# STE

## Commercial Electric Storage Water Heater

**STE - 400/500/600/750/1000**



Installation, User and Service Manual

Innovation has a name.

**your installer**

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**Read this manual carefully**

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



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

**Trademarks**

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Refer further to the General Conditions. These are available on request, free of charge.

Although considerable care has been taken to ensure a correct and suitably comprehensive description of all relevant components, the manual may nonetheless contain errors and inaccuracies. Should you detect any errors or inaccuracies in the manual, we would be grateful if you would inform us. This helps us to further improve our documentation.

**More information**

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

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5500 AB Veldhoven
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| | |
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In the event of problems with your gas, electricity or water supply connections, please contact the supplier/installation engineer of your installation.

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# 1 Technical specifications

## 1.1 Floor load

Take the storage water heaters weight in account for the maximum floor load; refer to the table (1.4 "General specifications").

## 1.2 Water composition

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

*Water specifications*

| **Water composition** | |
|---|---|
| Hardness<br>(alkaline earth ions) | > 1,00 mmol/l:<br>• German hardness > 5,6 °dH<br>• French hardness > 10,0 °fH<br>• English hardness > 7,0 °eH<br>• > 100 mg/l $CaCO_3$<br>• > 100 ppm $CaCO_3$ |
| Conductivity | > 125 µS/cm |
| Acidity (pH value) | 7,0 < pH value < 9,5 |

**Note**
If the water specifications deviate from those stated in the table, then the tank protection cannot be guaranteed (4 "Warranty").

## 1.3 Working clearance

For access to the storage water heaters, it is recommended that the following clearances are observed:

- around the anode connection/top of the water heater: 100 cm.
- around the water heater: 50 cm.

## 1.4 General specifications

*General Specifications - water heater*

| | **Unit** | **STE 400** | **STE 500** | **STE 600** | **STE 750** | **STE 1000** |
|---|---|---|---|---|---|---|
| Contents | litres | 405 | 499 | 678 | 763 | 1055 |
| Empty weight | kg | 99 | 131 | 179 | 201 | 262 |
| Maximum floor load | kg | 504 | 630 | 957 | 964 | 1317 |
| Heat Loss | W | 100 | 104 | 126 | 126 | 146 |
| Maximum operating pressure | kPa (bar) | 1000 (10) | 1000 (10) | 1000 (10) | 1000 (10) | 1000 (10) |
| Maximum water temperature | ºC | 95 | 95 | 95 | 95 | 95 |
| Anodes | - | 1 | 1 | 1 | 1 | 1 |

## 1.5 General specifications

*Electrical Specifications - flange element*

| | Unit | 2.0 kW | 2.5 kW | 3.3 kW | 6.0 kW | 7.5 KW |
|---|---|---|---|---|---|---|
| Supply voltage (-15%, +10% VAC) | Volt | 230 | 230 | 230 | 400 | 400 |
| Number of phases | - | 1 | 1 | 1 | 3 | 3 |
| Current (max. amount per phases) | A | 8.7 | 10.9 | 14.4 | 5 | 6.3 |
| Mains frequency (±1 Hz) | Hz | 50 | 50 | 50 | 50 | 50 |
| IP class | - | IP-5X | IP-5X | IP-5X | IP-5X | IP-5X |
| Maximum operating pressure | kPa (bar) | 600 (6) | 600 (6) | 600 (6) | 600 (6) | 600 (6) |
| Max. Setpoint Control Thermostat | °C | 85 | 85 | 85 | 85 | 85 |
| Overheat Thermostat | °C | 95 | 95 | 95 | 95 | 95 |

*Electrical Specifications - screw-in element*

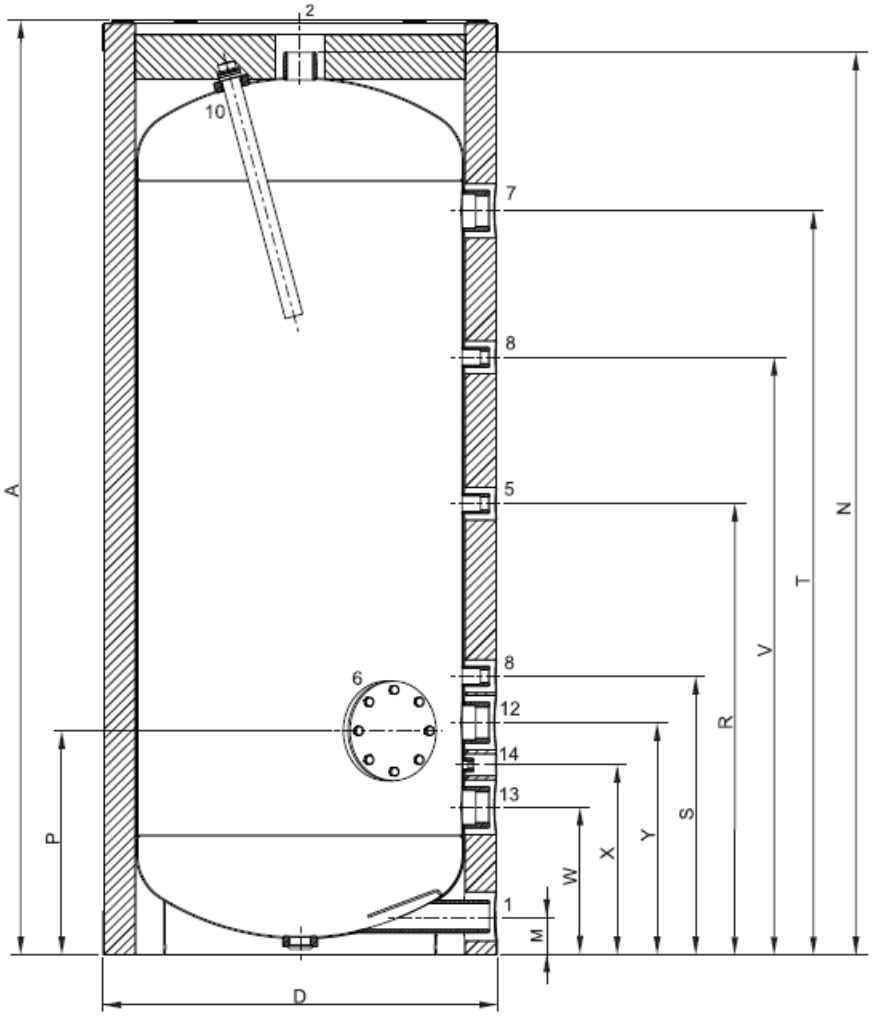
| | Unit | 2.0 kW | 2.5 kW | 3.0 kW | 4.5 kW | 6.0 kW | 7.5 KW |
|---|---|---|---|---|---|---|---|
| Supply voltage (-15%, +10% VAC) | Volt | 230 | 230 | 400 | 400 | 400 | 400 |
| Number of phases | - | 1 | 1 | 3 | 3 | 3 | 3 |
| Current (max. amount per phases) | A | 8.7 | 10.9 | 2.5 | 3.8 | 5 | 6.3 |
| Mains frequency (±1 Hz) | Hz | 50 | 50 | 50 | 50 | 50 | 50 |
| IP class | - | IP-5X | IP-5X | IP-5X | IP-5X | IP-5X | IP-5X |
| Maximum operating pressure | kPa (bar) | 600 (6) | 600 (6) | 600 (6) | 600 (6) | 600 (6) | 600 (6) |
| Max. Setpoint Control Thermostat | °C | 85 | 85 | 85 | 85 | 85 | 85 |
| Overheat Thermostat | °C | 95 | 95 | 95 | 95 | 95 | 95 |

## 1.6 Dimensions

| | | Unit | ST 400 | ST 500 | ST 600 | ST 750 | ST 1000 |
|---|---|---|---|---|---|---|---|
| A | Total height | mm | 1710 | 2045 | 1840 | 2035 | 2005 |
| D | Diameter (without insulation) | mm | 600 | 600 | 750 | 750 | 900 |
| | Diameter (with insulation) | mm | 740 | 760 | 910 | 930 | 1080 |
| M | Height cold water inlet | mm | 70 | 70 | 85 | 85 | 95 |
| N | Height warm water outlet | mm | 1655 | 1995 | 1805 | 2000 | 1965 |
| P | Height inspection opening | mm | 410 | 410 | 500 | 500 | 535 |
| R | Height circulation | mm | 825 | 995 | 1045 | 1085 | 1105 |
| S | Height immersion well/temp. sensor | mm | 510 | 510 | 655 | 655 | 705 |
| T | Height T&P connection | mm | 1360 | 1700 | 1470 | 1655 | 1595 |
| V | Height connection | mm | 1095 | 1350 | 1260 | 1380 | 1355 |
| W | Height connection | mm | 270 | 270 | 270 | 315 | 315 |
| X | Height connection | mm | 355 | 355 | 355 | 405 | 405 |
| Y | Height connection | mm | 425 | 425 | 425 | 485 | 485 |
| 1 | Connection Cold water inlet | - | R 2" | R 2" | R 2½" | R 2½" | R 2½" |
| 2 | Connection Warm water outlet | - | R 2" | R 2" | R 2½" | R 2½" | R 2½" |
| 5 | Connection circulation | - | Rp ¾" | Rp ¾" | Rp ¾" | Rp ¾" | Rp ¾" |
| 6 | Diameter inspection opening | mm | 115 | 115 | 180 | 180 | 180 |
| 7 | T&P connection | - | Rp 1½" | Rp 1½" | Rp 1½" | Rp 1½" | Rp 1½" |

| | | Unit | ST 400 | ST 500 | ST 600 | ST 750 | ST 1000 |
|---|---|---|---|---|---|---|---|
| 8 | Connection | - | Rp ¾" | Rp ¾" | Rp ¾" | Rp ¾" | Rp ¾" |
| 10 | Connection anode | - | Rp 1¼" | Rp 1¼" | Rp 1¼" | Rp 1¼" | Rp 1¼" |
| 12 | Connection | - | Rp 1½" | Rp 1½" | Rp 1½" | Rp 1½" | Rp 1½" |
| 13 | Connection | - | Rp 1½" | Rp 1½" | Rp 1½" | Rp 1½" | Rp 1½" |
| 14 | Connection | - | Rp ¼" | Rp ¼" | Rp ¼" | Rp ¼" | Rp ¼" |

*Vooraanzicht doorsnede toestel*




*IMD-1294 R0.0*

# 2 Installation

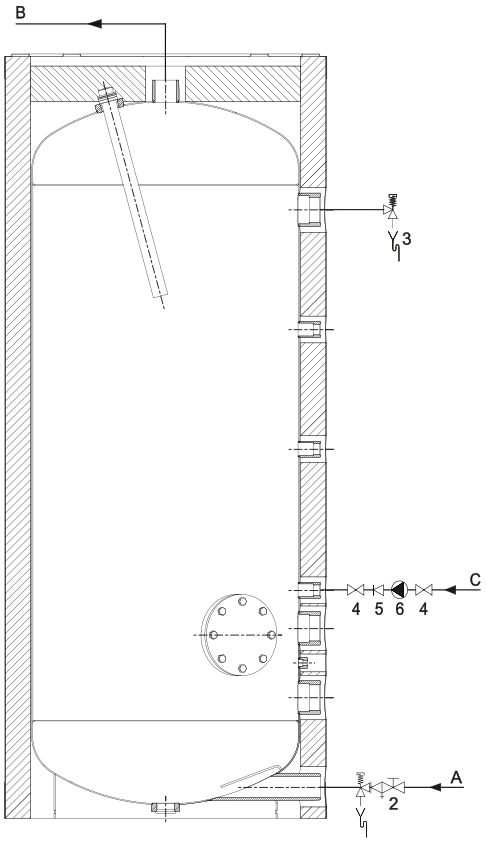
## 2.1 Installation diagram

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

*Installation diagram*

Legend
2. inlet security group
3. T&P-valve (mandatory)
4. stop valve (recommended)
5. non-return valve (mandatory)
6. circulation pump (optional)

A. cold water supply
B. hot water supply
C. circulation pipe
F. inlet heat exchanger
G. outlet heat exchanger

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## 2.2 Water connections

**Warning**
The installation should be carried out by a competent person, in compliance with general and locally applicable regulations.

### 2.2.1 Cold water side

See (A) in the installation diagram (2.1 "Installation diagram").

1. The maximum working pressure of the storage water heater is 10 bar. Because the pressure in the water pipe at times can exceed 10 bar, you must fit an approved pressure-reducing valve.
2. Fit a approved inlet security group (2) according local guidelines.

### 2.2.2 Hot Water side

See (B) in the installation diagram (2.1 "Installation diagram").

**Note**
Insulating long hot water pipes prevents unnecessary energy loss.

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

### 2.2.3 Circulation pipe

See (C) in the installation diagram (2.1 "Installation diagram").

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

1. Fit a circulation pump (6) of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve (5) after the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves for servicing (4).
4. Connect the circulation pipe according to the installation diagram (2.1 "Installation diagram").

## 2.3 Electrical connections

**Warning**
The installation should be carried out by a competent person, in compliance with general and locally applicable regulations.

### 2.3.1 Introduction

1. Remove, depending on the type of element, one (flange element) or two screws (screw-in element) in order to remove the plastic cover from the element.
2. Carefully remove the plastic cover from the heating element.
3. The electrical section can now be seen.

### 2.3.2 Electrical Element - flange

1. Mount the element in the inspection opening of the tank.
2. Feed the power cable through the grommet.

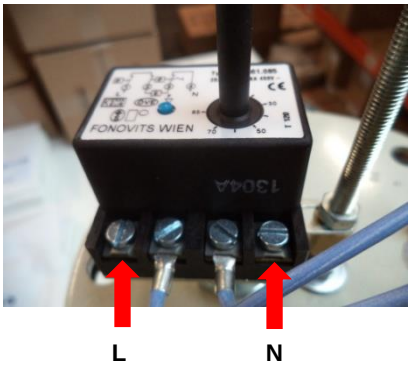
**Warning**
Not all flange-elements have the same supply voltage, see below.

*Supply voltage flange-elements*

| Element | 2.0 kW | 2.5 kW | 3.3 kW | 6.0 kW | 7.5 KW |
|---|---|---|---|---|---|
| Supply Voltage (+10%,-15%) | 230 $V_{AC}$ | 230 $V_{AC}$ | 230 $V_{AC}$ | 400 $V_{AC}$ | 400 $V_{AC}$ |
| Phase | 1 | 1 | 1 | 3 | 3 |

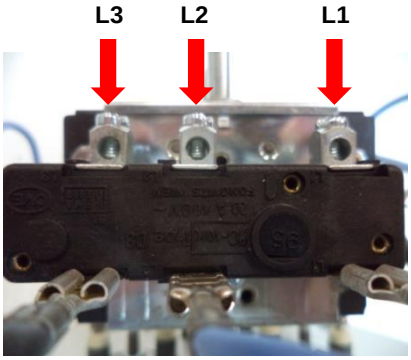
**Connecting an element of 230 $V_{AC}$**

3. Connect the neutral (N), of the power cable, to the N-terminal on the thermostat;
4. Connect the live (L), of the power cable, to the L-terminal on the thermostat;
5. Connect the earth (⏚), of the power cable, to the earth-terminal, in the element.




**Connecting an element of 400 $V_{AC}$**

3. Connect the first live (L), of the power cable, to the L1-terminal on the thermostat;
4. Connect the second live (L), of the power cable, to the L2-terminal on the thermostat;
5. Connect the third live (L), of the power cable, to the L3-terminal on the thermostat;
6. Connect the earth (⏚), of the power cable, to the earth-terminal, in the element.




### 2.3.3 Electrical Element - screw-in

1. Remove the cover and gasket from the inspection opening;
2. Mount the supplied flange and gasket in the inspection opening. For elements that need to be mounted in an STE 600, 750 or 1000 an additional reducing flange needs to be mounted first before the flange with screw-connection can be mounted.
3. Mount the element in the flange.
4. Feed the selected (power) cable through the grommet.

**Warning**
Not all screw-in elements have the same supply voltage, see below.

*Supply voltage flange-elements*

| Element | 2.0 kW | 2.5 kW | 3.0 kW | 4.5 kW | 6.0 kW | 7.5 KW |
|---|---|---|---|---|---|---|
| Supply Voltage (+10%,-15%) | 230 $V_{AC}$ | 230 $V_{AC}$ | 400 $V_{AC}$ | 400 $V_{AC}$ | 400 $V_{AC}$ | 400 $V_{AC}$ |
| Phase | 1 | 1 | 3 | 3 | 3 | 3 |

**Connecting an element of 230 $V_{AC}$**

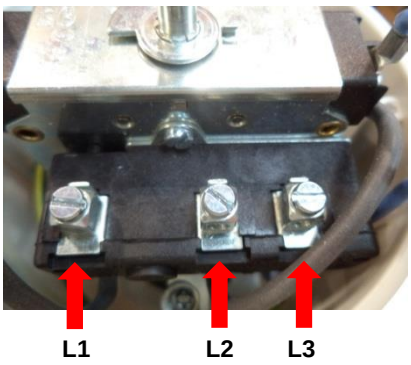
5. Connect the neutral (N), of the power cable, to the N-terminal on the thermostat;
6. Connect the live (L), of the power cable, to the L-terminal on the thermostat;
7. Connect the earth (⏚), of the power cable, to the earth-terminal, in the element.

Picture not available

Picture not available

**Connecting an element of 400 $V_{AC}$**

5. Connect the first live (L), of the power cable, to the L1-terminal on the thermostat;
6. Connect the second live (L), of the power cable, to the L2-terminal on the thermostat;
7. Connect the third live (L), of the power cable, to the L3-terminal on the thermostat;
8. Connect the earth (⏚), of the power cable, to the earth-terminal, in the element.




# 3 Maintenance

**Warning**
Maintenance may only be carried out by a competent person.

At each service, the storage water heater undergoes maintenance on water side. The maintenance must be carried out in the following order.
1. Preparation for maintenance
2. Water-side maintenance
3. Finalising maintenance

**Note**
Before ordering spare parts, it is important to write down the installation type, storage water heater model and the full serial number of the storage water heater. These details can be found on the rating plate. Only by ordering with this information can you be sure receiving correct spare parts.

## 3.1 Preparation for maintenance

The preparation for maintenance consists of testing and checking if all components are still working properly by completing the following steps:
1. Test the operation of the overflow valve of the protected cold supply setup. The water should discharge out.
2. Check the drainage pipes from the discharge points of all valves and remove any scale deposits that may be present.
3. Drain the storage water heater.

## 3.2 Water-side maintenance

Water-side maintenance consists of descaling and cleaning the tank, cleaning the elements and checking the anodes.

### 3.2.1 Cleaning the elements

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

### 3.2.1 Descaling and cleaning the tank

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

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

To guarantee a good, watertight seal around the cleaning opening, replace the gasket, washers, bolts and, if necessary, the lid with new parts before reassembly. Spare parts are obtainable from the supplier/manufacturer.

To simplify descaling and cleaning of the tank, the storage water heater is equipped with a cleaning opening.

Work order:
1. Undo bolts from the cover.
2. Remove cover and the gasket.
3. Inspect the tank and remove the loose scale deposits and contamination.
4. If the scale cannot be removed by hand, descale the storage water heater with a descaling agent. Contact the supplier/manufacturer for advice on what descaling agent to use.
5. Close the cleaning opening. To avoid damage to the tank tighten the bolts, that fasten the lid, with a torque no greater than 50 Nm. Use suitable tools for this.

### 3.1.2 Checking anode

The anode ensures the protection of the tank by sacrificing himself. Insufficient anode material may lead to poor protection and, hence, leakage of the tank.

**Storage water heater**
1. Loose the anode.
2. Check the diameter of the anode in different places. The diameter must be at least 60% of the original 1” diameter.
3. If the diameter is less than the minimum, the anode must be replaced. Please contact the supplier/manufacturer to order new anodes.
4. Mount the (new) anodes.

**Importent**
Anode must make electric connection in the tank. Make sure that the thread is not isolated from the tank.

**Electrical heating element**
1. Remove the element from the tank.
2. Check the diameter of the anode in different places. The diameter must be at least 60% of the original 1” diameter.
3. If the diameter is less than the minimum, the anode must be replaced. Please contact the supplier/manufacturer to order new anodes.
4. Mount the (new) anodes.

### 3.1.3 Checking heating element

The electrical heating element should be free of scale and lime build-up. The build-up of scale and lime prevent proper function of the element. The build-up of scale and lime may lead up to failure of the element.

**Note**
The first check of the elements must be done after 3 months.

# 4 Errors

This chapter deals with the following problems with the water heater:

- Water leakage
- No hot water
- Insufficient hot water

| Symptom | Cause | Precautions | Comment |
|---|---|---|---|
| Water leakage | Leakage from a water connection (threaded). | Tighten the threaded connection. | If the leak persists, consult you installation engineering. |
| | Leakage from another nearby water heater or pipe segment. | Trace the leak. | |
| | Leakage from the water heater tank. | Consult you supplier, installer and/or manufacturer. | |
| | Condense. | Stop draining of (to much) hot water until the water reached the set temperature. | |
| Insufficient or no hot water | No supply voltage. | 1. Check whether the electrical element is ON.<br>2. Check the main power supply.<br>3. Check whether there is power on the element. | If the error cannot be resolved or is persistent, contact your installation engineer. |
| | The element is switched off. | 1. Check whether the element is ON.<br>2. Check whether there is power on the connector block of the element.<br>3. Check whether the element(s) is defective. | |
| | Safety thermostat has cut out. | 1. The safety thermostat cut out correctly:<br>- Reset the element.<br>- Check whether the control thermostat is working.<br>- Check whether the circulation pump is working.<br>2. The safety thermostat has cut out without apparent reason:<br>- Check whether the thermostat is defective.<br>- Check whether the sensor of the thermostat is defective. | |
| | Water temperature setting is too low. | Set the control thermostat to a higher value. | |
| | Element defect. | Check the resistance of the element(s). At room temperature the resistance of a element must be between 32 and 33 Ohm. If the resistance value is significantly different (due to closed or open circuit) this indicates a fault element and should be replaced. | To replace the necessary parts, you must contact your installation engineer. |

| Symptom | Cause | Precautions | Comment |
|---|---|---|---|
| | Element(s) switched off. | 1. Check whether the element is ON. | If the error has not been rectified and no other cause can be found, isolate the water heater and alert you installation engineer. |
| | Hot water supply is used up. | 1. Reduce hot water consumption and give the water heater time to heat up.<br>2. If this error persists, check whether the safety thermostat is switching. If this is the case, check if the circulation pump is working properly. | |

# 5 Warranty

**5.1 General warranty**

If within one year of the original installation date of a storage water heater supplied by A.O. Smith, following verification, and at the sole discretion of A.O. Smith, an assembly or part (with exclusion of the tank) proves to be defective or fails to function correctly due to manufacturing and/or material defects, then A.O. Smith shall repair or replace this assembly or part.

**5.2 Tank warranty**

If within 5 years of the original installation date of a storage water heater supplied by A.O. Smith, following verification, and at the sole discretion of A.O. Smith, the glass-lined steel tank proves to be leaking due to rust or corrosion occurring on the water side, then A.O. Smith shall offer to replace the defective storage water heater with an entirely new storage water heater of equivalent size and quality. The warranty period given on the replacement storage water heater shall be equal to the remaining warranty period of the original storage 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 storage water heater, the warranty shall be reduced to one year from the original installation date.

**5.3 Conditions for installation and use**

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

a. The storage 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.
b. The storage water heater remains installed at the original site of installation.
c. The storage 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).
d. The tank is safeguarded against harmful scaling and lime build-up by means of periodic maintenance.
e. The water temperatures in the heater do not exceed the maximum setting.
f. The water pressure and/or heat load do not exceed the maximum values stated on the storage water heater plate.
g. The storage water heater is installed in a non-corrosive atmosphere or environment.
h. The storage water heater is connected to a protected cold supply arrangement, which is: approved by the relevant authority; with sufficient capacity for this purpose; supplying a pressure no greater than the working pressure stated on the storage 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 storage water heater, and further in compliance with the government and local authority installation and building codes, rules and regulations.
i. The storage water heater is at all times fitted with cathodic protection. If sacrificial anodes are used for this, these must be replaced and renewed when, and as soon as, they are 60% or more consumed. When power anodes are used, it is important to ensure that they continue to work properly.

**5.4 Exclusions**

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

a. damage to the storage water heater caused by an external factor;
b. misuse, neglect (including frost damage), modification, incorrect and/or unauthorised use of the storage water heater and any attempt to repair leaks;
c. contaminants or other substances having been allowed to enter the tank;
d. the conductivity of the water being less than 125 µS/cm and/or the hardness (alkaline-earth ions) of the water being less than 1.00 mmol/l;
e. unfiltered, recirculated water flowing through or being stored in the storage water heater;
f. any attempts at repair to a defective storage water heater other than by an approved service engineer.

**5.5 Scope of the warranty**

The obligations of A.O. Smith pursuant to the specified warranty are limited to free delivery from the warehouse of the replacement assemblies, parts or storage water heater, respectively. Shipping, labour, installation and any other costs associated with the replacement will not be accepted by A.O. Smith.

**5.6 Claims**

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

**5.7 Obligations of A.O. Smith**

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

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