

Cavalier Eco Electric Water Heater

Installation, Commissioning,
User & Maintenance Instructions

Models:

AMP 200-9 ECO	AMP 300-9 ECO
AMP 200-18 ECO	AMP 300-18 ECO
AMP 200-36 ECO	AMP 300-36 ECO
	AMP 300-54 ECO

LV3138565 | May 2022





IMPORTANT INFORMATION

These instructions must be read and understood before installing, commissioning, operating or maintaining the equipment.

Preface

Copyright

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Lochinvar Ltd. 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 A.7) for the warranty provisions.

Liability

User

Lochinvar 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

Lochinvar 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 AMP ECO water heater is designed in accordance with the applicable regulations. The water heater is delivered with compliance-marking and all necessary documentation to obey these regulations. See the compliance section.

Lochinvar 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 Lochinvar. This helps us to further improve our documentation.

Compliance

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

- CE
 - the European Directive 2014/35/EU on low voltage appliances (LVD)
 - the European Directive 2014/30/EU on Electromagnetic Compatibility (EMC)
 - the European Directives 2011/65/EU and 2015/863/EU on RoHS II and RoHS III
 - the European Directive 2009/125/EC on Ecological Design (ErP)
- UKCA
 - the Electrical Equipment (Safety) Regulations 2016 (UK SI 2016 No. 1101)
 - the Electromagnetic Compatibility Regulations 2016 (UK SI 2016 No. 1091)
 - the RoHS I regulations 2012 (UK SI 2012 No. 3032)
 - the Ecodesign for Energy-Related Products Regulation 2010 (UK SI 2010 No. 2617)

Refer to the appendix Declaration of conformity.

Regulations

The installation of the equipment MUST be in accordance with the relevant requirements of the Building Regulations, I.E.E. Regulations and the bylaws of the local water board.

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), especially:
 - BS 6700: 1997 - Design, installation, testing and maintenance of services supplying water for domestic use with buildings and their curtilages
 - BS 67074: 1989 Part 1 and 2 - Application, selection and installation of expansion vessels and ancillary equipment for sealed systems
 - BS 7671: 2008 - Requirements for electrical installations, I.E.E. wiring regulations seventeenth edition
 - CP 342: Part 2 1974 - Code of practice for centralized hot water supply-buildings other than dwellings
- CIBSE Guides
- Clean Air Act
- H.S.E Guidance

Note

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



Contact information

In the event of problems with your electricity or water supply connections, please 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.
- 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
0313856	EN	1.0

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 Display.....	19
3.1.2 Display buttons.....	20
3.2 Status of the water heater.....	21
3.2.1 Operating modes.....	21
3.2.2 Error conditions.....	22
4 Use	23
4.1 Turn on the water heater.....	23
4.1.1 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	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.....	39
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	Electrical connections.....	40
8.5.1	Preparation.....	41
8.5.2	Mains power.....	42
8.5.3	Alarm output.....	42
8.5.4	External ON/OFF.....	43
8.5.5	Finalization.....	44
8.6	Commissioning.....	44
8.6.1	Filling.....	44
8.6.2	Turn on the water heater.....	44
8.7	Decommissioning.....	45

8.7.1	Turn off the water heater.....	45
8.7.2	Draining.....	45
9	Settings.....	47
9.1	Display.....	47
9.2	Temperatures.....	48
9.2.1	Operating setpoint.....	48
9.2.2	Hysteresis.....	48
9.2.3	Tank sensor offset.....	50
9.3	Appliance Status.....	50
9.4	Economy Mode.....	51
9.4.1	Setpoint adjustment.....	52
9.4.2	Set the time and day.....	53
9.4.3	Economy mode schedule.....	54
9.5	Alarm output setup.....	55
9.5.1	Set the alarm output function.....	56
9.5.2	Alarm setpoint.....	56
9.6	Display settings.....	57
9.6.1	Set the unit of temperature.....	57
9.6.2	Set the display brightness.....	58
9.6.3	Set the backlight delay.....	58
9.6.4	Set the language.....	59
9.7	Appliance information.....	59
9.8	Error history.....	60
9.9	Error occurrence.....	61
9.10	Restore default.....	61
10	Maintenance.....	63
10.1	Preparation.....	63
10.2	Water-side maintenance.....	63
10.2.1	Inspect the anode.....	63
10.2.2	Descale the tank.....	64
10.3	Performance check.....	65
10.4	Finalization.....	66
11	Troubleshooting.....	67
11.1	Errors and warnings.....	67
11.1.1	General errors.....	67
11.1.2	Displayed errors.....	69
11.1.3	Warnings.....	70

Index	71
A Appendices	73
A.1 Technical details AMP ECO 200.....	73
A.2 Technical details AMP ECO 300.....	74
A.3 Dimensions.....	75
A.4 Energy labeling.....	76
A.5 Electrical wiring diagram.....	78
A.6 Declaration of conformity.....	82
A.6.1 United Kingdom.....	82
A.7 Warranty.....	84

User part

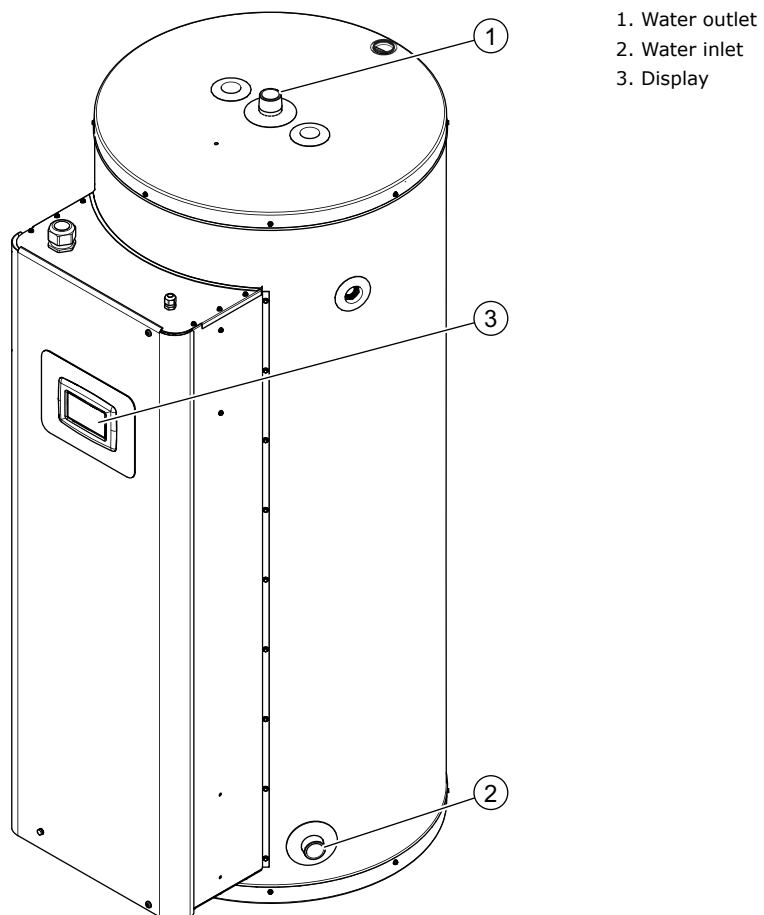
1 Introduction

The AMP ECO water heater stores and heats water for sanitary purposes.

Cold water enters the tank through the water inlet (2). The heated water leaves the tank at the top through the hot water outlet (1). When hot water is used, the tank of the water heater is filled with the same amount of cold water.

To operate the water heater, the display (3) is used.

Fig. AMP ECO water heater



2

Safety

Lochinvar 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 detect a burning smell:

- Shut off the mains power supply.
- Shut off the mains gas supply.
- Alert the emergency services.



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 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.






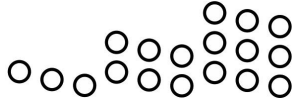

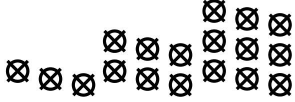





Note

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 the water heater three months after installation. Based on this check, the best service interval can be determined.

3.1.1.1 Symbols on the display

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

Symbol	Description
	There is a heat demand.
	The water temperature rises.
	End of water heating (standby).
	The water temperature drops.
	The water heater is not able to initiate the heating cycle.
	The heating element icons for a water heater with one, two or three rows of elements. The open circles represent the heating elements that are not energized.
	The heating element icon for a water heater with one, two or three rows of elements. The filled circles represent the heating elements that are energized with an electrical current.
	The heating element icon for a water heater with one, two or three rows of elements. The circles with an X represent the heating elements that are energized with no electrical current.
	The control system is in heating mode.
	Error.
	Warning.

3.1.2

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



Button	Function
[ACCEPT]	Save changed settings
[+]	Value up
[-]	Value down
[>]	Enter the submenu
[▲]	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: Standby		
		wed 14:45 NORMAL
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.
Heating	The water heater is heating up water.
Error	The heating cycle is stopped because the controller has detected an error.

3.2.1

Operating modes

The AMP ECO has 3 operating modes:

- [OFF mode](#) (see 3.2.1.1)
- [ON mode](#) (see 3.2.1.2)
- [Economy mode](#) (see 3.2.1.3)

3.2.1.1 OFF mode

In the **OFF mode** the water heater is de-activated. Contact your service and maintenance engineer if you want to use this functionality.

In the **OFF mode** the water heater is not protected against frost.

To switch the heater to OFF mode:

1. Open the external enable inputs 1 and 2 (see 8.5).

3.2.1.2 ON mode

In the **ON mode** the water heater continuously responds to the heat demand. The electric heating elements are activated when there is a heat demand.



Note

The **ON mode** is the factory default operating mode when the external enable 1 and 2 inputs are not used (both inputs are shorted from factory). This means the heating elements are activated when the mains power is connected to the water heater.

3.2.1.3 Economy mode

In the **Economy mode** the water heater continuously responds to the heat demand based on a reduced setpoint called Economy setpoint. The economy setpoint is determined by the ON mode setpoint (see 4.1.1) minus the setpoint adjustment (see 9.4).

The **Economy mode** can be activated in two ways:

- Using the week program in the Economy mode menu (see 9.4). This is only if the external enable inputs 1 and 2 (see 8.5) are set correctly.
- Using the external enable inputs 1 and 2 (see 8.5) directly. Contact your service and maintenance engineer if you want to use this functionality.

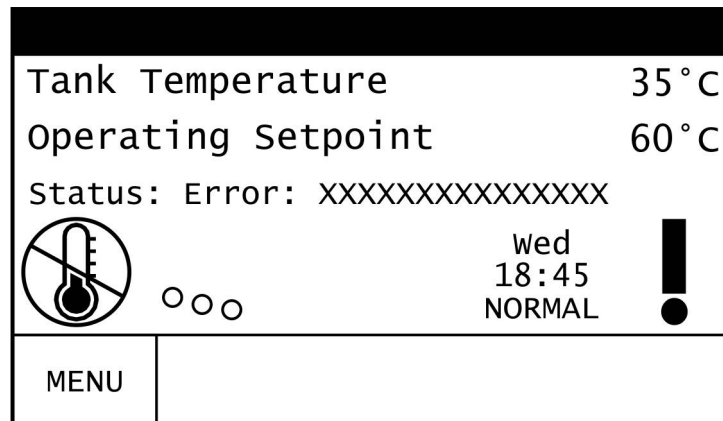
3.2.2

Error conditions

If there is an error or warning, the screen blinks and it shows a small description of the error or warning.

Press **[BACK]** to return to the Home screen. The Home screen shows the exclamation mark, or a question mark for a warning. For errors, the status changes to Error.

Fig. Error status



When the display shows an error:

1. Switch the isolator between the water heater and the mains power supply off and on to reset the water heater.



Note

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



Caution

Make sure that the water heater is filled with water before you turn on the water heater.

Switch the isolator between the water heater and the mains power supply on to start the water heater.

4.1.1

Set the water temperature

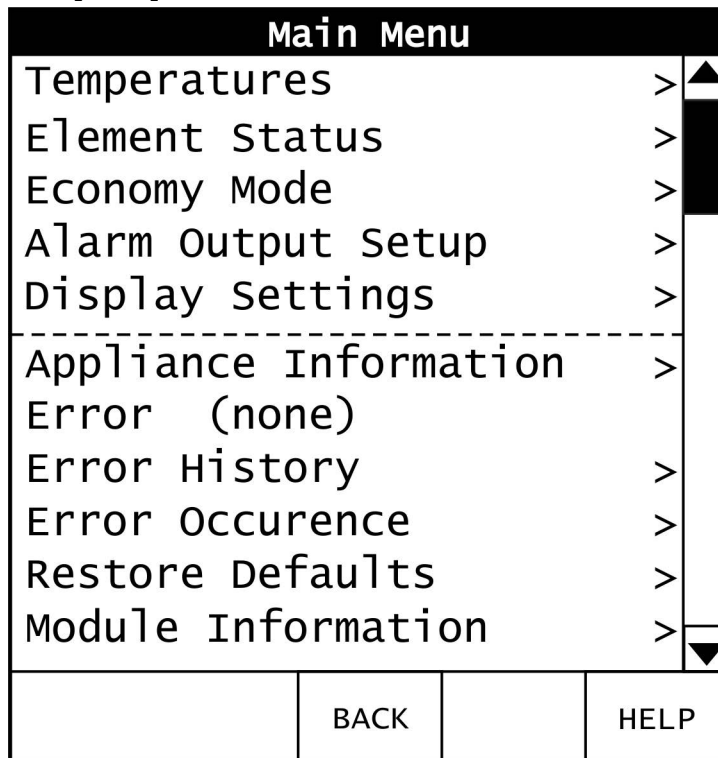


Caution

Preferably set the temperature setpoint to 60 °C. Harmful scaling and lime build-up will be higher when you set the temperature setpoint to 65 °C and higher. At lower temperature settings there is a higher risk of high legionella concentrations in the water.

To change the temperature setpoint:

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



- Open the **Temperatures** submenu.

Temperatures			
Operational Setpoint	60 °C	>	▲
1st Differential	1 °C	>	■
2nd Differential	1 °C	>	■
3rd Differential	1 °C	>	■
Tank Temperature	60 °C		■
Tank Sensor Offset	0 °C	>	▼
	BACK		HELP

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

Operating Setpoint		+
60 °C		
MIN 32 °C	MAX 83 °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 water heater in the **OFF mode** (see 3.2.1.1).



Note

If the water heater stays in the **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

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 AMP ECO water heater is intended for heating water for sanitary purposes.

The AMP ECO is an electric storage water heater. The electric heating elements transfer their heat directly to the water.

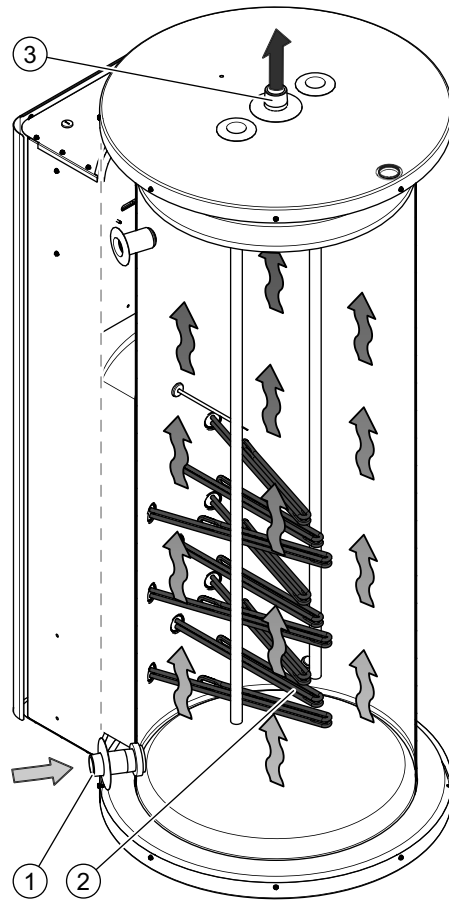
5.2 Working principle

Cold water enters the bottom of the tank through the water inlet (1). The heating elements (2) transfer their heat directly 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.

Depending on the model the water heater has 1, 2 or 3 rows of each 3 heating elements. The AMP ECO is equipped with a temperature sensor that measures the water temperature on the outside of the tank. The sensor is connected to the control system. When the water

temperature drops beneath the set temperature, the heating elements are activated and the water is heated.

Fig. AMP ECO water heater



1. Water inlet
2. Heating elements
3. Water outlet

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 water and power supply companies and the fire brigade.

Warning

The water heater may only be installed on a non-flammable floor or surface.

Warning

Isolate the heater from the mains before you start maintenance or repairs. Leave the water heater electrically isolated until you are ready to commission it.



Caution

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

Caution

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

Caution

The anode protection remains active when the water heater is in OFF mode.

Caution

Water may drip from the discharge pipe of the pressure-relief device. This pipe must be left open to the atmosphere.

Caution

Operate the pressure-relief device regularly to remove lime deposits and to verify that it is not blocked.

Caution

When installing the heater, you need an expansion valve. The expansion valve and associated fittings are not included in the package. The expansion valve must be suitable for a water pressure level of up to 800 kPa. Install the expansion vessel and expansion valve as close as possible to the water heater.



Warning

Never install a stop valve or a non-return valve between the expansion vessel/expansion valve and the water heater.



Caution
The heater is intended to be connected to the water mains permanently. Do not use a hose set to connect the heater.



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.

Note
The water heater is supplied without a power cable and isolator.
Use a power cable with wires of a suitable diameter based on the cable length and the current.

Note
Select and install an overvoltage category III, all-pole isolator with a contact gap of at least 3 mm. The all-pole isolator must be incorporated in the fixed wiring in accordance with the wiring rules.

6.2





Instructions on the water heater

The water heater has some safety instructions on its cover:

- The text "Read the installation instructions before you install the appliance".
- The text "Read the user instructions before putting the appliance into operation".
- The text "Live cables inside! Switch off the power supply completely (on local isolator) before opening the outer door to access the electrical components."
- The text "Check all electrical screw connections before commissioning and after service/maintenance."
- The text "A suitable temperature and pressure valve must be fitted in the designated connection."
- The text "A pressure relief valve must be fitted in the cold water supply."
- The text "Warranty is compelled to retract when the appliance is not maintained according to the maintenance instructions and when the water quality does not comply with the regulations as stated in the installation instructions."

Also the packaging has some safety instructions:

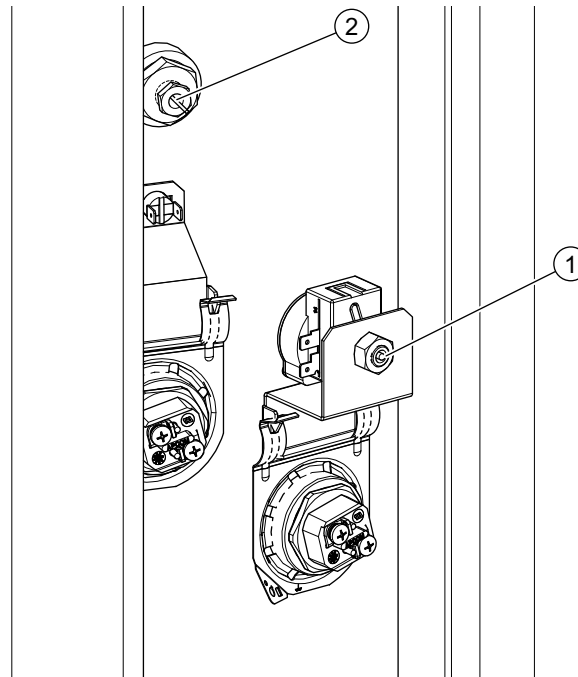
- The text "Read the installation instructions before installing the appliance".
- The text "Read the user instructions before putting the appliance into operation".
- Some safety pictograms:

	CE marked
	Packaging in compliance with ISPM 15
	Put the device into a <u>municipal waste collection depot for electrical and electronic equipment</u> (see 6.4.2)
	UKCA marked

6.3

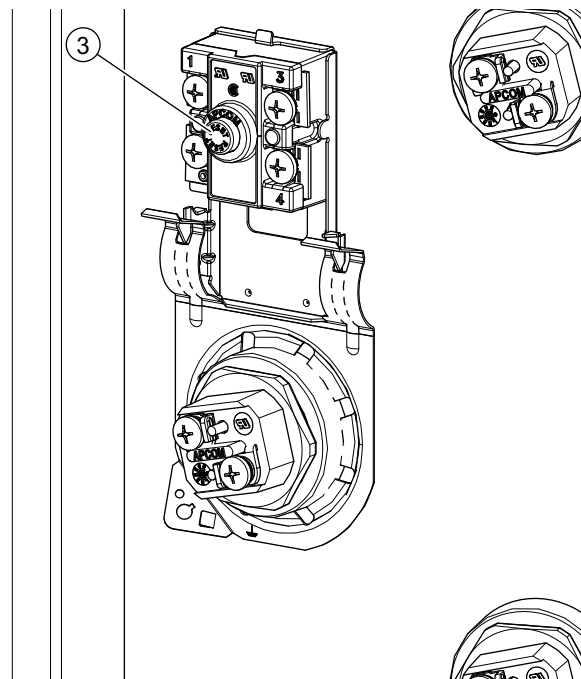
Safety devices

Fig. Main safety thermostat



1. Main Safety thermostat - body
2. Main Safety thermostat - probe

Fig. Row safety thermostat



3. Row Safety thermostat

Safety devices of the water heater:

Main Safety thermostat (G1)	The main safety thermostat (G1) breaks the control circuit when the water temperature is too high ($>92^{\circ}\text{C} \pm 3^{\circ}\text{C}$). The main safety thermostat also protects the heating elements when the water heater is activated when it is not filled with water. The main safety thermostat (G1) probe is installed above the middle element of the highest row. You can use the white button on the thermostat body to manually reset the thermostat when the water temperature has dropped ($<83^{\circ}\text{C}$). Make sure the water heater is completely filled with water before resetting the thermostat.
Row Safety thermostat (G2)	The row safety thermostat (G2) breaks the circuit (L1 and L2) of each row of elements when the temperature of the water becomes too high ($>93^{\circ}\text{C} \pm 3^{\circ}\text{C}$) due to a failure in the control circuit. You can use the red button to manually reset the thermostat when water temperature has dropped ($<83^{\circ}\text{C}$).
Thermal fuse	The thermal fuse is integrated in the wiring of the main safety thermostat (G1) and breaks the control circuit when it detects overheat of the element area. The thermal fuse cannot be reset. The complete wiring, with thermal fuse, must be replaced.

Safety devices of the installation:

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

1- All installations have a T&P valve connection. The use of a T&P valve is mandatory.

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

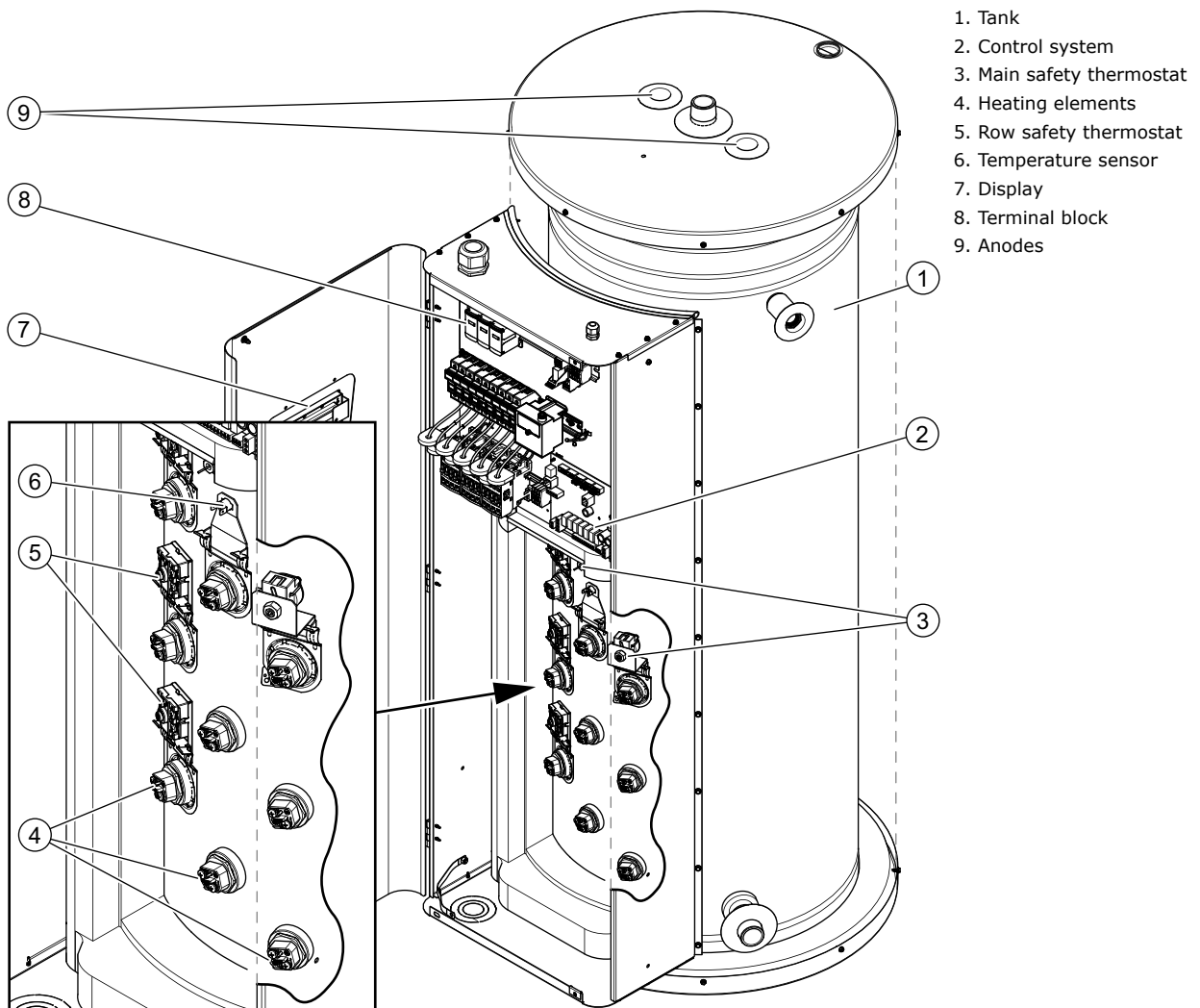
7.1

Structure of the water heater

The water heater has the following main components:

Tank (1)	The water is stored and heated up in the tank.
Heating elements (4)	The water is heated by the heating elements.

Fig. Components water heater



8

Installation



Warning

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



Caution

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

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

8.1

Packaging

Lochinvar 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



Warning

The water heater must be installed on a non-flammable floor and surface.

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 A) to make sure that the maximum floor load is sufficient for the weight of the water heater.

8.2.3

Water composition

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

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



Note

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

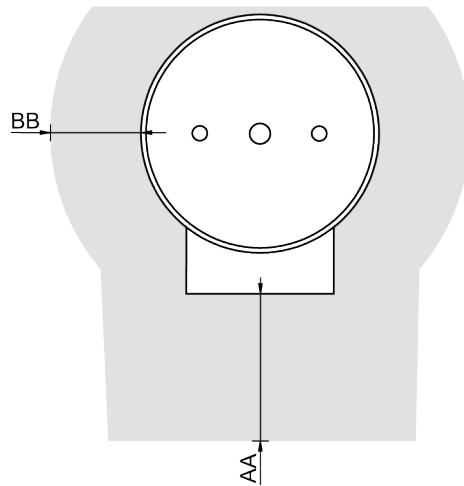
8.2.4

Working clearances

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

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

Fig. Working clearances

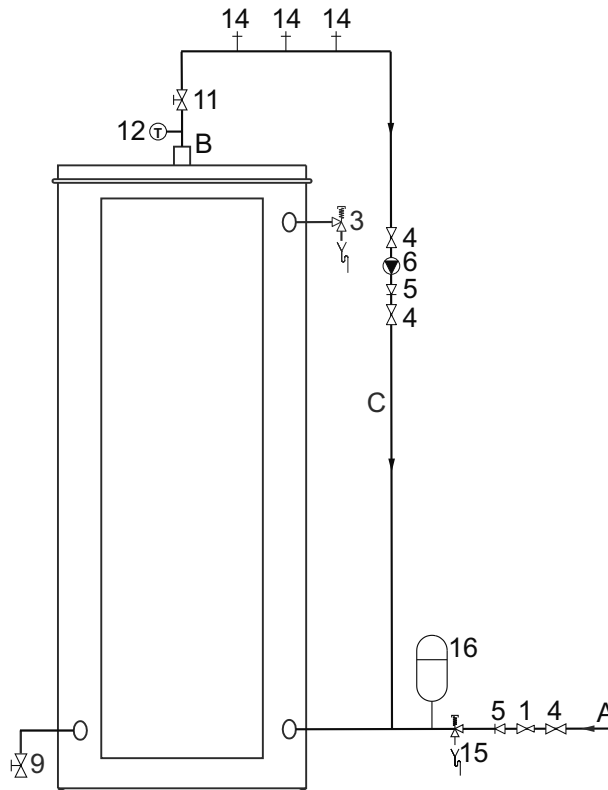


IMD-1449 R0

8.3

Installation diagram

Fig. Installation diagram



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



Note

Use this installation diagram when you:

- install the [water connections](#) (see 8.4)
- [fill the water heater](#) (see 8.6.1)
- drain the water heater

8.4

Water connections

8.4.1

Cold water connection



Caution

When installing the heater, you need an expansion valve. The expansion valve and associated fittings are not included in the package. The expansion valve must be suitable for a water pressure level of up to 800 kPa. Install the expansion vessel and expansion valve as close as possible to the water heater.



Warning

Never install a stop valve or a non-return valve between the expansion vessel/expansion valve and the water heater.

Warning

The heater is intended to be connected to the water mains permanently. Do not use a hose set to connect the heater.

Install the cold water connection:

1. When the mains water supply pressure is too high, install a pressure reducing valve (1), refer to the [Technical details](#) (see A).
2. Install a non-return valve (5).
3. Install an expansion valve (15).
4. Connect the overflow connection of the expansion valve, to an open waste water pipe.
5. Install an expansion vessel (16).

8.4.2

Hot water connection



Note

Insulate long hot water pipes to prevent unnecessary energy loss.

Note

The use of a T&P valve is mandatory.

Install the hot water connection:

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

8.4.3

Circulation connection

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



Note

Connect the circulation pipe (C) to the cold water inlet connection.

Note

Make sure that the circulation 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 (C) to the cold water inlet, between the water heater and the expansion vessel (16).

8.5

Electrical connections



Warning

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

8.5.1

Preparation

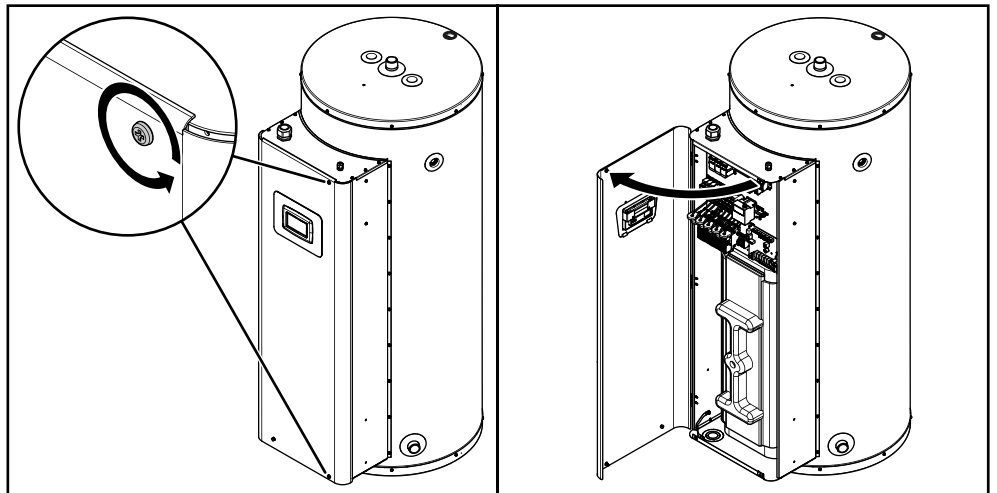
Open the door of the water heater to make the electrical section and the terminal block visible.



Warning

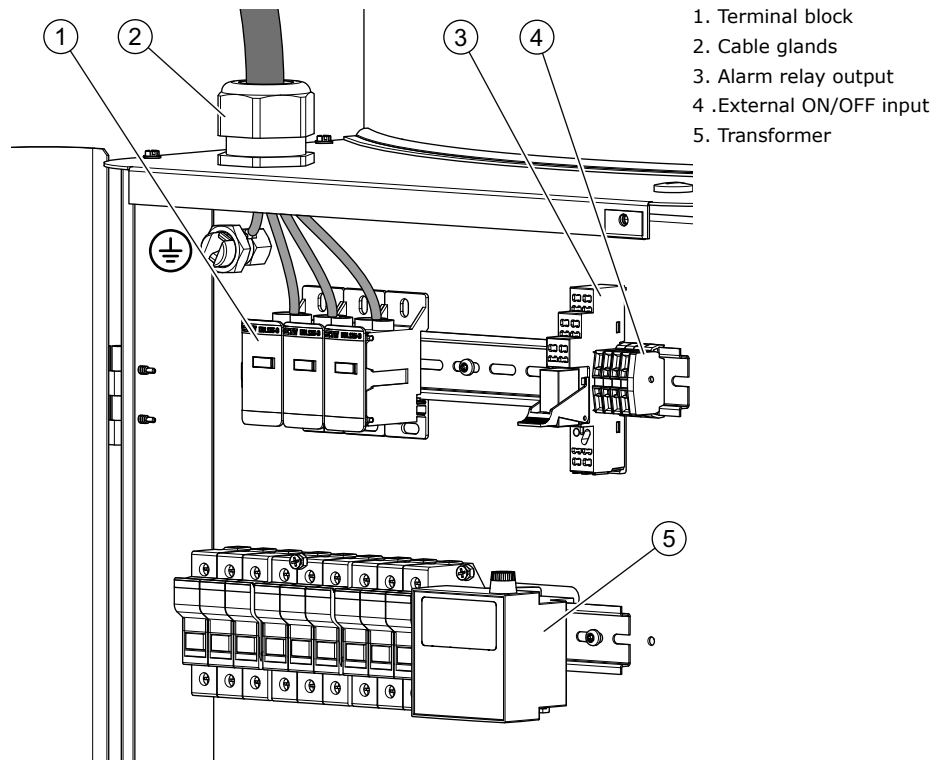
Live cables inside! Switch off the power supply completely (on local isolator) before opening the outer door to access the electrical components.

Fig. Open the door



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

Fig. Terminal block



8.5.2



Mains power

Note

The water heater is supplied without a power cable and isolator. Use a power cable with wires of a suitable diameter based on the cable length and the current.

Note

Select and install an overvoltage category III, all-pole isolator with a contact gap of at least 3 mm. The all-pole isolator must be incorporated in the fixed wiring in accordance with the wiring rules.

Note

This isolator must be installed in the same room as the appliance, suitably marked and no more than 1 meter away from the water heater.

Note

The length of the mains earth core that is connected to the electrical connection must be longer than the core of the mains live (L1, L2 and L3).

Connect the water heater to the mains power supply:

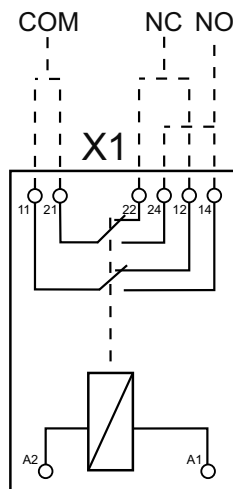
1. Pull the power cable through the cable gland.
2. Connect the live (L1, L2 and L3) and the earth (A) core of the power cable to the terminals of the terminal block.
3. Connect the power cable to the isolator.
4. Secure the power cable in the cable gland.

8.5.3

Alarm output

The alarm output allows you to transmit the alarm status to an external device. The alarm output is a relay.

	Connections	
	Supply	Output
Normally Open (NO)	11	14
	21	24
Normally Closed (NC)	11	12
	21	22



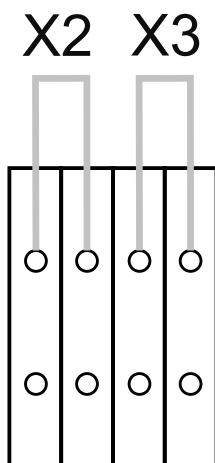
To use the alarm output:

1. Connect a power supply (250V/10A max.) to one of the supply terminals (11 or 21).
2. Connect the output terminal (NC: 12 or 22 and NO: 14 or 24) to your external device.

8.5.4

External ON/OFF

The External ON/OFF contacts can be used to control the heater.



Mode	Setpoint	External contacts
On	Normal	X2 = Closed X3 = Closed
Off	-	X2 = Open X3 = Open
Economy	Economy (Normal setpoint minus the Economy setpoint adjustment)	X2 = Closed X3 = Open
Week program	Switches between Normal and Economy according to program	X2 = Open X3 = Closed

The heater is supplied with two shunts on X2 and X3. You can remove the shunts to permanently set the heater to one mode. You can also replace the shunt with an external switch or relay so you can open/close the contact remotely.



Caution

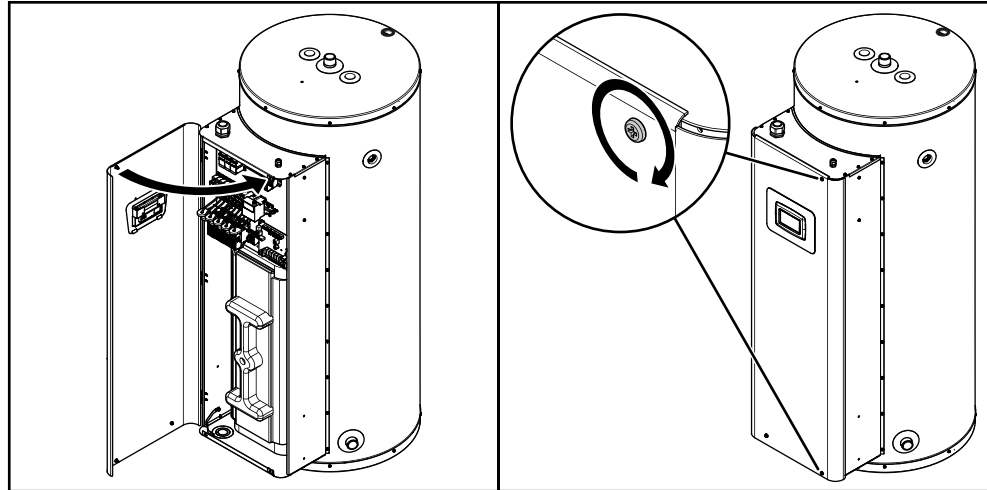
Do not apply power to these terminals.

8.5.5

Finalization

When all connections are made, close the door of the water heater.

Fig. Install the cover



8.6

Commissioning

To commission the water heater:

1. Fill the water heater (see 8.6.1)
2. Turn on the water heater

8.6.1

Filling

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

1. If applicable, open the stop valves (4) of the circulation pipe (C).
2. Make sure that the drain valve (9) is closed.
3. Open the nearest hot water draw-off point (14).
4. Open the stop valve (4) of the cold water supply pipe (A). Cold water flows into the water heater.
5. Fill the water heater until a full water jet flows from the nearest draw-off point. The water heater is completely full.
6. Open all draw-off points to bleed the entire installation of air. The water heater is now under water supply pressure.
7. 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 defective. If necessary, replace the expansion valve.
8. Close all hot water draw-off points.

8.6.2

Turn on the water heater



Caution

When you turn on the water heater for the first time, make sure that the date and time is set. Refer to the Economy mode settings menu (see 9.4).

Refer to the procedure in the user part to Turn on the water heater (see 4.1).

8.7 Decommissioning

To decommission the water heater:

1. Turn off the water heater (see 8.7.1)
2. Drain the water heater

8.7.1 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.

8.7.2 Draining

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

1. If applicable, close the service stop valve (11) in the hot water pipe.
2. If applicable, close the stop valves (4) of the circulation pipe (C).
3. Close the stop valve (4) in the cold water supply.
4. Open the drain valve (9).
5. Aerate the entire installation of air until the water heater is completely drained.
6. If the water heater needs to be drained completely, disconnect and tilt the water heater in the direction of the drain valve.

9 Settings

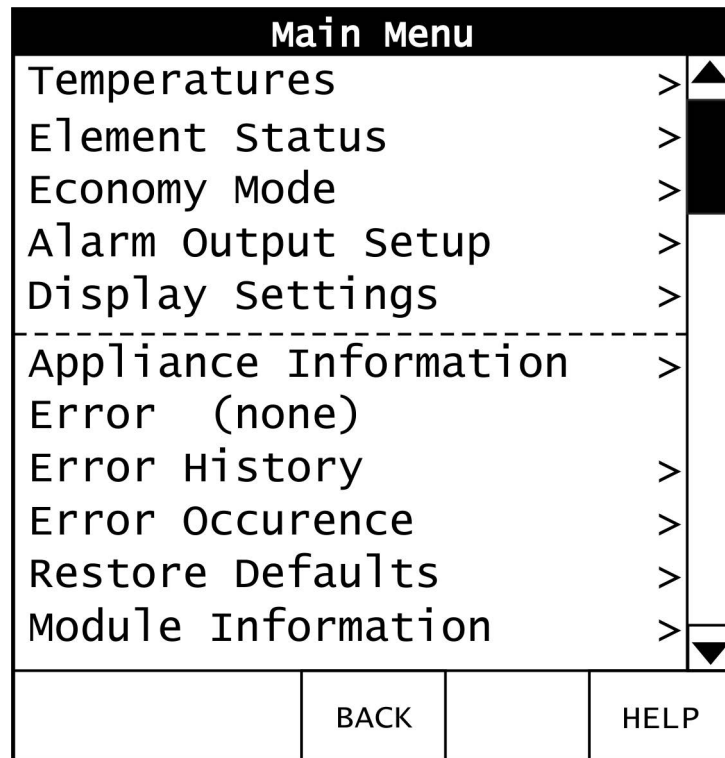
9.1 Display

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 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.

9.2

Temperatures

The **Temperatures** submenu shows the temperature setpoint, the differentials, the actual water temperature in the water heater and the tank sensor offset.

Fig. Temperature submenu

Temperatures			
Operational Setpoint	60 °C	>	▲
1st Differential	1 °C	>	
2nd Differential	1 °C	>	
3rd Differential	1 °C	>	
Tank Temperature	60 °C		
Tank Sensor Offset	0 °C	>	▼
	BACK		HELP

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

9.2.1

Operating setpoint



Caution

Preferably set the temperature setpoint to 60 °C. Harmful scaling and lime build-up will be higher when you set the temperature setpoint to 65 °C and higher. At lower temperature settings there is a higher risk of high legionella concentrations in the water.

To change the temperature operating setpoint:

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

Operating Setpoint			
60 °C			+
MIN		MAX	
32 °C		83 °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.

9.2.2

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 hysteresis is determined by the number of element rows and the differential setting of each row. The sequence in which the rows are energized is: the first row to be switched on is the last row that will be switched off. The default operating setpoint is 60° and the

differential is 1°C. With these settings, the rows are energized as indicated in the table below.

To set the differential:

1. Open the 1st differential control screen.

1st Differential			
1°C			+
MIN 1°C		MAX 11°C	
			-
ACCEPT		BACK	

2. Change the differential 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.

The default value for the differential is 1 °C.

Example 1: default setting

Row Number	Differential	Energized at Temperature (Turn On)	Energizing stops at Temperature (Turn Off)
Row 3 (top row)	1°C	< 57°C	> 58°C
Row 2 (middle row)	1°C	< 58°C	> 59°C
Row 1 (bottom row)	1°C	< 59°C	> 60°C

Example 2: different differentials

Row Number	Differential	Energized at temperature (Turn On)	Energizing stops at temperature (Turn Off)
Row 3 (top row)	4°C	< 49°C	> 53°C
Row 2 (middle row)	5°C	< 53°C	> 58°C
Row 1 (bottom row)	2°C	< 58°C	> 60°C

9.2.3

Tank sensor offset

If the indicated tank temperature does not match the actual water temperature: change the Tank Sensor Offset.

To change the Tank Sensor Offset:

1. From the **Temperatures** submenu open the Tank Sensor Offset control screen.

Tank sensor offset			
0 °C			+
MIN -3 °C		MAX 3 °C	-
ACCEPT		BACK	

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

9.3

Appliance Status

The **Element Status** submenu shows detailed information on the appliance:

Status	Current status of the appliance.
Element rows	Number of rows of elements in the appliance.
Max temperature contact	Closed: temperature is below the maximum Open: Temperature has been above the maximum, and the temperature protection circuit has activated.
External enable 1	Input 1 open or closed.
External enable 2	Input 2 open or closed.
Element row x active	Elements in this row are active.
Alarm condition	Yes: the relay output has been triggered by an alarm. No: no alarm.
Alarm acknowledged	Not used.
Alarm relay output	Closed: the relay output has been triggered by an alarm. Open: no alarm.

Fig. Element status submenu

Element Status		
Status:	Standby	▲
Element Rows	0	
Max Temperature Contact	Closed	
External enable 1	Closed	
External enable 2	Closed	
Element row1 active	No	

Element row2 active	No	
Element row3 active	No	
Alarm Condition	No	
Alarm Acknowledged	No	
Alarm Relay Output	Open	▼
	BACK	HELP

9.4 Economy Mode

The **Economy Mode** submenu shows the settings used to establish an Economy setpoint and Economy mode operating periods.

In this menu, you can switch the mode used for each day:

- **NORMAL**: the appliance will switch between NORMAL and ECO mode according to the schedule you set. The default setting is:
 - Start time for NORMAL mode: 00:00
 - End time for NORMAL mode: 23:59
 - When you change the Start time, the appliance will run in ECO mode from 00:00, then switch to NORMAL mode at the start time.
 - When you change the End time, the appliance will switch to ECO mode at the End time.

- ECO: the appliance will run in ECO mode the entire day

Economy Mode			
Setpoint adjustment	11°C	>	▲
Current time	Tue 15:05	>	
Appliance in economy mode	No	>	
Sunday	NORMAL	>	
-Start normal mode	00:00	>	
-End normal mode	23:59	>	

Monday	NORMAL	>	
-Start normal mode	00:00	>	
-End normal mode	23:59	>	
Tuesday	NORMAL	>	
-Start normal mode	00:00	>	
-End normal mode	23:59	>	
Wednesday	NORMAL	>	
-Start normal mode	00:00	>	
-End normal mode	23:59	>	
Thursday	NORMAL	>	
-Start normal mode	00:00	>	
-End normal mode	23:59	>	
Friday	NORMAL	>	
-Start normal mode	00:00	>	
-End normal mode	23:59	>	
Saturday	NORMAL	>	
-Start normal mode	00:00	>	
-End normal mode	23:59	>	▼
	BACK		HELP

Fig. Economy Mode submenu

9.4.1

Setpoint adjustment



Caution

At temperature settings below 60°C there is a higher risk of high legionella concentrations in the water.

On this page, you specify the difference between the Normal setpoint and the Economy setpoint.

(Normal setpoint) - (Economy setpoint adjustment) = (Economy setpoint).

To change the Economy setpoint adjustment:

1. From the Economy mode submenu open the Economy setpoint adjustment control screen.

Setpoint adjustment			
11 °C			+
MIN 0 °C	MAX 11 °C		-
ACCEPT		BACK	

2. Change the 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.

9.4.2

Set the time and day

To change the time and day of the week:

1. From the Economy mode submenu open the Current Time control screen.

Current time				
Tue 15 : 05 ^				+
				-
ACCEPT	<	BACK	>	

2. Change the setpoint:
 - a) The **[^]** indicates which value can be changed.
 - b) Use **[+]** to increase the value.
 - c) Use **[-]** to decrease the value.
 - d) Use **[>]** and **[<]** to move between days, hours and minutes.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

9.4.3

Economy mode schedule

To change the economy mode schedule:

1. From the Economy mode submenu, open the control screen for one of the days of the week.

Sunday				+
NORMAL				
MIN NORMAL		MAX ECONOMY		-
ACCEPT		BACK		

2. Change the setting:
 - NORMAL: the appliance will switch between NORMAL and ECO mode.
 - ECO: the appliance will run in ECO mode the entire day
 - a) Use **[+]** to increase the value.
 - b) Use **[-]** to decrease the value.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

If you set a day to NORMAL, you can set the start and end times for the NORMAL mode:

1. From the Economy mode submenu open the Start Normal mode control screen.

-Start normal mode					+
00 : 00 ^					
					-
ACCEPT	<	BACK	>		

2. Change the start time:
 - a) The **[^]** indicates which value can be changed.
 - b) Use **[+]** to increase the value.
 - c) Use **[-]** to decrease the value.
 - d) Use **[>]** and **[<]** to move between hours and minutes.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

4. From the Economy mode submenu open the End Normal mode control screen.

-End normal mode				
23 : 59 ^				+
				-
ACCEPT	<	BACK	>	

5. Change the end time:
- The [^] indicates which value can be changed.
 - Use [+] to increase the value.
 - Use [-] to decrease the value.
 - Use [>] and [<] to move between hours and minutes.
6. Press [ACCEPT] to confirm the value or press [BACK] to return to the previous screen.

9.5

Alarm output setup

The **Alarm output setup** submenu shows the output function and the alarm setpoint. The output function allows you to choose which events trigger the alarm output. These events are available:

Function	Alarm output is triggered...
Disabled	never.
Error	when an error occurs.
Error or warning	when an error or warning occurs.
Temp < alarm SP	when the water temperature drops below the alarm setpoint.
Temp < SP	when the water temperature drops below the normal setpoint.
Heating mode	when the appliance switches to heating mode.

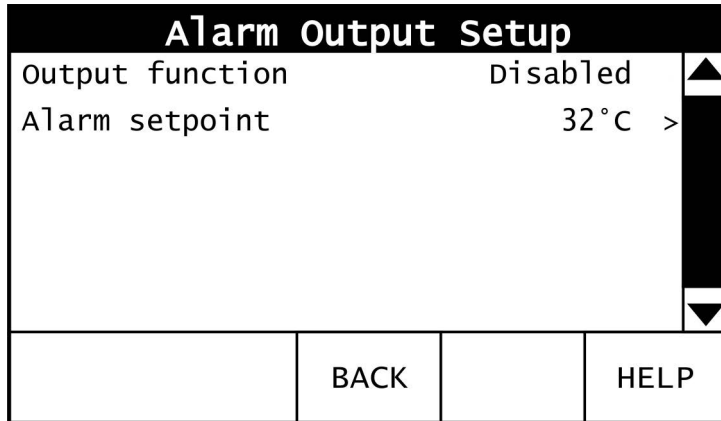


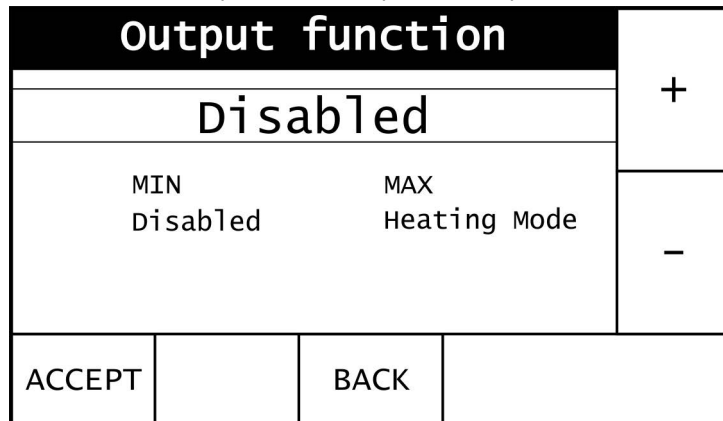
Fig. Alarm output setup submenu

9.5.1

Set the alarm output function

To change the alarm output function:

1. From the Alarm output submenu open the Output function control screen.



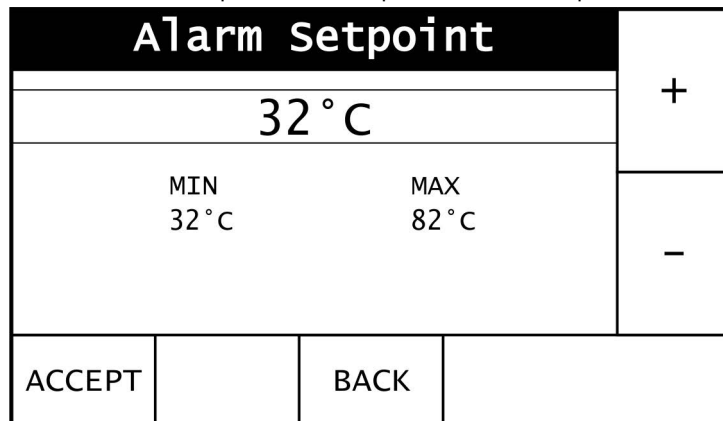
2. Change the alarm output function:
 - a) Use **[+]** to select the next function.
 - b) Use **[-]** to select the previous function.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

9.5.2

Alarm setpoint

To change the alarm temperature setpoint:

1. From the Alarm output submenu open the Alarm Setpoint control screen.

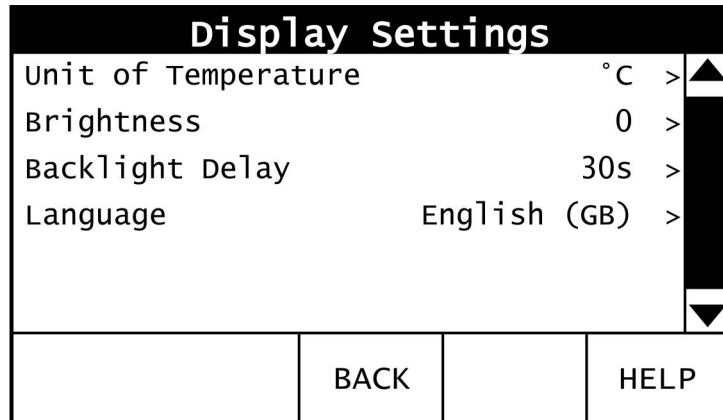


2. Change the alarm temperature setpoint:
 - a) Use **[+]** to increase the setpoint.
 - b) Use **[-]** to decrease the setpoint.
3. Press **[ACCEPT]** to confirm the value or press **[BACK]** to return to the previous screen.

9.6 Display settings

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

Fig. Display settings submenu

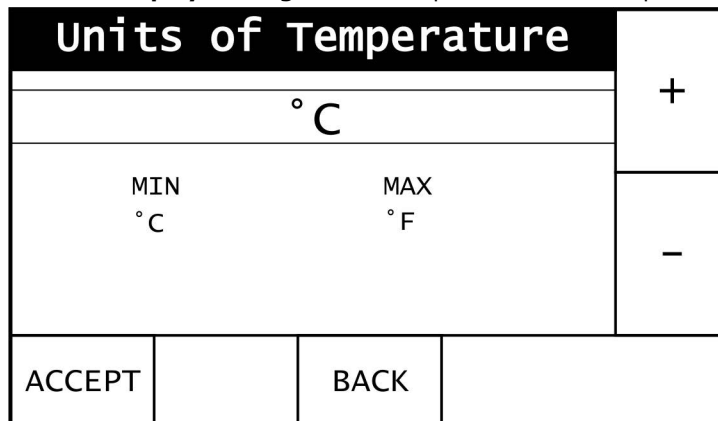


Press on a line with a **[>]** to change the settings.

9.6.1 Set the unit of temperature

To change the unit of temperature:

1. From the **Display Settings** submenu open the Unit of temperature control screen.



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

9.6.2

Set the display brightness

By default, the brightness of the display is low (brightness=0). If you set the brightness to 1 or higher, the display backlight becomes brighter when you press a button.

To change the display brightness:

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

Brightness			
0			+
MIN 0	MAX 10		
			-
ACCEPT		BACK	

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

9.6.3

Set the backlight delay

If you set the display brightness to 1 or higher, the display becomes brighter when you press a button. The backlight delay sets how long it takes before the backlight switches back to low level.

To change the backlight delay:

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

Backlight Delay			
30s			+
MIN 30s	MAX 240 s (On)		
			-
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.

9.6.4

Set the language

To change the language:

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

Language			
English (GB)			+
MIN		MAX	
Français (FR)		English (GB)	
			-
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.

When you press **[ACCEPT]**, the display restarts. This does not influence the control system.

9.7

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.

Total time	Total time the appliance has been on
TT. Heating	Total time the heaters have been on
Total cycles counter	Number of heating cycles
Row x cycles	Number of heating cycles for heater row x
Row x act	Total time the heaters in row x have been on
CCB version	Version of the control system software
UIM version	Version of the display software

Fig. Display - Appliance Information

Appliance Information							
Total time	52d17h6m						
TT Heating	2d10h31m						
Total Cycles Counter	274						
Row 1 Cycles	305						
Row 1 act.	2d10h24m						
Row 2 Cycles	42						
Row 2 act.	7h31m						
Row 3 Cycles	25						
Row 3 act.	4h39m						
CCB Version	X.XX						
UIM Version	X.XX.XX						
<table border="1" style="width: 100%;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">BACK</td> <td style="width: 33%;"></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">HELP</td> </tr> </table>			BACK				HELP
	BACK						
		HELP					

9.8

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 the error to open the information about that specific error.

Fig. Display - Error History

Error History							
1:	XXXXXXXXXXXXXXXXXXXX (XXX) > XXdXXhXXm ago						
2:	XXXXXXXXXXXXXXXXXXXX (XXX) > XXdXXhXXm ago						
3:	XXXXXXXXXXXXXXXXXXXX (XXX) > XXdXXhXXm ago						
4:	XXXXXXXXXXXXXXXXXXXX (XXX) > XXdXXhXXm ago						
5:	XXXXXXXXXXXXXXXXXXXX (XXX) > XXdXXhXXm ago						
<table border="1" style="width: 100%;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%; text-align: center;">BACK</td> <td style="width: 33%;"></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">HELP</td> </tr> </table>			BACK				HELP
	BACK						
		HELP					

Fig. Display error information

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

9.9 Error occurrence

From the main menu, you can open the **Error Occurrence** submenu. The **Error Occurrence** submenu shows the number of errors for each error category.

Fig. Display - Error Occurrence

Error Occurance		
High-limit thermostat	0	▲
No current detected	0	
Tank temperature probe	0	
Power supply error	0	
CCB hardware	0	
Model error	0	

UIM version	0	▼
	BACK	HELP

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

9.10 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

Restore Defaults		
Are you sure you want to restore the system to the factory defaults?		
Yes		No

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

10 Maintenance

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

To determine the correct interval, Lochinvar recommends to do a system check 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 and the water heater model. Use this information when you order the spare parts.

Do the following maintenance activities:

- [Preparation](#) (see 10.1)
- [Water-side maintenance](#) (see 10.2)
- [Performance check](#) (see 10.3)
- [Finalization](#) (see 10.4)

10.1 Preparation

Isolate the water heater from the mains before you start maintenance tasks.

10.2 Water-side maintenance

To do water side maintenance:

- [Inspect the anode](#) (see 10.2.1)
- Descale the tank

10.2.1 Inspect the anode

The life cycle of the anode is determined by the quality and the quantity of the water that flows through the water heater. Inspect the anode at least once a year to make sure that the tank is protected against corrosion.

To inspect the anode:

1. Close the stop valve in the cold water supply.
2. Open the nearest hot water tap to reduce the water pressure in the water heater.
3. Use a wrench to loosen the anode.
4. Take the anode out of the water heater.

5. Inspect the volume of the anode. When the anode is consumed for 60 % or more, replace the anode.



Note

If the anode needs to be replaced, always use an anode of the same type. Please refer to the type and the serial number on the data plate.

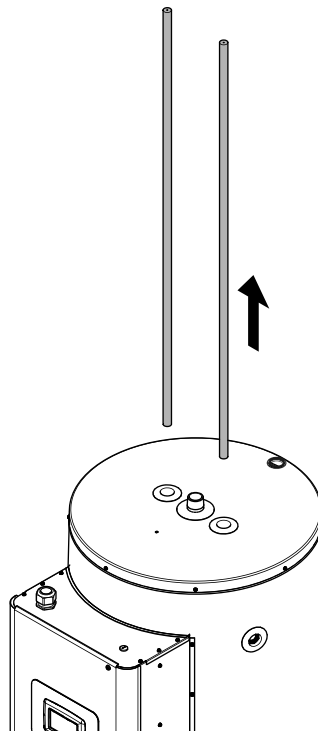
6. Place the anode in the water heater.
7. Use a wrench to fasten the anode. Make sure that the connection is watertight.



Note

Never install an anode isolated from the metal tank.

Fig. Inspect the anode



10.2.2

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).

Note

Before reassembly replace the gaskets. You must order these gaskets at your supplier. Look at the data plate for the correct ordering information.

To descale and clean the tank:

1. Decommission the water heater (see 8.7).
2. Open the door of the water heater.



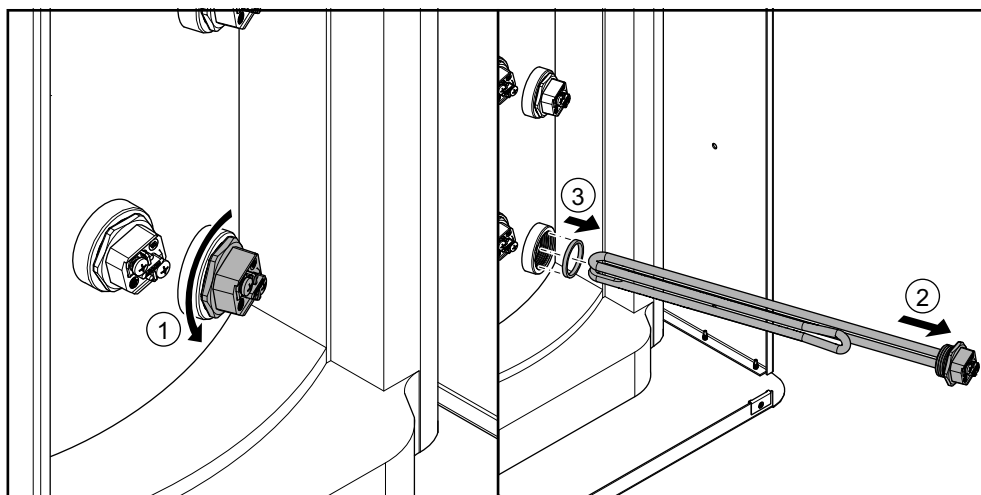
Warning

Live cables inside! Switch off the power supply completely (on local isolator) before opening the outer door to access the electrical components.

3. Remove the isolating material.

4. Remove the lowest heating element:
 - a) Loosen electrical wires earth (A) and live (L) on the element.
 - b) Loosen the heating element.
 - c) Take the heating element out of the water heater.
Carefully store the heating element.
5. Inspect the tank on limescale through the opening.
6. When there is lime scale:
 - a) Remove the following heating elements.
Start at the lowest heating element.
 - b) Use a descaling agent to remove the scale and contamination. Contact the supplier of your water heater for advice on what descaling agent to use.
7. Clean the heating elements.
8. Replace the gasket.
9. Measure the resistance value between the two connections of each heating element.
The value needs to be approximately 19 +/- 4 Ohm for 3 kW elements and 10 +/- 2 Ohm for 6 kW elements.
10. Install all heating elements:
 - a) Place the element in the tank.
 - b) Tighten the heating element.
 - c) Attach the electrical wires earth (A) and live (L) on the element.
11. Install the isolating material.
12. Close the door.
13. Fill the water heater (see 8.6.1).

Fig. Remove a heating element



10.3

Performance check

Make sure that the resistance value of each element is correct:

1. Open the door of the water heater.



Warning

Live cables inside! Switch off the power supply completely (on local isolator) before opening the outer door to access the electrical components.

2. Remove the isolating material.
3. Measure the resistance value between the two connections of each heating element.
The value needs to be approximately 19 +/- 4 Ohm for 3 kW elements and 10 +/- 2 Ohm for 6 kW elements.

4. Replace the heating element when the resistance value is not correct.
 - a) Decommission the water heater (see 8.7).
 - b) Loosen electrical wires earth (A) and live (L) on the element.
 - c) Loosen the heating element.
 - d) Take the heating element out of the water heater.
 - e) Place a new element in the tank.
 - f) Tighten the heating element.
 - g) Attach the electrical wires earth (A) and live (L) on the element.
5. Make sure that all wiring is installed correctly.
6. Make sure that all electrical screw connections are tightened.
7. Install the isolating material.
8. Close the door.
9. If necessary, fill the water heater (see 8.6.1).

10.4

Finalization

When all maintenance activities are done:

1. If necessary, fill the water heater (see 8.6.1).
2. Turn on the water heater (see 4.1).
3. Check if the performance of all components is correct:
 - a) Make sure that the water heater operates the operating cycle correctly.
 - b) If applicable, make sure that the T&P valve operates correctly.
Open the T&P valve pressure relief and make sure that water spurts out.



Warning

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

- c) Make sure the pressure relief connection of the expansion valve operates correctly.
Open this pressure relief and make sure that water spurts out.

11 Troubleshooting

11.1 Errors and warnings

The water heater can have three different kinds of errors:

- General errors, which are not displayed
- Displayed errors (see 11.1.2), 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 11.1.3)



Note

It is possible to view the error history of the water heater, refer to Error history (see 9.8).

11.1.1 General errors



Note

For the coding of the connections, refer to the Electrical wiring diagram (see A.5).

Indication	Cause	Measure
Water leakage	There is a leakage from a threaded water connection.	Tighten the threaded connection.
	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.

Indication	Cause	Measure
Insufficient or no hot water	The water heater is off.	Turn on the water heater (see 4.1).
	The temperature is set too low.	Set the setpoint higher.
	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 400 V _{AC} (-15%, +10%).
	The hot water supply is used up.	Reduce the hot water consumption. Wait until the water heater heats up.
	A safety device is activated.	<ul style="list-style-type: none"> - Make sure that the voltage between the connections of the heating elements is 230VAC (-15%, +10%). - Refer to indication "A safety device is activated", next page.
Earth leakage circuit breaker is out	There is not enough water in the tank.	<ul style="list-style-type: none"> - Make sure that the water heater is filled with water.
	One of the heating elements is defective.	<ul style="list-style-type: none"> - Measure the resistance value between each heating element connection and the outside of the tank. The value must be infinite. - Determine which element is defective.

Indication	Cause	Measure
A safety device is activated	The main safety thermostat (G1) is activated	<ul style="list-style-type: none"> - Make sure the water heater is completely filled. - Tap off water, so the temperature drops in the water heater. - Make sure all connections are connected correctly (refer to the wiring diagram). - Use the white button to manually reset the thermostat. - If necessary, replace the safety thermostat (G1).
	The row safety thermostat (G2) is activated.	<ul style="list-style-type: none"> - Tap off water, so the temperature drops in the water heater. - Make sure all connections are connected properly (refer to the wiring diagram). - Use the red button to manually reset the thermostat. - If necessary, replace the safety thermostat (G2).
	The thermal fuse broke the control circuit.	<ul style="list-style-type: none"> - Check what caused the excessive heat rise of the element area. - Measure the resistance value over the thermal fuse. The value needs to be <5 Ohm. - If necessary, replace the thermal fuse wiring.

11.1.2

Displayed errors



Note

For the coding of the connections, refer to the [Electrical wiring diagram](#) (see A.5).

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
045 (Blocking error) Sensor error Top sensor short	Sensor is not (correctly) connected.	<ul style="list-style-type: none"> - Make sure that the connector is connected to J5 Pin 2 and 3. - Make sure that the wire is connected to the sensor.
	Damaged wiring and/or defective sensor.	Replace the wiring and/or the sensor.
047 (Blocking error) Sensor error Top sensor open	Short circuit in the sensor circuit.	Replace the wiring and/or the sensor.

Code and description	Cause	Measure
0A5 (Lock out error) Temperature error Max. temperature exceeded (or thermal fuse activated)	The main safety thermostat (G1) is activated.	<ul style="list-style-type: none"> - Make sure the water heater is completely filled. - Tap off water, so the temperature drops in the water heater. - Make sure all connections are connected correctly, refer to the electrical wiring diagram (see A.5). - Use the white button to manually reset the thermostat. - If necessary, replace the safety thermostat (G1). - Cycle power to the water heater to reset the error.
	The thermal fuse broke the control circuit.	<ul style="list-style-type: none"> - Check what caused the excessive heat rise of the element area. - Measure the resistance value over the thermal fuse. The value needs to be <5 Ohm. - If necessary, replace the thermal fuse wiring. - Cycle power to the water heater to reset the error.
4F1 (Blocking error) Communication error No communication between control board and display board.	Wiring is damaged.	<ul style="list-style-type: none"> - Make sure that the wiring, between the control board and the display board, is connected and not damaged. - If necessary, reconnect or replace the wiring.
031 - 038 (Blocking error) Power supply error Problem with power supply	Supply voltage not correct.	The measured voltage must be 400 VAC (-15%, +10%).
	Voltage to the control board not correct.	<ul style="list-style-type: none"> - Make sure that the wiring of the 400-28VAC transformer (E) is connected and not damaged. - Check the transformer fuse (F2). The measured voltage to the control board must be 28 VAC (-15%, +10%).
XXX (Lock out error) Control error Hardware failure	Internal error message from the controller.	<ul style="list-style-type: none"> - Cycle power to the water heater to reset the error. - If the error persists, replace the controller.

11.1.3

Warnings



Note

For the coding of the connections, refer to the [Electrical wiring diagram](#) (see A.5).

Indication	Cause	Remark
40D No current detected No current detected in one or more heating circuit(s).	Damaged wiring and/or defective heating element.	Do a performance check . (see 10.3)
	Damaged wiring and/or defective current sensor.	<ul style="list-style-type: none"> - Make sure the wiring of the element current sensors (D) is correct. - Replace the wiring and/or the sensor.

Index

A

About the water heater.....	27
About this manual.....	7
Alarm output.....	42
Alarm output setup.....	55
Alarm setpoint	56
Ambient conditions	37
Appendices.....	73
Appliance Status.....	50
Appliance information.....	59

C

Circulation connection	40
Cold water connection.....	39
Commissioning.....	44
Compliance.....	4
Conditions.....	37
Contact information	5
Copyright.....	3

D

Declaration of conformity.....	82
Decommissioning.....	45
Descale the tank	64
Dimensions.....	75
Display.....	19, 47
Display buttons	20
Display settings.....	57
Displayed errors.....	69
Disposal.....	33
Document identification	8
Draining	45

E

Economy Mode.....	51
Economy mode schedule.....	54
Electrical connections.....	40
Electrical wiring diagram.....	78
Energy labeling.....	76
Environmental aspects.....	33
Error history.....	60
Error occurrence.....	61
Errors and warnings	67
External ON/OFF.....	43

F

Filling	44
Finalization.....	44, 66

G

General errors.....	67
---------------------	----

H

Hot water connection.....	40
Hysteresis.....	48

I

Inspect the anode.....	63
Installation.....	37
Installation diagram.....	39
Installation, Maintenance and Service part.....	25
Instructions on the water heater.....	30
Interface	19
Introduction.....	15, 27

L

Liability	3
-----------------	---

M

Mains power.....	42
Maintenance.....	63
Maximum floor load.....	37

N

Notation conventions	7
----------------------------	---

O

OFF mode.....	21
ON mode.....	22
Operating modes.....	21
Operating setpoint.....	48
Operator interface.....	19

P

Packaging.....	37
Performance check.....	65
Preface.....	3
Preparation.....	63

R

Recycling.....	33
Regulations	4
Restore default.....	61

S

Safety.....	17, 29
Safety devices.....	31
Safety instructions.....	29
Scope	7
Set the alarm output function.....	56
Set the backlight delay.....	58
Set the display brightness.....	58
Set the language.....	59
Set the time and day.....	53
Set the unit of temperature.....	57
Set the water temperature.....	23
Setpoint adjustment.....	52
Settings.....	47
Status of the water heater.....	21
Structure of the water heater.....	35
Symbols on the display.....	20

T

Tank sensor offset.....	50
Target group	7
Technical details AMP ECO 200.....	73
Technical details AMP ECO 300.....	74
Temperatures.....	48
Trademark.....	3
Trademarks.....	3
Troubleshooting.....	67
Turn off for a long period	24
Turn off for a short period	24
Turn off the water heater.....	24, 45
Turn on the water heater.....	44

U

United Kingdom.....	82
Use.....	23
User part.....	13

W

Warnings.....	70
Warranty.....	84
Water composition.....	38
Water connections.....	39
Water heater	35
Water-side maintenance.....	63
Working clearances	38
Working principle	27

A Appendices

A.1 Technical details AMP ECO 200

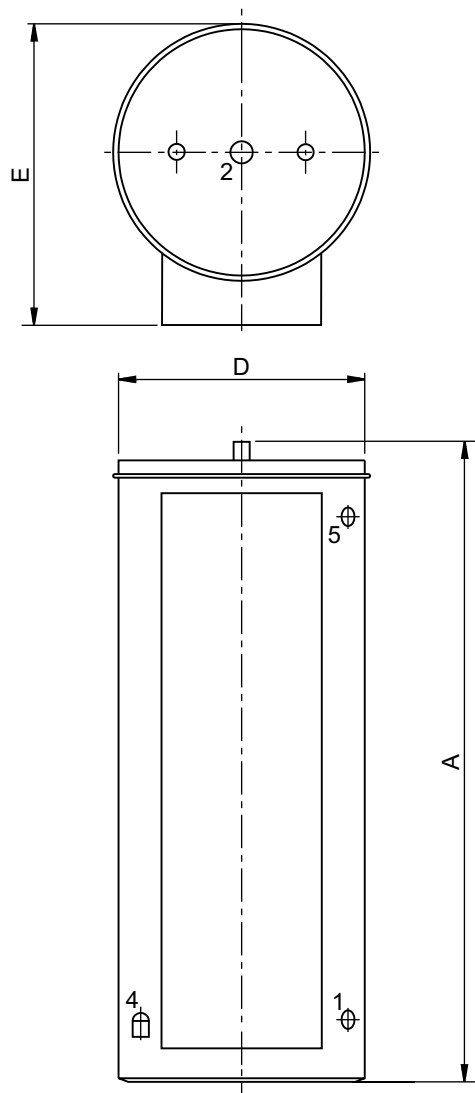
Description	Unit	AMP ECO 200-9	AMP ECO 200-18	AMP ECO 200-36
General				
Contents	l	173	173	173
Empty weight	kg	73	73	73
Maximum floor load	kg	246	246	246
Maximum operating pressure	kPa (bar)	800 (8)	800 (8)	800 (8)
Control thermostat - adjustment range	°C	32 - 83	32 - 83	32 - 83
Control thermostat - default value	°C	60	60	60
Operating setpoint - adjustment range	°C	32-83	32-83	32-83
Operating setpoint - default value	°C	60	60	60
Row differentials - adjustment value	°C	1-11	1-11	1-11
Row differentials - default value	°C	1	1	1
Number of anodes	-	2	2	2
Heating time $\Delta T = 45\text{ °C}$	min.	65	32	16
Electrical				
Electrical power consumption	kW	8,4	16,8	33,6
Supply voltage	V	400 (-15/+10%)		
Mains frequency	Hz	50 (± 1 Hz)		
Number of phases	-	3	3	3
Power	kW	8,4	16,8	33,6
Load	A	12	24	49
Number of electric heating elements	-	3	3	6
Number of fuses	-	3	3	6
IP class	-	IP X1		

A.2 Technical details AMP ECO 300

Description	Unit	AMP ECO 300-9	AMP ECO 300-18	AMP ECO 300-36	AMP ECO 300-54
General					
Contents	l	264	264	264	264
Empty weight	kg	110	110	110	110
Maximum floor load	kg	374	374	374	374
Maximum operating pressure	kPa (bar)	800 (8)	800 (8)	800 (8)	800 (8)
Control thermostat - adjustment range	°C	32 - 83	32 - 83	32 - 83	32 - 83
Control thermostat - default value	°C	60	60	60	60
Operating setpoint - adjustment range	°C	32-83	32-83	32-83	32-83
Operating setpoint - default value	°C	60	60	60	60
Row differentials - adjustment value	°C	1-11	1-11	1-11	1-11
Row differentials - default value	°C	1	1	1	1
Number of anodes	-	2	2	2	2
Heating time DT = 45 °C	min.	99	49	25	16
Electrical					
Electrical power consumption	kW	8,4	16,8	33,6	50,4
Supply voltage	V	400 (-15/+10%)			
Mains frequency	Hz	50 (± 1 Hz)			
Number of phases	-	3	3	3	3
Power	kW	8,4	16,8	33,6	50,4
Load	A	12	24	49	73
Number of electric heating elements	-	3	3	6	9
Number of fuses	-	3	3	6	9
IP class	-	IP X1			

A.3 Dimensions

Size	Description	Unit	AMP ECO 200-9 AMP ECO 200-18 AMP ECO 200-36	AMP ECO 300-9 AMP ECO 300-18 AMP ECO 300-36 AMP ECO 300-54
Dimensions water heater				
A	Overall height	mm	1460	1580
D	Appliance diameter	mm	560	640
E	Depth	mm	690	790
Dimensions connections				
1	Cold water supply connection (male)	"	1 1/4	1 1/4
2	Hot water outlet connection (male)	"	1 1/4	1 1/4
3	T&P-valve connection (female)	"	3/4	3/4
4	Drain valve connection (female)	"	3/4	3/4



IMD-0298b R1

A.4 Energy labeling

Description	Unit	AMP ECO 200-9	AMP ECO 200-18	AMP ECO 200-36
Declared load profile				
Load profile	-	XL	XL	XL
Energy efficiency class (Energy label)	-	C	C	C
Energy efficiency	%	38.4	38.7	38.9
Daily electricity consumption	kWh	20.104	19.931	19.758
Daily fuel consumption	kWh GCV	0.000	0.000	0.000
Mixed water 40 °C (V40)	l	252	255	258
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	-	-	-

Description	Unit	AMP ECO 300-9	AMP ECO 300-18	AMP ECO 300-36	AMP ECO 300-54
Declared load profile					
Load profile	-	XL	XL	XL	XL
Energy efficiency class (Energy label)	-	C	C	C	C
Energy efficiency	%	38.7	39.1	39.3	39.0
Daily electricity consumption	kWh	19,934	19,656	19,530	19,729
Daily fuel consumption	kWh GCV	0.000	0.000	0.000	0.000
Mixed water 40 °C (V40)	l	395	407	405	403
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	-	-	-	-

A.5

Electrical wiring diagram

Fig. Electrical wiring diagram - 3 elements

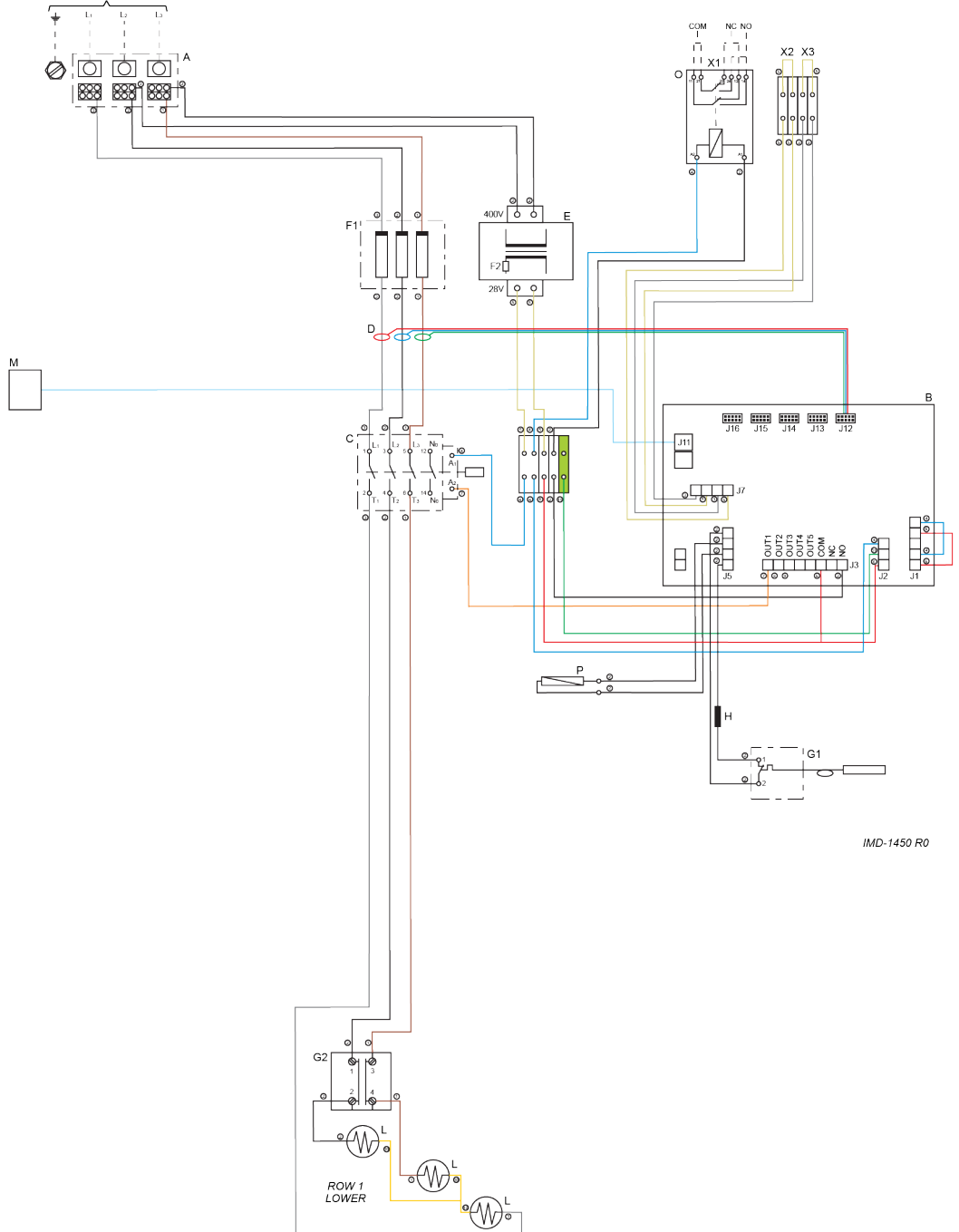


Fig. Electrical wiring diagram - 6 elements

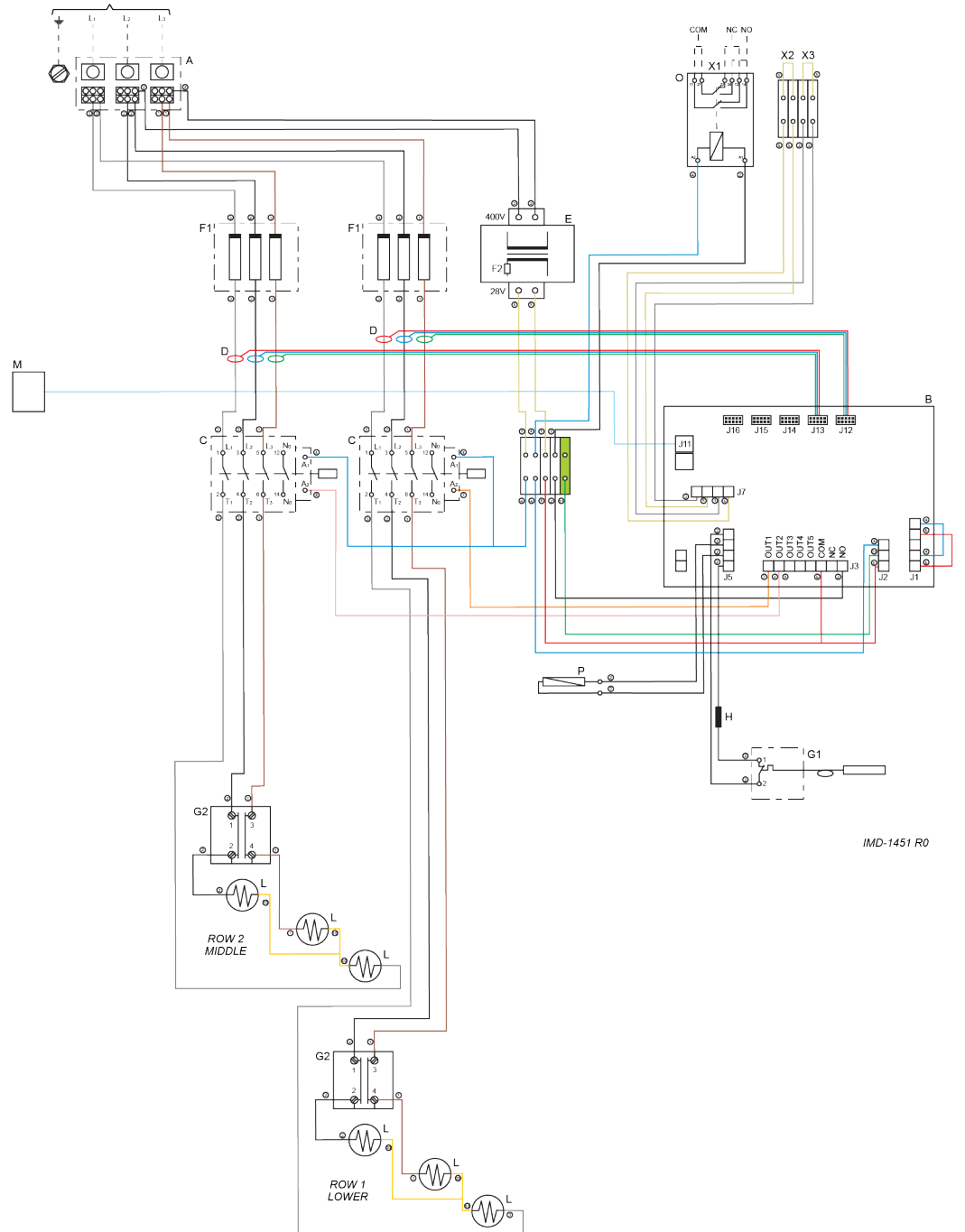
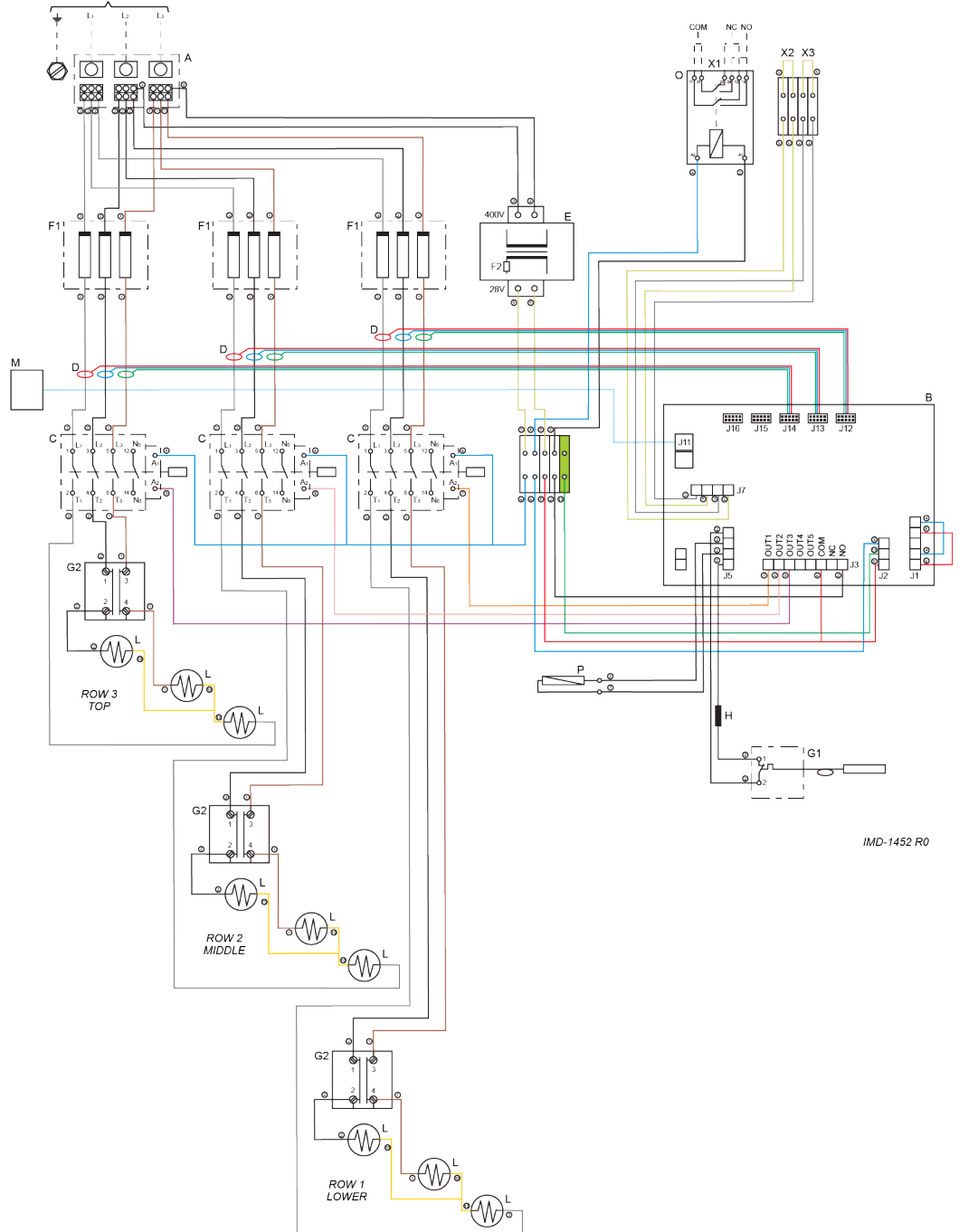


Fig. Electrical wiring diagram - 9 elements



IMD-1452 R0

Cable colors

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

Terminal block connections

- A Earth
- L₁. Phase 1 input
- L₂. Phase 2 input
- L₃. Phase 3 input

Additional connections

- X1 Alarm relay output
- X2 External on/off input 1
- X3 External on/off input 2

Components

- A. Terminal Block
- B. Control
- C. Relay
- D. Element current sensors
- E. Transformer 400-28VAC
- F1. Element fuse (gG 400VAC/32A)
- F2. Transformer fuse (T1AL250)
- G1. Main safety thermostat
- G2. Row safety thermostat
- H. Thermal fuse
- L. Electrical heating element
- M. Display
- O. Alarm relay
(SPDT - 250VAC/10A max.)
- P. Temperature sensor

A.6

Declaration of conformity

A.6.1

United Kingdom



CE - Declaration of Conformity

Manufacturer: Lochinvar Limited
7 Lombard Way
The MXL Centre
Banbury - United Kingdom

hereby declares that the following products:

Product description: Commercial Electric Water Heater

Product family name: Cavalier Eco

Product models: AMP 200-9 Eco, AMP 200-18 Eco, AMP 200-36 Eco,
AMP 300-9 Eco, AMP 300-18 Eco, AMP 300-36 Eco, AMP 300-54 Eco

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

Low Voltage Directive (LVD) - 2014/35/EU

- EN 50106:2008
- EN 60335-1:2012 + AC:2014 + A11:2014 + A13:2017 + A1:2019 + A2:2019 + A14:2019 + A15:2021
- EN 60335-2-21:2003 + A1:2005 + AC:2007 + A2:2008 + AC:2010
- EN 60335-2-21:2021
- EN 62233:2008 + AC:2008

Electromagnetic Compatibility Directive (EMC) - 2014/30/EU

- EN 55014-1:2017 + A11:2020 + EN IEC 55014-1:2021 + EN 55014-1:2006 + A1:2009 + A2:2011
- EN 55014-2:2015 + EN IEC 55014-2:2021 + EN 55014-2:1997 + AC:1997 + A1:2001 + A2:2008
- EN 61000-3-2:2014 + EN IEC 61000-3-2:2019 + A1:2021
- EN 61000-3-3:2013 + A1:2019

ECO Design Directive (ErP) - 2009/125/EC

- Commission regulation No. 814/2013 based on notices 2014/C - 207/03

Requirements for Restriction of Hazardous Substances (RoHS II/III) Directive - 2011/65/EU en 2015/863/EU

Company:
Lochinvar Limited

Date:
November 1, 2021

Signature:

E. van Driel
Managing Director



UK - Declaration of Conformity

Manufacturer: Lochinvar Limited
7 Lombard Way
The MXL Centre
Banbury - United Kingdom

hereby declares that the following products:

Product description: Commercial Electric Water Heater

Product family name: Cavalier Eco

Product models: AMP 200-9 Eco, AMP 200-18 Eco, AMP 200-36 Eco,
AMP 300-9 Eco, AMP 300-18 Eco, AMP 300-36 Eco, AMP 300-54 Eco

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

Electrical Equipment (Safety) Regulation 2016 (UK SI 2016 No. 1101)

- EN 50106:2008
- EN 60335-1:2012 + AC:2014 + A11:2014 + A13:2017 + A1:2019 + A2:2019 + A14:2019 + A15:2021
- EN 60335-2-21:2003 + A1:2005 + AC:2007 + A2:2008 + AC:2010
- EN 60335-2-21:2021
- EN 62233:2008 + AC:2008

Electromagnetic Compatibility Regulations 2016 (UK SI 2016 No. 1091)

- EN 55014-1:2017 + A11:2020 + EN IEC 55014-1:2021 + EN 55014-1:2006 + A1:2009 + A2:2011
- EN 55014-2:2015 + EN IEC 55014-2:2021 + EN 55014-2:1997 + AC:1997 + A1:2001 + A2:2008
- EN 61000-3-2:2014 + EN IEC 61000-3-2:2019 + A1:2021
- EN 61000-3-3:2013 + A1:2019

Ecodesign for Energy-Related Products Regulations 2010 (UK SI 2010 No. 2617)

- Commission regulation No. 814/2013 based on notices 2014/C - 207/03

RoHS Regulation 2012 (UK SI 2012 No. 3032)

Company:
Lochinvar Limited

Date:
November 1, 2021

Signature:

E. van Driel
Managing Director

A.7

Warranty

Contact Lochinvar or go to www.lochinvar.ltd.uk for the current warranty terms and conditions.



7 Lombard Way, The MXL Centre, Banbury, Oxon, OX16 4TJ
Tel: +44(0) 1295 269 981, Fax:+44(0) 1295 271 640, Email: info@lochinvar.ltd.uk
www.lochinvar.ltd.uk

Lochinvar Ltd reserves the right to change specifications without prior notice