) 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.

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 amount of chlorides is more than 200 ppm and/or the hardness (alkaline earth ions) of the water being more than 2.05 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 stainless steel tank of) a (replacement) water heater that it has supplied.

Index

| | |
|------------------------|----|
| Switch to ON mode..... | 23 |
|------------------------|----|

| | |
|---------------------------------|----|
| A | |
| About the water heater..... | 27 |
| About this manual..... | 7 |
| Air pressure differential | 50 |
| Ambient conditions | 37 |
| Appendices..... | 81 |
| Appliance Status..... | 59 |
| Appliance information..... | 61 |
| Assemble the burner..... | 70 |

| | |
|---------------------------------|----|
| C | |
| C13/C33 concentric systems..... | 43 |
| C13/C33 parallel systems..... | 45 |
| C43/C53/C63 systems | 47 |
| CO ₂ value..... | 51 |
| Circulation connection | 40 |
| Clean the air inlet filter..... | 70 |
| Clean the burner..... | 69 |
| Clean the condensate drain..... | 68 |
| Cold water connection..... | 39 |
| Commissioning..... | 49 |
| Compliance..... | 4 |
| Condensate drain..... | 40 |
| Conditions..... | 37 |
| Contact information | 5 |
| Control Switch..... | 19 |
| Conversion of gas type..... | 55 |
| Copyright..... | 3 |

| | |
|--------------------------------|--------|
| D | |
| Declaration of conformity..... | 87 |
| Decommissioning..... | 52 |
| Descale the tank..... | 68 |
| Dimensions..... | 82 |
| Display..... | 19, 57 |
| Display buttons | 20 |
| Display settings..... | 59 |
| Displayed errors..... | 75 |
| Disposal..... | 33 |
| Document identification | 8 |
| Draining | 53 |

| | |
|-----------------------------|----|
| E | |
| Electrical connections..... | 48 |

| | |
|---|----|
| Electrical wiring diagram..... | 86 |
| Energy labeling..... | 85 |
| Environmental aspects..... | 33 |
| Error history..... | 62 |
| Error occurrence..... | 63 |
| Errors and warnings | 73 |
| External ON mode..... | 22 |
| External ON mode switch (optional)..... | 49 |

| | |
|-------------------|--------|
| F | |
| Filling | 49 |
| Finalization..... | 49, 71 |

| | |
|---------------------------|----|
| G | |
| Gas connection | 40 |
| Gas details..... | 84 |
| Gas supply pressure..... | 50 |
| Gas-side maintenance..... | 69 |
| General errors..... | 73 |

| | |
|---------------------------|----|
| H | |
| Hot water connection..... | 40 |
| Hysteresis..... | 58 |

| | |
|--|--------|
| I | |
| Ignition attempts..... | 61 |
| Installation..... | 37 |
| Installation diagram..... | 38 |
| Installation, Maintenance and Service part | 25 |
| Instructions on the water heater..... | 30 |
| Interface | 19 |
| Introduction..... | 15, 27 |
| Isolate from the mains..... | 24 |

| | |
|-----------------|---|
| L | |
| Liability | 3 |

| | |
|-------------------------|----|
| M | |
| Mains power..... | 49 |
| Maintenance..... | 67 |
| Maximum floor load..... | 37 |

N

Notation conventions 7

O

OFF mode..... 22
ON mode.....22
Operating modes.....22
Operator interface..... 19

P

Packaging.....37
Performance check..... 67
Preface..... 3
Preparation.....68

R

Recycling..... 33
Regulations 4
Restore default..... 63

S

Safety..... 17, 29
Safety devices..... 31
Safety instructions.....29
Scope 7
Service menu..... 64
Set the backlight delay.....60
Set the display brightness..... 59
Set the fan speed..... 65
Set the language.....60
Set the service mode..... 64
Set the water temperature.....23
Settings..... 57
Status of the water heater..... 21
Structure of the water heater..... 35
Symbols on the display..... 20

T

Target group 7
Technical details 81
Temperatures..... 57, 58
Trademark..... 3
Trademarks..... 3
Troubleshooting..... 73
Turn off for a long period..... 24
Turn off for a short period..... 24
Turn off the water heater..... 24, 53

Turn on the water heater..... 52

U

Use..... 23
Use external enable..... 61
User part.....13

V

Venting system..... 41

W

Warnings.....79
Warranty.....88
Water composition.....38
Water connections..... 39
Water heater 35
Water inlet..... 27
Water outlet..... 27
Water-side maintenance.....68
Working clearances38
Working principle27