HITACHI

SERVICE MANUAL

airH_2O 800

R290 SERIES

MODELS

OUTDOOR UNITS
M: RASM-(2-6)(V)TW2E

INDOOR UNITS - HYDROSPLIT SYSTEM
H: HWM-W2E(-B)
H Combi: HWD-W2E-220S(-K)

INDOOR UNITS - CONTROL BOX SYSTEM
CONTROL BOX: ATW-CBX-01

Cooling & Heating

SMGB0154 rev.0 - 10/2025

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General information

1.1 General information

1.1.1 General notes

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The English version is the original one; other languages are translated from English. Should any discrepancy occur between the English and the translated versions, the English version shall prevail.

Hitachi makes every effort to offer correct, up-to-date documentation. Despite this, printing errors cannot be controlled by Hitachi and are not its responsibility.

As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.

No type of modification must be made to the equipment without prior, written authorization from the manufacturer.

This air to water heat pump has been designed for standard water heating for human beings. For use in other applications, please contact your Hitachi dealer or service contractor.

1.1.2 Introduction

Hitachi proudly announces the newest air-to-water heat pumps in its award-winning **airH2O 800** range.

airH2O 800 units produce heating and domestic hot water like any oil or gas boiler, but transforming renewable energy from the outside air into heat. Air to water heat pumps extract the free energy present in the air, which is enough to heat a home up to a comfortable temperature, even on the coldest winter day. Every kW of electricity used to power the heat pump can yield up to more than 5 kW of energy for heating; this provides savings of up to 80 % on heating expenses compared to a traditional fossil fuel boiler.

The new **airH2O 800** Series, based on state-of-the-art technology, does not only achieve an outstanding performance in space heating but also provides domestic hot water with high efficiency. Additionally, cooling operation for summer can also be provided installing the dedicated cooling kit accessory of Hitachi.

The system is simple to control; its new user controller (PC-ARFH3E) improves the acclaimed and successful design used with the existing LCD controller and provides a great deal of new functions like: live view, energy consumption data, fan coils control, weekly timer, wizard to set timer, override function, etc.

1.1.2.1 Overview of airH2O 800 system

The new **airH2O 800** system consist of an air to water heat pump system composed by an outdoor unit (**airH2O 800M**, refrigerant cycle) and an indoor unit (water cycle) connected just with water pipes, it is, without the need of using refrigerant pipes.

The **airH2O 800M** is designed to be installed outdoors, in any kind of dwelling (house, apartment, villa,…), whether in a new construction or in an existing building. Installation work is greatly simplified thanks to the lack of refrigerant piping connections.

For safety reasons, this new **airH2O 800** units have been designed to avoid any electrical works into the unit's cabinet.

This means that all the hydraulic control and the terminal have been removed from the outdoor unit. Only 1 outdoor to indoor connection must be performed (H-LINK).

The wide range of **airH2O 800** products is basically divided in two types of system:

- Control Box system
- Hydrosplit system

◆ Control Box system - airH2O 800M + Control Box

The Control Box system has the advantage of placing the control terminal board indoors, simplifying wiring installation and avoiding any additional connection to the **airH2O 800M** (only power supply and H-LINK):

Thus, it can be used in 2 circumstances:

- On those sites where an indoor unit is not required.
- For customised solutions. In this case, all the indoor elements are connected to the Control Box.

◆ Hydrosplit system - airH2O 800M + airH2O 800H / airH2O 800H Combi

Two types of indoor unit can be used in Hydrosplit systems:

airH2O 800H

The indoor unit of **airH2O 800H** is designed for space heating, in a wall-mounted installation with an embedded buffer tank and a secondary water pump.

It is offered in 2 different versions, one featuring a 6 kW electrical heater, and the other being prepared to be combined with a complementary boiler.

Moreover, both can be combined with an external tank for domestic hot water production. A 200 litres and a 300 litres tanks are offered as accessories for this.

airH2O 800H Combi

The indoor unit of **airH2O 800H Combi** is conceived as a floor standing unit with an embedded buffer tank and a secondary water pump. It is prepared for heating operation as well as for domestic hot water production. For this purpose, it has a built-in domestic hot water 220 litres tank.

Furthermore, new **airH2O 800H Combi** models have been designed for the UK market that meet the UK requirements referred in the UK Building Regulations.

1.1.2.2 Summary of operations

Space heating

airH2O 800 units are factory-supplied ready for space heating operation. Different heating installation configurations can be selected, providing a comfortable atmosphere all year long, even in the coldest climates:

- **Mono-valent system**

  The air to water heat pump is sized to provide 100 % of the heating requirements on the coldest day the year.
- **Mono-energy system**

  This is the most popular configuration. The air to water heat pump is sized to provide 80 % of the heating requirements on the coldest days of the year. An auxiliary electric heater is used to provide the additional heating required on cold days. This option usually results in an ideal balance between installation costs and future energy consumption, as proven by its popularity in colder climates than ours, such as Sweden and Norway.
- **Alternating bi-valent system**

  For installations with an existing heating system by boiler and when is needed to heat the supplied water temperature to the circuit up to high temperatures (80 °C), the boiler can be configured to alternate with the air to water heat pump.

Selecting the different configuration types it is possible to adapt the system to all customer requirements, providing a wide application range from the simplest configuration to complete configuration: radiator, heating floor or both (2nd temperature area).

Domestic hot water production

For **airH2O 800H** and Control Box, the Hitachi accessory “DHWT-(200/300)S-3.0H2E” can be used for the production of DHW.

In case of **airH2O 800H Combi**, the domestic hot water tank is built in the indoor unit.

An electric heater is incorporated inside both remote and integrated tanks in order to allow an immediate heating of the domestic hot water in accordance with the user’s needs.

Space cooling

airH2O 800 units can also be operated in cooling operation. The dedicated cooling kit accessory has been designed for this purpose. Combining the heating only models with these cooling kits, the reversible models become available. In this case, combination with fan-coils, refreshing floor or both (2nd temperature area) can be applied.

Combination with solar panels

airH2O 800 system can be combined with solar panels. The solar combination enables to heat up the DHW by means of the sun. The solar combination is designed to transfer the heat from the solar panels (sun radiation) to the heat exchanger of DHW tank.

Swimming pool water heating operation

For summer session period, **airH2O 800** system can be used to heat up the water temperature of swimming pools up to a value between 24 °C and 33 °C.

1.2 Applied symbols

During normal heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.

Situations that pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.

A series of special symbols are used to clearly identify these situations.

Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

A3

RISK OF EXPLOSION:
This symbol shows that this equipment uses an odourless flammable refrigerant. This appliance is filled with R290. If the refrigerant is leaked, there is a possibility of ignition if it enters in contact with an external ignition source.

DANGER

- ***The text following this symbol contains information and instructions relating directly to your safety, in addition to hazards or unsafe practices which could result in severe personal injuries or death.***
- ***Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.***

In the texts following the danger symbol you can also find information on safety procedures during unit installation.

CAUTION

- *The text following this symbol contains information and instructions relating directly to your safety, in addition to hazards or unsafe practices which could result in minor personal injury or product or property damage.*
- *Not taking these instructions into account could lead to minor injuries to you and others in the proximities of the unit.*
- *Not taking these instructions into account could lead to unit damage.*

In the texts following the caution symbol you can also find information on safety procedures during unit installation.

NOTE

- *The text following this symbol contains information or instructions that may be of use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*

1.3 Norms and regulations

Refrigerant R290 is a non-fluorinated greenhouse gas (*) and an alternative refrigerant for the compliance of traditional HFC refrigerant bans foreseen in the EU regulation 2024/573 (F-Gas) in 2027 and 2032.

Do not vent R290 to the atmosphere. The refrigerant shall be recovered when needed for the system servicing and at the end of product life.

NOTE

(*) GWP_{290} = 0.02 under Intergovernmental Panel on Climate Change (IPCC) AR6.

1.3.1 Appropriate refrigerant

The refrigerant used in each unit is identified on the specification label and manuals of the unit. Hitachi shall not be held liable for any failure, trouble, malfunction or accident caused by units illegally charged with refrigerants other than the specified one.

1.3.2 Consequences of charging non-specified refrigerant

It may cause mechanical failure, malfunction and other accidents. It may cause operational failure of protection and safety devices of the system. It may also cause lubrication failure of the sliding part of the compressor due to deterioration of refrigerant oil.

Once a non-specified refrigerant has been charged, no further servicing (including draining of refrigerant) shall be performed, even in case of malfunction. Improper handling of refrigerant may be a cause of fire and explosion, and servicing in such cases may be considered an illegal act.

End clients and costumers shall be informed that servicing is not approved, and the installer who charged the non-specified refrigerant shall be asked to fix the unit.

Hitachi will accept no responsibility for units that have been charged with non-specified refrigerant once.

1.4 Classification and product guide

1.4.1 Classification of the units

1.4.1.1 Outdoor units

◆ airH2O 800M - RASM-(2-6)(V)TW2E

Unit type: **airH2O 800M** (Outdoor unit)
Position-separating hyphen (fixed)
System capacity (HP): 2, 3, 3.5, 4, 5, 6
V: Single phase unit (~ 230 V 50 Hz)
—: Three phase unit (3N~ 400 V 50 Hz)
R290 refrigerant
W: Hydrosplit system
Series 2
Made in Europe

RASM	**-**	**X**	**(V)**	**T**	**W**	**2**	**E**

1.4.1.2 Indoor units - Hydrosplit system

◆ airH2O 800H - HWM-W2E(-B)

Unit type: **airH2O 800H** (Hydrosplit system - single water module (indoor unit))
Position-separating hyphen (fixed)
W: Water to water
Series 2
Made in Europe
-B: Model for boiler combination

HWM	**-**	**W**	**2**	**E**	**(-B)**

◆ airH2O 800H Combi - HWD-W2E-220S(-K)

Unit type: **airH2O 800H Combi** (Hydrosplit system - dual water module (indoor unit + domestic hot water tank))
Position-separating hyphen (fixed)
Water-to-water DHW heat exchanger
Series 2
Made in Europe
Position-separating hyphen (fixed)
Tank model: 220 litres
Tank material: Stainless steel
-K: Model for UK market

HWD	**-**	**W**	**2**	**E**	**-**	**220**	**S**	**(-K)**

1.4.1.3 Indoor units - Control Box system

◆ Control Box - ATW-CBX-01

Air-to-water
Position-separating hyphen (fixed)
Remote control box
Position-separating hyphen (fixed)
Series 01

ATW	-	CBX	-	01

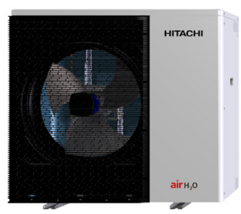
1.4.2 Product guide

Icons between brackets mean possible extra operations to the factory-supplied operations (additional accessories, field-supplied accessories or systems can be needed).

- Heating operation
- Additional heater (electrical heater accessory)
- Domestic Hot Water (DHW)
- UK market
- Swimming pool application
- Cooling operation
- Solar combination
- Boiler combination
- Integrated Wi-Fi

1.4.2.1 Outdoor units

◆ airH2O 800M - RASM-(2-6)(V)TW2E

Model	Power supply	Model code	Remarks	Picture
RASM-2VTW2E	~ 230 V 50 Hz	7E355003	Monobloc air-to-water heat pump system	
RASM-3VTW2E		7E355005		
RASM-3.5VTW2E		7E355006		
RASM-4VTW2E		7E355007		
RASM-5VTW2E		7E355008		
RASM-6VTW2E		7E355009		
RASM-4TW2E	3N~ 400 V 50 Hz	7E355107		
RASM-5TW2E		7E355108		
RASM-6TW2E		7E355109		

For cooling operation, refer to the cooling kit accessory.

1.4.2.2 Indoor units - Hydrosplit system

◆ airH2O 800H - HWM-W2E(-B)

Standard model

Model	Power supply	Model code	Remarks	Picture
HWM-W2E	~ 230 V 50 Hz 3N~ 400 V 50 Hz	7E545902	Wall mounted indoor units for Hydrosplit air-to-water heat pump system with electrical heater (6 kW)	

Model for boiler combination

Model	Power supply	Model code	Remarks	Picture
HWM-W2E-B	~ 230 V 50 Hz	7E545905	Wall mounted indoor units for Hydrosplit air-to-water heat pump system for boiler combination	

◆ airH2O 800H Combi - HWD-W2E-220S(-K)

Standard model

Model	Power supply	Model code	Remarks	Picture
HWD-W2E-220S	~ 230 V 50 Hz 3N~ 400 V 50 Hz	7E545903	Floor standing indoor units with integrated 220 L DHW tank for Hydrosplit air-to-water heat pump system	

Model for UK market

Model	Power supply	Model code	Remarks	Picture
HWD-W2E-220S-K	~ 230 V 50 Hz 3N~ 400 V 50 Hz	7E545904	Floor standing indoor units with integrated 220 L DHW tank (UK version) for Hydrosplit air-to-water heat pump system	

1.4.2.3 Indoor units - Control Box system

◆ Control Box - ATW-CBX-01

Model	Power supply	Model code	Remarks	Picture
ATW-CBX-01	~ 230 V 50 Hz 3N~ 400 V 50 Hz	7E599971	Control box for combination with airH2O 800M	

1.4.2.4 Indoor units - Complementary system

Model	Unit reference
airH2O 800H (HWM-W2E(-B))	H
airH2O 800H Combi (HWD-W2E-220S(-K))	HC
Control Box (ATW-CBX-01)	CBX

◆ Cascade Controller - ATW-YCC-04

Model	Compatible units	Model code	Remarks	Picture
ATW-YCC-04	H, HC, CBX	7E549963	Cascade Controller New controller generation	

1.4.3 Accessory code list

Model	Unit reference
airH2O 800H (HWM-W2E(-B))	H
airH2O 800H Combi (HWD-W2E-220S(-K))	HC
Control Box (ATW-CBX-01)	CBX
Cascade Controller (ATW-YCC-04)	YCC
All models	A

1.4.3.1 Cooling kit accessories

Accessory	Applicable models	Name	Code	Figure
ATW-CKSC-02	HC	Cooling operation kit for **airH2O 800H Combi** - Insulations + Jumper	7E549959	
ATW-CKSC-03	HC	Cooling operation kit for **airH2O 800H Combi** - Insulations + Jumper + Drain Pump	7E549960	
ATW-CKS-04	H	Cooling operation kit for **airH2O 800H**	7E549974	

1.4.3.2 Control accessories

Accessory	Applicable models	Name	Code	Figure
PC-ARFH3E	H, HC, CBX	Unit controller Wired room thermostat for **airH2O 800** units	7E543026	
PC-ARFH3EB	H, HC, CBX	Unit controller Wired room thermostat for **airH2O 800** units (black version)	7E543027	
PC-ARCHE	H, HC, CBX	Compact wired thermostat	7E543022	

Accessory	Applicable models	Name	Code	Figure
PC-ARFH1E1	A	Wired room thermostat (Languages EN, ES, DE, FR, IT, NL, SL)	7E543019	
PC-ARFH1E1-02	A	Wired room thermostat (Languages EN, DA, SV, FI, PT, HR, EL)	7E543020	
PC-ARFH1E1-03	A	Wired room thermostat (Languages EN, PL, UK, HU, RO, SL, CS)	7E543021	
ATW-RTU-04	A	Wireless ON/OFF thermostat (Receiver + Room thermostat)	7E543003	
ATW-RTU-06	A	Wireless Intelligent thermostat for 2nd circuit (Only Room thermostat. For Intelligent thermostat application). Can be combined with ATW-RTU-07.	7E543005	
ATW-RTU-07	A	Wireless Intelligent thermostat (Receiver + Room thermostat)	7E543015	
ATW-KNX-02	H, HC, CBX	KNX interface for **airH2O 800** units	7E549925	
ATW-AOS-02	H, HC, CBX	Auxiliary output signal box (Relay board for additional output signals)	7E549935	
HC-A16MB	A	MODBUS gateway for multi **airH2O 800** systems (up to 8 **airH2O 800** units max., with Cascade Controller 2 units max. or without Cascade Controller)	7E513210	

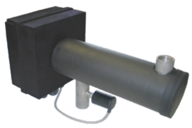
Accessory	Applicable models	Name	Code	Figure
ATW-MBS-02	H, HC, CBX	MODBUS gateway for single **airH2O 800** system	7E549924	
ATW-FCP-03	H, HC	Unit controller cover	7E549964	
ATW-EC-01	A	Extension cord for gateway Wifi ATW-IOT-02 (10 meters)	7E549973	

1.4.3.3 Temperature sensor accessories

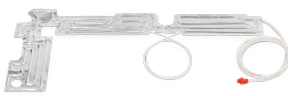
Accessory	Applicable models	Name	Code	Figure
ATW-ITS-01	H, HC, CBX	Indoor wired room temperature sensor	7E549932	
ATW-WTS-02Y	H, HC, CBX	Universal water temperature sensor	9E500004	

1.4.3.4 Water circuit accessories

Accessory	Applicable models	Name	Code	Figure
ATW-2TK-07	H, HC, CBX	2nd zone mixing kit (wall mounted model)	7E549951	
ATW-2TK-08	HC	2nd zone mixing kit (integrable in airH2O 800H Combi)	7E549965	
ATW-CP-05	HC	Active anode (cathodic protection)	7E549954	

Accessory	Applicable models	Name	Code	Figure
DHWT-200S-3.0H2E	H, CBX	Domestic hot water tank (200 L)	70544002	
DHWT-300S-3.0H2E	H, CBX	Domestic hot water tank (300 L)	70544003	
ATW-HSK-01	H, HC, CBX	Hydraulic separator	7E549905	
ATW-AQT-01	H, HC, CBX	Aquastat security	7E549907	
ATW-3WV-01	H, HC, CBX	3-way valve (internal thread and spring return)	7E549906	
ATW-WCV-01	H, HC, CBX	Water check valve	9E500014	
WEH-6E	CBX	Water electric heater	90500002	
ATW-DPOV-01	H, HC, CBX	Differential pressure overflow valve	7E549916	

1.4.3.5 Outdoor unit accessories

Accessory	Name	Code	Figure
DBS-26	Drain discharge connection	60299192	
ATW-DH0-01	Drain heater	7E549975	

Control configuration

2.1 Safety protection and control device

2.1.1 Outdoor units

◆ airH2O 800M - RASM-(2-6)(V)TW2E

<table>
<tr><th colspan="4">MODEL</th><th>RASM-(2-3.5)VTW2E</th><th>RASM-(4-6)(V)TW2E</th></tr>
<tr><td rowspan="3">For compressor</td><td colspan="2">Pressure switch</td><td>-</td><td colspan="2">Automatic reset, non-adjustable
(each one for each compressor)</td></tr>
<tr><td rowspan="2">High</td><td>Cut-out</td><td rowspan="2">MPa</td><td colspan="2">$4.15^{-0.05}_{-0.15}$</td></tr>
<tr><td>Cut-in</td><td colspan="2">3.20±0.15</td></tr>
<tr><td rowspan="4">For control</td><td rowspan="2">Fuse</td><td>~ 230 V 50 Hz</td><td rowspan="2">A</td><td colspan="2">50</td></tr>
<tr><td>3N~ 400 V
50 Hz</td><td colspan="2">2 x 20</td></tr>
<tr><td colspan="2">CCP timer</td><td>-</td><td colspan="2">Non adjustable</td></tr>
<tr><td colspan="2">Setting time</td><td>min</td><td colspan="2">3</td></tr>
<tr><td colspan="3">For condenser fan motor
Internal thermostat</td><td>A</td><td colspan="2">Automatic reset, non-adjustable
(each one for each motor)</td></tr>
<tr><td colspan="3">For control circuit
Fuse capacity on PCB</td><td>A</td><td colspan="2">5</td></tr>
<tr><td rowspan="3">For water circulation</td><td colspan="2">Low water flow control</td><td>-</td><td colspan="2">Water flow control by water pump feedback
(reset manual by alarm)</td></tr>
<tr><td></td><td>Activation</td><td>m^3/h</td><td>0.5</td><td>0.8</td></tr>
<tr><td colspan="2">Water pump control</td><td>-</td><td colspan="2">Water pump status by feedback control</td></tr>
<tr><td rowspan="2">For water pressure</td><td colspan="2">Low water pressure</td><td>bar</td><td colspan="2">0.7</td></tr>
<tr><td colspan="2">High water pressure</td><td>bar</td><td colspan="2">2.5</td></tr>
<tr><td>For water temperature</td><td colspan="2">Freeze temperature protection</td><td>-</td><td colspan="2">-3 °C of minimum water temperature (cooling mode)</td></tr>
<tr><td rowspan="2">For refrigerant temperature</td><td rowspan="2">Freeze temperature protection</td><td>Condition 1</td><td>°C</td><td colspan="2">Tl <-20 (for 30 seconds)
Tg <-20 (for 30 seconds)</td></tr>
<tr><td>Condition 2</td><td>°C</td><td colspan="2">Tl <-10 or Tg <-10 and Two<6 (for 30 seconds)
Tin or Two < 2 (for 30 seconds)</td></tr>
<tr><td>For the control circuit</td><td colspan="2">Fuse capacity</td><td>A</td><td colspan="2">5 (Inside PCB)</td></tr>
</table>

2.1.2 Indoor units - Hydrosplit system

◆ airH2O 800H & 800H Combi - HWM-W2E(-B) & HWD-W2E-220S(-K)

MODEL				HWM-W2E-B	HWM-W2E	HWD-W2E-220S	HWD-W2E-220S-K
For electric heater	Safety thermostat		°C	-	Manual reset, non-adjustable (one per unit): 75 ±5%		
	Fuse capacity		A	-	12	12	12
For water circulation	Low water flow control		-	Water flow control by water pump feedback (reset manual by alarm)			
	Activation		m^3/h	0.3	0.3	0.3	0.3
	Water pump control		-	Water pump status by feedback control			
For water temperature	High temperature protection		-	+5 °C of maximum water temperature (heating mode)			
	Freeze temperature protection		-	-3 °C of minimum water temperature (cooling mode) or < 5 °C			
For refrigerant temperature	Freeze temperature protection	Condition 1	°C	Tl<-20 (for 30 seconds) Tg<-20 (for 30 seconds)			
		Condition 2	°C	Tl < -10 and Two < 6 (for 30 seconds) Tin or Two < 2 (for 30 seconds)			
For the control circuit	Fuse capacity		A	5 (inside PCB)	5 (inside PCB)	5 (inside PCB)	5 (inside PCB)
For DHW	Electric heater	Safety thermostat	°C	-	-	Manual reset, regulation adjustable, cut-out non-adjustabl: 85 ±5%	
		Fuse capacity	A	-	-	16	16
	DHW Thermostat		°C	-	-	Manual reset, regulation adjustable, cut-out non-adjustabl: 90	
	Pressure and temperature safety valve	Pressure	bar	-	-	-	7
		Temperature	°C	-	-	-	96

2.1.3 Indoor units - Control Box system

◆ Control Box - ATW-CBX-01

MODEL			ATW-CBX-01
For the control circuit	Fuse capacity	A	5 (inside PCB)

2.2 Space water temperature control

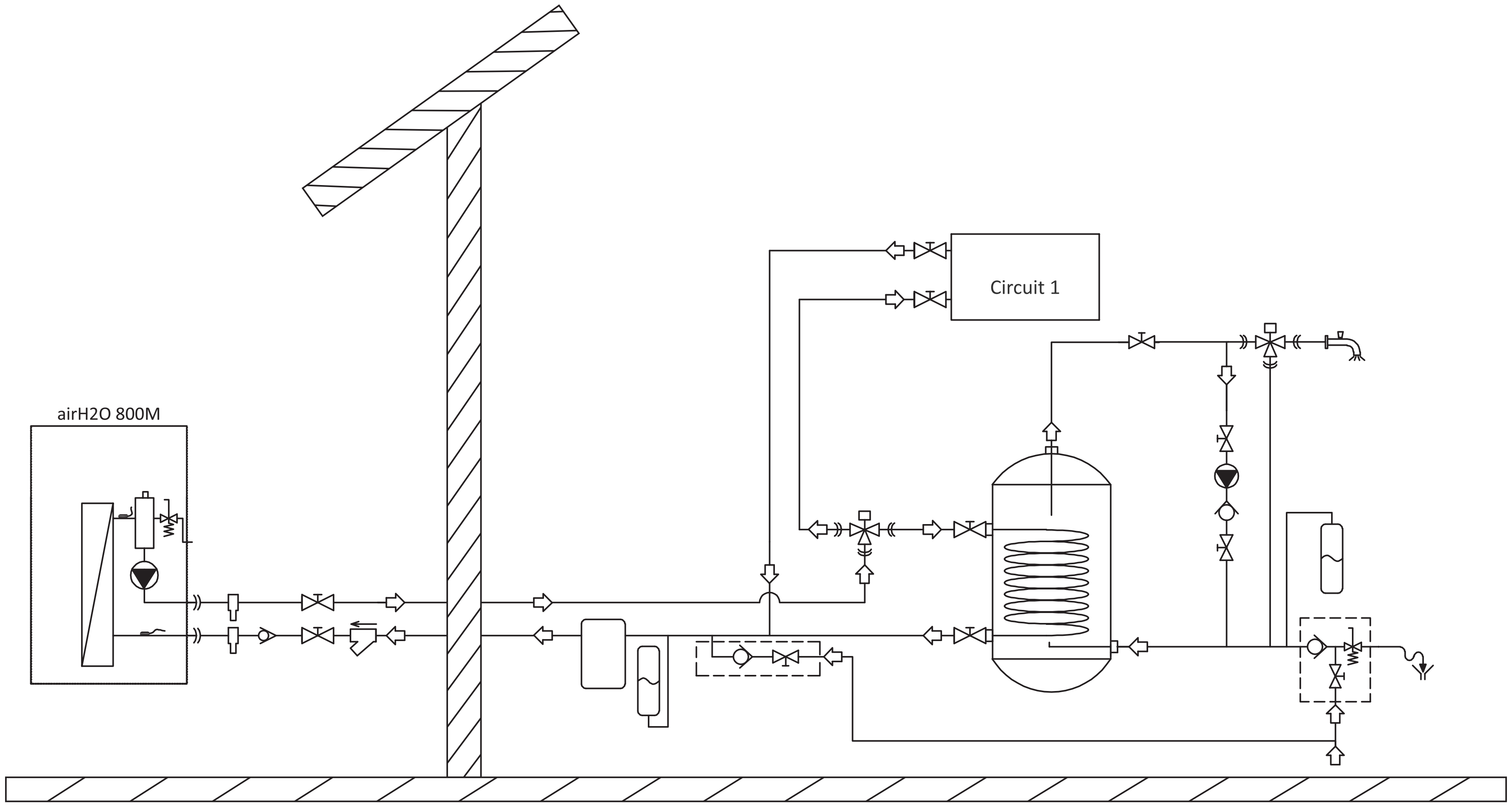
2.2.1 Main configurations

NOTE

- *In case of using a fan coil not managed by an* ***airH2O 800*** *unit, it is a mandatory to use a fan coil feedback control connected to the unit (Demand ON/OFF, Input 1, Terminals 13 and 14 of the Terminal Board 2 of the PCB) in order to stop chilling operation in case the fan coil stops and to avoid a freeze condition into the indoor unit plate heat exchanger.*
- *Cooling mode: the air to water heat pump is pre-configurated to work only in heating mode. In order to allow the cooling mode, it is necessary to use the drain pan kit accessory and perform a dip-switch setting (DSW1, PIN4: ON) + Jumper into CN8. In the case, all the cooling mode uses for the unit will be permitted and the unit controller user's interface cooling configuration will appear. In case of heating installation working also in cooling operation, the responsibility of correct system functioning will be of the installer.*
- *The configuration examples given below are only for illustration purposes.*

Configuration 1: Direct circuit

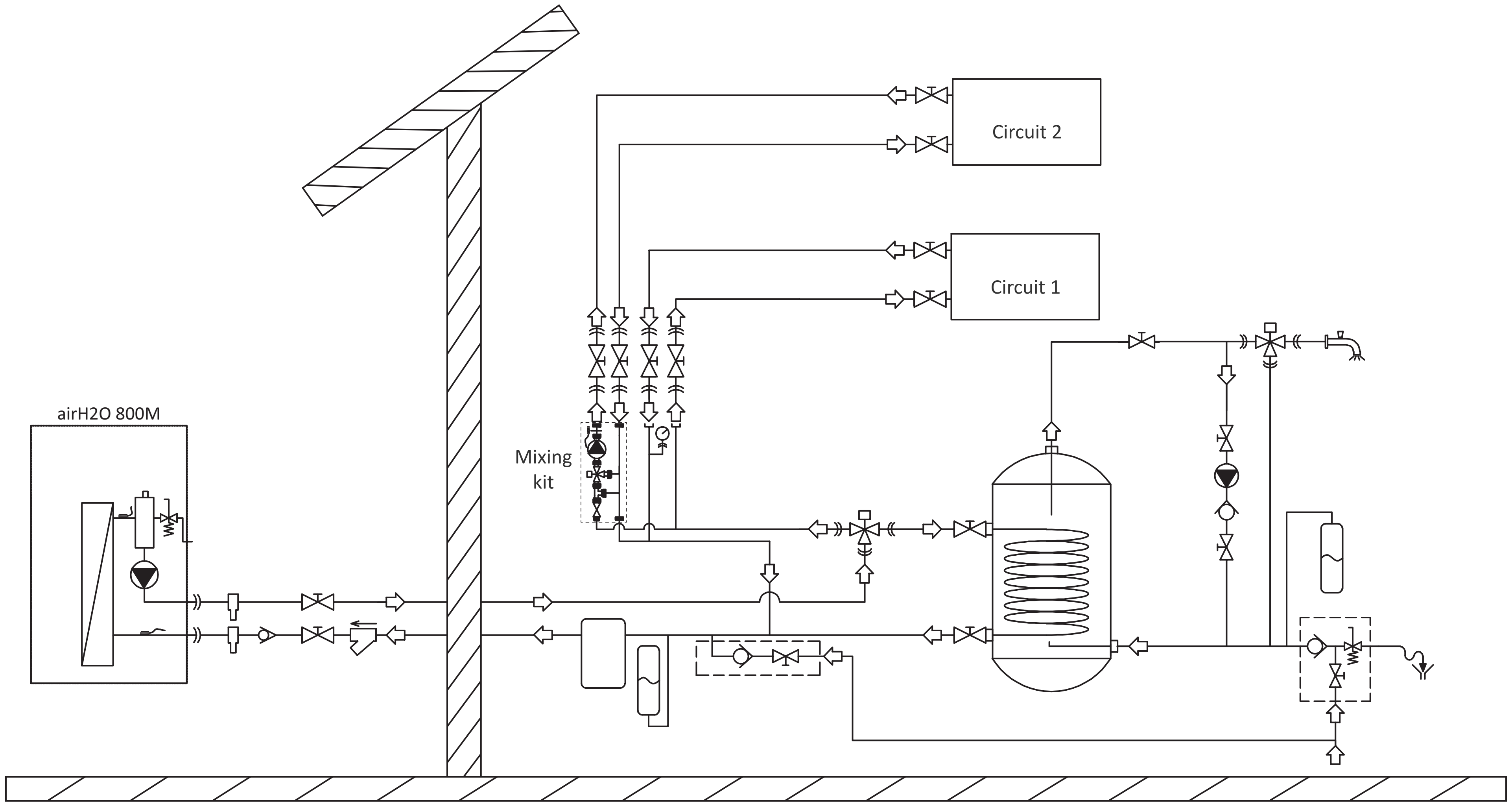
- The unit is connectable to only one circuit demand, either high temperature (i.e., radiator or fan coils) or low temperature (radiant floor).
- In addition, the unit can be combined with an external sanitary tank, in case of Control Box and **airH2O 800H** (with solar kit extension, detailed on "2.7 Solar combination").
- Additionally, an external boiler and/or swimming pool can be combined (see "2.5 Boiler combination" for more details).
- Water temperature target depends on actual water outlet temperature and calculations by the selected setting mode.



Hydraulic scheme for one circuit installation.

Configuration 2: Direct and mixing circuit

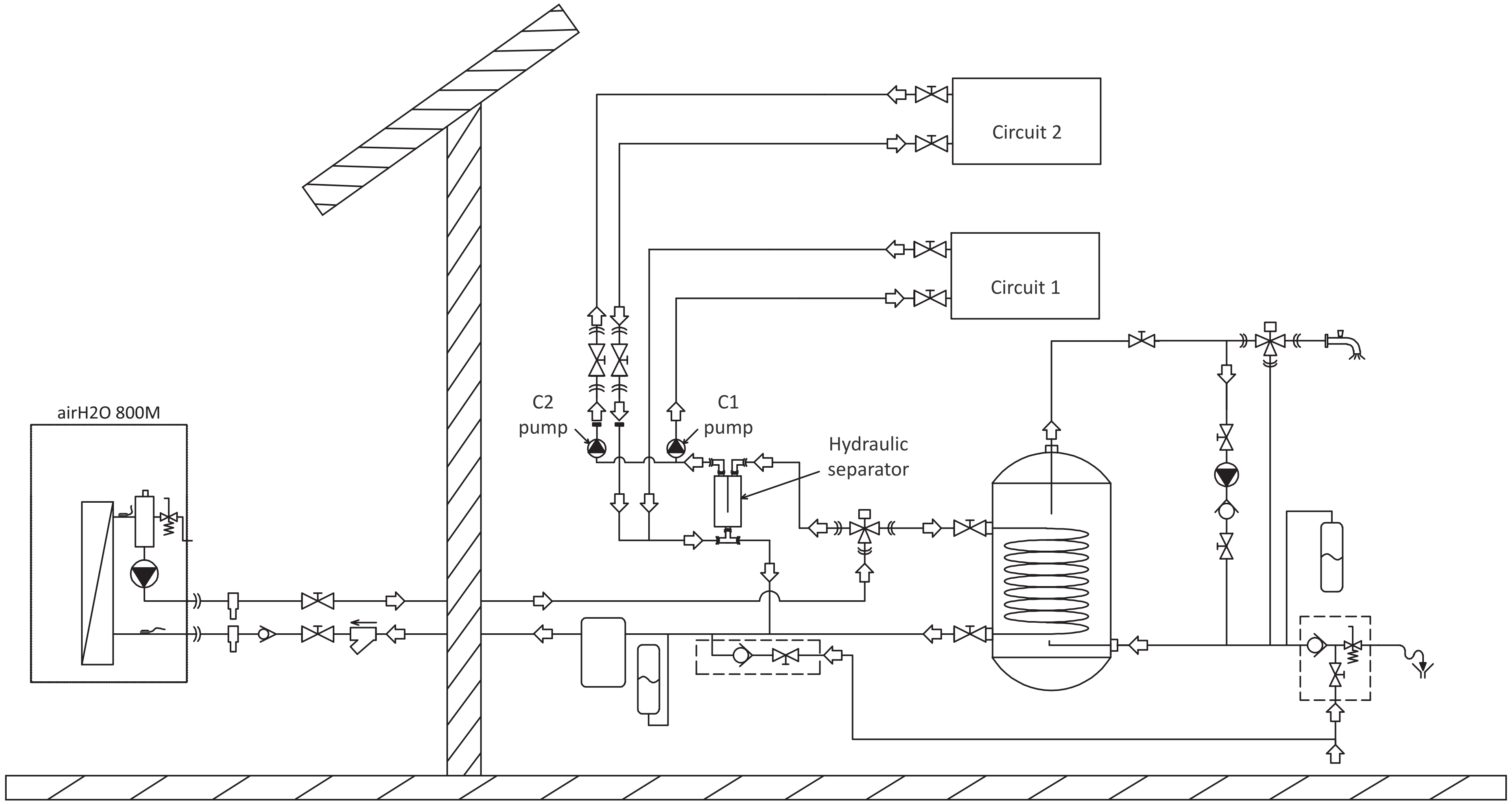
- When the **airH2O 800** range is connected to two different heating circuits, circuit 1 will be direct (high temperature for radiator operation) and circuit 2 will be a mixing circuit in order to have a second temperature control using mixing valve (low temperature for floor heating operation).
- Additionally, a motorized valve can be added in order to close the direct circuit (1) when not in use (see "Optional functions" chapter). The floor heating loops (circuit 2) require a lower temperature than with fan coils (circuit 1). To get these two water temperature levels, a mixing kit is required. This mixing kit is controlled using the indoor unit by means of a mixing valve and an additional water sensor.
- The unit can always be combined with an external sanitary tank, in case of Control Box and **airH2O 800H** (with solar kit extension, detailed on "2.7 Solar combination").
- Additionally, an external boiler and/or swimming pool can be combined (see "2.5 Boiler combination" for more details).
- Water temperature target depends on the maximum heating supply set points (target area 1, target area 2).



Two levels of water outlet temperature; hydraulic scheme for two circuits installation with two different water temperature requirements.

Configuration 3: Direct and mixing circuit

- The unit can always be combined with an external sanitary tank, in case of Control Box and **airH2O 800H** (with solar kit extension, detailed on "2.7 Solar combination").
- Additionally, an external boiler and/or swimming pool can be combined (see "2.5 Boiler combination" for more details).
- Water temperature target depends on the maximum heating supply set points (target area 1, target area 2).



Two levels of water outlet temperature; hydraulic scheme for two circuits installation with two different water temperature requirements.

2.2.2 Space heating

◆ Space heating activation conditions

The unit can operate in Space heating mode in case all of the following criteria are fulfilled:

1 Water calculation mode is selected (the unit offers 3 methods for the calculation of the water temperature set point) and

2 The unit is in Demand ON conditions (the Demand ON request can come from the intelligent thermostat, central thermostat and/or from the external input signal) and

3 The unit is switched ON.

Conversely, space heating mode is disabled under any of the following circumstances:

- There is the request of Domestic hot water (DHW) operation or
- Water temperature at the cooling circuit is hot enough (Thermo OFF conditions) or
- There is an external signal blocking the operation of the Heat Pump (Tariff function, Forced OFF or any blocking order from central device) or
- There is an alarm.

NOTE

It's important to note that when the space heating mode is not active, the **airH2O 800** *unit will not request compressor frequency for space heating. Additionally, if no other operation mode is active, the outdoor unit will enter a Thermo-OFF situation.*

◆ Water temperature set point

The water calculation mode involves setting the water temperature set point for each of the two water circuits, and the configuration options are as follows:

1 **Deactivated:**

The heating circuit is disabled, and no water temperature adjustments are made.

2 **OTC Points:**

Water target is determined by an Outside Temperature Compensated (OTC) control, defined by 4 points creating a line. This line represents the function used by the air-to-water heat pump to adjust the temperature based on the current ambient temperature.

An additional control compensates for the nonlinear relationship between radiator temperature and energy provided to the room. The compensation curve is selected using the vertex offset parameter, with a higher offset resulting in a more curved line defined by the 4 points.

3 **OTC Gradient:**

Water target is determined by an Outside Temperature Compensated (OTC) control with a different gradient of the curve.

The initial point of the curve is always set at 20 °C (water outlet target) at an outdoor ambient temperature of 20 °C. Users can edit the gradient variable and the vertex offset, and the values for the other 4 variables on the chart are automatically adjusted.

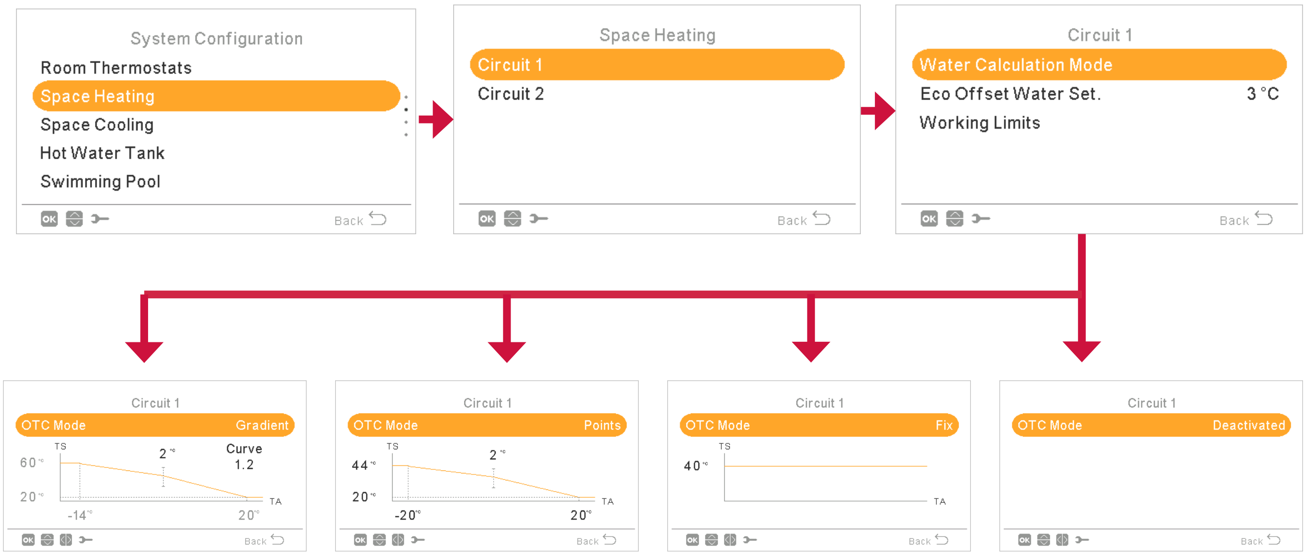
4 **Fix:**

Water target value is defined by a fixed temperature set by the user. In this mode, the water temperature remains constant as set by the user, regardless of external or internal factors.

System configuration set according to water type is available from the system configuration menu at unit controller:

System configuration - Space heating - Circuit 1 / Circuit 2

Description	Default value	Range
Water calculation mode	Gradient (Circuit 1) Deactivated (Circuit 2)	Deactivated Points Gradient Fix

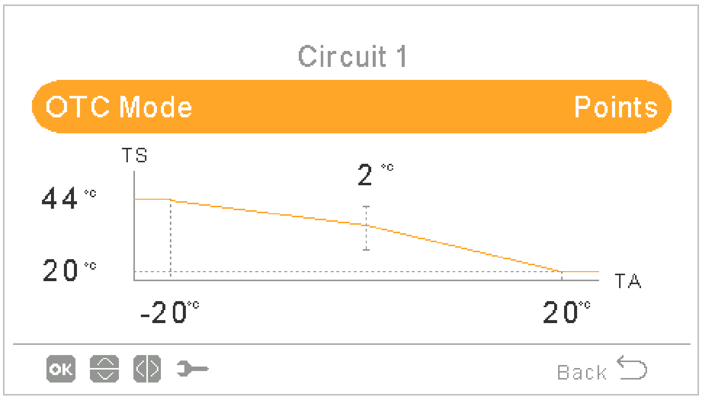

System Configuration
Room Thermostats
Space Heating
Space Cooling
Hot Water Tank
Swimming Pool
Back
Space Heating
Circuit 1
Circuit 2
Back
Circuit 1
Water Calculation Mode
Eco Offset Water Set. 3 °C
Working Limits
Back
Circuit 1
OTC Mode Gradient
TS
60
2
Curve 1.2
20
TA
-14
20
Back
Circuit 1
OTC Mode Points
TS
44
2
20
TA
-20°
20°
Back
Circuit 1
OTC Mode Fix
TS
40
TA
Back
Circuit 1
OTC Mode Deactivated
Back

OTC points: Outside temperature compensated (OTC) control by points

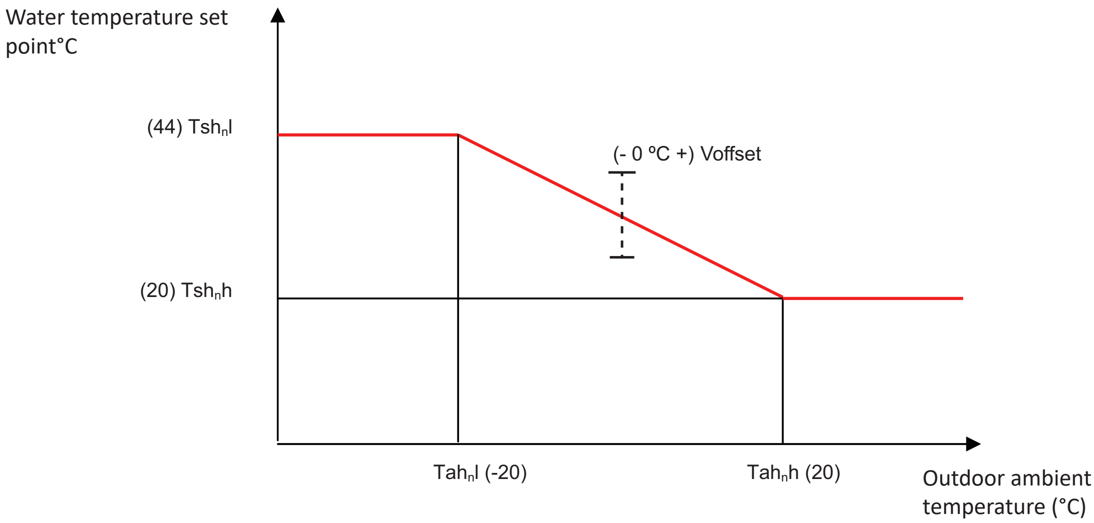
In the OTC points mode, the system employs an Outside Temperature Compensated (OTC) control based on specified points.

The weather-dependent set point field settings play a crucial role in determining the unit's operation in response to external conditions. When the weather-dependent operation is activated, the water temperature is automatically adjusted based on the outdoor temperature.

Specifically, higher outdoor temperatures lead to a reduction in water temperature, while lower outdoor temperatures result in warmer water. This dynamic adjustment ensures optimal performance and efficiency in response to varying weather conditions.



Water set point will be determined using the following rule:



Where:

- *$Tsh_n L$: Temperature setting at low ambient temperature*
- *$Tsh_n H$: Temperature setting at high ambient temperature*
- *$Tah_n L$: Low ambient temperature*
- *$Tah_n H$: High ambient temperature*
- *Voffset: Vertex offset*
- *n: water circuit number (n= 1 or 2)*

Settings should be done through the unit controller:

System Configuration –Space Heating - Circuit 1 / Circuit 2 – Points

Description	Default Value	Range	Units
Low ambient temperature C1 / C2	-20	-20~6	°C
High ambient temperature C1 / C2	20	7~25	°C
Set point at low ambient temperature C1 / C2	44	$Tmaxh_1$~$Tminh_1$ (*)	°C
Set point at high ambient temperature C1 / C2	20	$Tmaxh_1$~$Tminh_1$ (*)	°C
Vertex offset C1	0	-10 ~ 10	°C

NOTE

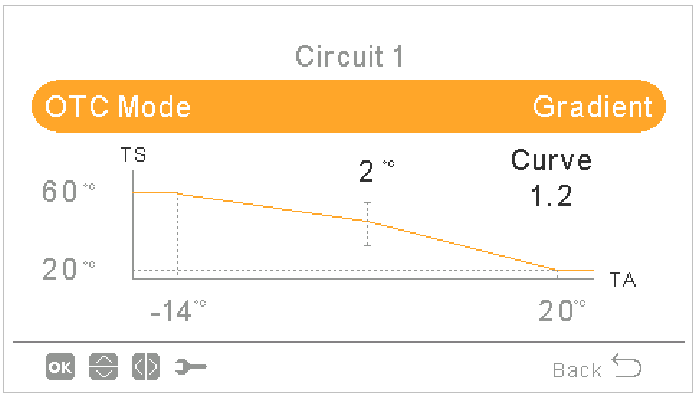
- *Default value corresponds to water rule = 0.6 (radiant floor).*
- *(*): Values ($Tmaxh_{1/2}$~$Tminh_{1/2}$) are set by installer in maximum temperature setting configuration.*

CAUTION

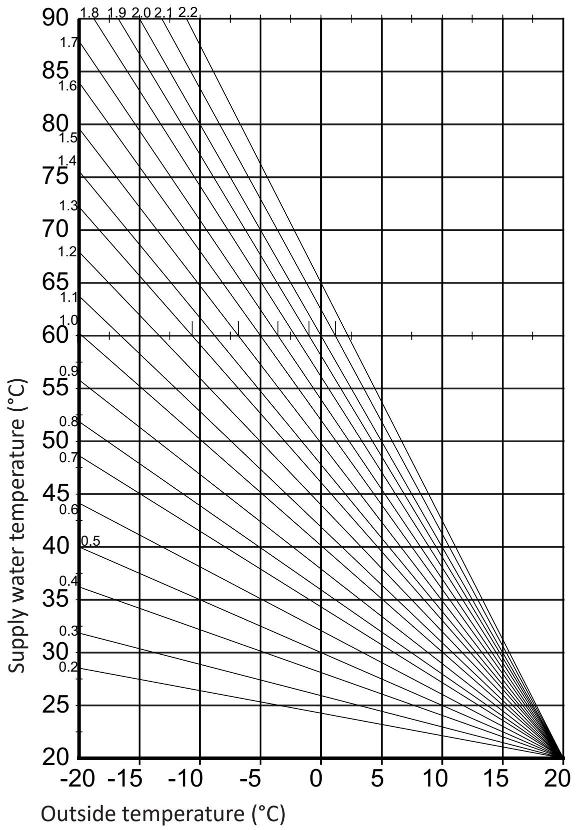
- *It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too high into floor heating).*
- *When only circuit 1 is heating, circuit 2 will be fed with water at temperature equal to the target water of circuit 1.*

OTC Gradient: Outside temperature compensated (OTC) control by gradient

OTC Gradient operates through an Outside Temperature Compensated (OTC) control, determined by a distinct gradient of the curve. The starting point of the curve is consistently set at 20 °C (water outlet target) when the outdoor ambient temperature is 20 °C. Users have the flexibility to adjust the gradient variable and vertex offset, with automatic adjustments to the other 4 variables on the chart.



The gradient of the heating curve delineates the connection between alterations in the supply temperature and variations in the outside temperature.



Gradient	Water outlet target
0.2	-0,2 x Text + 24
0.3	-0,3 x Text + 26
0.4	-0,4 x Text + 28
0.5	-0,5 x Text + 30
0.6	-0,6 x Text + 32
0.7	-0,7 x Text + 34
0.8	-0,8 x Text + 36
0.9	-0,9 x Text + 38
1.0	-1,0 x Text + 40
1.1	-1,1 x Text + 42
1.2	-1,2 x Text + 44
1.3	-1,3 x Text + 46
1.4	-1,4 x Text + 48
1.5	-1,5 x Text + 50
1.6	-1,6 x Text + 52
1.7	-1,7 x Text + 54
1.8	-1,8 x Text + 56
1.9	-1,9 x Text + 58
2.0	-2,0 x Text + 60
2.1	-2.1 x Text + 62
2.2	-2.2 x Text + 64

System Configuration –Space Heating - Circuit 1 / Circuit 2 – Gradient

Description	Default Value	Range	Units
Gradient Curve	0.6	0.2~2.2	-
Vertex offset C1 / C2	0	-10 ~10	°C

CAUTION

- *It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too high into floor heating).*
- *When only circuit 1 is heating, circuit 2 will be fed with water at temperature equal to the target water of circuit 1.*

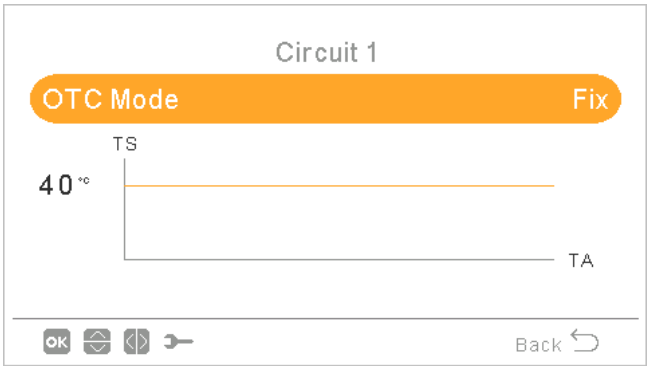
Example:

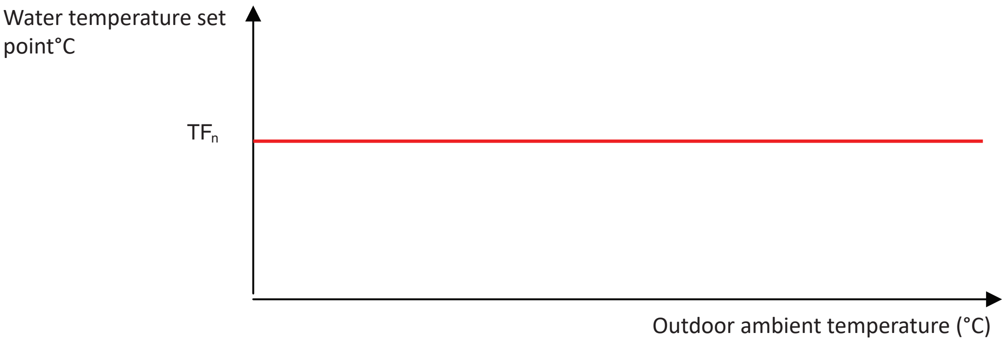
OTCh1= ***1.1***

Text (outdoor temperature) = 0 °C → *water outlet target = -1.1 x 0 + 42 =* **42 °C**

Fixed water temperature setting

In the fixed water temperature setting, the Outside Temperature Compensation (OTC) feature does not influence this configuration. The user has the autonomy to manually choose a constant water outlet temperature within the range of 20 °C to 75 °C using the unit controller's user interface. This setting allows users to establish a fixed and specific water temperature regardless of external temperature variations.





Where:

- *TF_n: Fixed temperature setting*
- *n: heating circuit number (n= 1 or 2)*

System Configuration –Space Heating - Circuit 1 / Circuit 2 – Fix

Description	Default Value	Range	Units
Fixed temperature C1 / C2	40	$Tmax_1$~$Tmin_1$ (*)	°C

NOTE

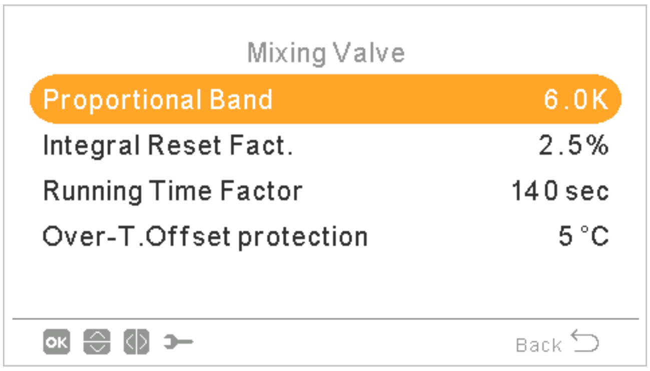
(*): Values ($Tmaxh_{1/2}$~$Tminh_{1/2}$) are set by installer.

CAUTION

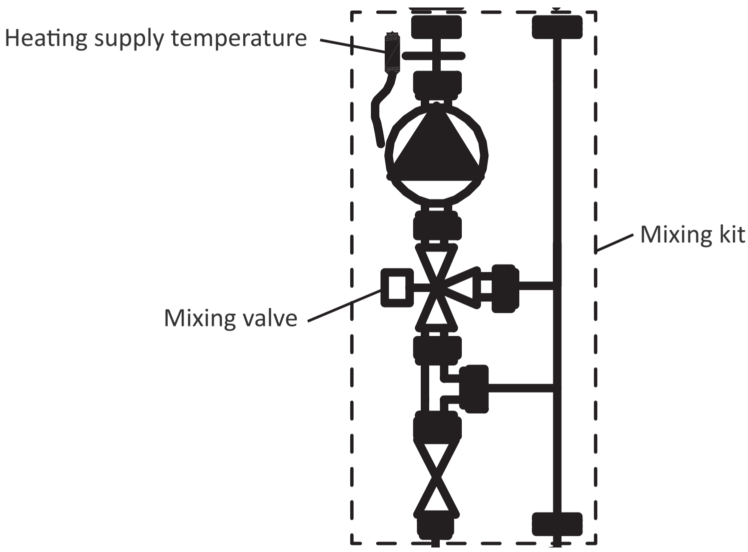
- *It is the installer’s responsibility to make sure no unwanted situation occurs (for example: water temperature setting too high into floor heating).*
- *When only circuit 1 is heating, circuit 2 will be fed with water at temperature equal to the target water of circuit 1.*

◆ Mixing valve - second water temperature control

The operation of the mixing valve in controlling the second heating supply temperature is achieved by maintaining it at the second heating temperature set point. The position of the mixing valve is determined through a proportional-integral action (P+I) control algorithm. This algorithm calculates the difference between the heating supply set point and the actual heating supply temperature, adjusting the mixing valve position to ensure precise temperature control.



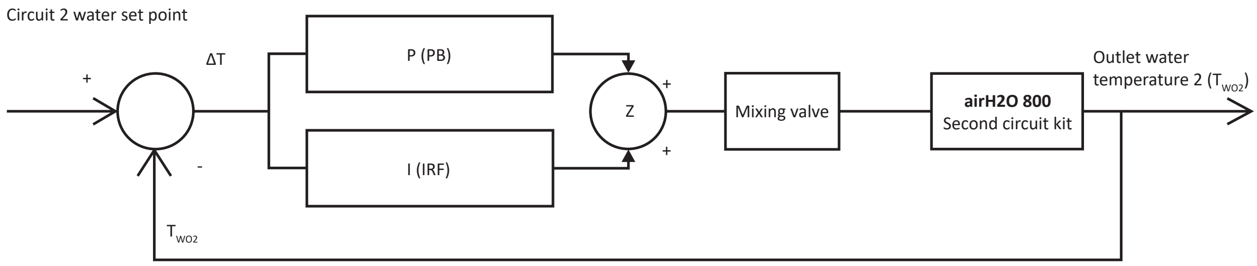
Example for illustrative purpose only:



NOTE

Refer to "Configuration 2: Direct and mixing circuit" to identify the location of the mixing kit in the circuit.

Circuit 2 mixing valve position



Where:

- *PB: Proportional band of mixing valve.*
- *IRF: Integral reset factor of mixing valve*
- *RTV: Running time factor of mixing valve*

Water set point priority

When both circuits are in Demand ON conditions, water set point used by **airH2O 800** is always water set point from C1 since it is expected to be higher than water set point for C2.
On the other hand, **airH2O 800** uses water temperature setting of C2 circuit in case C1 circuit is in Demand OFF or OFF

An incorrect installation would be a system requiring lower water temperature setting at C1 and higher water temperature setting at C2. This installation type must be avoided since C2 never will be heated up to its required setting temperature when both circuits are active.

System Configuration –Space Heating - Circuit 2 – Mixing valve

Description	Default Value	Range	Units
Proportional Band (K)	6.0	0~20	°C
Integral Reset Fact (%)	2.5	0.0~20	%
Mixing valve Run Time Factor (sec)	140	10~250	sec
Over-T offset protection (*)	5	OFF, 3~10	°C

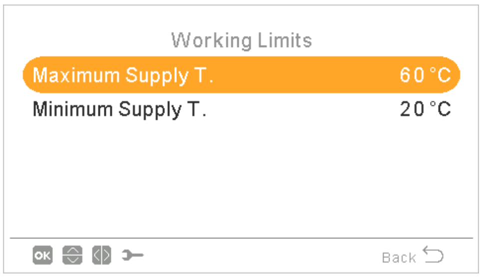
The specified values are calibrated to be compatible with the 2nd zone mixing kit accessories, specifically ATW-2TK-07 and ATW-2TK-08. It is strongly advised against altering these values, as doing so may compromise the proper functioning of the system.

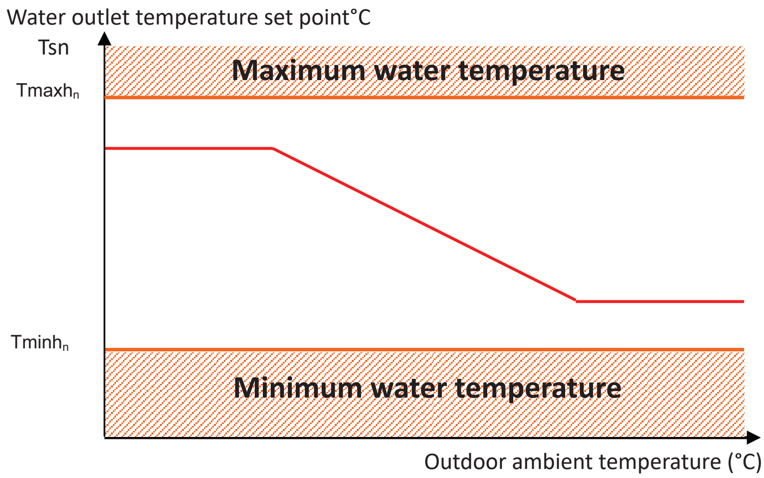
NOTE

(*): The configuration of the mixing valve is common for space heating and space cooling modes. This is the reason why "Over-T offset protection" is also present within the cooling mode regardless this setting only protects the space heating mode.

◆ Working limits - selection of heating circuit minimum/maximum temperature limits by installer

The installer has the responsibility to establish working limits for the heating circuit by setting minimum and maximum temperature limits. This measure is implemented to restrict the space heating temperature set point within a defined range, preventing the occurrence of excessively high or low temperatures in the heating system.





System Configuration –Space Heating - Circuit 1 / Circuit 2 - Working Limits

Description	Default Value	Range	Units
Maximum supply temperature	75	35~75	°C
Minimum supply temperature	20	20~34	°C

NOTE

Temperature limits have priority over all other temperature set point modifications (room thermostat, user selection, etc.) and maximum water temperature is limited by unit's operational range.

CAUTION

Due to the thermal inertia of the system, the real temperature could get up to 5 °C above the maximum set temperature.

◆ User offsets for gradient or points

The presented concept involves an offset mechanism linked to water temperature, determined by OTC points or gradient values.

When the system operates in the "fix" mode, the offset is not present, as the water temperature can be adjusted by modifying the fix mode setting.

The rationale behind implementing this offset is to facilitate the installer in configuring the OTC points or gradients based on the specific installation requirements. Nevertheless, it is recognized that under certain seasonal conditions, this standard configuration might prove insufficient to adequately address the thermal demands of the dwelling and ensure optimal user comfort.

To address such situations during specific periods of the year, a specialized offset has been devised. This feature empowers the user to temporarily raise or lower the water supply temperature, as initially set by the installer, with a permissible range of +/- 5 °C.

By incorporating this offset functionality, the need for altering the set points or gradient configuration is obviated, providing users with the flexibility to align the system according to their individual preferences and needs.

System Configuration –Space Heating - Circuit 1 / Circuit 2 - User Offset

Description	Default Value	Range	Units
User Offset for C1	0	-5~5	°C
User Offset for C2	0	-5~5	°C

2.2.3 Space cooling

◆ Space cooling activation conditions

The unit can operate in Space cooling mode in case all of the following criteria are fulfilled:

1 Space cooling mode is allowed (the unit allows the selection of the cooling mode in case the cooling kit and the DSW1, PIN4 is set to ON) and
2 Water calculation mode is selected (the unit offers 2 methods for the calculation of the water temperature set point) and
3 The unit is in Demand ON conditions (the Demand ON request can come from the intelligent thermostat, central thermostat and/or from the external input signal) and
4 The unit is switched ON.

Conversely, space cooling mode is disabled under any of the following circumstances:

- There is the request of Domestic hot water (DHW) operation or
- Water temperature at the cooling circuit is cold enough (Thermo OFF conditions) or
- There is an external signal blocking the operation of the Heat Pump (Tariff function, Forced OFF or any blocking order from central device) or
- There is an alarm.

◆ Water temperature set point

The water temperature set point configuration is designed to be independently determined for each of the two water circuits. This means that distinct and individual temperature settings can be established for each circuit, providing flexibility and customization based on specific requirements or preferences.

The system offers three distinct modes for configuring the cooling circuit:

1 **None:** cooling circuit is disabled. This mode ensures that no cooling functions are active.

2 **OTC points:** water target is determined through an Outside Temperature Compensated (OTC) control.

The control is defined by four points, indicating the minimum and maximum water outlet temperatures in relation to the minimum and maximum outdoor ambient temperatures.

3 **Fix:** water target value is set by the user at a fixed temperature. In this mode, the user manually specifies the desired water temperature for cooling operations.

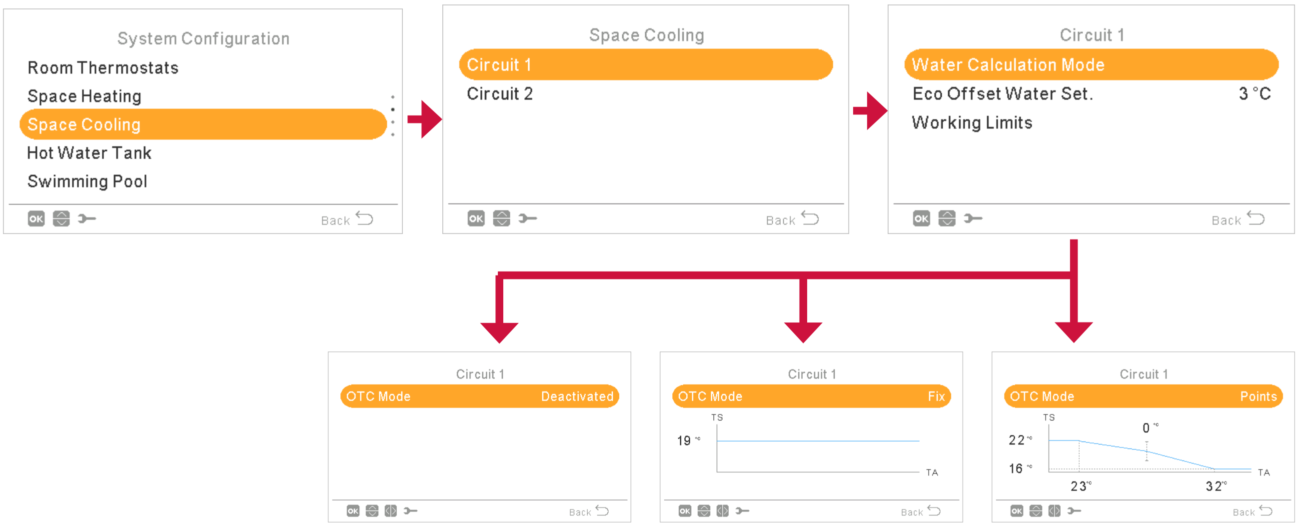
Water circuit set point configuration can be set as follows:

System Configuration –Space Cooling - Circuit 1 / Circuit 2

Description	Default Value	Range
Water calculation mode	Fix (Circuit 1) Deactivated (Circuit 2)	Deactivated Points Fix

NOTE

By default, the **airH2O 800** *system is initially configured for a single circuit, specifically the direct circuit, with a fixed water temperature setting. This default setup simplifies the initial configuration and ensures ease of use, especially in scenarios where only one circuit is initially required or desired. Users can later customize the system for multiple circuits or adjust the water temperature setting according to their specific needs.*

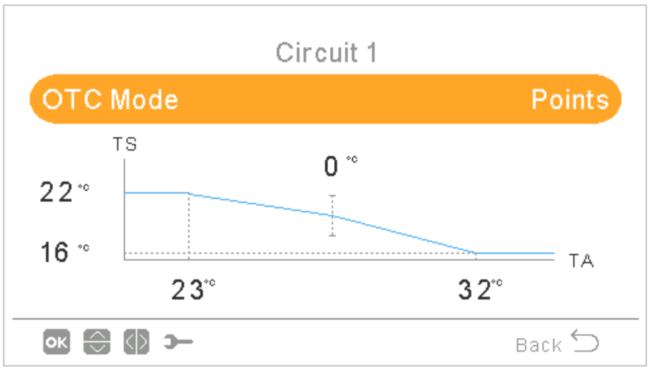


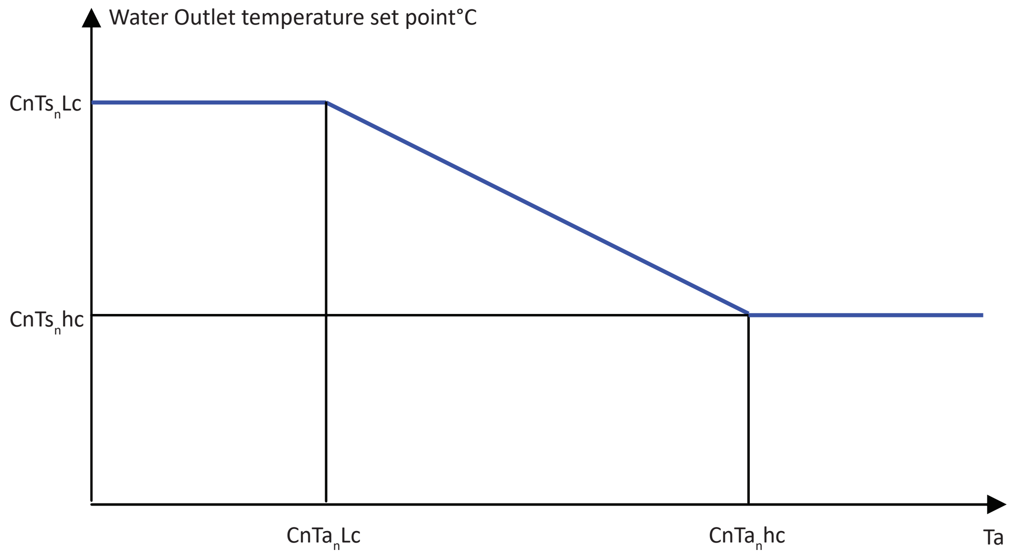
OTC points: Outside temperature compensated (OTC) control by points

In the OTC points mode, the system employs an Outside Temperature Compensated (OTC) control based on specified points.

The weather-dependent set point field settings play a crucial role in determining the unit's operation in response to external conditions. When the weather-dependent operation is activated, the water temperature is automatically adjusted based on the outdoor temperature.

Specifically, higher outdoor temperatures lead to a reduction in water temperature, while lower outdoor temperatures result in warmer water. This dynamic adjustment ensures optimal performance and efficiency in response to varying weather conditions.





Where:

- *$CnTs_n$Lc: Temperature setting for maximum water temperature at low ambient temperature cooling.*
- *$CnTs_n$hc: Temperature setting for min water temperature at high ambient temperature cooling.*
- *$CnTa_n$Lc: Low ambient temperature setting for maximum water temperature cooling.*
- *$CnTa_n$hc: High ambient temperature setting for minimum water temperature cooling.*
- *n: water circuit number (n= 1 or 2).*

Settings should be done through the unit controller:

System Configuration –Space Cooling - Circuit 1 / Circuit 2 – Points

Description	Default Value	Range	Units
Low ambient temperature	23	17 ~ 30	°C
High ambient temperature	32	31 ~ 45	°C
Set point at low ambient temperature	22	$Tmaxh_1$~ $Tminh_1$ (*)	°C
Set point at high ambient temperature	16	$Tmaxh_1$~ $Tminh_1$ (*)	°C

NOTE

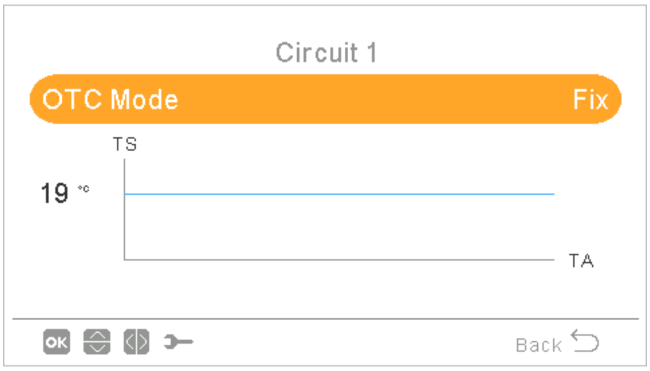
- *(*): Values in maximum and minimum conditions are set by installer.*
- *Default values are the same for both circuits in order to prevent low temperatures in the refreshing floor circuit.*

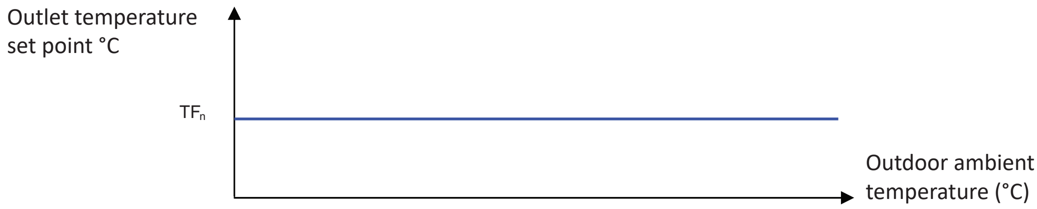
CAUTION

It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too low into floor refreshing).

Fixed water temperature setting

In the fixed water temperature setting, the Outside Temperature Compensation (OTC) feature does not influence this configuration. The user has the autonomy to manually choose a constant water outlet temperature within the range of 5 °C to 21 °C using the unit controller's user interface.
This setting allows users to establish a fixed and specific water temperature regardless of external temperature variations.





Where:

- *TF_n: Fixed water temperature setting.*
- *n: heating circuit number (n= 1 or 2).*
- *Setting should be done through the unit controller:*

System Configuration –Space Cooling - Circuit 1/ Circuit 2 – Fix

Description	Default Value	Range	Units
Fixed temperature C1 / C2	19	$Tmaxh_1$~$Tminh_1$ (*)	°C

NOTE

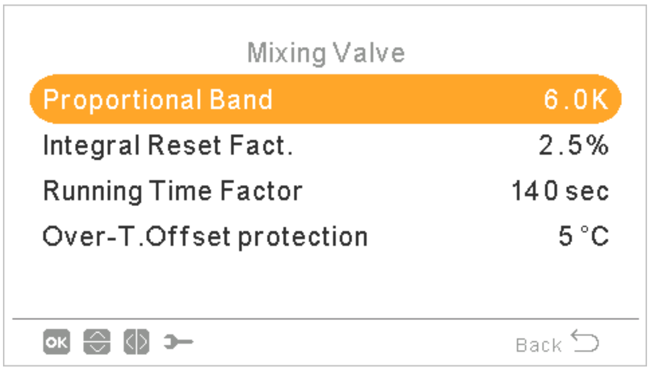
- *(*): Values ($Tmaxh_{1/2}$~$Tminh_{1/2}$) are set by installer.*
- *Default values are the same for both circuits in order to prevent low temperatures in the Refreshing floor circuit.*

CAUTION

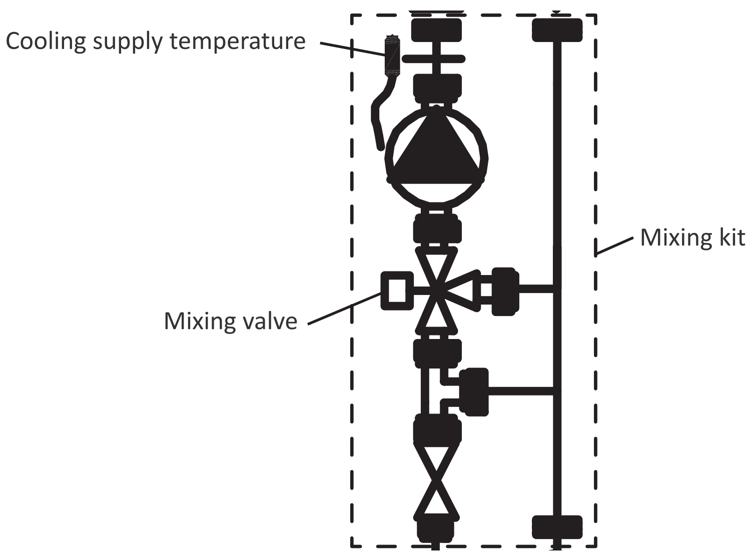
It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too low into floor refreshing).

◆ Mixing valve - second water temperature control

The operation of the mixing valve in controlling the second cooling supply temperature is achieved by maintaining it at the second cooling temperature set point. The position of the mixing valve is determined through a proportional-integral action (P+I) control algorithm. This algorithm calculates the difference between the cooling supply set point and the actual cooling supply temperature, adjusting the mixing valve position to ensure precise temperature control.



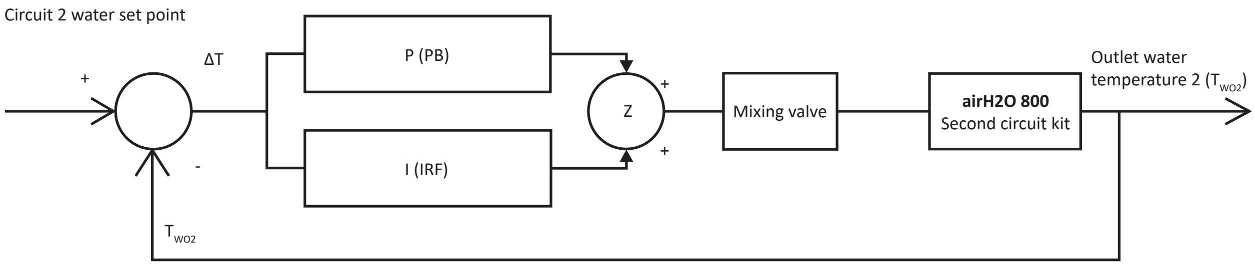
Example for illustrative purpose only:



NOTE

Refer to "Configuration 2: Direct and mixing circuit" to identify the location of the mixing kit in the circuit.

Circuit 2 mixing valve position



Where:

- *PB: Proportional band of mixing valve.*
- *IRF: Integral reset factor of mixing valve.*
- *RTV: running time factor of mixing valve.*

Water set point priority

When both circuits are in Demand ON conditions, water set point used by **airH2O 800** is always water set point from C1 since it is expected to be lower than water set point for C2.
On the other hand, **airH2O 800** uses water temperature setting of C2 circuit in case C1 circuit is in Demand OFF or OFF

An incorrect installation would be a system requiring higher water temperature setting at C1 and lower water temperature setting at C2. This installation type must be avoided since C2 never will be cooled down to its required setting temperature when both circuits are active.

System Configuration –Space Cooling - Circuit 2 – Mixing valve

Description	Default Value	Range	Units
Proportional Band (K)	6.0	0~20	°C
Integral Reset Fact (%)	2.5	0.0~20	%
Mixing valve Run Time Factor (sec)	140	10~250	sec
Over-T offset protection (*)	5	OFF, 3~10	°C

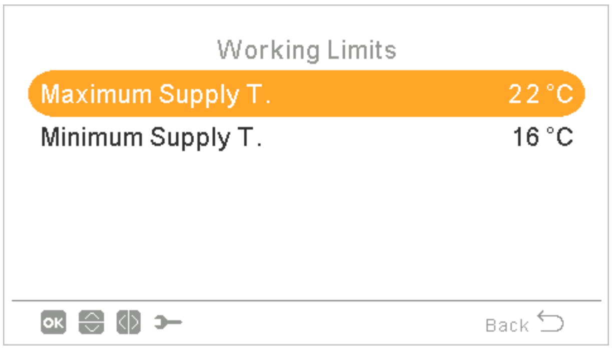
The specified values are calibrated to be compatible with the 2nd zone mixing kit accessories, specifically ATW-2TK-07 and ATW-2TK-08. It is strongly advised against altering these values, as doing so may compromise the proper functioning of the system.

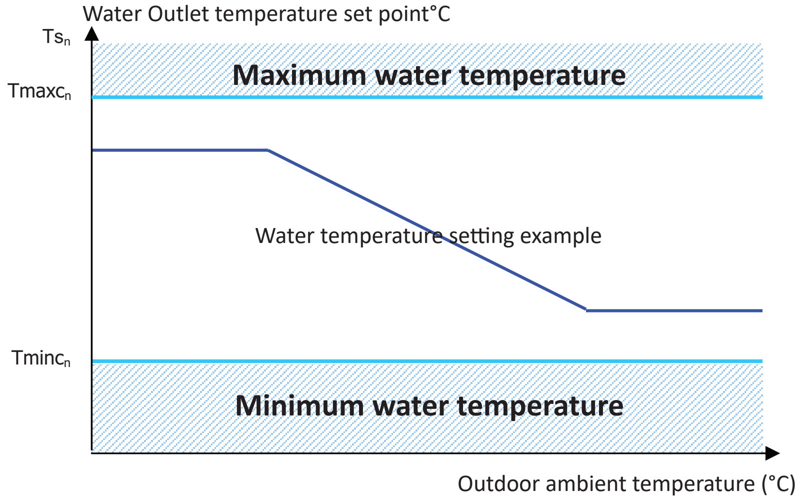
NOTE

(*): The configuration of the mixing valve is common for space heating and space cooling modes. This is the reason why "Over-T offset protection" is also present within the cooling mode regardless this setting only protects the space heating mode.

◆ Working limits - selection of cooling circuit minimum/maximum temperature limits by installer

The installer has the responsibility to establish working limits for the cooling circuit by setting minimum and maximum temperature limits. This measure is implemented to restrict the space cooling temperature set point within a defined range, preventing the occurrence of excessively high or low temperatures in the cooling system.





System Configuration –Space Cooling - Circuit 1 / Circuit 2 - Working Limits

Description	Default Value	Range	Units
Maximum supply temperature	22	19~22	°C
Minimum supply temperature	16	5~18	°C

NOTE

Temperature limits have priority over all other temperature set point modifications (room thermostat, user selection, etc.) and maximum water temperature is limited by unit's operational range.

CAUTION

Due to the thermal inertia of the system, the real temperature could get up to 5 °C above the *maximum set temperature.*

◆ User offsets for points

The presented concept involves an offset mechanism linked to water temperature, determined by OTC points.

When the system operates in the "fix" mode, the offset is not present, as the water temperature can be adjusted by modifying the fix mode setting.

The rationale behind implementing this offset is to facilitate the installer in configuring the OTC points based on the specific installation requirements. Nevertheless, it is recognized that under certain seasonal conditions, this standard configuration might prove insufficient to adequately address the thermal demands of the dwelling and ensure optimal user comfort.

To address such situations during specific periods of the year, a specialized offset has been devised. This feature empowers the user to temporarily raise or lower the water supply temperature, as initially set by the installer, with a permissible range of +/- 5 °C.

By incorporating this offset functionality, the need for altering the set points configuration is obviated, providing users with the flexibility to align the system according to their individual preferences and needs.

System Configuration –Space Cooling - Circuit 1 / Circuit 2 - User Offset

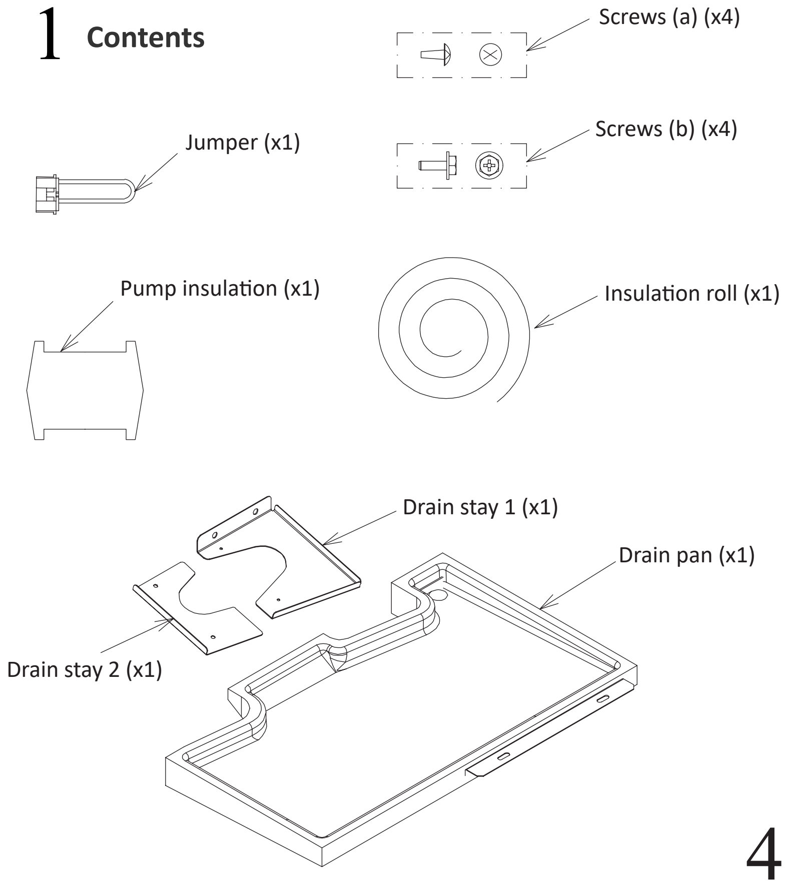
Description	Default Value	Range	Units
User Offset for C1	0	-5~5	°C
User Offset for C2	0	-5~5	°C

◆ Cooling operation kit accessory

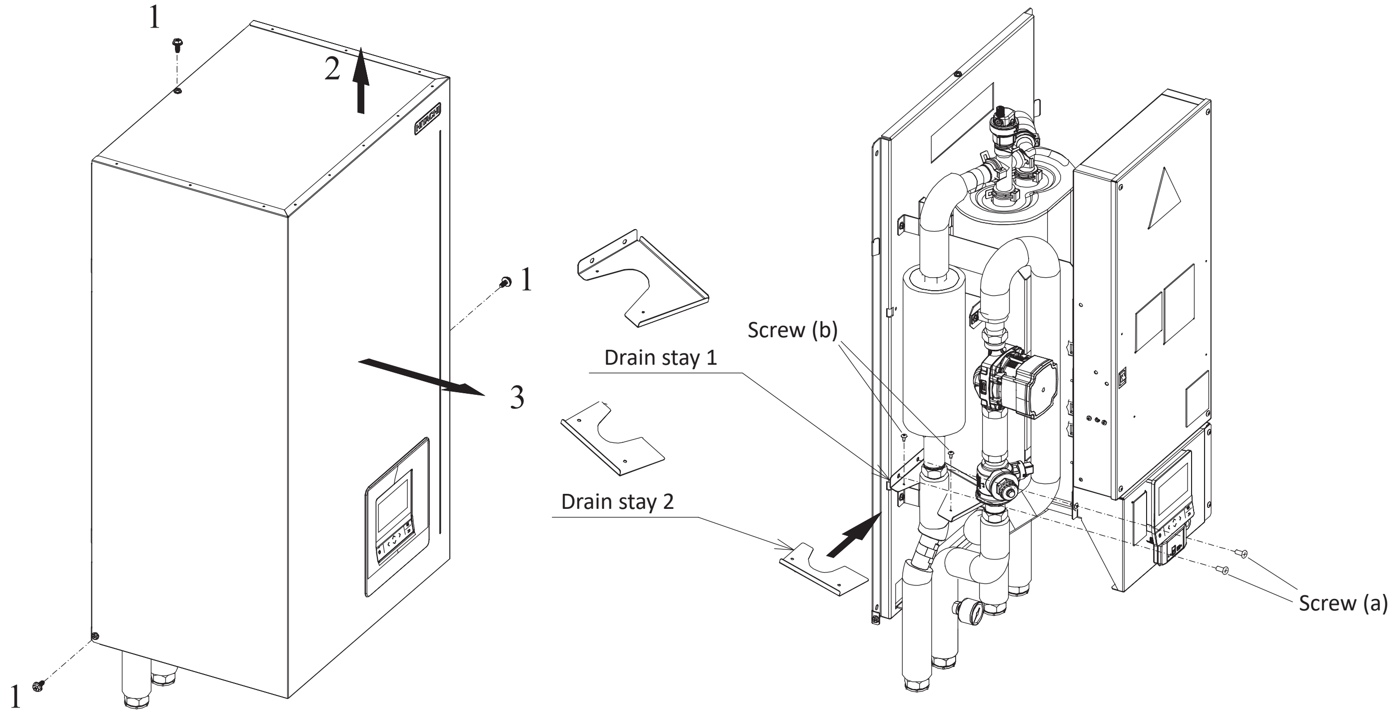
The air to water heat pump is initially set up to operate exclusively in heating mode. To enable the cooling mode, it is essential to utilize the cooling operation kit accessory and make specific DIP-switch settings (DSW1, PIN4: ON), along with the insertion of a jumper into CN8. This configuration allows the unit to facilitate all cooling mode functions, and the unit controller's user interface will display the cooling configuration options for user adjustment.

Cooling operation kit accessory for* airH2O 800H *(ATW-CKS-04)

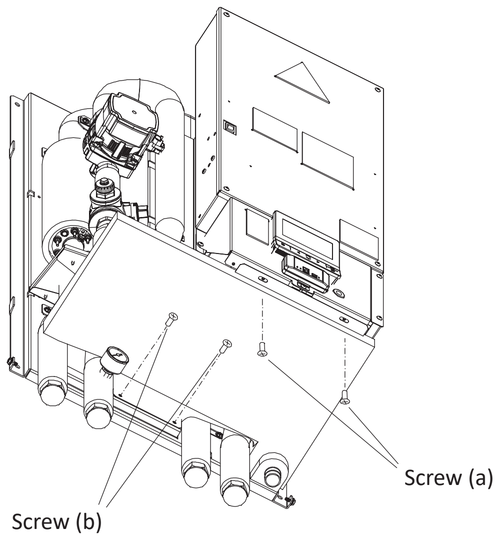
1 Contents



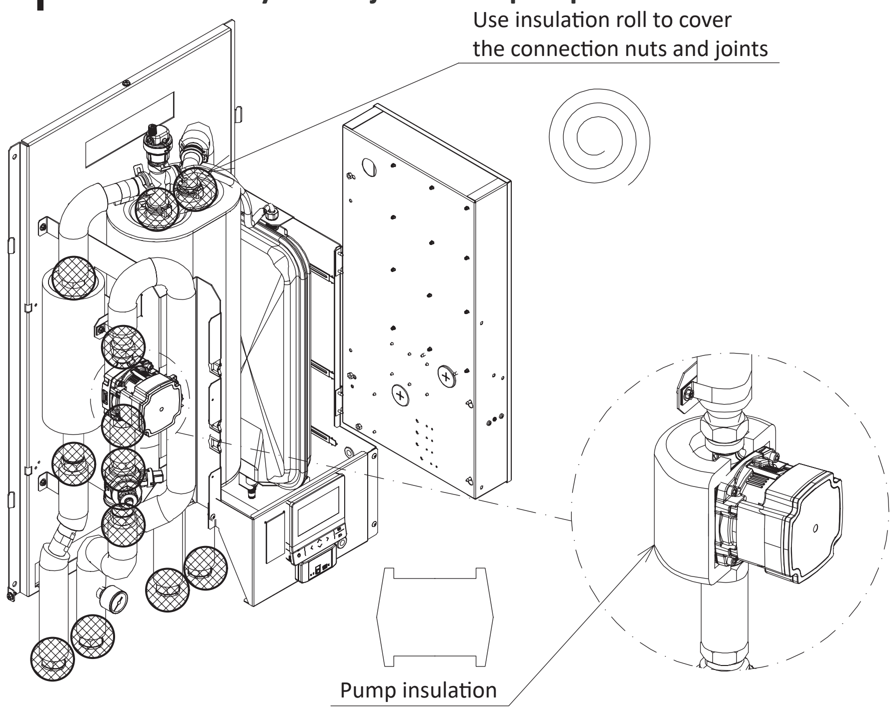
2 Remove the cover and assemble the drain stay



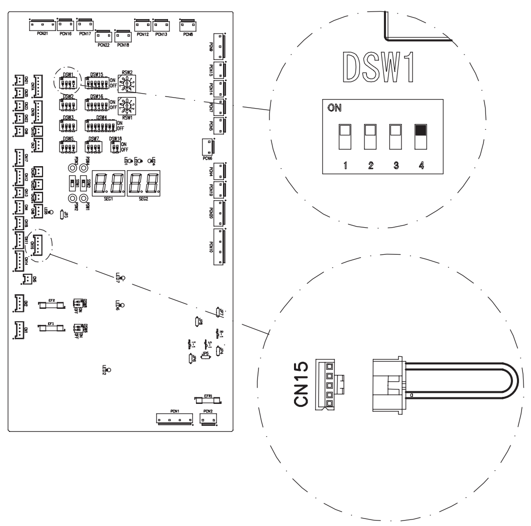
3 Assemble the drain pan



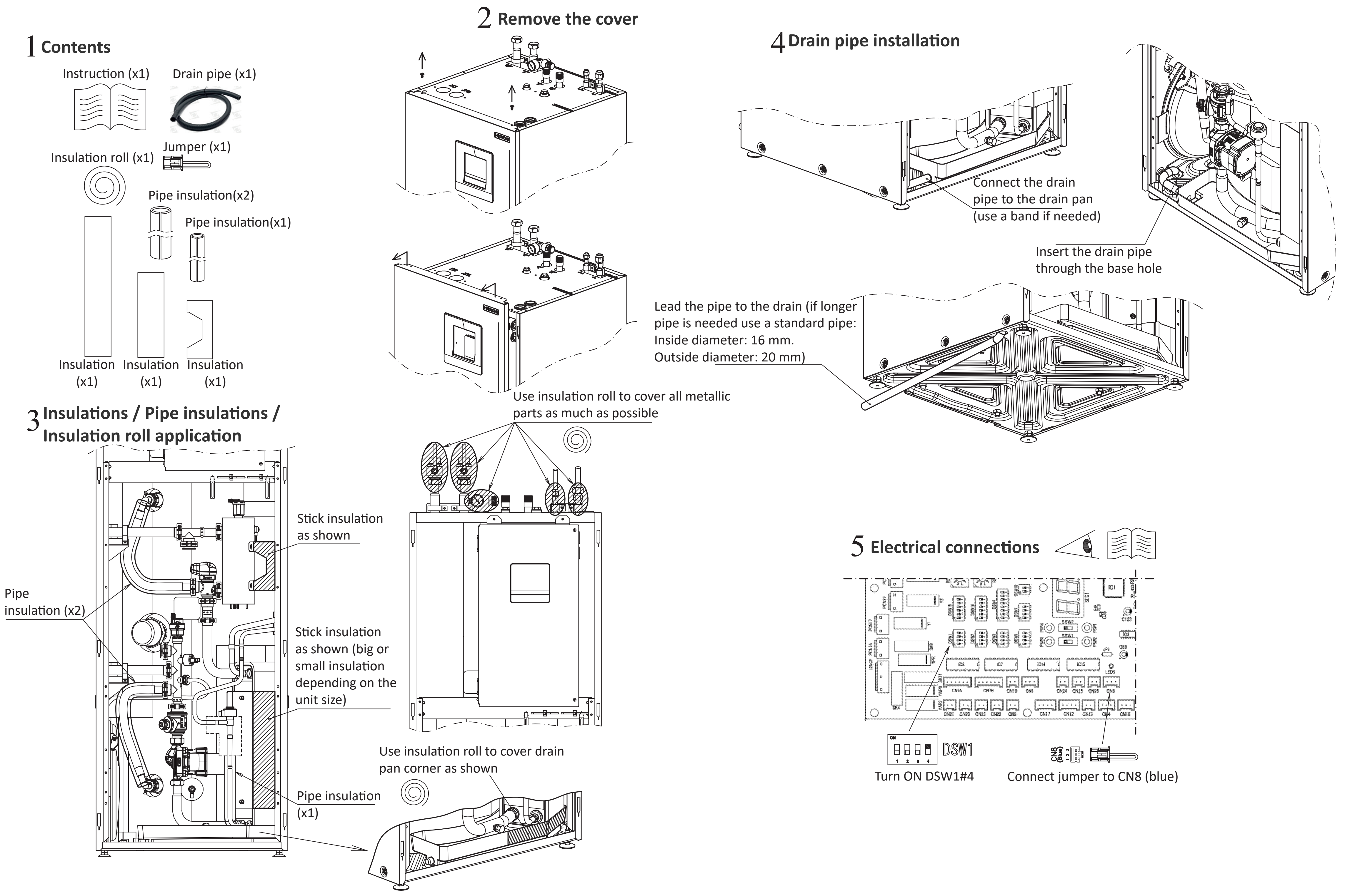
4 Insulate the hydraulic joints and pump



5 Turn ON DSW1#4 and connect jumper to CN15 (red)



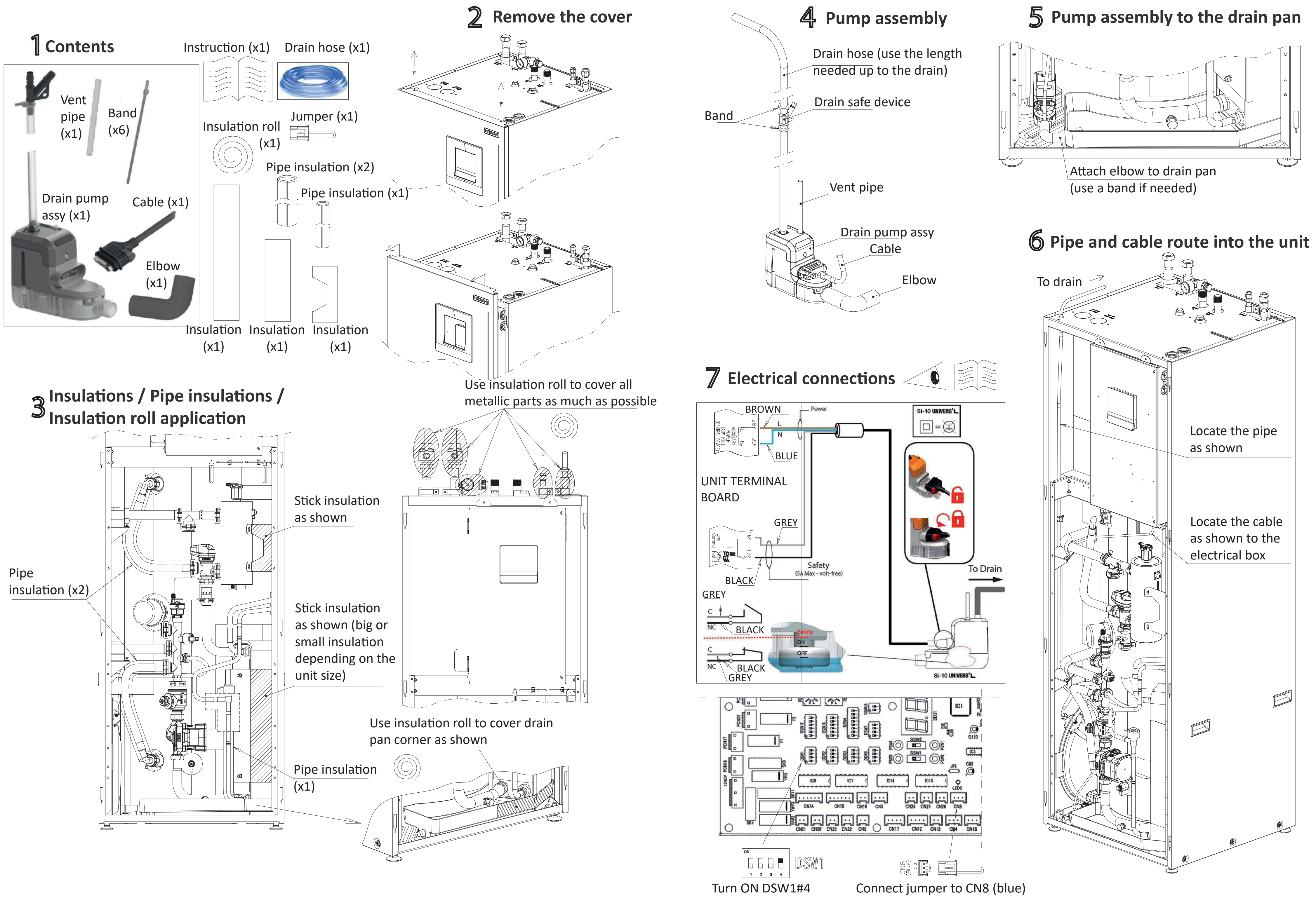
Cooling operation kit accessory for **airH2O 800H Combi** ***(ATW-CKSC-02)***



NOTE

In this example, the illustrations show a unit other than the **airH2O 800H Combi***. However, they are representative of how to assemble the kit on this unit.*

Cooling operation kit accessory for **airH2O 800H Combi** *(ATW-CKSC-03)*



NOTE

In this example, the illustrations show a unit other than the **airH2O 800H Combi***. However, they are representative of how to assemble the kit on this unit.*

2.2.4 Compressor Thermo ON/OFF control for space heating, DHW and swimming pool

◆ Forced compressor stop (Thermo-OFF)

The forced compressor stop, known as Thermo-OFF, is triggered under the following circumstances:

1 Demand OFF operation, or
2 Any of the following conditions are met:
   a. The measured outlet temperature value is equal to or exceeds Ttwo + 5 °C.
   b. The outlet water temperature surpasses the maximum range temperature (refer to *"Working range"* chapter in the Technical Catalogue).
   c. Outlet water temperature exceeds the maximum temperature set by the installer (applies only in the case of space heating).
   d. Inlet water temperature is equal to or greater than 74 °C.
   e. An abnormal condition is detected.

◆ Compressor re-operation (Thermo-ON)

The re-operation of the compressor, referred to as Thermo-ON, is initiated under the following conditions:

a. A demand ON operation is active, and
b. The compressor has been idle for 3 minutes or longer, and
c. The measured outlet water temperature is below the target temperature (Ttwo), and
d. The measured inlet water temperature is lower than 74 °C, and
e. The measured inlet water temperature has decreased $THON_{Offset}$ from the Twi temperature at the moment of thermo OFF. For detailed information refer to "2.2.5.1 Increase the interval between compressor operations after Thermo-OFF", and
f. Outdoor ambient temperature is below 25 °C in case of space heating or below 35 °C in case of DHW operation. Otherwise, ambient temperature display on the PC-ARFH3E blinks indicating the unit is outside the working range.

2.2.5 Compressor Thermo ON/OFF control for space cooling

◆ Forced compressor stop (Thermo-OFF)

The forced compressor stop, activated by Thermo-OFF in the context of space cooling, occurs under the following circumstances:

1 Demand OFF operation, or
2 Any of the following conditions are met:
   a. The measured outlet temperature value is equal to or falls below Ttwo - 4 °C.
   b. The outlet water temperature is lower than the maximum water range temperature.
   c. The water outlet temperature is less than 5 °C.
   d. There is a space cooling Demand OFF.
   e. An abnormal condition is detected.

◆ Compressor re-operation (Thermo-ON)

The re-operation of the compressor, activated by Thermo-ON, occurs when the following conditions are met:

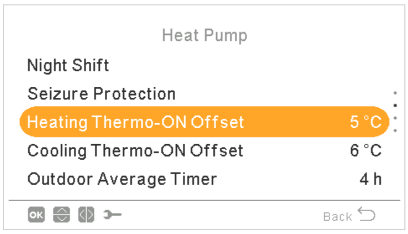
a. The compressor has been stopped for 3 minutes or more, and
b. The measured outlet water temperature is below the target temperature (Ttwo), and
c. The measured inlet water temperature has increased $THON_{Offset}$ from the Twi temperature at the moment of thermo OFF.

2.2.5.1 Increase the interval between compressor operations after Thermo-OFF

To prevent short compressor ON/OFF cycles under very low load conditions, the software introduces an additional Thermo-ON control based on the water inlet temperature (Twi).

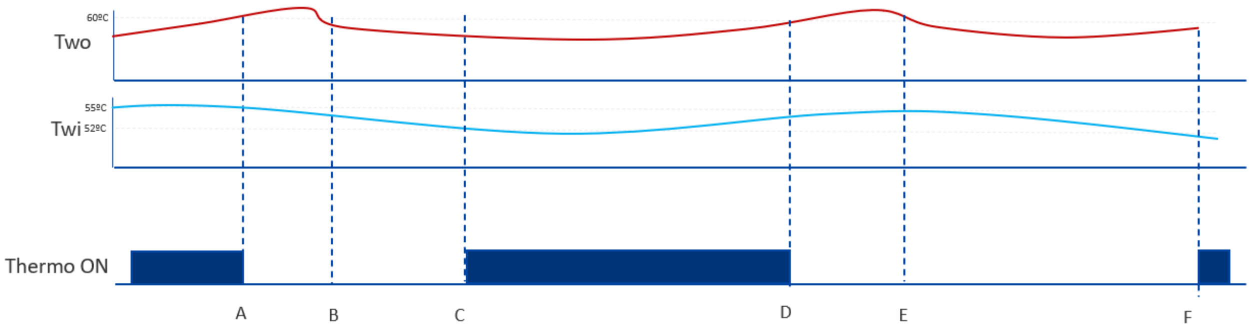
When a Thermo-OFF event occurs, the Twi (water inlet temperature) at that moment is recorded as Twi_{INST}. The next Thermo-ON will only be triggered once the water inlet temperature decreases by a set offset ($THON_{OFFSET}$), which can be configured via the LCD controller:

Menu -> System Configuration -> Heat Pump -> Heating/Cooling Thermo-ON Offset



For a clearer understanding of this new behaviour, please refer to the following diagrams:

Heating example (water temperature set point = 60 °C):

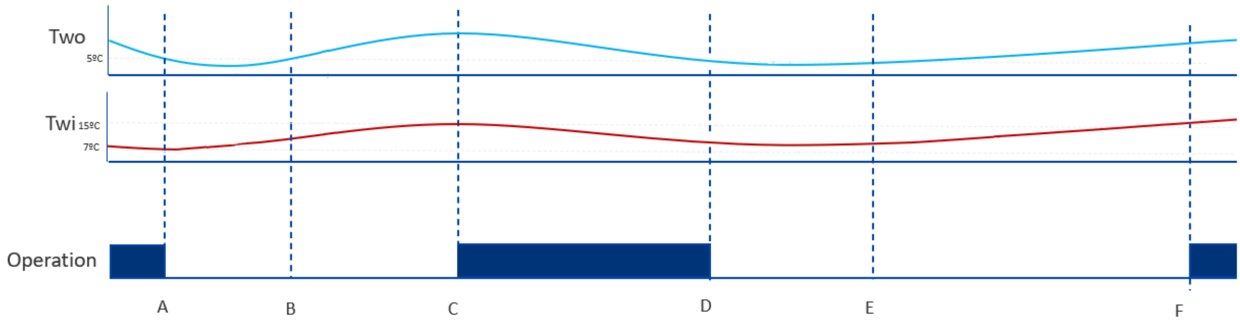


On instant (A), system performs Thermo-OFF since water reaches a temperature above 60 °C. According to previous software, Thermo-ON would be allowed to be performed on instant (B) where water is below 60 °C. However, according to software improvement, Thermo-ON is performed on instant (C) since:

- At the moment of Thermo-OFF (A) system has taken a snapshot of Twi value Twi_{INST} = 55 °C.
- System allows Thermo-ON operation at instant (C) where Twi value is lower than 52 °C: $Twi < Twi_{INST} - THON_{OFFSET}$
- For this example a temperature difference of 3 °C between Twi_{INST} and Twi is required for allowing the system to start.

At instant (D), there is another Thermo-OFF by water outlet temperature higher than 60 °C. At this moment Twi_{INST} = 54 °C. Since system requires a temperature difference of 3 °C between Twi_{INST} and Twi, Thermo-ON operation is allowed when Twi is lower than 51 °C (F) instead of at instant (E).

Cooling example (Water temperature set point = 5 °C):



On instant (A), system performs Thermo-OFF since water reaches a temperature below 5 °C. According to previous software, Thermo-ON would be allowed to be performed on instant (B) where water is above 5 °C. However, according to software improvement, Thermo-ON is performed on instant (C) since:

- At the moment of Thermo-OFF (A) system has taken a snapshot of Twi value Twi_{INST} = 7 °C.
- System allows Thermo-ON operation at instant (C) where Twi value is higher than 15 °C: $Twi > Twi_{INST} + THON_{OFFSET}$
- For this example it is required a temperature difference of 8 °C between Twi_{INST} and Twi for allowing the system to start.

At instant (D), there is another Thermo-OFF by water outlet temperature lower than 5 °C. At this moment Twi_{INST} = 9 °C. To allow system to perform Thermo-ON, $Twi > Twi_{INST} + THON_{OFFSET}$. This means that system will perform thermo OFF at (F) when Twi is higher than 17 °C instead of at instant (E).

Conditions where control is not applied:

- If the software enforces a forced Thermo-OFF condition due to the new control, it will be released if the water setpoint temperature increases (for heating) or decreases (for cooling) by more than the $THON_{OFFSET}$ value.
- The control does not apply during Domestic Hot Water (DHW) or swimming pool operations.
- The software does not retain the Twi_{INST} value when there is a change in operating mode.
- The new control is not applied during a Demand OFF operation triggered by the thermostat.

This improvement not only reduces system power consumption by minimizing compressor start-up cycles but also protects the system from restarting at very low water temperatures in cooling mode.

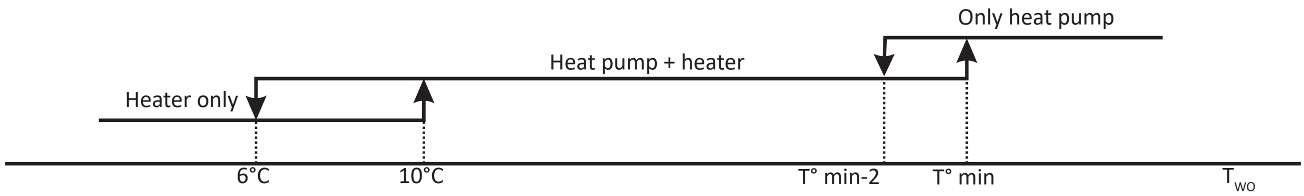
2.2.6 Initial start-up at low outdoor ambient temperatures

This option is applicable exclusively during space heating operation. This applies only if the heater is not disabled by DSW for **airH2O 800H** and **airH2O 800H Combi** or when an external heater is configured for **airH2O 800M**.

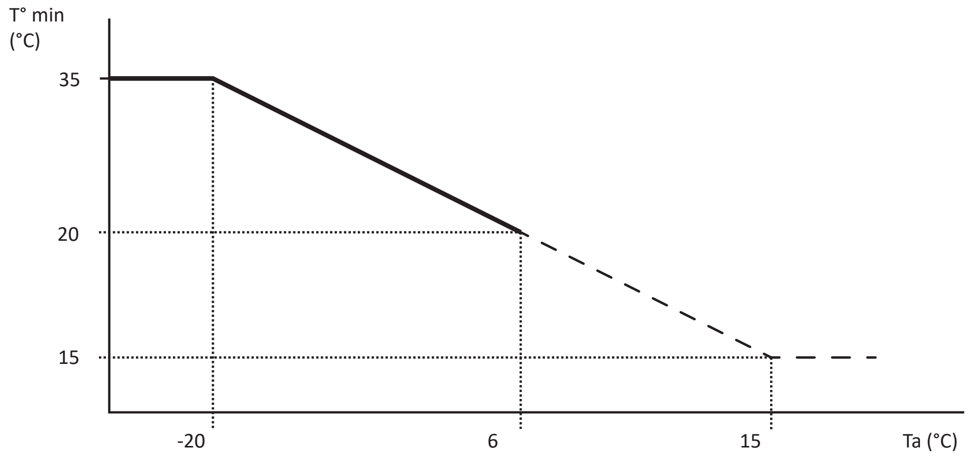
For effective commissioning, particularly when the water temperature is very low, a gradual heating approach is essential. To accommodate this, an additional function is available for initiating operations under low water temperature conditions.

This function is particularly significant in conditions of space heating at lower water temperatures (around 10 °C to 20 °C) and lower outdoor ambient temperatures (below 10 °C). It is crucial to exercise caution during these conditions, as heating at such low temperatures means working with a non-optimal compression ratio, which can potentially damage the heat pump. For example and especially during the defrosting process, where the lack of energy at the hydraulic cycle may lead the plate exchanger to freeze.

To address this, a specialized approach is implemented. If the instantaneous ambient temperature (Ta) is greater than 6 °C, the heating is performed solely by the heat pump. On the other hand, if it is 6 °C or lower, heating is performed together by the heat pump and the electrical heater. However, in case that water temperature (T_{WO}) is lower than 6 °C, only heater is allowed to work, mitigating the above mentioned operation risks when ambient temperatures are exceptionally low.



Where:



NOTE

The specified condition is not applicable if the heater is forcefully turned off by the DSW (DIP switch) setting and during Domestic Hot Water (DHW) operation.

CAUTION

- *In the event of the heater being forcibly turned off through an optional DSW (DIP switch) setting, the mentioned conditions are not executed. Instead, heating is carried out solely by the heat pump. It is explicitly stated that Hitachi is not responsible for the operation under these circumstances.*
- *It is recommended to start the unit (first power ON) with heater forced OFF and compressor forced OFF, in order to circulate water by water pump and remove possible air into the heater (check heater completely filled).*

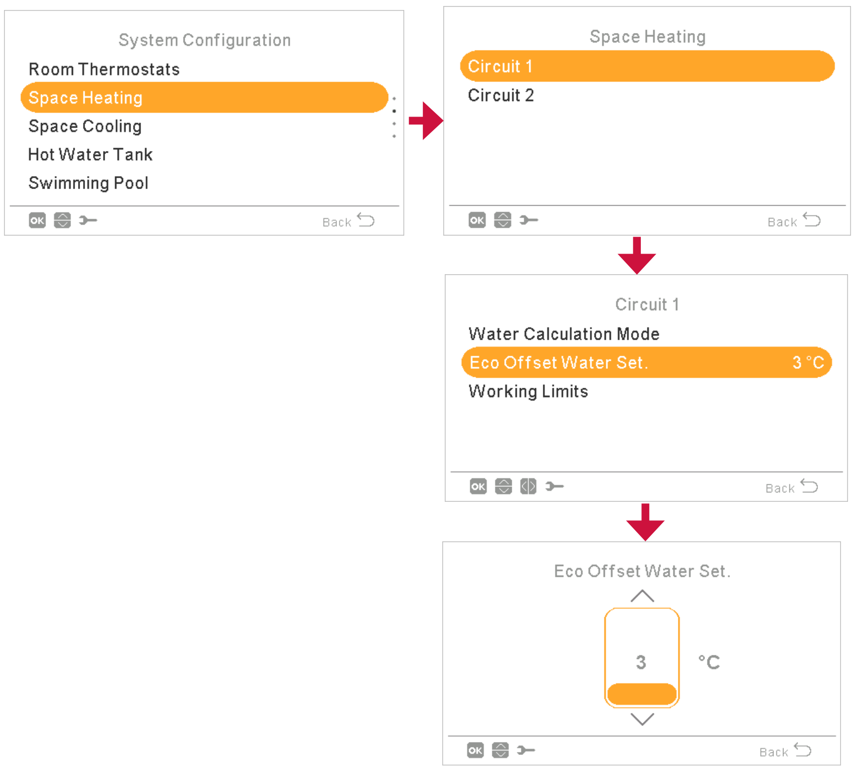
2.2.7 Water ECO offset

The water ECO offset function in **airH2O 800** enables the utilization of a reduced offset for the water temperature setting. With this function, the current water temperature setting can be decreased by a specified parameter, which is configurable through the unit controller.

This feature allows for a more energy-efficient operation by lowering the water temperature according to user preferences or environmental considerations.

System Configuration → Space heating / Space Cooling → Circuit 1 / Circuit 2

Description	Default Value	Range	Units
ECO offset Water Set.	3	1~10	°C



◆ Function activation

ECO offset function is active for each circuit by different options:

1 **External configurable input:** This activation is achieved through an external input, as detailed in the optional functions chapter.

2 **Schedule (PC-ARFH3E):** Activation is possible through programming a schedule on the unit controller (PC-ARFH3E).

3 **Central device actions:** The ECO offset function can also be triggered by actions performed on a central device.

◆ Function control

Heating

The heating control of the water offset function is done by the following:

TtwofCn = TtwoOTCn - CnECO

Cooling

TtwofCn = TtwoOTCn + CnECO

Where:

- *TtwofCn: Final water temperature setting (°C)*
- *TtwoOTCn: Water temperature setting fixed OTC Control (°C)*
- *CnECO: Water ECO offset for heating (°C)*
- *Cn: Circuit number (n=1; n=2)*

NOTE

This function is applicable only for water space heating or cooling.

2.2.8 Outdoor temperature compensation control

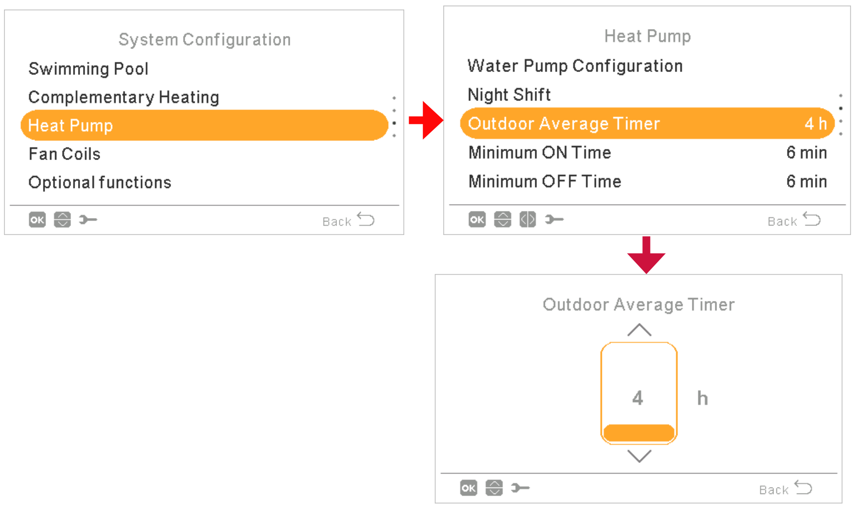
◆ OTC average timer

Average timer corrects the influence of the ambient temperature variations. The weather dependant set point calculation is done on the average outdoor temperature.

The outdoor temperature is averaged over the selected time period. This configuration should be done through the unit controller.

System Configuration → Heat pump

Description	Default Value	Range	Units
Outdoor average timer	4	0~24	hour



NOTE

- *When the value is set to 0, there is no outdoor average temperature. The value is a direct value from sensor.*
- *The outdoor temperature average have the same timer both for circuit 1 and circuit 2.*

◆ Secondary outdoor sensor accessory

The optional outdoor temperature sensor accessory (ATW-2OS-02) can be directly linked to the controller, especially useful when the heat pump is situated in a location unsuitable for accurate outdoor temperature measurements.

airH2O 800 has the capability to utilize two outdoor temperature sensors: the standard outdoor unit ambient temperature sensor and an additional auxiliary ambient temperature sensor designed for both space heating and cooling circuits. The sensor is configured as an auxiliary sensor, a setup that will be detailed further in this chapter. This arrangement allows for improved outdoor temperature monitoring, enhancing the precision of the system's operation.

◆ Configuration of the Outdoor Temperature Compensation control (OTC)

The source temperature for average calculation is selectable at startup using DSW5 (Dip Switch 5), PIN1, and PIN2.

The specific values associated with these pins determine the configuration:

DSW5		Action
PIN1	PIN2	
OFF	OFF	C1: outdoor sensor average; C2: outdor sensor average
OFF	ON	C1: outdoor sensor average; C2: auxiliary ambient sensor average
ON	OFF	C1: auxiliary ambient sensor average; C2: outdoor sensor average
ON	ON	C1: auxiliary ambient sensor average; C2: auxiliary ambient sensor average

Select auxiliary sensor (1, 2 or 3) for second outdoor ambient function.

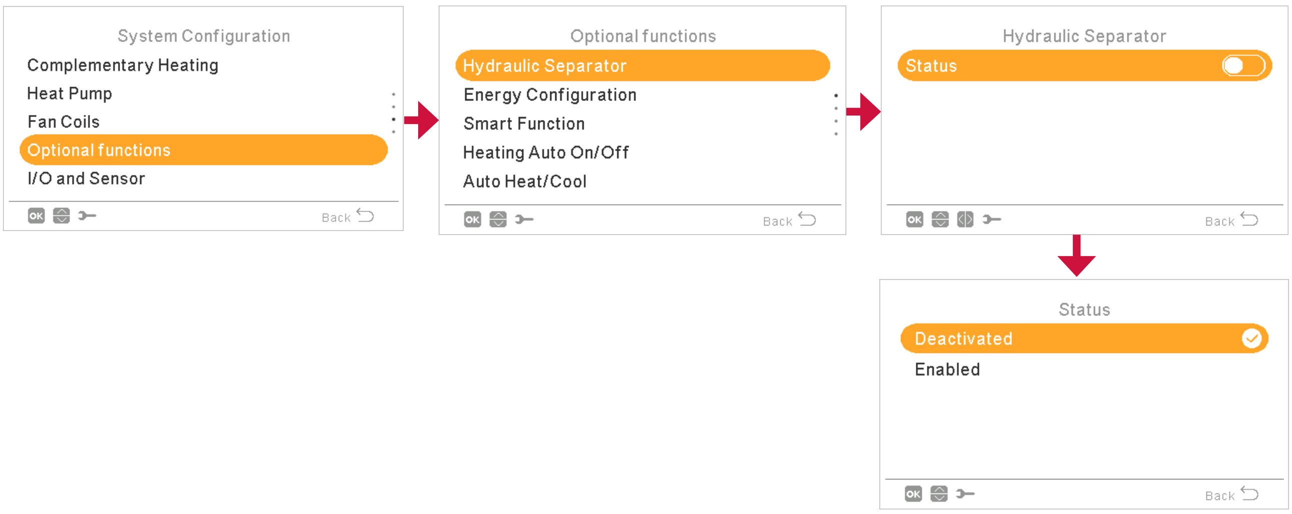
2.2.9 Hydraulic separator

In certain installations, the water pump of the **airH2O 800** unit may not be adequately sized for larger heating systems, leading to the use of a hydraulic separator or buffer tank as a Secondary water pump. This additional component is crucial for ensuring the proper dimensioning of the water pump in such cases.

This settings should be done through the unit controller as explained below:

System Configuration → Optional functions → Hydraulic Separator

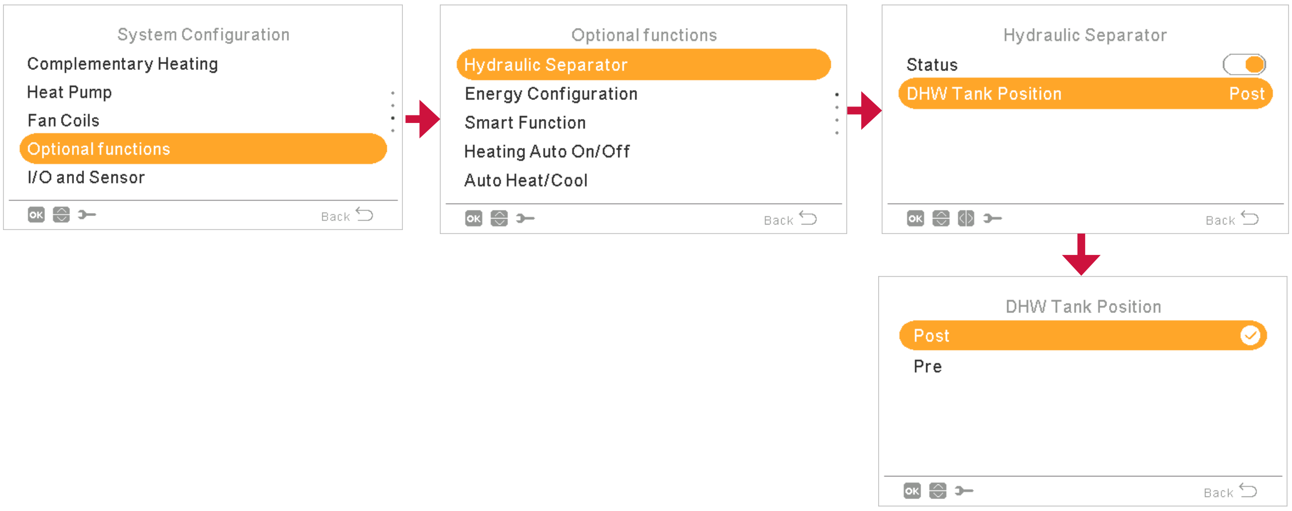
Description	Default Value	Range
Hydraulic separator status	Deactivated	Deactivated/Enabled



2.2.9.1 DHW tank position (for Control box and airH2O 800H only)

When the "Hydraulic Separator" function is enabled, the DHW Tank position setting becomes available, specifically for Control box and **airH2O 800H** units. This setting provides the option to choose between two configurations:

- Post: The 3-way valve for diverting to the DHW tank is positioned after the hydraulic separator.
- Pre: The 3-way valve for diverting to the DHW tank is positioned before the hydraulic separator.



The chosen setting influences the behaviour of WP3.

1. It is recommended to place the 3-way valve after WP3 in case an external boiler is installed (this will allow to perform DHW with external boiler too).

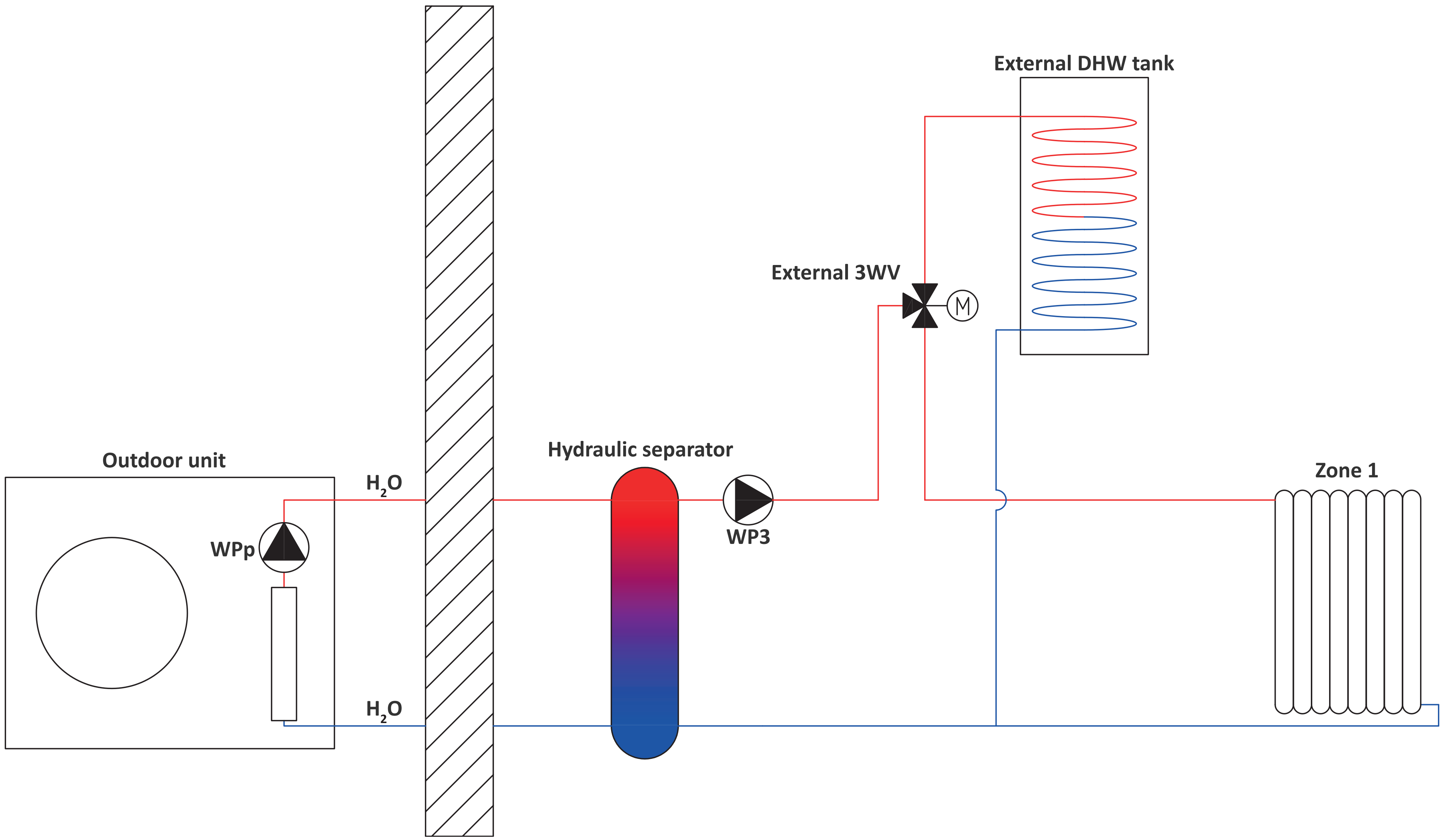
2. It is recommended to place the 3-way valve before the hydraulic separator if no external boiler is installed (this will only use one water pump and reduce energy consumption during DHW operation).

This recommendation applies for Control box and **airH2O 800H** modules, even with boiler in series / parallel and for hydraulic configuration 1 (direct), 2 (standard) or 3 (parallel).

airH2O 800H Combi units already have an integrated 3-way valve with tank, so the configuration is internally fixed to "Pre".

◆ Example 1: DHW tank after hydraulic separator

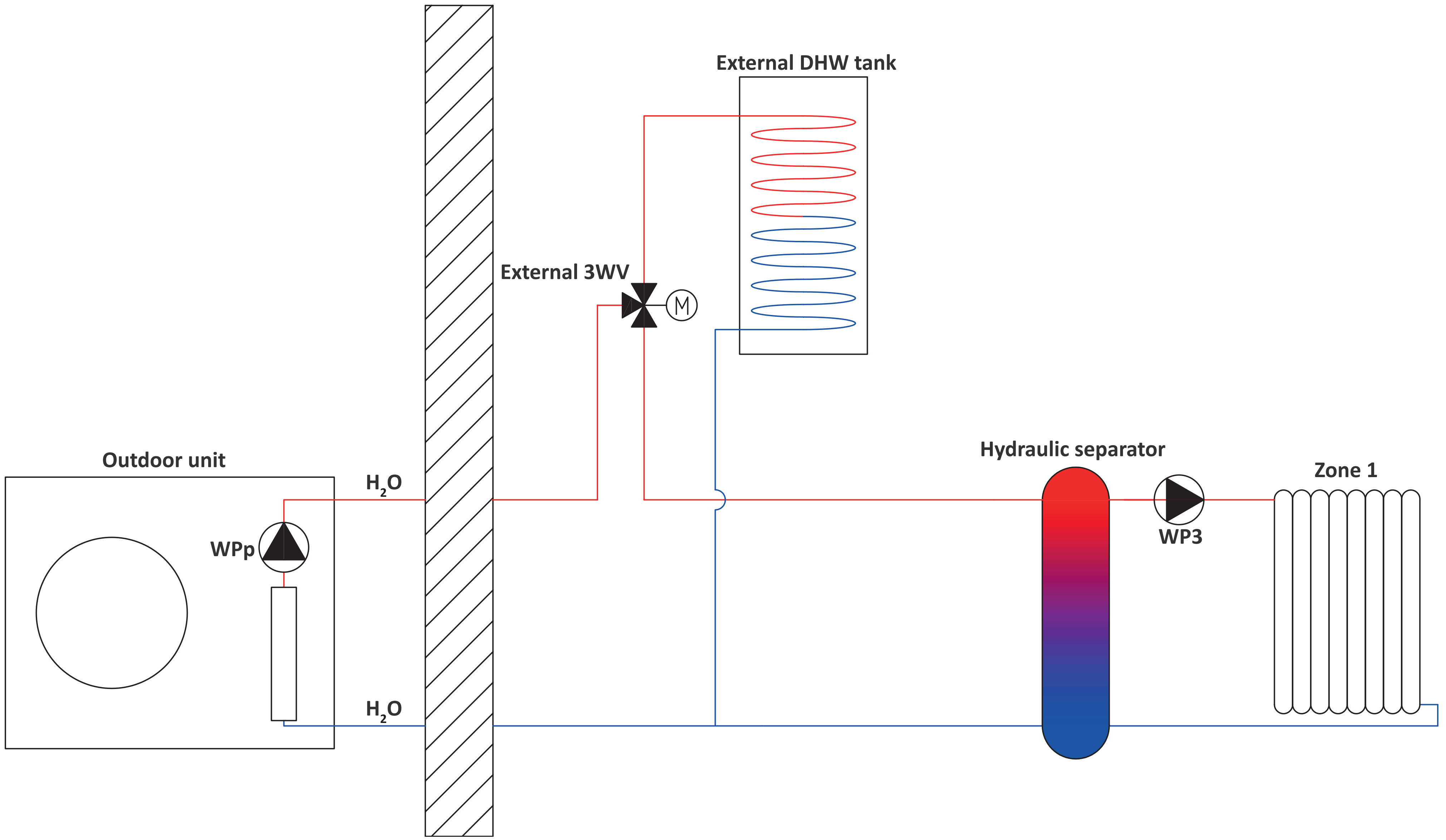
- DHW tank position: post.
- WPp: can be stopped when buffer reaches Thermo-OFF conditions in case Two3 is used, DSW5#4 = ON and Stop pump by Thermo-OFF option is enabled, or under Demand-OFF conditions when ECO pumps is set (DSW4#5 = ON).
- WP3: cannot be set to stop during DHW operation.



This installation forces that whenever there is DHW operation, hydraulic separator or buffer tank shall be heated until tank coil's temperature becoming a waste of energy and becoming a problem when operation switches to space heating again where water at hydraulic separator may be outside from space heating circuit temperature limits.

◆ Example 2: DHW tank before hydraulic separator

- DHW Tank Position: Pre
- WPp: can be stopped under Demand-OFF conditions when ECO pumps is set (DSW4#5 = ON).
- WP3: Can be set to stop during DHW operation



This configuration avoids heating the buffer tank or the hydraulic separation up to the tanks coils temperature and avoid over temperature problems when operation switches from DHW to space heating.

NOTE

- *Note that whenever this configuration is done, DHW tank cannot be heated by external boiler.*

2.2.9.2 Pumps during DHW

Depending on the hydraulic layout, it may be useless to keep WP2 and WP3 in operation during DHW production.

It is only recommended to keep WP2 and WP3 running during DHW operation in case a buffer tank is installed, as it will be used to provide heat to the emitters.

Pumps during DHW allow to select if we want to keep the pumps not related to DHW running or prefer to stop them.

The unit’s own pump (WP1) is always kept ON because is necessary for the heat generation.

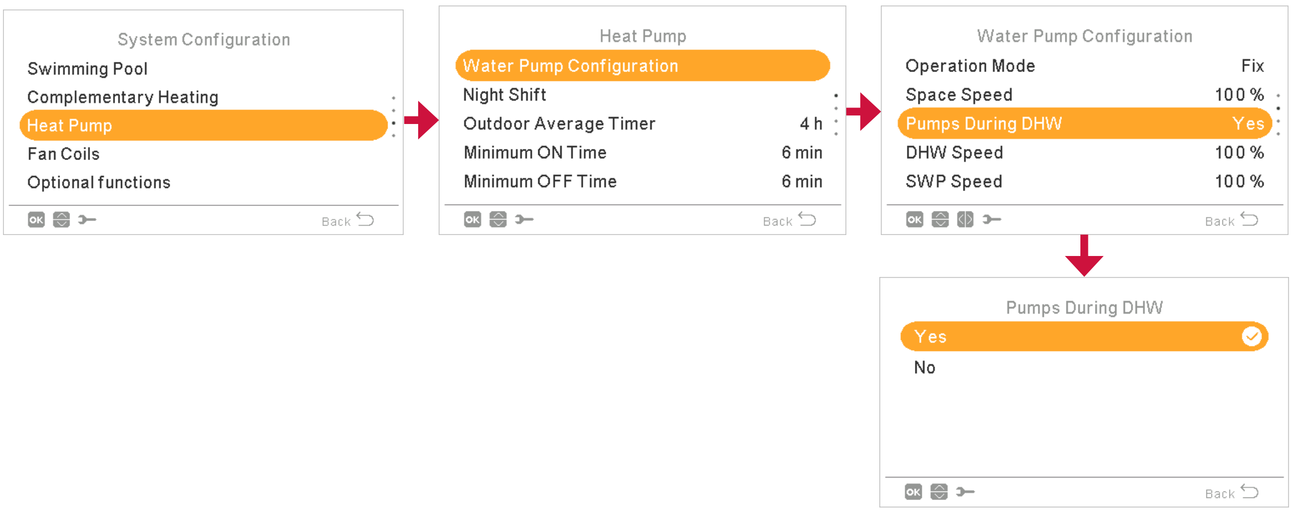
WP2 is not required for DHW, so it will be forced to stop if indicated.

WP3 is not required for DHW with pre hydraulic separator configuration, so it will be forced to stop if indicated.

WP3 is required for DHW with post hydraulic separator configuration, so it is always kept ON.

System Configuration – Heat Pump – Water pump Configuration

Description	Default Value	Range
Pumps during DHW	Yes	Yes / No

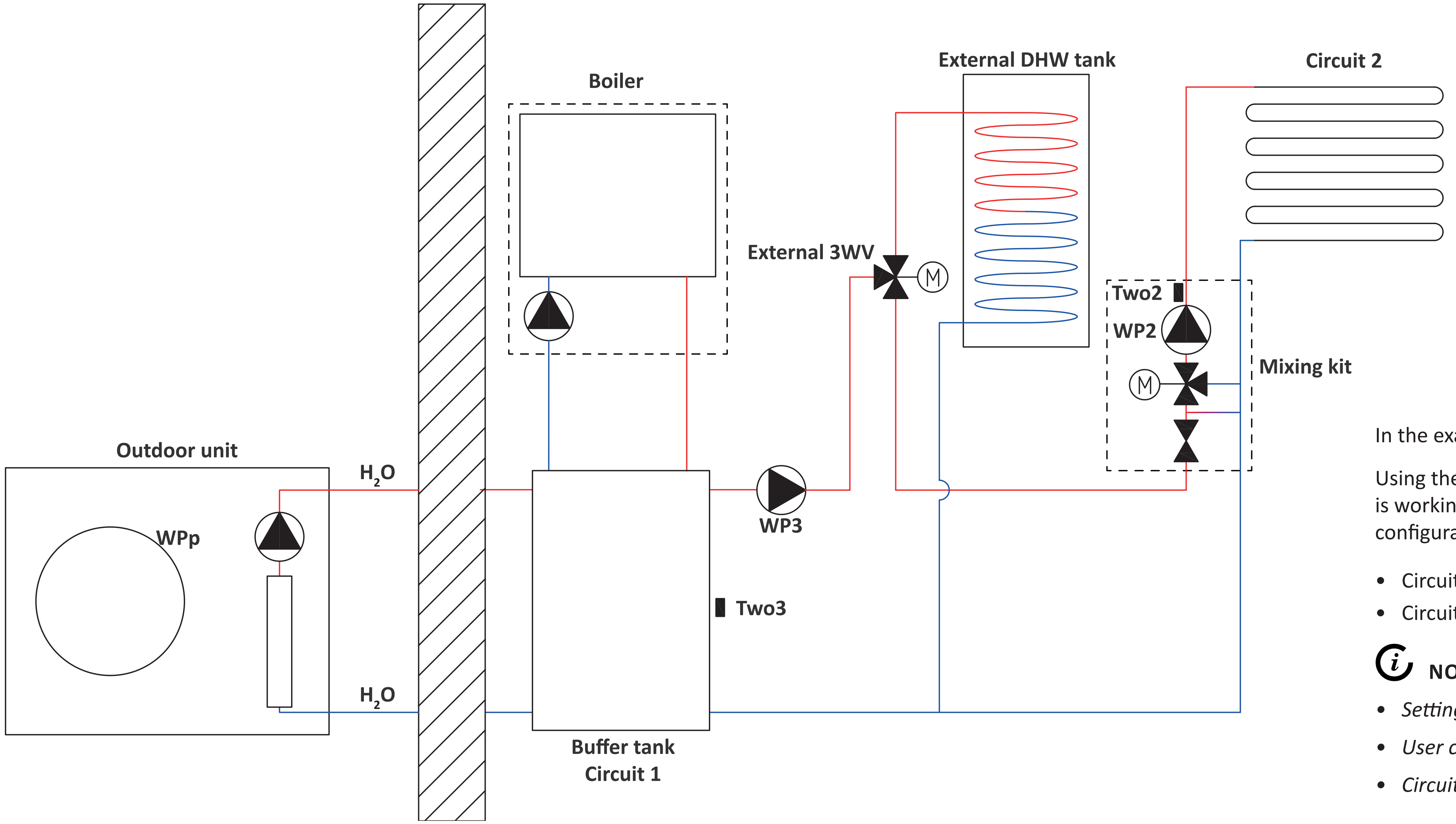


2.2.10 Installation with big buffer tank

Some installations need a big buffer tank in combination with an auxiliary heating system (boiler, pellets, solar panels, etc.). In those cases, the control of the water temperature can be done by an external temperature sensor (Two3) to heat the water of that tank.

This functionality is also used in combination with SG Ready smart function (refer to "Optional functions").

Example of installation 1 for illustrative purpose only:



In the example, the system works for only one zone application.

Using the buffer tank in combination with a boiler, circuit 1 is working as circuit 2 in a mixing loop. With this system, the configuration of the unit controller is like for two circuits:

- Circuit 1: buffer tank working as circuit 1
- Circuit 2: mixing circuit for space heating

NOTE

- *Settings for circuit 1 must be always higher than for circuit 2.*
- *User can configure only one thermostat only for circuit 2.*
- *Circuit 1 only works as a buffer tank (Thermo ON/OFF mode).*

Also, it is possible to switch OFF the **airH2O 800** water pump when thermo OFF condition is active (i.e.: when the buffer tank temperature is reached).

◆ Configuration and parameters for an installation with buffer tank

For an installation incorporating a buffer tank with the new **airH2O 800** unit, it provides the flexibility to choose between two different water pump distribution options for Circuits 1 (C1) and 2 (C2) known as standard and parallel

NOTE

This feature is not applicable to the Cascade Controller.

To enable this functionality for an installation with a buffer tank, the following configuration steps must be undertaken:

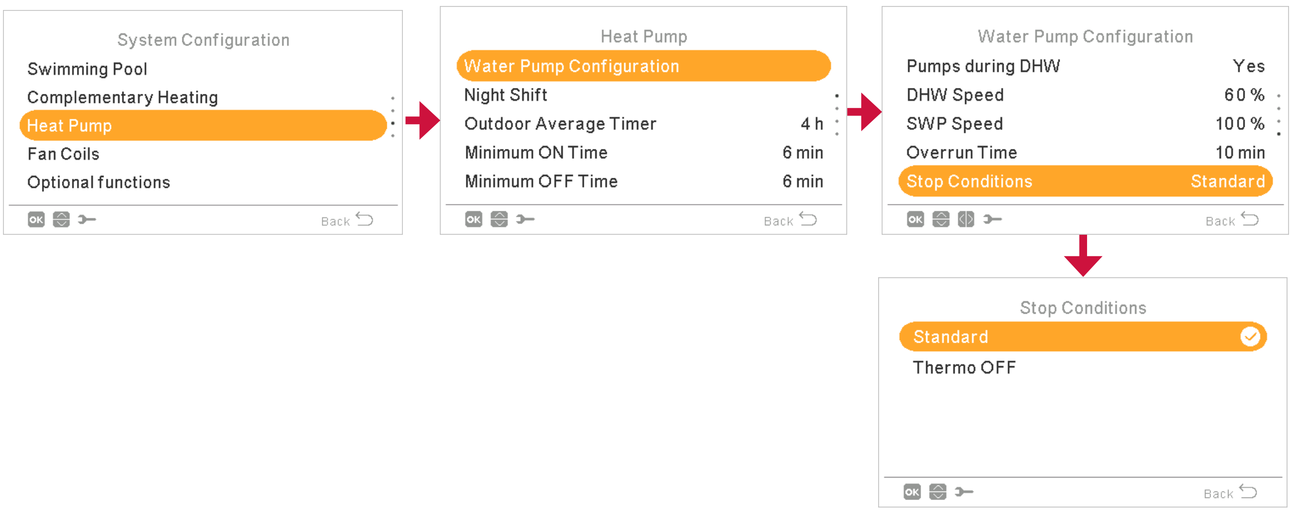
1. **DSW Settings:** ensure that DSW5 PIN 4 is set to ON. This setting is crucial to activate the buffer tank function.
2. **Auxiliary sensor:** utilize Auxiliary Sensor 1, 2, or 3.

   Set the chosen auxiliary sensor to Two3. This ensures the external temperature sensor (Two3) is correctly associated with the buffer tank control.
3. **Output signals:** choose output signal 1 or 2.

   Set the selected output signal to WP3. This configuration designates the water pump associated with the buffer tank.
4. **Unit controller configuration:** utilize the unit controller to configure and activate this function.

System Configuration – Heat Pump – Water pump Configuration

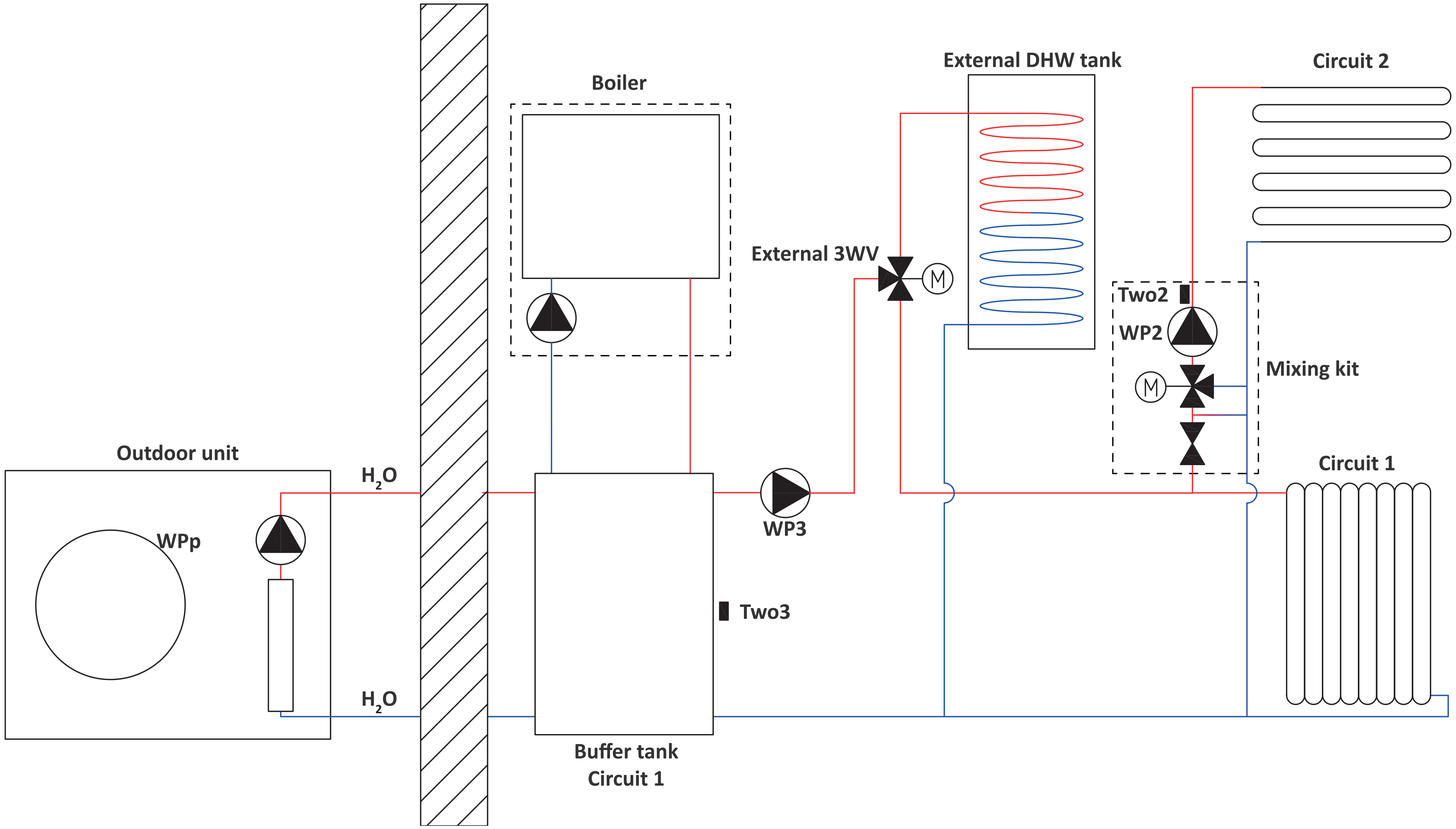
Description	Default Value	Range
Stop conditions	Standard	Standard / Thermo OFF



If water pump changes to Thermo-off, water pump 1 is switched off after the buffer tank temperature is achieved. Water pump 3 is always running (except when switch OFF condition).

In this example, the system works for 2 zone application: with the buffer tank in combination with a boiler, the Circuit 1 works as a direct circuit (temperature of buffer tank must be the same as for Circuit 1); and Circuit 2, using a mixing loop.

Example of installation 2 for illustrative purpose only:



According to this example, the unit controller should be configured as for 2 circuits:

- Circuit 1: direct circuit for space heating zone 1
- Circuit 2: mixing circuit for space heating zone 2

NOTE

- *Setting of circuit 1 must be always higher than the setting for circuit 2.*
- *User can configure 2 thermostats for each circuit.*
- *Circuit 1 works as a direct circuit.*

◆ Main control

The water temperature control relies on monitoring temperature data from both Circuit 1 and Circuit 2, specifically utilizing measurements from T_{WO} and T_{WO2}. Illustratively:

Consider the following scenario:

- Water temperature settings (T_{two}) are configured at 50 °C.
- The water outlet temperature from Circuit 1 (T_{WO}) registers at 40 °C.
- Simultaneously, the water outlet temperature from Circuit 2 (T_{WO2}) records 35 °C.

1 **Unit frequency water temperature control:**

The unit dynamically adjusts the frequency of water temperature control based on T_{WO}. If the recorded temperature (T_{WO}) falls below the set temperature (T_{two}), the unit takes corrective measures to attain the specified temperature.

2 **Thermo-ON/OFF trigger:**

Thermo-ON/OFF actions are initiated when T_{WO2} reaches the set temperature for Circuit 1. This means that the system responds to the temperature conditions in Circuit 1, activating or deactivating heating operations as needed.

3 **Circuit 1 Demand-OFF transition:**

In instances where Circuit 1 is in a Demand-OFF state, indicating no active heating demand, the unit settings seamlessly transitions to Circuit 2.

The incorporation of a mixing valve becomes pivotal during this transition, as it is employed to modulate the temperature of the water stored in the buffer tank. This ensures that, even with Circuit 1 not actively demanding heat, the temperature within the buffer tank is controlled via Circuit 2.

2.2.11 Screed drying function

The **airH2O 800** series features a distinctive optional function specifically designed for the process of drying screed applied to floor heating systems. This specialized process adheres to the standards outlined in EN 1264 part 4 and it is offered in 2 versions: Standard and Custom.

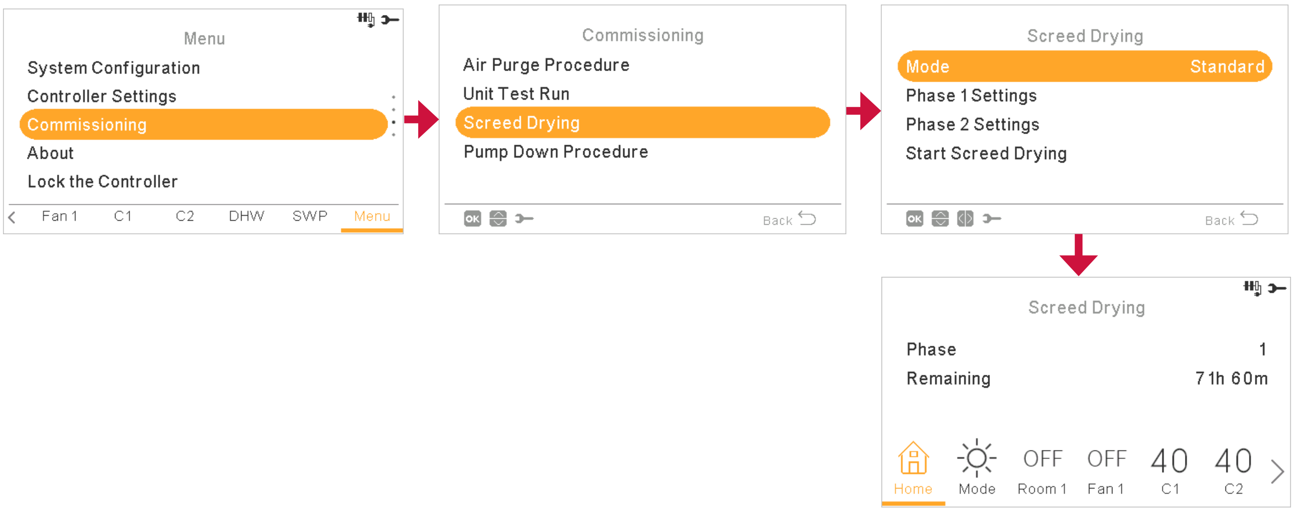
Upon activation of the floor screed drying function, the water temperature set point follows a predetermined schedule tailored for this purpose. Once this drying sequence concludes, the controller seamlessly returns to normal operation. During this phase, Circuit 1 and Circuit 2 are compelled into an ON state, and their modes are forcibly set to heating.

All other heating modes undergo an override, except for hot sanitary water, which remains unaffected. Furthermore, the room thermostat is rendered inactive throughout the duration of this function, ensuring that the drying process is executed independently of room temperature control.

The configuration of this option is settled from the unit controller:

Commissioning → Screed drying

<table>
<tr><th colspan="4">Description</th><th>Default Value</th><th>Range</th><th>Units</th></tr>
<tr><td colspan="4">Mode</td><td>Standard</td><td>Standard-Custom</td><td>-</td></tr>
<tr><td rowspan="4">Standard</td><td rowspan="2">Phase 1 Settings</td><td>Circuit 1</td><td rowspan="4">Desired setting</td><td rowspan="2">25</td><td rowspan="2">20-25</td><td rowspan="4">°C</td></tr>
<tr><td>Circuit 2</td></tr>
<tr><td rowspan="2">Phase 2 Settings</td><td>Circuit 1</td><td rowspan="2">55</td><td rowspan="2">20-75</td></tr>
<tr><td>Circuit 2</td></tr>
<tr><td rowspan="12">Custom</td><td rowspan="6">Phase 1 Settings</td><td colspan="2">Duration</td><td>3</td><td>3-6</td><td>days</td></tr>
<tr><td colspan="2">Mode</td><td>Fix</td><td>Fix-Linear</td><td>-</td></tr>
<tr><td>Circuit 1</td><td rowspan="2">Initial setting
(only for linear mode)</td><td rowspan="2">20</td><td rowspan="4">20-25</td><td rowspan="4">°C</td></tr>
<tr><td>Circuit 2</td></tr>
<tr><td>Circuit 1</td><td rowspan="2">Desired setting</td><td rowspan="2">25</td></tr>
<tr><td>Circuit 2</td></tr>
<tr><td rowspan="6">Phase 2 Settings</td><td colspan="2">Duration</td><td>4</td><td>4-8</td><td>days</td></tr>
<tr><td colspan="2">Mode</td><td>Fix</td><td>Fix-Linear</td><td>-</td></tr>
<tr><td>Circuit 1</td><td rowspan="2">Initial setting
(only for linear mode)</td><td rowspan="2">25</td><td rowspan="4">20-75</td><td rowspan="4">°C</td></tr>
<tr><td>Circuit 2</td></tr>
<tr><td>Circuit 1</td><td rowspan="2">Desired setting</td><td rowspan="2">55</td></tr>
<tr><td>Circuit 2</td></tr>
<tr><td colspan="4">Start Screed Drying</td><td>-</td><td>-</td><td>-</td></tr>
</table>



◆ Standard mode

1 **Phase 1 settings (Default):** The water set point is kept constant at 25 °C for 3 days.

2 **Phase 2 settings:** The water set-point is set to the maximum heating supply temperature for 4 days.

◆ Custom mode

1 **Phase 1 settings :**

- ✓ **Duration:** Select the duration of the phase 1 from 3 to 6 days.
- ✓ **Mode:** Linear or Fix:
  - **Fix:** The water set point is kept constant at the selected temperature in desired setting menu.
  - **Linear:** The water set point keeps going up from the initial setting to the selected desired setting.

2 **Phase 2 settings:**

- ✓ **Duration:** Select the duration of the phase 2 from 4 to 8 days.
- ✓ **Mode:** Linear or Fix:
  - **Fix:** the water set point is kept constant at the selected temperature in desired setting menu.
  - **Linear:** the water set point keeps going up from the initial setting to the selected desired setting.

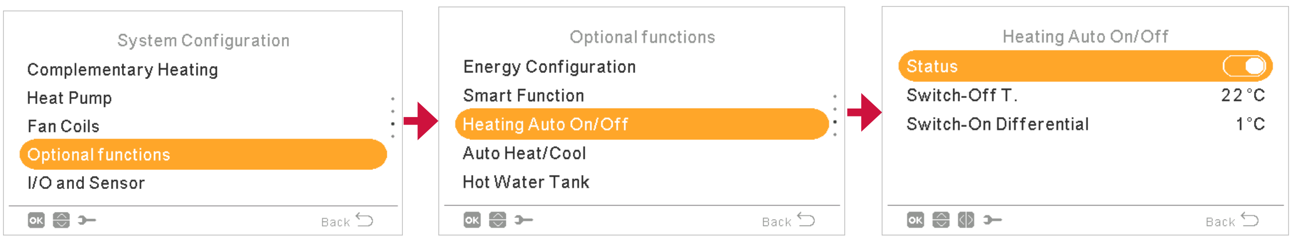
2.2.12 Heating auto ON/OFF

In situations where the outside temperature rises, maintaining the heating system in operation may become unnecessary. The **airH2O 800** system addresses this by automatically switching to OFF mode when the daily average outdoor temperature from the preceding day surpasses the designated Switch-OFF Temperature.

The system intelligently utilizes variables configured through the unit controller to determine this behaviour:

System configuration → Optional functions → Heating Auto ON/OFF

Description	Default Value	Range	Units
Status	Deactivated	Deactivated/Enable	-
Switch-OFF T	22	10~25	°C
Switch-ON Differential	1	1~3	°C



The system computes the 24-hour average outdoor temperature. No evaluations are made within the initial 24 hours. Subsequently, the system dynamically refines this average by incorporating a new temperature sample every 5 minutes, continuously monitoring and adjusting to current conditions.

2.2.13 Auto Heat/Cool (only for units with cooling kit installed)

Auto Heat/Cool functionality, exclusive to units equipped with a cooling kit, empowers users to optimise their heating and cooling models. This feature is active when cooling is enabled, and users can activate it through the Auto Summer Switch-OFF average on the user interface.

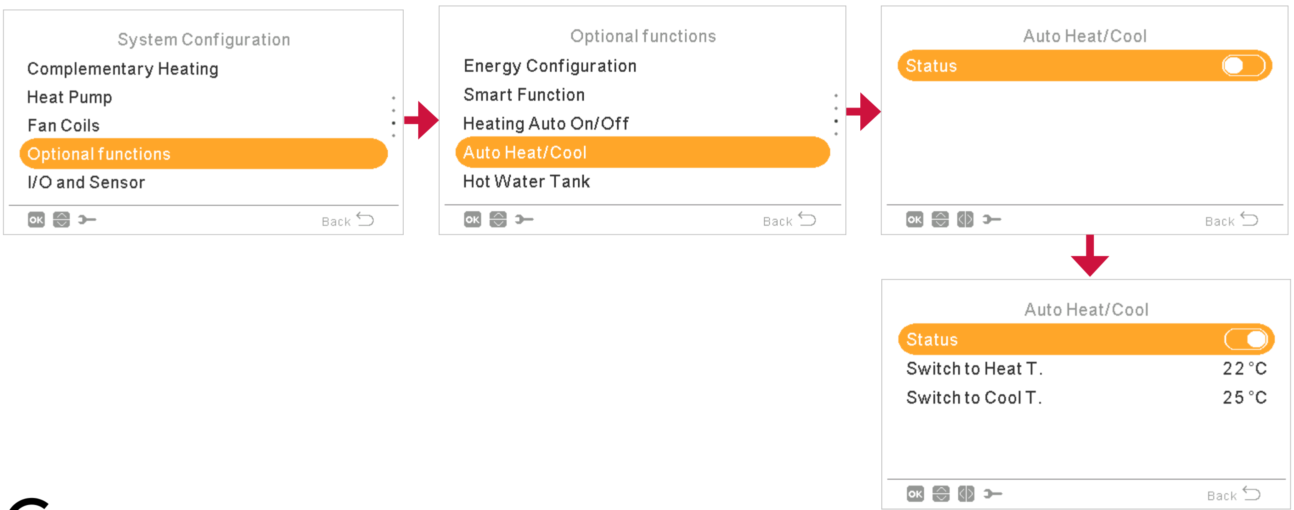
When the end-user selects automatic mode on the interface, the system dynamically adjusts based on the averaged outdoor temperature, ensuring it stays within the predefined range for space heating (using the space heating OFF temperature) and space cooling (using the space cooling ON temperature).

As outdoor temperatures fluctuate, the system seamlessly transitions between heating and cooling modes to meet the specified requirements. If the outdoor temperature drops, the system switches to heating, and conversely, if it rises, it shifts to cooling.

This functions should be configured through the unit controller:

System configuration → Optional functions → Auto Heat/Cool.

Description	Default Value	Range	Units
Auto HEAT/COOL status	Deactivated	Deactivated/Enable	-
Switch to Heat T	22	10~23	°C
Switch to Cool T	25	24~35	°C



NOTE

- *The system calculates the average temperature of the last 24 hours taking samples every 5 minutes.*
- *On the first 24 hours, the system keep the previous mode before being set to Auto mode.*
- *After the first 24 hours the system will check the function with the new average temperature when it is updated each 5 minutes.*

The checking conditions are:

Condition	Automatic
Average < (Heating Auto T)	Heating
Average > (Cooling Auto T)	Cooling

2.2.14 Demand ON/OFF

The **airH2O 800** unit provides flexibility in activating space heating or cooling demand through various methods:

1 **Demand ON/OFF via external input signal:**

- The ATW-RTU-04 ON/OFF thermostat can be employed for external input signal control.
- Option 1: use input 1 for both circuit 1 and circuit 2.
- Option 2: independently assign input "n" for circuit 1 and input "n2" for circuit 2.

2 **Demand ON/OFF between room ambient and room setting temperature:**

- Utilize the PC-ARFH3E as a room thermostat or the wireless intelligent thermostat (ATW-RTU-06/7).
- The system will regulate demand based on the difference between room ambient temperature and the set room temperature.

3 **Demand ON/OFF via central device:**

- A central device can be used to control the demand operation.

NOTE

- *“n” is the number according the input (input1, input2...etc).*
- *The options for the configuration should be done through the unit controller.*

2.2.14.1 Demand ON/OFF by an external input signal

The **airH2O 800** system allows for Demand ON/OFF control via an external input signal, specifically using the ON/OFF thermostat (ATW-RTU-04) connected to terminals 13/14 of the Terminal board (input 1, Demand ON/OFF). The behavior is as follows:

- **Demand ON Condition:**
  When a closed signal is active in Input 1, the system enters a Demand ON state. This means that the system is activated for space heating or cooling based on the input signal.
- **Demand OFF Condition:**
  Conversely, when an open signal is active in Input 1, the system transitions to a Demand OFF state. In this condition, the system is deactivated, halting space heating or cooling operations.

NOTE

The options for the configuration should be done through the unit controller.

2.2.14.2 Demand ON/OFF by a room thermostat

The demand ON/OFF function in the **airH2O 800** system provides flexible control options and can be configured in various ways:

1 **Unit controller as room thermostat:**

Utilizing the unit controller as a room thermostat.

2 **Wireless intelligent thermostat (ATW-RTU-06/07):**

Integration with a wireless intelligent thermostat, such as ATW-RTU-06/07.

3 **Central device as air control device:**

Employing a central device as an air control device.

4 **Room temperature sensors + PC-ARFH3E (unit controller + room thermostat):**

Combining room temperature sensors with PC-ARFH3E, which functions as both a unit controller and a room thermostat.

Operational Features:

The system is equipped with overheat or overcool protection. If the room thermostat detects excessive temperature conditions:

- Demand OFF is initiated, leading to the deactivation of the compressor and heater.
- If the ECO pump is selected, the water pump also switches to OFF after the designated over-run time.

The parameters used by the system for the control of this function are described below:

Heating:

- If $RT_{Cn} > RS_{Cn} + Roffh_{Cn}$ → Demand OFF condition
- If $RT_{Cn} \leq RS_{Cn}$ → Demand ON condition

Cooling:

- If $RT_{Cn} < RS_{Cn} - Roffc_{Cn}$ → Demand OFF condition
- If $RT_{Cn} \geq RS_{Cn}$ → Demand ON condition

Where:

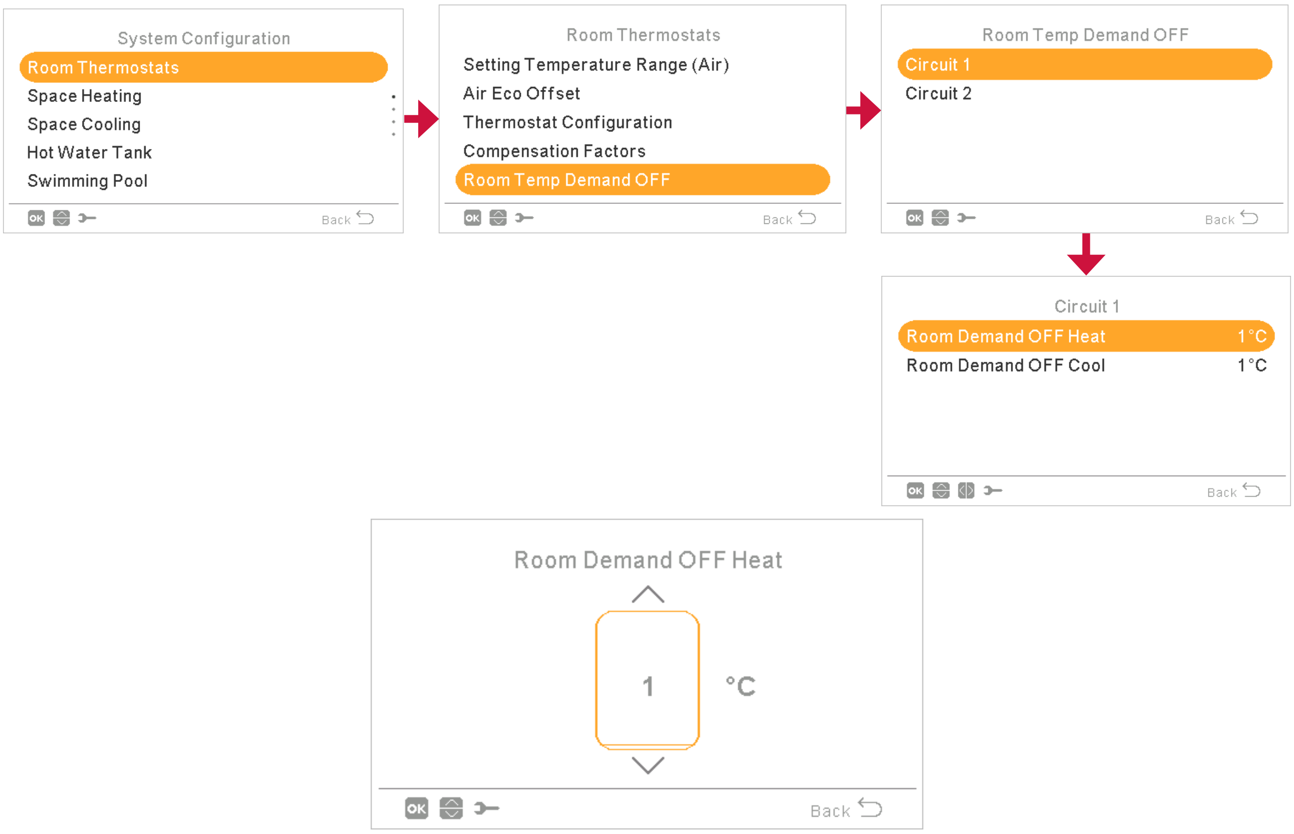
- *RT_{Cn}: Room temperature (°C)*
- *RS_{Cn}: Room temperature set point (°C)*
- *$Roffh_{Cn}$: Hysteresis in Heating (°C)*
- *$Roffc_{Cn}$: Hysteresis in Cooling (°C)*

- *Cn: Circuit number (n=1: Circuit 1; n=2: Circuit 2)*

The configuration of this function should be done through the unit controller:

System Configuration → Room Thermostats → Room Temp Demand OFF → Circuit 1 / Circuit 2

Description	Default Value	Range	Units
Room demand OFF Heat	1	OFF 1~5	°C
Room demand OFF Cool	1	OFF 1~5	°C



NOTE

To disable the room demand ON/OFF function, just set to OFF, then system is in constant demand ON and heat pump is stopped in case Thermo OFF is reached. Room temperature and room temperature set point are still used to adjust water temperature by means room temperature compensation function.

2.2.14.3 Minimum ON/OFF time between demand ON/OFF operation

To mitigate the risk of potential compressor damage, the **airH2O 800** system incorporates the following conditions regarding the minimum ON/OFF time between demand ON/OFF operations:

- **Minimum ON time:**

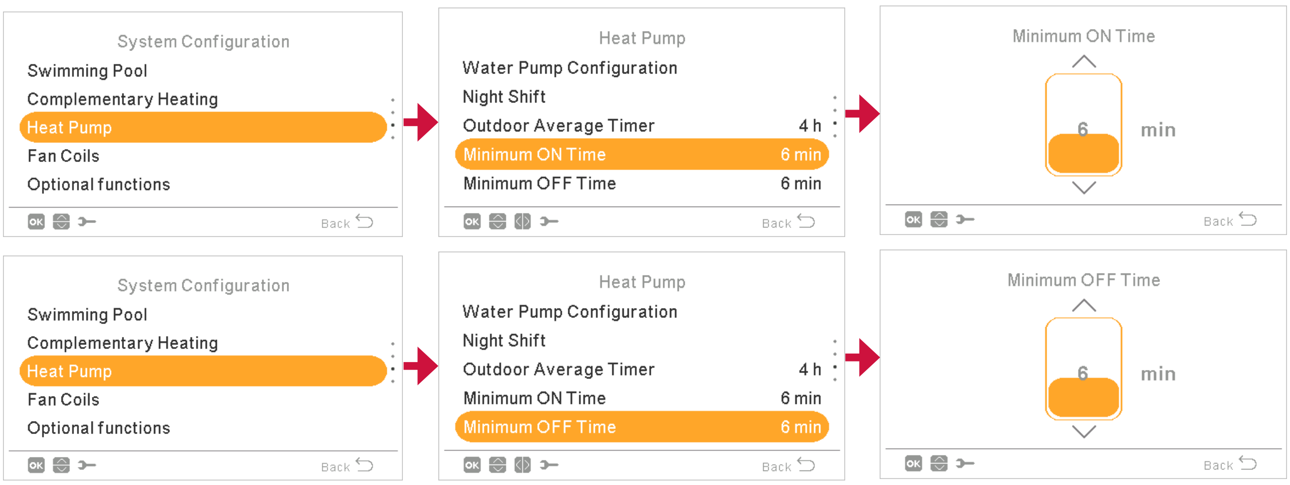
  When a demand ON is activated, this function imposes a minimum duration that the system must remain in the ON state. This measure prevents frequent and rapid cycling of the compressor, contributing to the longevity of the system and reducing the risk of damage.
- **Minimum OFF time:**

  Following a demand OFF scenario, this function sets the minimum duration that must elapse before the system can be reactivated. By enforcing this minimum OFF time, the system ensures a reasonable delay between demand cycles, preventing the compressor from restarting too quickly and enhancing its overall reliability.

This function can be set through the unit controller:

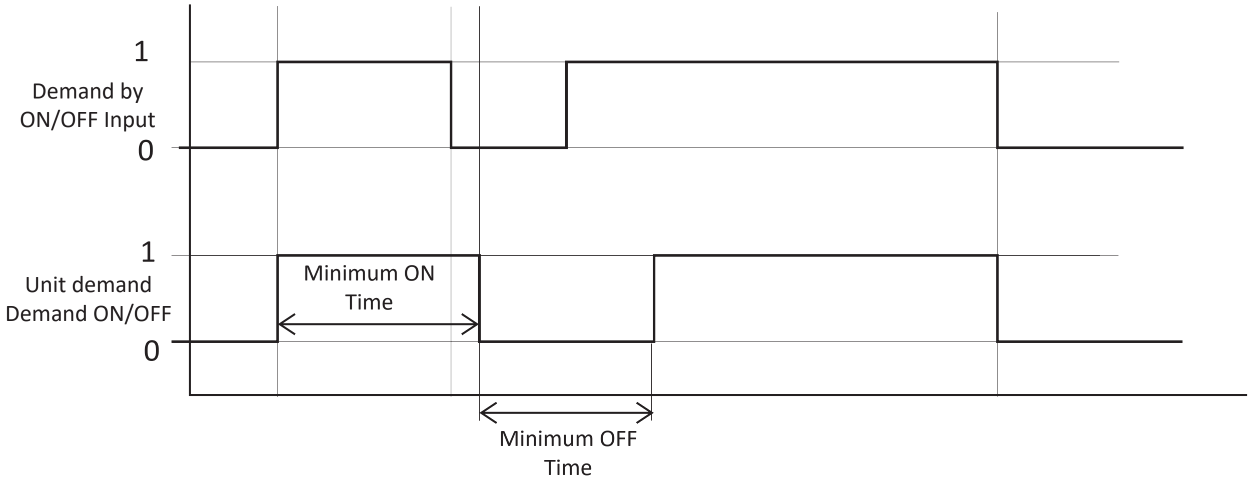
System Configuration → Heat pump

Description	Default Value	Range	Units
Minimum ON Time (Rton)	6	0 ~ 15	min
Minimum OFF Time (Rtoff)	6	0 ~ 15	min



NOTE

- *Time starts counting when a signal is received from an ON/OFF input.*
- *If both parameters are set to 0, this function has no effect.*



NOTE

- *It is applied for 2 circuits (same parameters).*
- *Not considering in compressor start.*

2.2.15 Room temperature compensation control

airH2O 800 offers a room temperature compensation control feature that utilizes room temperatures and room temperature settings to adjust the water temperature setting for both circuits (circuit 1 and 2) to improve user comfort. This function is compatible with various configurations:

1 **Unit controller (PC-ARFH3E) as a room thermostat:**

When PC-ARFH3E is used as a unit controller and room thermostat.

2 **Wireless intelligent thermostat (ATW-RTU-06/07):**

Integration with a wireless intelligent thermostat, such as ATW-RTU-06/07.

3 **Central device as an air control device:**

When a central device is utilized as an air control device.

4 **Room temperature sensors + PC-ARFH3E + room thermostat:**

Combining room temperature sensors with PC-ARFH3E (functioning as a unit controller) and a room thermostat.

5 **Water calculation based on OTC gradient or OTC points:**

This function is applicable when water calculation is based on outside temperature compensation (OTC) gradient or otc points. Fixed settings are not available for this function.

Room Temperature Compensation Operation:

Throughout the day, following the time program in the room unit, changes in the room temperature set point lead to a shift in the heating curve—either upwards or downwards—reflecting variations in the desired room temperature. The adjustment in the supply set point, due to the room set point, is influenced by the outside temperature and the selected heating curve.

When room compensation is enabled, the calculated supply set point is adjusted based on the difference between the room temperature and the room set point, reducing room temperature errors. The extent of room influence can be fine-tuned using the room temperature compensation factor setting.

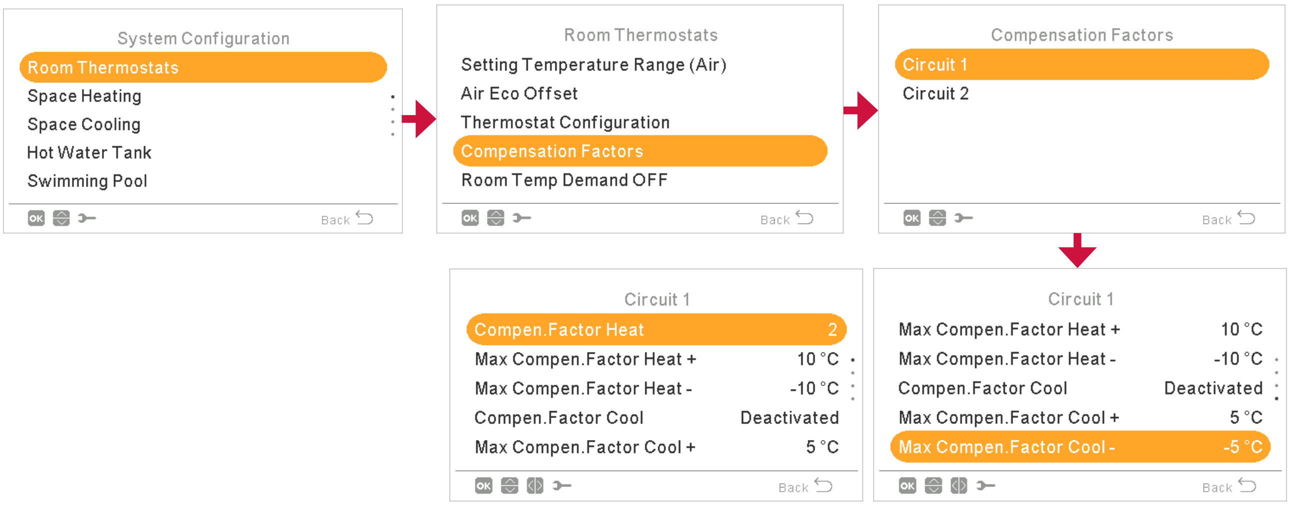
Adjusting the room compensation factor allows users to increase or decrease the level of room compensation. A higher value prioritizes room temperature error reduction, while a lower value aligns the controller more closely with the selected heating curve.

This comprehensive room temperature compensation control provides users with the ability to tailor the system's response to room conditions, balancing comfort and energy efficiency based on individual preferences.

The configuration of this parameter should be done through the unit controller:

System Configuration → Room Thermostats→ Compensation Factors → Circuit 1 / Circuit 2

Description	Default Value	Range	Units
Compen.Factor Heat	2	OFF- 1~5	
Max Compen.Factor Heat +	10	0-10	°C
Max Compen.Factor Heat -	-10	-10-0	°C
Compen.Factor Cool	OFF	OFF- 1~5	
Max Compen.Factor Cool +	5	0-10	°C
Max Compen.Factor Cool -	-5	-10-0	°C



NOTE

- *To disable Room compensation function, set to OFF.*
- *Maximum compensation factor (heat/cool; +/-) sets the maximum value of compensation value (positive or negative) to be adjusted in OTC setting control.*

Water temperature set point is calculated as follow:

Heating

- TtwoCn: = Ttwo_OTCn + Rfacthn x (ΔTroom)
  - ✓ If Rfacthn x (ΔTroom2) > Maxfacthpn → Rfacthn x (ΔTroom) = Maxfacthpn
  - ✓ If Rfacthn x (ΔTroom2) < Maxfacthnn → Rfacthn x (ΔTroom) = Maxfacthnn

Cooling

- TtwoCn: = Ttwo_OTCn - Rfactcn x (ΔTroom)
  - ✓ If Rfactcn x (ΔTroom) < Maxfactcnn → Rfactcn x (ΔTroom) = Maxfactcnn
  - ✓ If Rfactcn x (ΔTroom) > Maxfactcpn → Rfactcn x (ΔTroom) = Maxfactcpn

Where:

- *TtwoCn: Result Water Set points for Cn Circuit (°C);*
- *Ttwo_OTCn: Water Set points as calculated by OTC in Cn Circuit (°C);*
- *ΔTroom: Room Temperature Offset = RSC - RTCn.*
- *RSCn = Room set point (°C);*
- *RTCn = Room temperature (°C);*
- *Cn: Circuit number (n= 1 Circuit 1; 2= Circuit 2)*

NOTE

- *When water calculation is fixed, room set point influence has no effect.*
- *First 10 minutes after power on room set point influence has no effect.*

2.2.16 Switch OFF space condition by room thermostat

The **airH2O 800** system provides a feature allowing the use of room temperature and room temperature setting to switch OFF the system under specific conditions. This functionality is available in the following scenarios:

1 **PC-ARFH3E as room thermostat:**

The system can be turned OFF by pushing the OFF button on PC-ARFH3E when used as a room thermostat.

2 **Wireless intelligent thermostat (ATW-RTU-06/07):**

If the room temperature setting (RS) on ATW-RTU-06/07 is lower than 10 °C, it triggers a switch OFF condition for the selected heating or cooling space. If both user thermostats (circuit 1 and circuit 2) are involved, it results in a unit OFF condition for the overall heating space or cooling space.

2.2.17 Determination of room temperature data

The determination of room temperature data in the **airH2O 800** system involves the utilization of various room temperature sensors. The available options for room temperature sensors are:

1 **PC-ARFH3E sensors:**

- Room temperature data can be sourced from PC-ARFH3E sensors.

2 **Unit Taux sensor as room temperature sensor:**

- The unit Taux sensor can be used as a room temperature sensor.

3 **Central application:**

- Room temperature data can also be obtained from a central application.

Priority of room temperature sensor application for compensation functions:

The system follows a priority order when applying room temperature compensation functions:

1. Use data from the unit Taux sensor.
2. If the unit Taux sensor data is unavailable or not applicable, use data from PC-ARFH3E sensors.
3. If neither the unit Taux sensor nor the PC-ARFH3E sensors provide data, rely on data from the central application.

Priority in room temperature setting:

The priority in room temperature setting is determined as follows:

- If data is received from the central application, the central setting value takes precedence in all cases.
- Subsequently, the value is only updated if the room thermostat (wired or wireless) provides a different value than the previous one. This update occurs after restoring the value to its previous state before the change made by the central value.

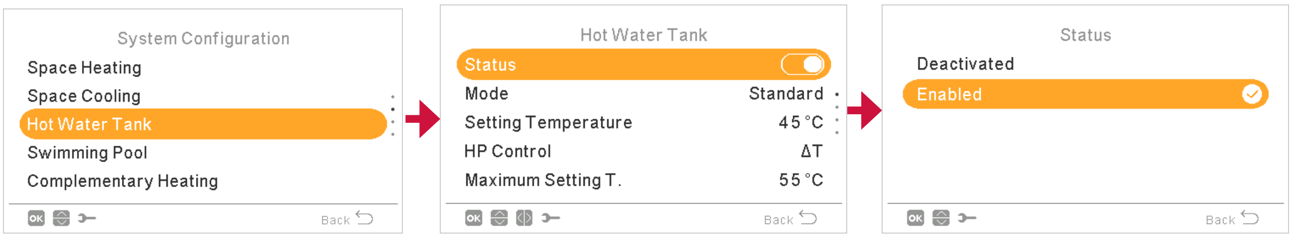
2.3 Sanitary water operation

2.3.1 Enabling operation

Sanitary water operation should be enabled from the unit controller:

System Configuration → Hot Water Tank

Description	Default Value	Range
Status	Deactivated	Deactivated / Enabled



The sanitary operation mode in the **airH2O 800** system is accorded priority over all other operation modes, unless otherwise specified. Several constraints govern the interactions between Sanitary Operation and other modes:

1 **Heat pump operation for sanitary water:**

When sanitary water requires heat pump operation, no other modes are allowed to simultaneously demand heat pump operation. The priority is given to satisfying the requirements of the sanitary water, and this takes precedence over other modes.

2 **Sanitary water without heat pump operation:**

If sanitary water operation does not necessitate heat pump operation, and the system is either stopped or working solely with the heater, there are no restrictions on the activation of other operation modes. In this scenario, the system is free to operate in other modes as needed.

3 **Solar application priority:**

Solar application is granted priority if the waiting time for solar has not yet passed. In situations where solar energy is available, the system prioritizes its utilization for heating purposes before resorting to alternative modes.

2.3.2 DHW Tank heater operation

The electric heater of the domestic tank is Deactivated factory setting. The configuration for this function should be enabled through the DIP switch of PCB.

Configuration: DSW4 PIN3: ON

2.3.3 DHW temperature setting

The domestic hot water (DHW) temperature setting in the **airH2O 800** system involves specific conditions for starting or stopping the sanitary water operation. Here are the conditions that determine when DHW operation is stopped (DHWT Demand OFF) or started (DHWT Demand ON):

1 **DHWT Demand OFF Conditions:**

Sanitary water operation, both with the heater and heat pump, is stopped when TDHW (Domestic hot water temperature) is greater than TDHWS (Setting of domestic hot water temperature).

2 **DHWT Demand ON Conditions:**

Sanitary water operation resumes under the following conditions:

- Operation mode is either High Demand or Standard Demand.
- Boost operation mode is active.

NOTE

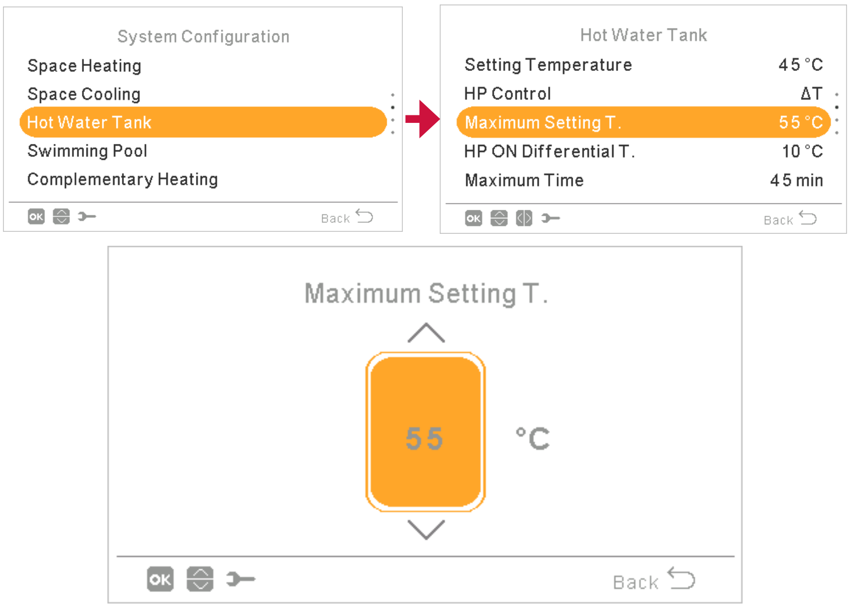
- *The heat pump can independently produce domestic hot water up to a maximum of 70 °C. However, Hitachi recommends setting the temperature of the tank by the heat pump only up to 50 °C and keeping the default value for Thpoff. If a higher temperature setting is desired, the tank's heater must be used to reach the setting temperature, and this functionality is enabled through an optional function.*
- *The water tank may not reach the desired temperature solely via the heat pump system if the outdoor ambient temperature is too low, limiting the maximum temperature of the tank's primary circuit water flow. In such cases, the heat pump will heat the tank to its maximum achievable temperature, which may be lower than the desired setpoint. If the desired temperature is not reached, the electric heater (if enabled) will provide additional heating to achieve it.*

2.3.4 Maximum set point selected by installer

To prevent excessively high hot water temperatures in the tank, the **airH2O 800** system incorporates an additional function that allows the installer to set a maximum temperature for the hot water tank. This setting can be adjusted in the system configuration:

System Configuration → Hot Water Tank

Description	Default Value	Range	Units
Maximum Setting T°	55	40~70	°C



NOTE

- *For all units, the default maximum setting temperature is 75 °C when the tank heater is enabled by DSW4 PIN3: ON or when the boiler combination mode is set to parallel, and DHW by the boiler is enabled.*

2.3.5 DHW operation mode

The Domestic Hot Water (DHW) operation in the **airH2O 800** system can function in three different modes: economic, standard, and high demand modes. Each mode has specific characteristics and conditions:

1 **Economic Mode (airH2O 800H Combi only):**

Conditions for activation: DHW heating operation starts under the same conditions as the standard mode, with the difference that water temperature measurement is conducted at a higher tank position. This adjustment reduces the number of DHW operations and extends their duration, enhancing overall efficiency.

2 **Standard Mode:**

Conditions for activation: DHW heating operation begins when the temperature of the water in the tank is low enough to activate the heat pump. DHW is heated up using either the heat pump or the electrical heater (if enabled).

3 **High Demand Mode:**

Conditions for activation: DHW heating operation starts when the temperature difference between the water temperature and the setting temperature is larger than the specified differential temperature. DHW can be heated up using the heater, the heat pump, or a combination of both. This mode is only available when the hot water tank heater is activated (DSW4 pin 3 ON).

DHW operation mode should be selected from the unit controller:

System configuration → DHW

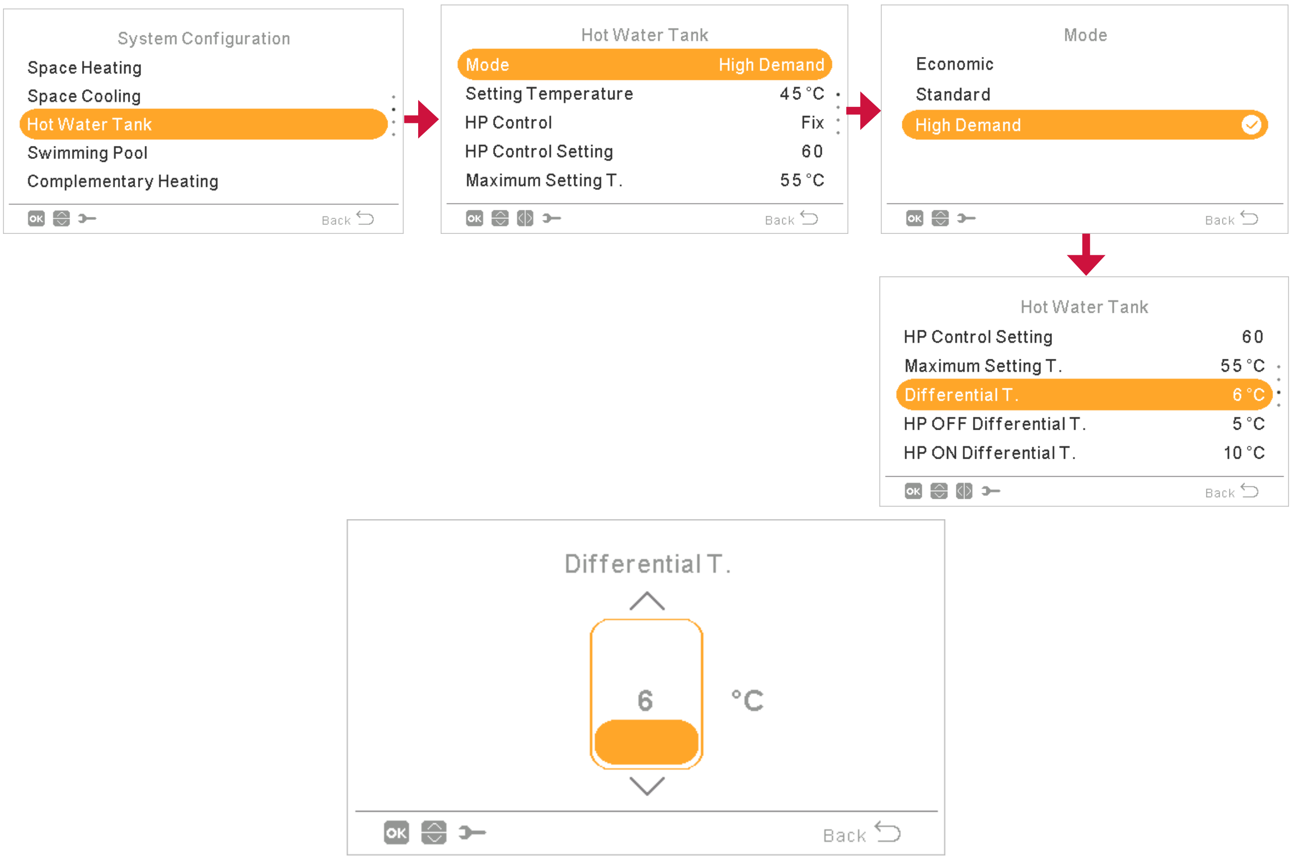
Description	Default Value	Range
Mode	Standard	Standard Economic High Demand

2.3.5.1 Differential temperature for DHW high demand mode

In the **airH2O 800** system, the differential temperature for the DHW high demand mode can be configured and adjusted through the unit controller. This setting allows users or installers to customize the conditions under which the High Demand Mode is activated for domestic hot water (DHW) heating.

System configuration → Hot water tank

Description	Default Value	Range	Units
Differential T	6	2~15	°C



2.3.6 Heat pump operation for DHW (T_{HPON} and T_{HPOFF})

The operation of the heat pump for Domestic Hot Water (DHW) is governed by specific temperature conditions, and the relevant parameters are T_{HPON}, T_{HPOFF}, T_{HPSTOP} and $T_{HPSTART}$. Here's how the heat pump operation for DHW is managed:

1 **Heat pump activation for DHW:**

Heat pump operation for DHW begins when the actual water temperature in the tank (T_{DHW}) is lower than the $T_{HPSTART}$ temperature.

2 **Heat pump deactivation for DHW:**

Heat pump operation for DHW ceases when the actual water temperature in the tank (T_{DHW}) is higher than the T_{HPSTOP} temperature.

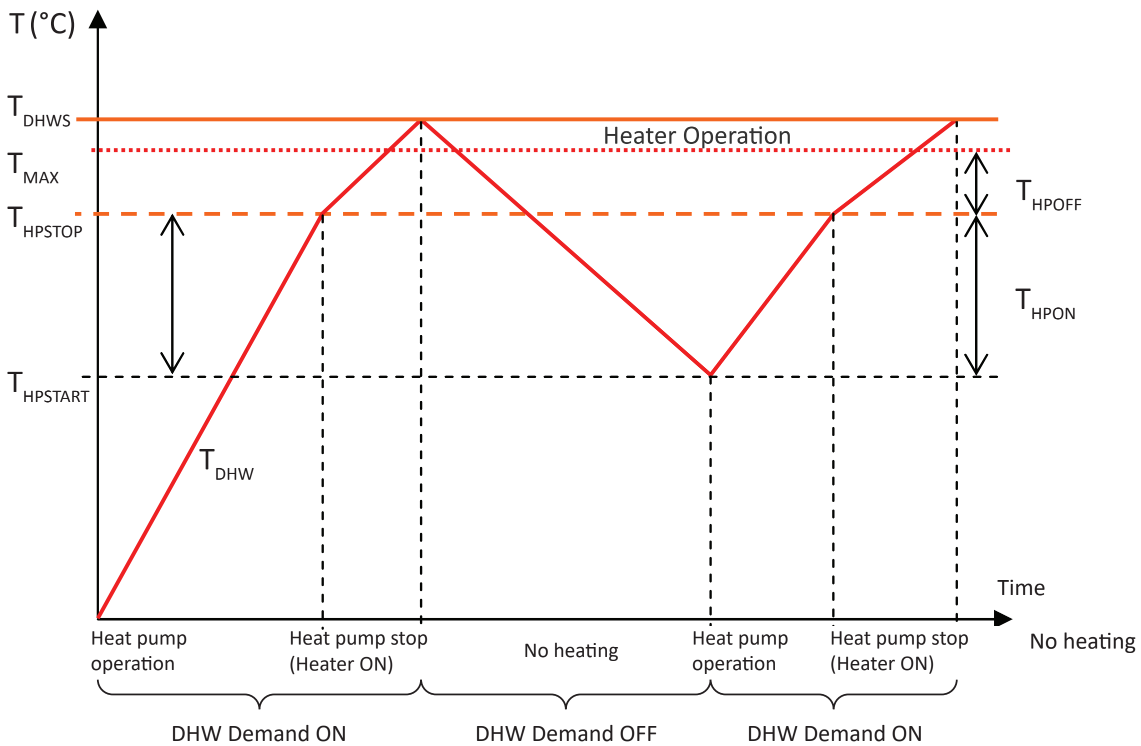
3 **Post-deactivation tank heating:**

After heat pump deactivation, the unit continues to heat the sanitary water tank using the sanitary tank electric heater (if enabled) until the stoppage conditions are met.

4 **Tank heating by heat pump after deactivation (if enabled):**

If the sanitary tank electric heater is disabled (default setting), the heat pump continues to heat the sanitary water tank until reaching the T_{HPSTOP} temperature.

Control



Where:

- *T_{DHWS}: DHWT Setting temperature (°C)*
- *T_{MAX}: Heat pump maximum temperature (defined by unit working range) (°C)*
- *T_{HPSTOP}: Temperature which the heat pump stop heat the tank*
- *$T_{HPSTART}$: Temperature which the heat pump start to heat the tank*
- *$T_{HPSTART}$ will be limited to equal or lower than 42 °C when ambient temperature (Tamb) > 25 °C*

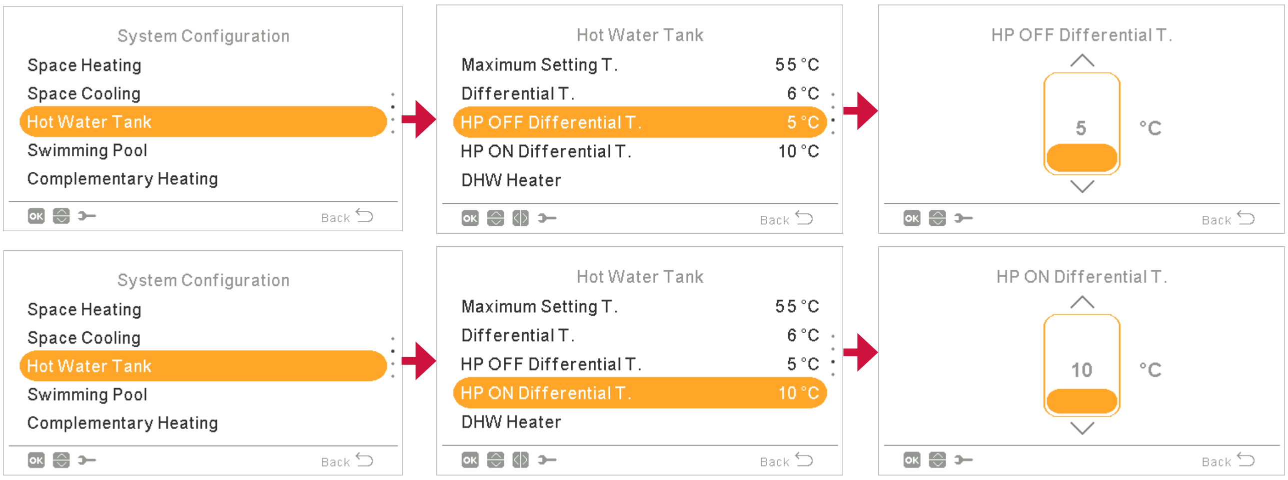
NOTE

The heat pump can independently produce domestic hot water up to a maximum of 70 °C. However, Hitachi recommends setting the temperature of the tank by the heat pump only up to 50 °C and keeping the default value for Thpoff. If a higher setting is desired, the tank's heater must be used to reach the setting temperature (enabled by an optional function).

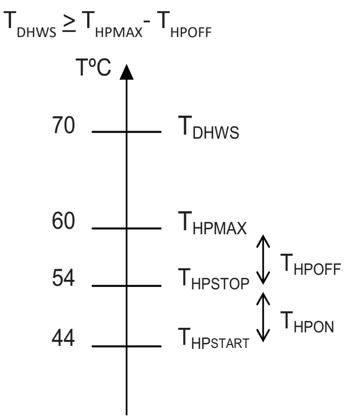
The configuration of this function should be done through the unit controller:

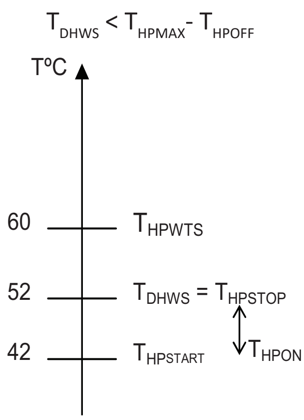
System configuration → Hot water tank

Description	Default Value	Range	Units
HP OFF Differential T	5	3~10	°C
HP ON Differential T	10	5~35	°C



Example of temperature settings for **airH2O 800H**, **airH2O 800H Combi** and Control Box:





2.3.7 Maximum DHW loading time (T_{DHWMAX})

The Maximum DHW Loading Time (T_{DHWMAX}) function controls the maximum time that sanitary water operation can work using the heat pump mode. This function does not affect heater operation. Here are the key points related to T_{DHWMAX}:

1 **Maximum DHW heating Time:**

T_{DHWMAX} sets the maximum allowable time for sanitary water operation in heat pump mode. This limitation is specifically applied to the heat pump portion of DHW heating.

2 **Dependency on DHW second cycle waiting time:**

The Maximum DHW Heating Time cannot be applied when DHW second cycle waiting time (DHW_{CDHW}) is disabled or set to 0.

3 **Application conditions for maximum DHW heating time:**

The maximum DHW heating time is applied when:

- DHW electric heater is enabled through DSW (Dip Switch) settings.
- DHW electric heater waiting time is enabled.

4 **Heat pump DHW demand OFF condition:**

Heat pump DHW demand is turned OFF if the heat pump operation time exceeds T_{DHWMAX}.

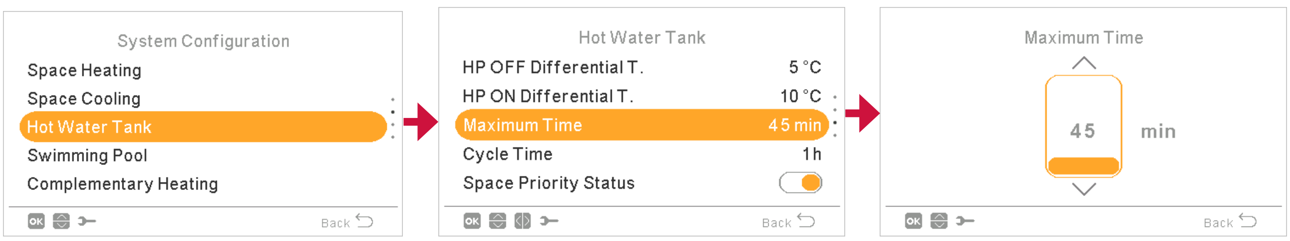
NOTE

When the heat pump is stopped by the T_{DHWMAX} function, sanitary water is still heated by the heater (if enabled) until other conditions request stoppage.

The configuration of this option should be done through the unit controller:

System configuration → Hot water tank

Description	Default Value	Range	Units
Maximum Time	45	OFF 5~250	min



2.3.8 DHW second cycle waiting time

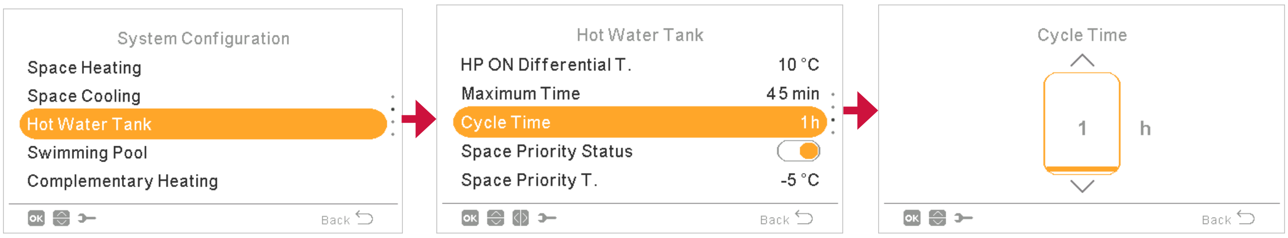
The DHW second cycle waiting Time function defines the minimum time between 2 heat pump cycles for domestic hot water (DHW). This function is active only when the standard mode or economic mode is selected.

Sanitary water heating is not active when the time between 2 consecutive DHW heat pump cycles (sanitary water OFF time) is less than the specified cycle time.

This function can be configured through the unit controller:

System configuration → Hot water tank

Description	Default Value	Range	Units
Cycle Time	1	0~24	hour



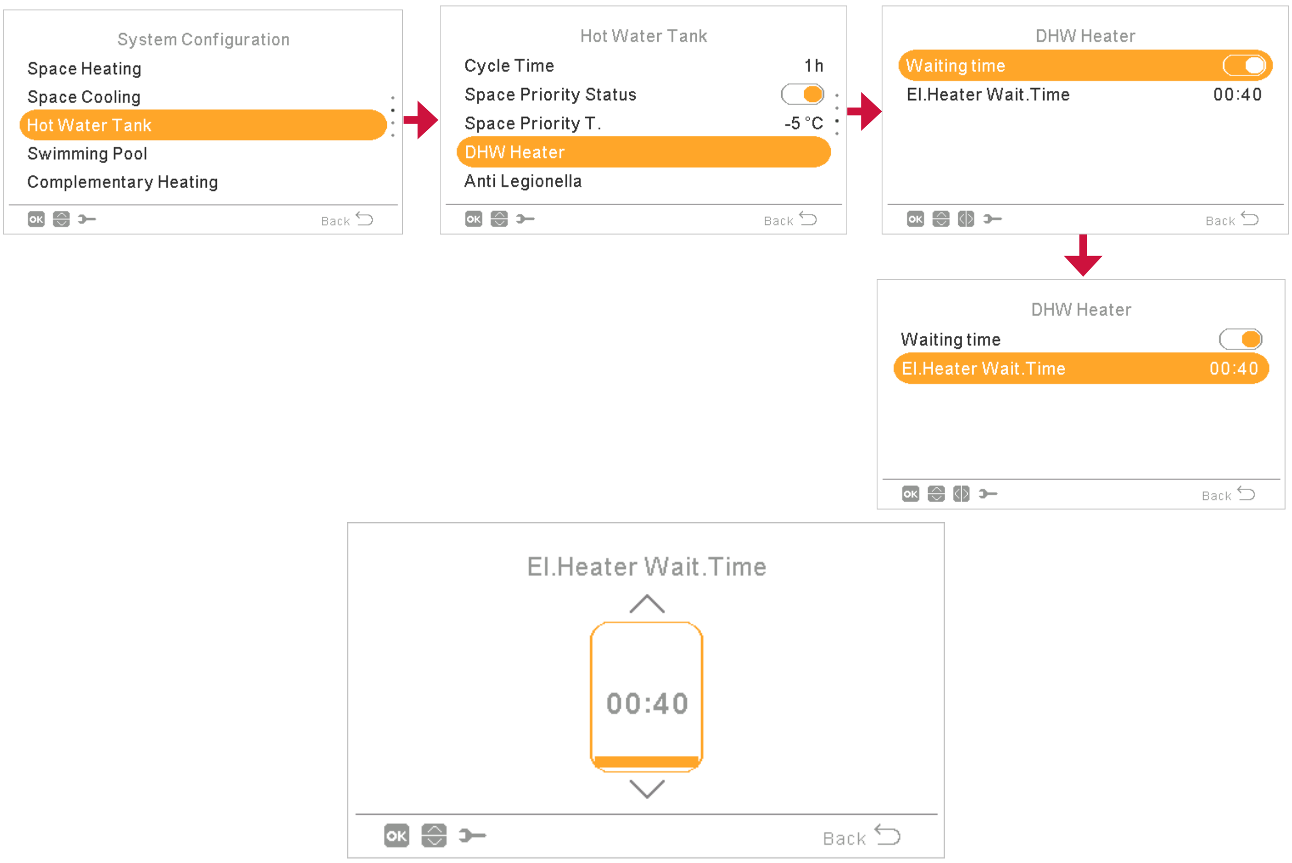
2.3.9 DHW electric heater waiting time

The DHW electric heater waiting time function is implemented to address situations where the heat pump alone cannot provide sufficient capacity for heating domestic hot water (DHW). When the heat pump is unable to meet the required capacity, the electric heater is activated to supplement the heating process.

The electrical heater wait time parameter (DHW_{EH}) defines the waiting time for the beginning of electric heater operation since the compressor start-up. This parameter allows for a controlled delay before engaging the electric heater, allowing the system to assess the heat pump's initial performance before activating the electric heater.

System configuration → Hot water tank →DHW Heater

Description	Default Value	Range
Waiting time (DHW_{EH})	Deactivated	Deactivated / Enabled
El.Heater Wait Time (DHW_{EH})	00:40	00:10 ~ 08:00



DHW electric heater waiting time (DHW_{EH}) setting options:

- Deactivated: If DHW_{EH} is set to deactivated, the system considers that the electric heater is only used after reaching T_{HPSTOP}. This implies that the electric heater comes into play once the heat pump operation has stopped due to reaching T_{HPSTOP}.
- Enabled: If DHW_{EH} is set to enabled, the system assumes that the electric heater is always used when there is a DHW demand operation, regardless of the conditions related to T_{HPSTOP}.

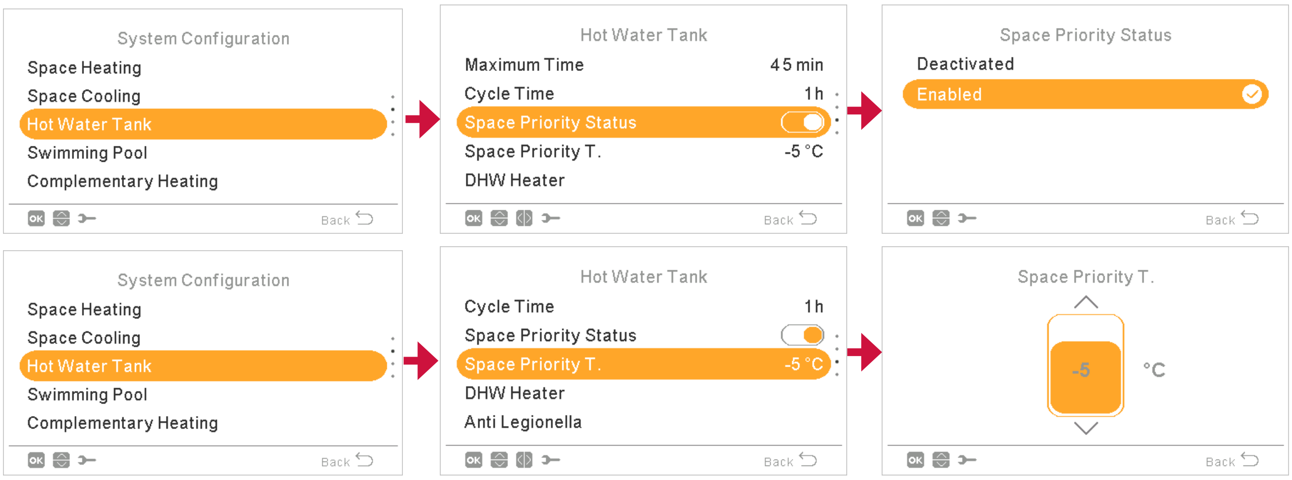
2.3.10 Space heating priority temperature

The space heating priority temperature function allows for prioritizing space heating over domestic hot water (DHW) heating. When this function is enabled, the heat pump operation in sanitary mode stops, and the system continues with the heater if necessary, giving priority to space heating.

This function is only performed if space heating or space cooling can be done. If space heating or space cooling is not possible, the operation continues with DHW heating as usual.

System configuration → Hot water tank

Description	Default Value	Range	Units
Space Priority Status	Deactivated	Deactivated / Enabled	-
Space Priority T	-5	-20~0	°C



2.3.11 DHW compatibility overview

◆ airH2O 800M, airH2O 800H, airH2O 800H Combi and Control Box

	Operation Mode		
Operation Control	ECO(*)	Standard	High Demand
HP Start	$THM_{DHWTH} < T_{HPSTART}$	$THM_{DHWTL} < T_{HPSTART}$	$THM_{DHWTL} < T_{HPSTART}$
HP Stop	$THM_{DHWTH} > T_{HPSTOP}$	$THM_{DHWTL} > T_{HPSTOP}$	$THM_{DHWTL} > T_{HPSTOP}$
EH Start	In case Electric heater waiting time is enabled, it starts after electric heater waiting time (DHWEH) is passed. On the other hand in case T_{DHWS} > 55 °C, electric heater starts when HP stops.		$THM_{DHWTL} < (T_{DHWS} - T_{DHWON})$
EH Stop	$THM_{DHWTH} > T_{DHWS}$	$THM_{DHWTL} > T_{DHWS}$	$THM_{DHWTL} > T_{DHWS}$

Operation Control	Anti-legionella	Boost	Emergency
HP Start	$THM_{DHWTL} < T_{HPSTART}$	$THM_{DHWTL} < T_{HPSTART}$	-
HP Stop	$THM_{DHWTL} > T_{HPSTOP}$	$THM_{DHWTL} > T_{HPSTOP}$	-
EH Start	$THM_{DHWTL} \leq ANTL_{SET}$ + 3 °C	$THM_{DHWTL} < DHW_{bs}$	$THM_{DHWTL} < T_{DHWS}$ – 4 °C
EH Stop	$THM_{DHWTL} \geq ANTL_{SET}$ + 5 °C	$THM_{DHWTL} > DHW_{bs}$	$THM_{DHWTL} > T_{DHWS}$

NOTE

- *ECO mode is only available for* **airH2O 800H Combi**.
- *THM_{DHWTL} = Water temperature inside tank read by the lower thermistor (°C).*
- *THM_{DHWTH} = Water temperature inside tank read by the upper thermistor (°C).*
- *$T_{HPSTART}$ = Temperature which the heat pump starts to heat the tank (°C).*
- *T_{HPSTOP} = Temperature which the heat pump stops heat the tank (°C).*
- *T_{DHWON} = 6 °C by default on remote controller. Only editable in high demand.*
- *T_{DHWS} = DHWT Setting temperature (°C).*
- *DHW_{bs} = Boost setting temperature (°C).*
- *$ANTL_{SET}$ = Anti-legionella setting temperature (°C).*

2.3.12 DHW defrost

This function allows to perform the defrost operation at the DHW tank instead of at the indoor water installation. This configuration is done through dip switch of PCB.

This option is recommended to be used where minimum water volume to perform defrost is assured, when external DHW tanks are installed.

Configuration:

DSW4 PIN8: OFF

When defrost signal is received from the outdoor unit during sanitary water operation, the 3-way valve is switched OFF to perform the defrost operation into the space heating circuit. This operation mitigates the drop of the water temperature inside the sanitary water tank, and therefore the required operation time to achieve water setting temperature is reduced.

DSW4 PIN8: ON

When defrost signal is received from the outdoor unit, the 3-way valve of the DHW is set to ON in order to proceed to the defrost operation into the tank.

2.3.13 Optional function for DHW

2.3.13.1 DHW Anti Legionella protection

Legionella protection in the domestic hot water system is addressed by allowing the DHW set point to be temporarily raised to a higher-than-normal temperature. This is particularly effective when there is a DHW electric heater to achieve and maintain this elevated temperature.

NOTE

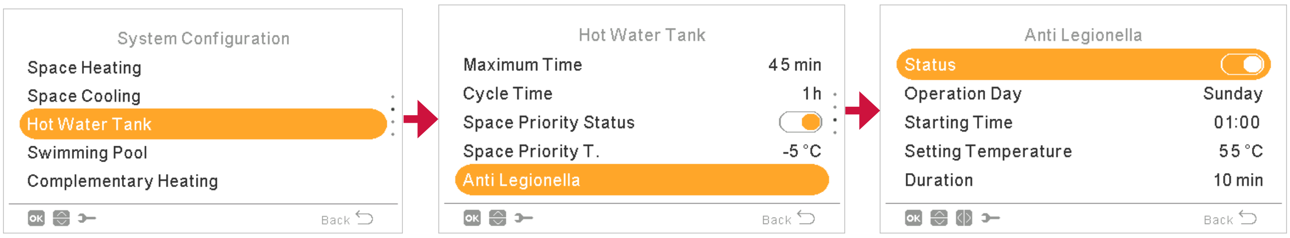
The installer, according to national regulation, must configure this disinfection function field setting.

Installers have the following configuration parameters that can be done through the unit controller:

- **Operation day:** specifies the day(s) of the week on which the domestic water should undergo disinfection (heating to a higher temperature).
- **Status:** defines whether the disinfection function is turned ON (1) or OFF (0).
- **Starting time:** sets the time of the day at which the domestic water disinfection should begin.
- **Setting temperature:** specifies the high water temperature to be reached during the disinfection process.
- **Duration:** defines the time period during which the set point temperature should be maintained for effective legionella protection.

System configuration → Hot water tank → Antilegionella

Description	Default Value	Range	Units
Status	Deactivated	Deactivated / Enabled	-
Operation day	Sunday	Daily / Mon ~ Sun	day
Starting Time	01:00	(00:00~ 23:50)	time
Setting temperature	70(*)	40~55(*2)	°C
Duration	10	10~60	min



NOTE

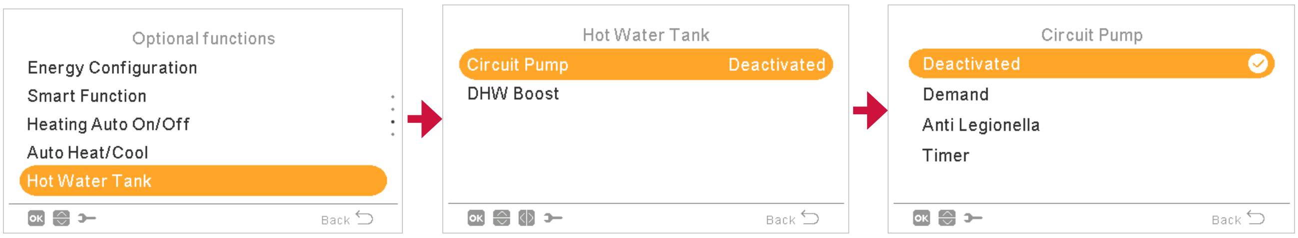
- *(*) The default temperature for Legionella protection is 55 °C for installations without an electrical heater.*
- *(*2) The maximum setting temperature is 75 °C when the electrical heater is enabled (DSW4-3 ON).*
- *Antilegionella takes priority when smart activation is configured as "only DHW enabled" or during timer DHW operation.*
- *In case of OFF DHWT (Domestic Hot Water Tank) Operation, Antilegionella is not enabled.*
- *DHWset has an offset of 3 °C to ensure a keeping period during Legionella protection.*

2.3.13.2 DHW re-circulation

In the **airH2O 800** system, there is an output dedicated to Domestic Hot Water (DHW) Water Pump Re-circulation. This feature allows users to circulate and heat all the water inside the DHW system when heating DHW with the heat pump. Additionally, this output can be utilized in conjunction with Legionella protection and timer functions.

System configuration → Optional functions → Hot water tank

Description	Default Value	Range
Circuit pump	Deactivated	Deactivated Demand Anti Legionella Timer



1 **Deactivated Mode:**

When the DHW Water Pump Re-circulation output is deactivated, it is not utilized, and the circulation is not initiated.

2 **Demand Mode:**

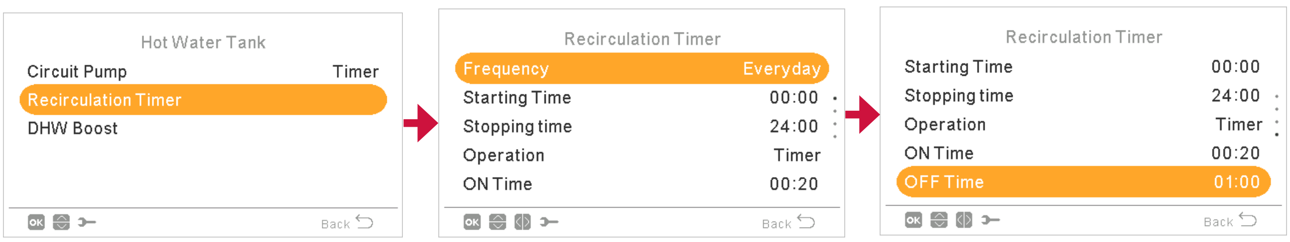
In the demand mode, the output is enabled when the Domestic Hot Water heating operation (either by the heat pump or heater) is actively in progress.

3 **Anti Legionella Mode:**

During Anti-legionella operation, the output must be enabled when the Domestic Hot Water heating operation for Legionella protection (using the heat pump or heater) is engaged.

4 **Timer Mode:**

The timer function allows users to program the water recirculation based on specific schedules. Users can set the timer to start or stop the water recirculation at predefined times.



2.3.13.3 DHW boost

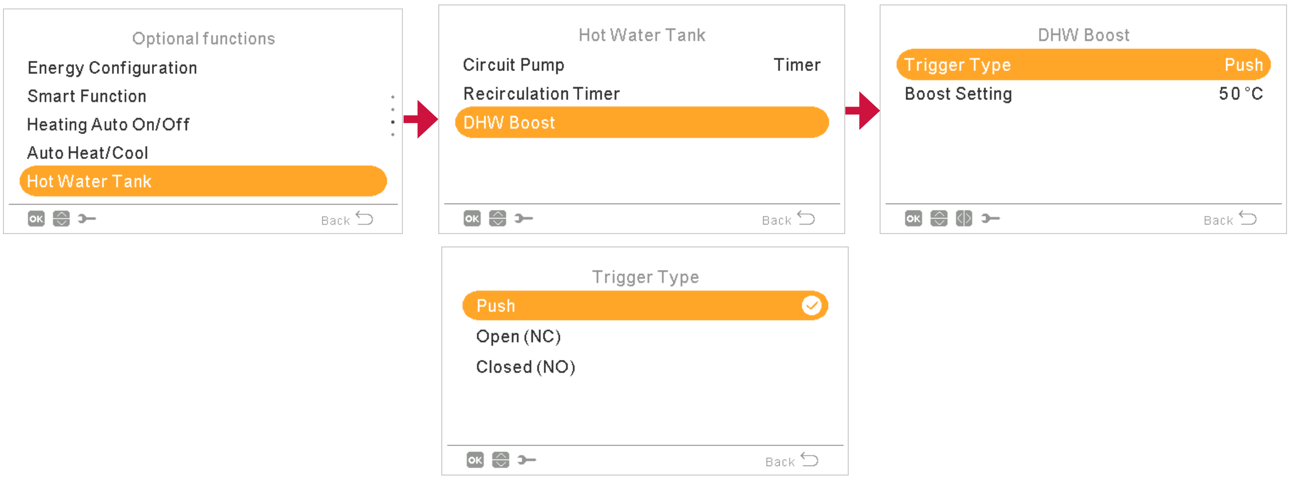
The DHW Boost feature in the **airH2O 800** system allows users to initiate a one-time heating of the domestic hot water temperature, raising it to the specified boost temperature setting. This feature proves beneficial in situations where an immediate increase in hot water temperature is needed for a single day.

The configuration of this option should be done through the unit controller:

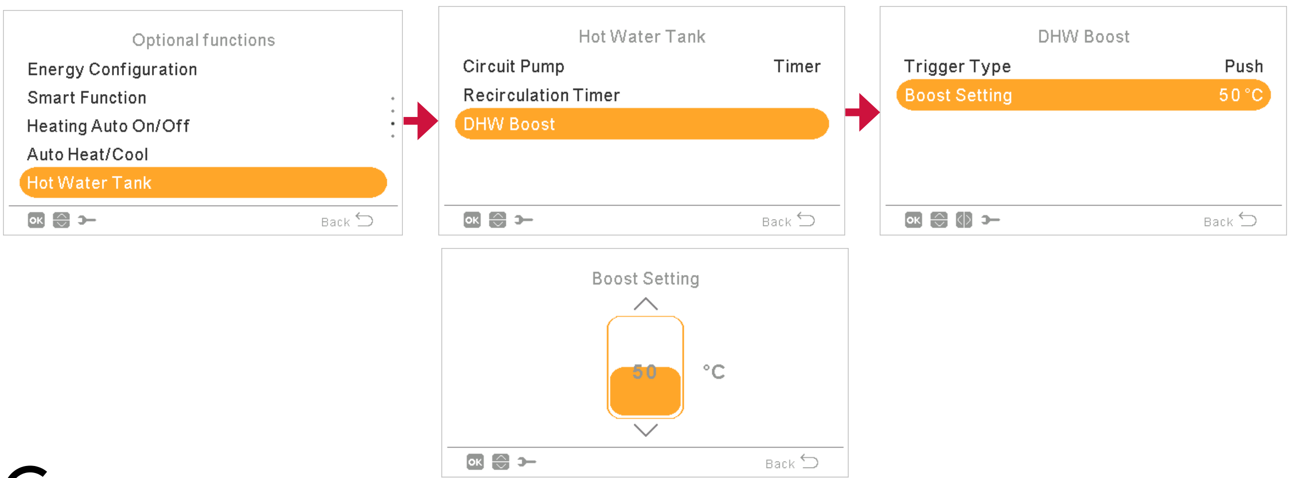
System configuration → Optional functions → Hot water tank → DHW Boost

Description	Default Value	Range
Trigger type	Push	Push Open Closed
Boost setting	50	30 ~ Max set by installer

1 To initiate a boost operation, ensure the specified input designated for boost is checked and apply the chosen action (push, open, or closed).



2 Select the boost setting temperature:



NOTE

If boost is started, it might not be stopped until temperature is reached.

2.4 Auxiliary electric heater for space heating

The **airH2O 800H** standard version (HWM-W2E) and **airH2O 800H Combi** (HWD-W2E-220S(-K)) units come equipped with a 6 kW integrated electric heater, designed to provide additional heating capacity during extremely cold outdoor temperatures. For the Control Box unit (ATW-CBX-01), the electric heater should be requested as an accessory (WEH-6E).

Model	Heater Capacity	Heater steps	Electrical Heater nominal voltage
2 - 6 HP	6 kW	3 steps (2/4/6 kW)	~ 230 V 50 Hz / 3N~ 400 V 50 Hz

Operation Conditions:

The electric heater functions only when the unit is in space heating mode.

It is disabled in other modes such as hot sanitary water, swimming pool, and cooling mode.

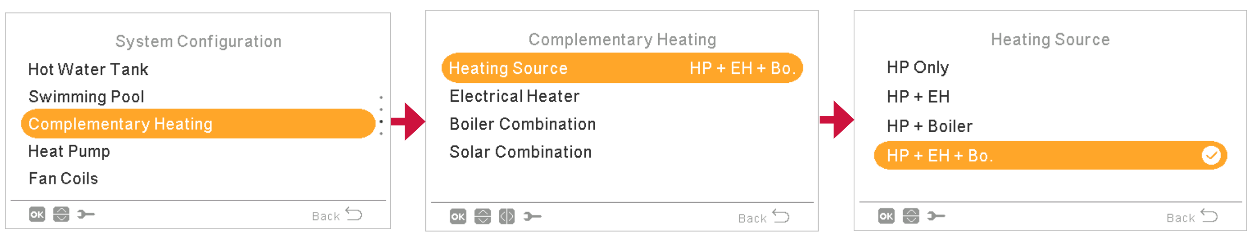
Heating Source Configuration:

The electric heater operates when the heating source is set to either "heater" or "heater + boiler."

In the case of "heater + boiler," it will never operate simultaneously with both; the decision is based on ambient temperature considerations.

System Configuration – Complementary Heating

Description	Default Value	Range
Heating source	HP only	HP only HP + Heater HP + Boiler HP + Heater + Boiler



2.4.1 Electric heater bivalent point

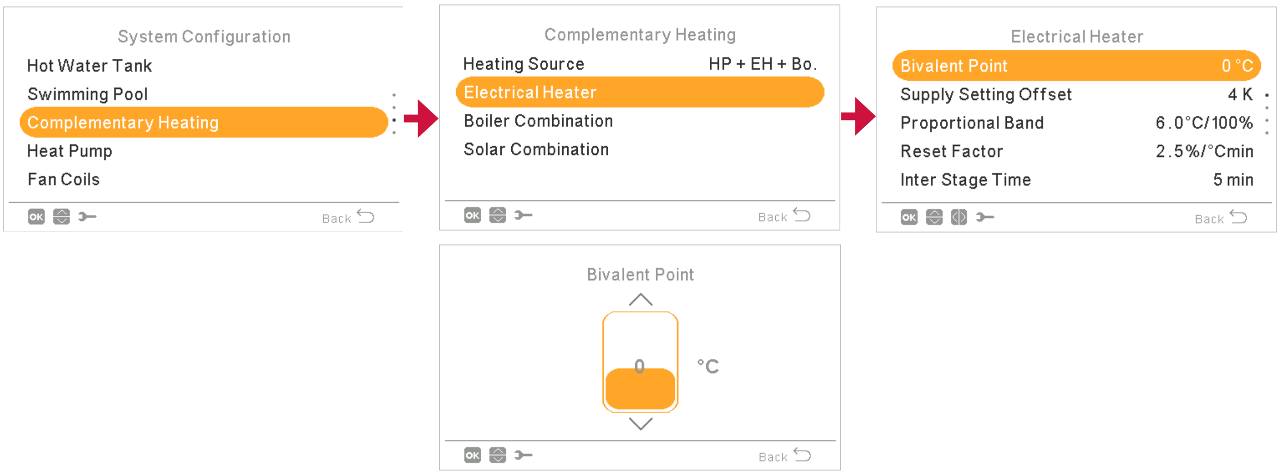
The operation of the electric heater in **airH2O 800** units is contingent upon specific conditions, particularly the outdoor ambient temperature in relation to the bivalent point for the electric heater.

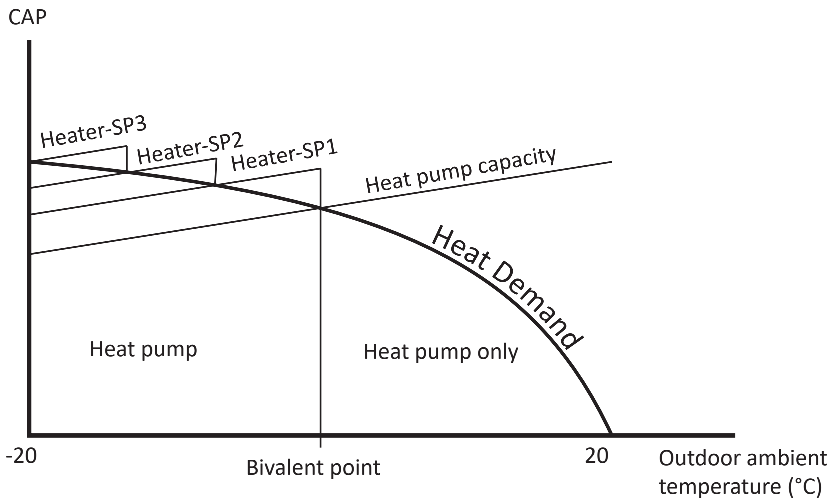
The electric heater will only be enabled when the outdoor ambient temperature is greater than the bivalent point set for the electric heater.

This condition ensures that the electric heater is utilized strategically, typically during extremely cold outdoor temperatures when additional heating capacity is required.

System Configuration – Complementary Heating – Electrical Heater

Description	Default Value	Range	Units
Bivalent Point	0	-20~20	°C



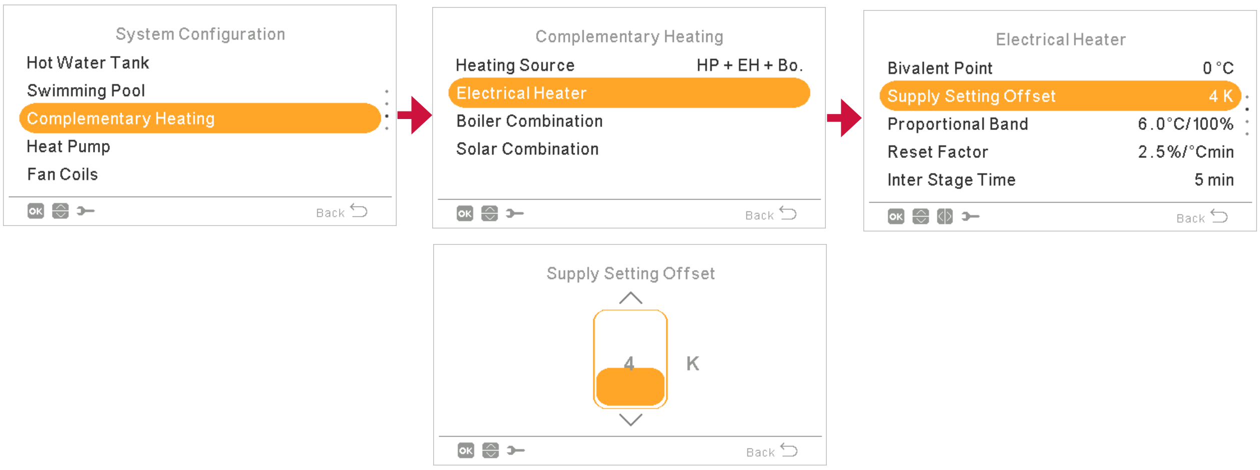


2.4.2 Target temperature

The operation of the electrical heater is influenced by the heater set point, and the system allows users to fine-tune this operation through the supply setting offset.

System Configuration – Complementary Heating - Electrical Heater

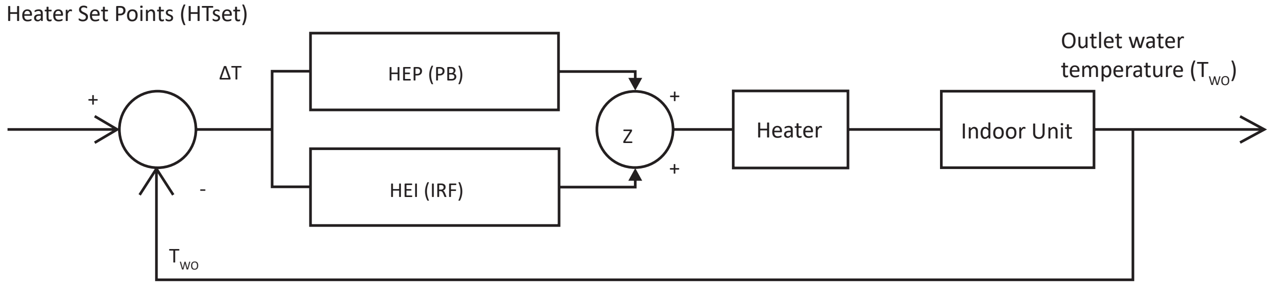
Description	Default Value	Range	Units
Supply setting offset	4	0~10	K



2.4.3 Load factor

The load factor in **airH2O 800** units is a crucial parameter that governs the desired heating supplied by the electrical heater. This factor is determined through a proportional-integral (p+i) function, producing a value within the range of 0 to 100%.

The actual output of the heater is then translated from this percentage into a 3-step output through the implementation of a hysteresis system.

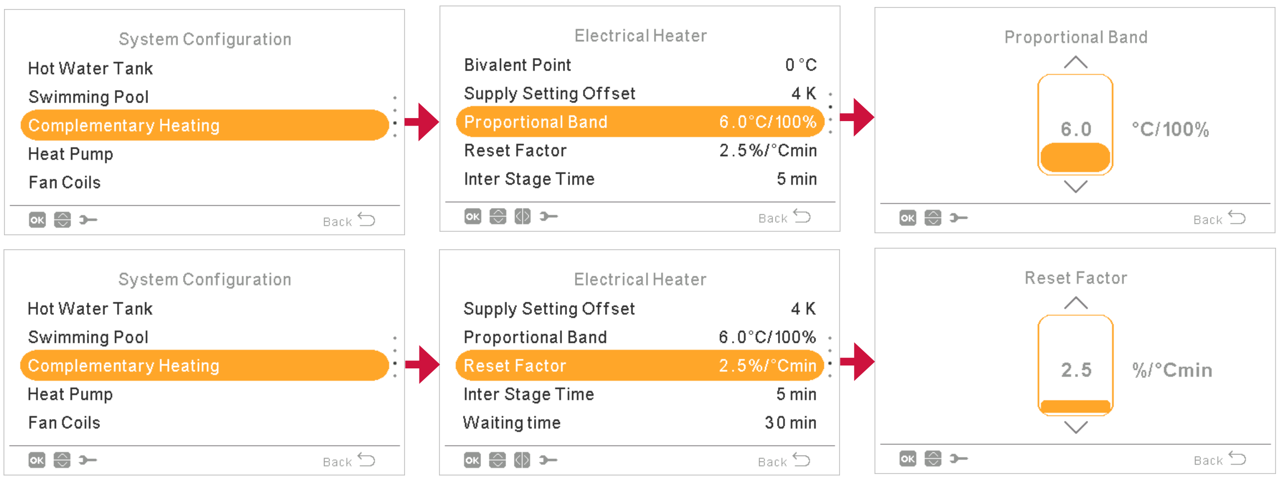


Where:

- *HEPB: Proportional band of electric heater.*
- *HEIRF: Integral reset factor of electric heater.*

System Configuration – Complementary Heating - Electrical Heater

Description	Default Value	Range	Units
Proportional band	6.0	0~20	°C/100%
Reset factor	2.5	0~20	%°C min



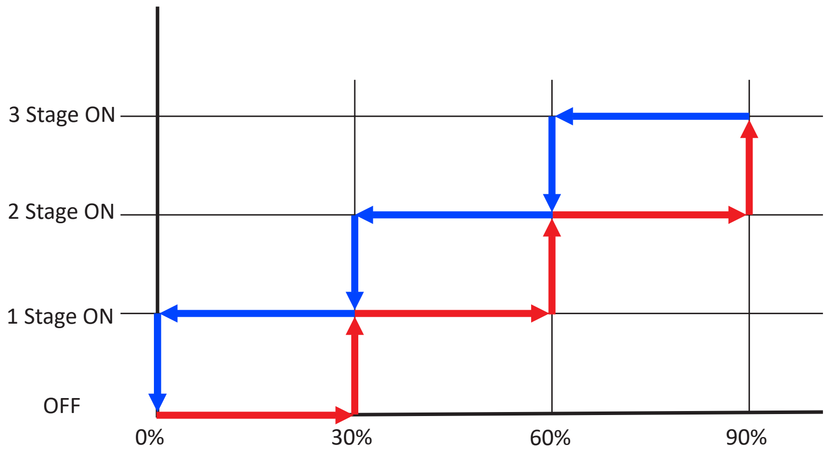
2.4.4 Heater step control

Efficient regulation of the heating output in **airH2O 800** units is achieved through the heater step control. This control mechanism, intricately linked to the load factor, employs a sophisticated P+I function to determine the desired heating level. The resulting percentage is then translated into a precise 3-step output, incorporating a hysteresis system for stability.

NOTE

Maximum heater step is limited by “step maximum heater”.

Steps	Power
	HWM-W2E, HWD-W2E-220S(-K) and ATW-CBX-01 + WEH-6E
1	2kW
2	4kW
3	6kW



Step increase conditions

- Step increases from 0 (heater OFF) to 1 when Load factor is higher than 30%
- Step increases from 1 to 2 when Load factor is higher than 60%
- Step increases from 2 to 3 when Load factor is higher than 90%

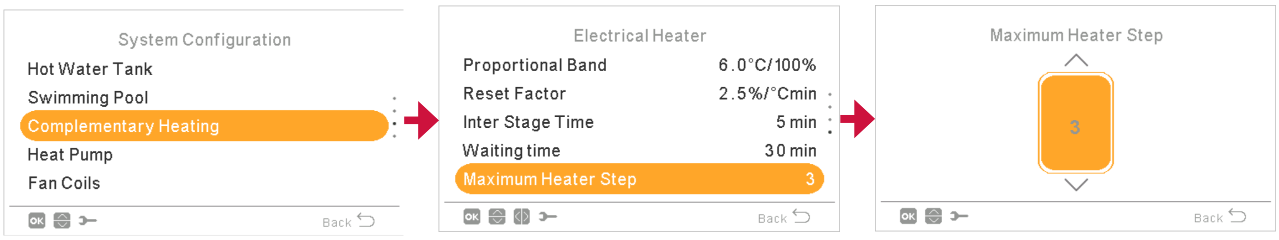
Step decrease conditions

- Step decreases from 3 to 2 when Load factor is lower than 30%
- Step decreases from 2 to 1 when Load factor is lower than 60%
- Step decreases from 1 to 0 (heater OFF) when Load factor is 0%
- Normal operation will require a maximum increase or decrease of 1 step.

System Configuration – Complementary Heating - Electrical Heater

On some installations heater capacity may be to big for the capacity demand. For this reason, it is possible to limit the maximum heater step. As an example, in case the installation required only 4kW of electric heater, maximum Heater step shall be set to 2.

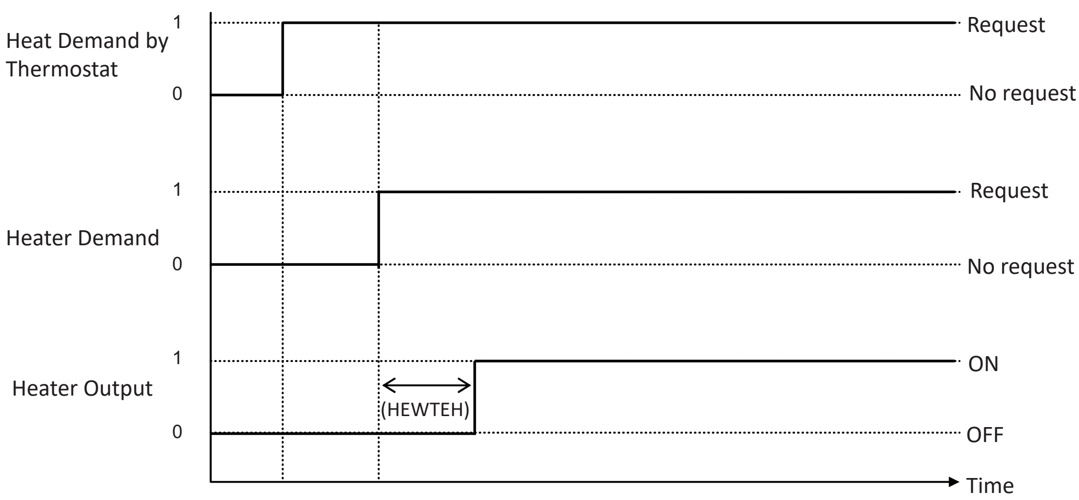
Description	Default Value	Range
Maxim Heater Step	3	1~3



2.4.4.1 Heater waiting time

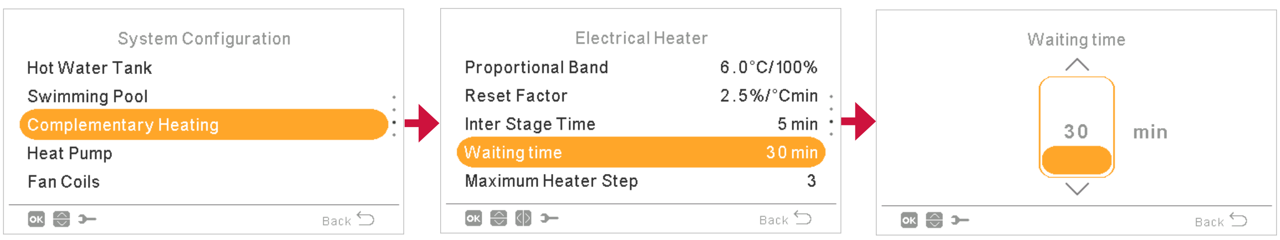
If the water set point (Ttwo) is less than or equal to the maximum heat pump operation, the electric heater is permitted to operate only after the waiting time (HEWTEH) has elapsed since the heat pump started.

However, if the water set point (Ttwo) exceeds the maximum heat pump operation, or if the heater must operate in emergency mode, the electric heater operates without regard to waiting time.



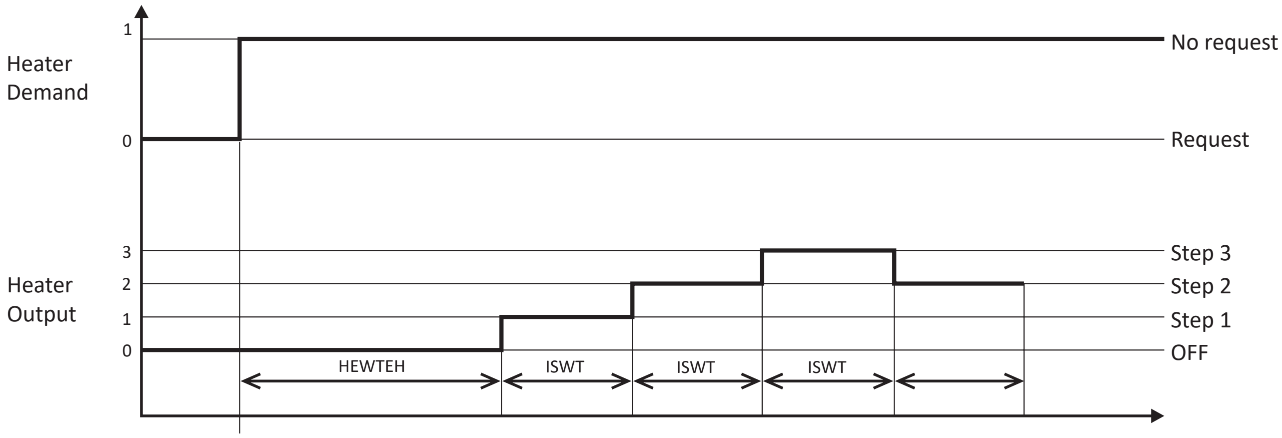
System Configuration – Complementary Heating - Electrical Heater

Description	Default Value	Range	Units
Waiting Time	30	5~90	min



2.4.5 Heater inter-stage steps control

Control of inter-stage steps in the heater involves a specific protocol. Following each step increase, additional increments are restricted during the designated Inter-Stage Waiting Time (ISWT) to prevent hunting. Notably, there is no such limitation for step decreases. Given a sampling time of 1 minute, a minimum of 1 minute must transpire between successive step changes.

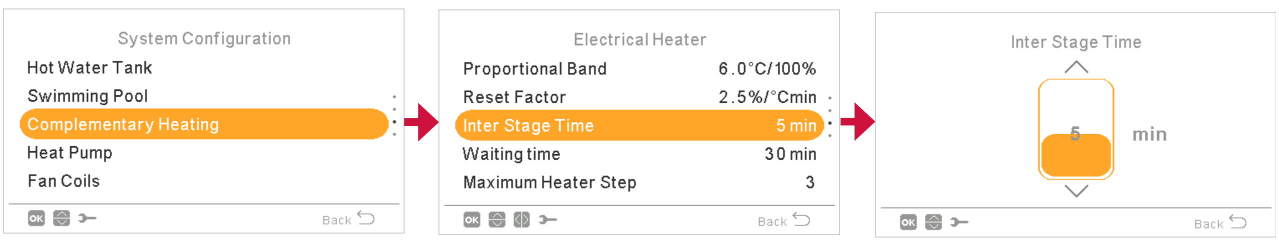


NOTE

- *ISWT: Inter Stage Time.*
- *HEWTEH: Waiting time*

System Configuration – Complementary Heating - Electrical Heater

Description	Default Value	Range	Units
Inter Stage Time	5	1~10	min



2.4.6 Optional functions of space heating electric heater

- **Heater forced OFF:**

If the user or installer activates the heater forced OFF through DSW4-7 ON, all heater functions are prohibited. The unit controller configuration and heater protections, such as low water temperatures and emergency operation, are overridden.

- **One-step heater for 3-phase imbalance option:**

The optional "one-step heater for 3-phase unbalance option" function allows all three heater steps to operate simultaneously.

2.4.7 Emergency mode by electric heaters

When the user enables the emergency mode, the heaters operate accordingly.

NOTE

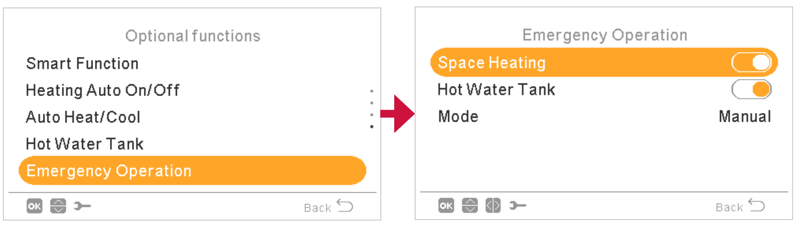
Additional details on the electrical heater or boiler emergency mode can be found in the "Optional functions" chapter.

In the event of outdoor unit failure, the required heating can be provided by electric heaters or by a boiler. This configuration must be activated at the unit controller user's interface and two modes can be selected: automatic mode or manual mode.

The configuration of this function should be done through the unit controller:

System Configuration→Optional functions→Emergency Operation

Description	Default value	Range
Space Heating	Deactivated	Deactivated / Enabled
Hot Water Tank	Deactivated	Deactivated / Enabled
Mode	Manual	Manual / Automatic



- **Space Heating:**

The option to enable or disable the emergency operation for space heating is available. However, this feature is only accessible if the "Heating source" in the "Complementary Heating Configuration" includes the "Electrical Heater" option.

- **Hot Water Tank:**

For DHW, users can enable or disable the emergency operation. This capability is only active when the electrical heater for DHW is enabled, as determined by the DSW setting.

DHW operation in emergency mode is always allowed except when there is any issue with DHW sensors. This means that as long as the alarm is different than 10 or 16, DHW operation in emergency mode is possible.

- **Mode:**

1 **Automatic mode:**

In automatic mode, emergency operation is triggered in response to an alarm which does not compromise the safety of the product. This means that when an alarm is detected, the system will automatically initiate emergency operation.

The emergency mode for space heating will not be triggered in case:

✓ An alarm in the indoor unit side is detected.
✓ An alarm in the outdoor unit side being the alarm number 75, 76, 11, 12, 13, 26, 83, 84, 90, 49 or 71 is detected.

Otherwise, it will be activated.

The emergency mode for DHW will not be triggered in case the alarm number is 10 or 16. Otherwise, it will be activated.

2 **Manual mode:**

In manual mode, users can control the emergency operation through dip-switch settings. Specifically, the status of DSW4-4 determines whether heaters/boiler emergency is enabled or disabled:

✓ If DSW4-4 is set to ON, heater/boiler emergency is enabled.
✓ If DSW4-4 is set to OFF, heater/boiler emergency is disabled.

Emergency operation in manual mode will not be allowed in case:

✓ An alarm in the indoor unit side is detected.
✓ An alarm in the outdoor unit side being the alarm number 75, 76, 11, 12, 13, 26, 83, 84, 90, 49 or 71 is detected.

Otherwise, it will be activated.

The emergency operation in manual mode for DHW will not be allowed in case the alarm number is 10 or 16. Otherwise, it will be activated.

2.4.7.1 DHW electric heater operation in emergency mode

The operation of the Domestic Hot Water (DHW) electric heater in emergency mode involves specific conditions for activation and disabling. Here are the details:

◆ Conditions for activation

1 DHW is enabled.
2 User has allowed DHW electric heater through user selection.
3 Tank temperature (THM_{DHWT}) is less than DHW Setting temperature (T_{DHWS}) minus 4 °C.

◆ Conditions for disabling

Emergency mode for DHW electric heater is disabled when any of the following conditions is fulfilled:

1 Tank temperature (THM_{DHWT}) is less than or equal to DHW Setting temperature (T_{DHWS}).
2 DSW4-4 is set to OFF (in manual mode).
3 Hot Water Tank is disabled for emergency operation.
4 Alarm number 10 or 16 is detected.

2.4.7.2 Space heating electric heater operation in emergency mode

The operation of the electric heater in emergency mode for space heating involves specific conditions for activation and disabling. Here are the details:

◆ Conditions for activation

1 Space heating is enabled.
2 User has allowed the space heating electric heater or boiler through user selection.
3 Water temperature (Two/Two3) is less than Water Temperature target (Ttwo).

◆ Conditions for disabling

When Emergency Heater or Boiler is enabled, water calculation is based on the difference between water outlet (Two) (for Heater) or Water outlet 3 (Two3) (for Boiler) and water target (Ttwo).

When any of the following conditions is fulfilled:

1 Measured water outlet temperature value (Two/Two3) is greater than or equal to water outlet temperature target value (Ttwo) plus 5 °C.
2 Outlet water temperature is higher than 2 °C above the maximum water range temperature set by the installer.
3 Demand is OFF.
4 Recovery of outdoor unit alarm (in automatic mode).
5 DSW4-4 is set to OFF (in manual mode).
6 Space Heating is disabled for emergency operation.
7 Indoor unit alarm is detected.
8 Outdoor unit alarm 75, 76, 11, 12, 13, 26, 83, 84, 90, 49 or 71 is detected.

NOTE

- *Water pump 1 (primary) will be activated with the electric heater.*
- *Water pump 3 will be activated with the boiler.*
- *During emergency operation, the signal from outdoor units is not acquired. The ambient temperature is consistently considered fixed at 10 °C. Water calculation, whether based on points or gradient, is computed at this temperature. It is advisable to switch to a fixed water calculation when emergency mode is engaged.*
- *If an auxiliary outdoor ambient sensor is enabled, water calculation is determined by this temperature.*
- *When emergency operation is enabled, the faulty alarm of the outdoor unit is also kept in the unit controller (the alarm number is shown and a red button flashes).*

2.5 Boiler combination

2.5.1 Boiler operation

The boiler will operate only when the unit is in space heating or hot sanitary water modes. It is expressly disabled in any other modes, such as swimming pool mode and cooling mode.

The **airH2O 800** range must be combined with a boiler or an alternative energy supplier. This combination ensures the effective and efficient operation of the heating system.

Operations with a boiler are shown in the following table:

Description	airH2O 800H	airH2O 800H Combi	Control Box
Space Heating	o	o	o
Space Cooling	-	-	-
DHW Heating	o	-	o
Swimming Pool	-	-	-

NOTE

- *o: Operation possible.*
- *-: Operation not possible.*

2.5.2 Boiler combination for space heating

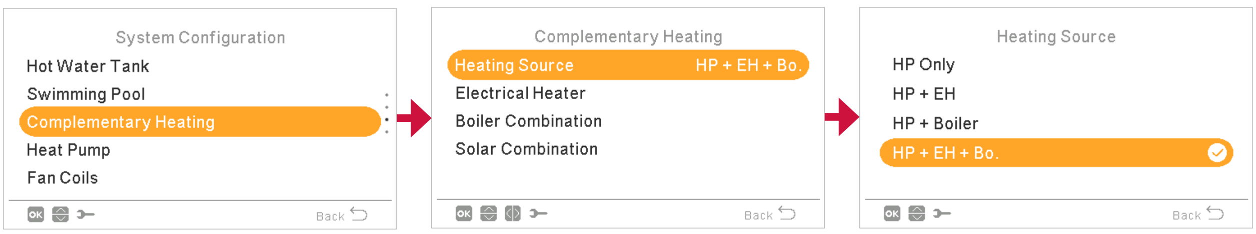
Boiler will only operate when heating accessory is set to boiler or heater + boiler.

The boiler and heater functions cannot operate simultaneously. The decision on which to operate is determined by ambient temperature considerations, as detailed in "2.5.4 Use of boiler + heater (only available for **airH2O 800H, airH2O 800H Combi** and Control Box)".

System protection takes precedence over boiler operation whenever applicable. In situations where system protection measures are required, they will be prioritized over the operation of the boiler.

System Configuration – Complementary Heating:

Description	Default Value	Range
Heating source	HP Only	HP Only HP + Heater HP + Boiler HP + Heater + Boiler

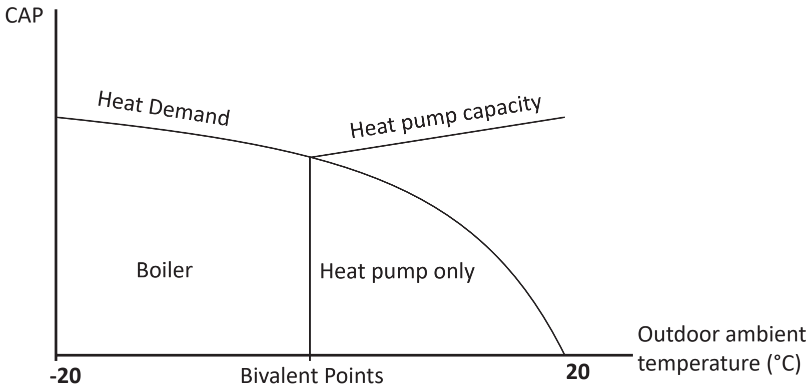


2.5.3 Bivalent point

The unit is designed to primarily operate in heat pump mode. It is desirable for the unit to utilize the boiler accessory only when the ambient temperature is low. This strategy optimizes the use of the heat pump mode, taking advantage of its efficiency in moderate conditions.

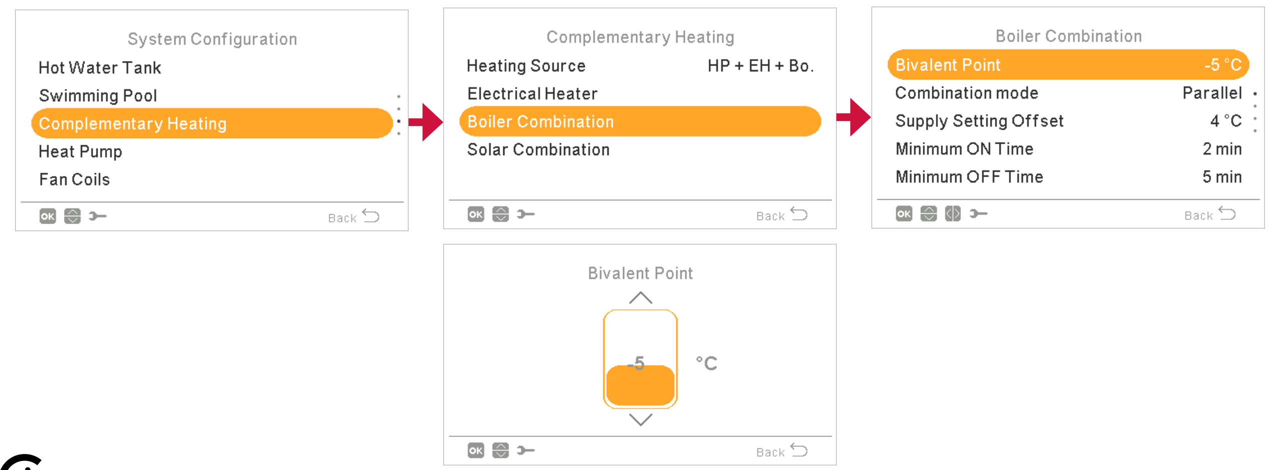
The bivalent point refers to a situation where the unit's operation transitions to using the boiler accessory. This transition is influenced by the reduction in capacity that occurs with decreasing temperatures.

The boiler accessory will be enabled only when the outdoor ambient temperature is less than the bivalent outdoor temperature for the boiler (BB).



System Configuration – Complementary Heating - Boiler Combination:

Description	Default Value	Range	Units
Bivalent Point	-5	-20~20	°C



NOTE

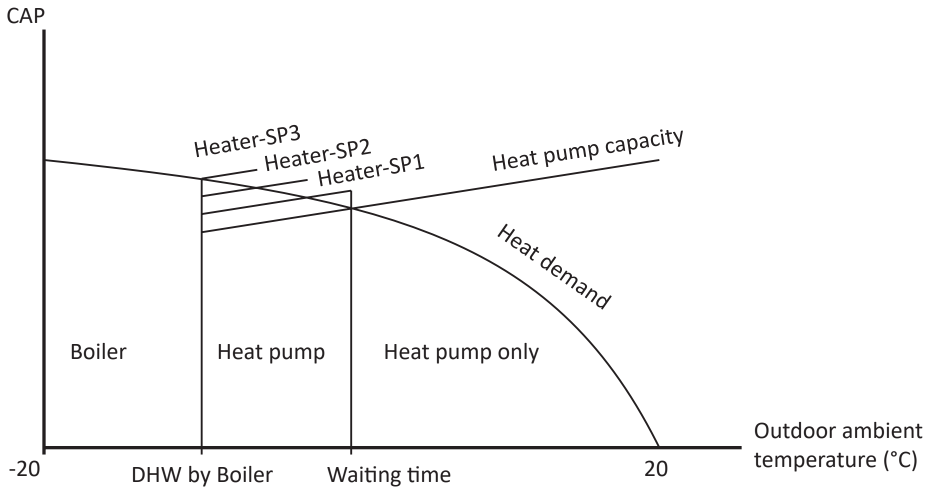
- *When the complementary heating source is set to "HP + Heater + Boiler," the bivalent point has a specified range of -20~15 °C.*
- *If the supplementary heating source is configured as "HP + Heater + Boiler," the controller is responsible for maintaining a specific relationship between the bivalent points of the heater and the boiler, ensuring that the bivalent points of the heater remain equal to or less than the bivalent points of the boiler plus 5 °C. To achieve this, the unit automatically adjusts and increases the bivalent points of the heater, ensuring a consistent 5 °C difference is maintained.*

2.5.4 Use of boiler + heater (only available for airH2O 800H, airH2O 800H Combi and Control Box)

In the boiler + heater setup, the unit typically functions with the heat pump as the primary heating source. Additional heating needs are met by the heater, and the boiler comes into operation only when the ambient temperature is too low for the heat pump.

The enabling conditions for the boiler or heater are as follows:

- If the ambient temperature is less than the Bivalent Points (Heater), the heater is activated.
- If the ambient temperature is less than the Bivalent Points (Boiler), the boiler is activated.



NOTE

In case of heater + boiler configuration, default values are changed as above.

2.5.5 Boiler combination modes

The **airH2O 800** range, when combined with a boiler, offers two distinct combination modes:

1 **Bivalent parallel (alternative) operation:**

In this mode, the **airH2O 800** range and the boiler operate in parallel, providing an alternative heat source. Both systems contribute to meet the heating demands simultaneously.

2 **Bivalent serial (common) operation:**

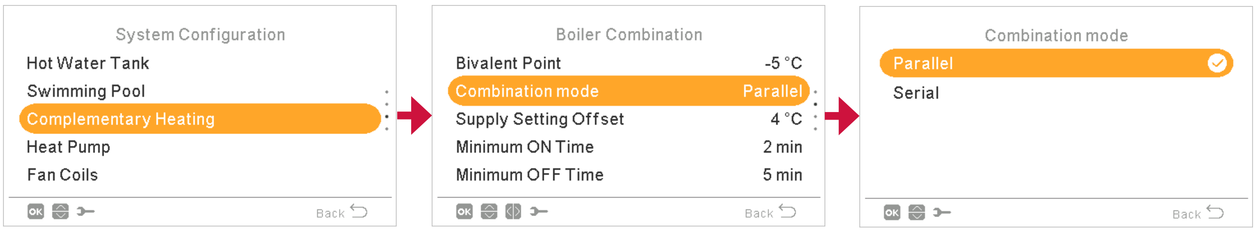
In this mode, the **airH2O 800** range and the boiler operate in series, creating a common heat source. The systems work sequentially to address the heating requirements, with one serving as a backup or complement to the other.

These combination modes offer flexibility and adaptability, allowing users to choose the configuration that best suits their heating needs and preferences.

Configuration should be done through the unit controller:

System Configuration – Complementary Heating - Boiler Combination

Description	Default Value	Range
Combination mode	Parallel	Parallel/Serial

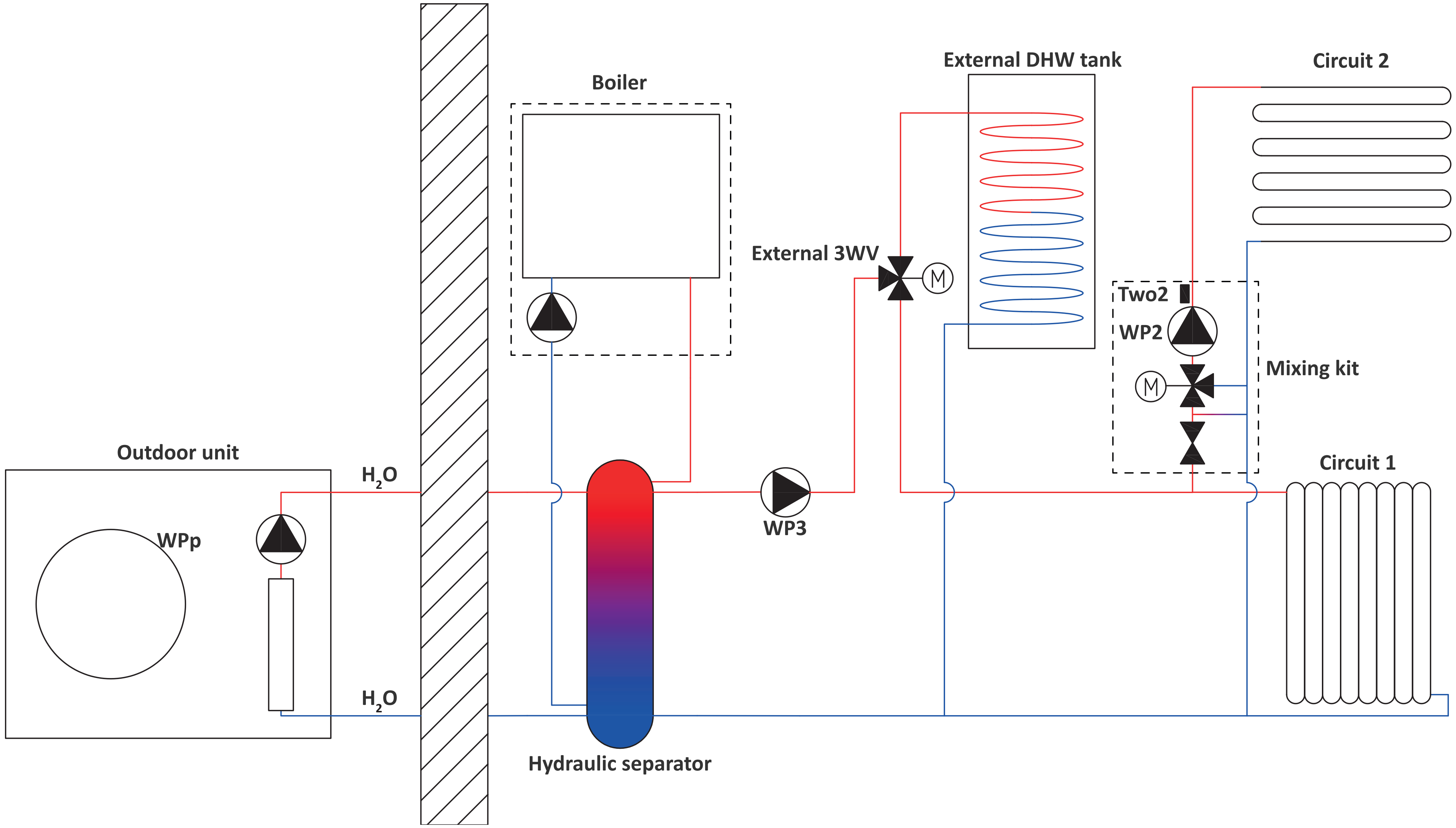


2.5.5.1 Boiler parallel mode combination

In the boiler parallel mode combination, it is a bivalent system where the boiler is set up in parallel with the heat pump. To ensure proper hydraulic balancing, the use of a hydraulic separator or buffer tank is recommended.

This configuration is particularly suitable for retrofit (upgrade) applications. In such cases, an existing gas/oil boiler can be retained to fulfil the complete heating requirements, especially during the coldest days of the year. The parallel arrangement allows both the boiler and heat pump to operate concurrently, providing flexibility and optimising the system's efficiency.

Example for illustrative purpose only:



Space heating

For space heating in a parallel system (either heat pump or boiler), the water setting remains consistent with the water set point for the heat pump, excluding outdoor unit temperature restrictions but with maximum water temperature restrictions set by the installer.

- **Conditions to enable boiler for space heating:**

1. Space heating operation is selected.
2. Complementary heating is set to Boiler or Boiler + Heater.
3. Boiler is in parallel mode.
4. Ambient temperature is less than the bivalent points for the boiler for more than the waiting time for the boiler or ambient temperature is less than the boiler bivalent point at unit start.

- **Operation conditions to enable boiler operation for DHWT:**

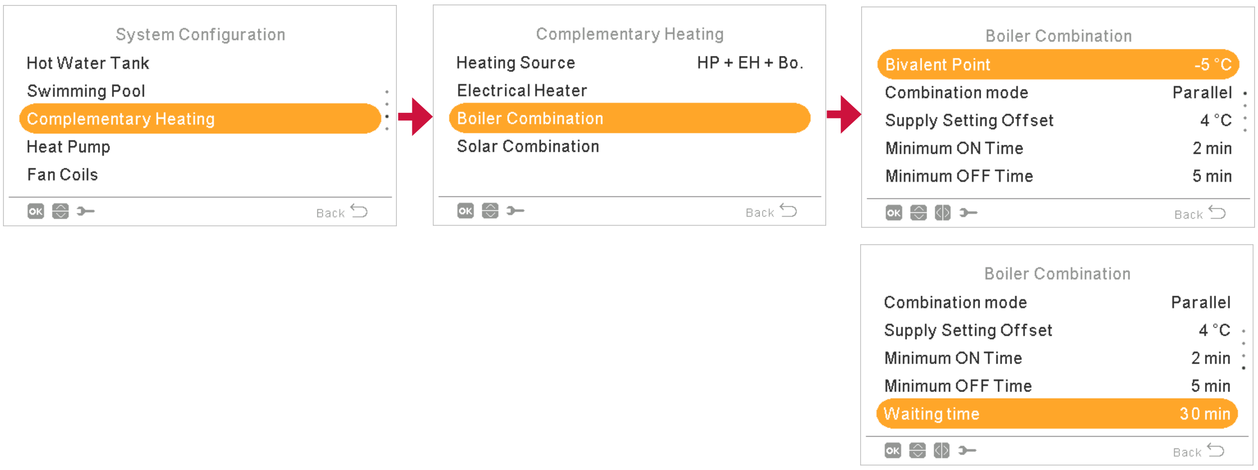
1. The indoor unit is not a **airH2O 800H Combi** with an integrated tank (DSW7, PIN1: ON).
2. There is a DHW operation request.
3. TDHW (Domestic Hot Water Temperature) is less than THPSTOP.
4. Operation time is less than TDHWMAX.
5. Boiler operation for the DHW tank is enabled.
6. Complementary heating is set to boiler or boiler + heater.
7. Boiler is in parallel mode.
8. Ambient temperature is less than the boiler bivalent points for more than the boiler operation wait time for DHW or ambient temperature is less than the boiler bivalent points at start.

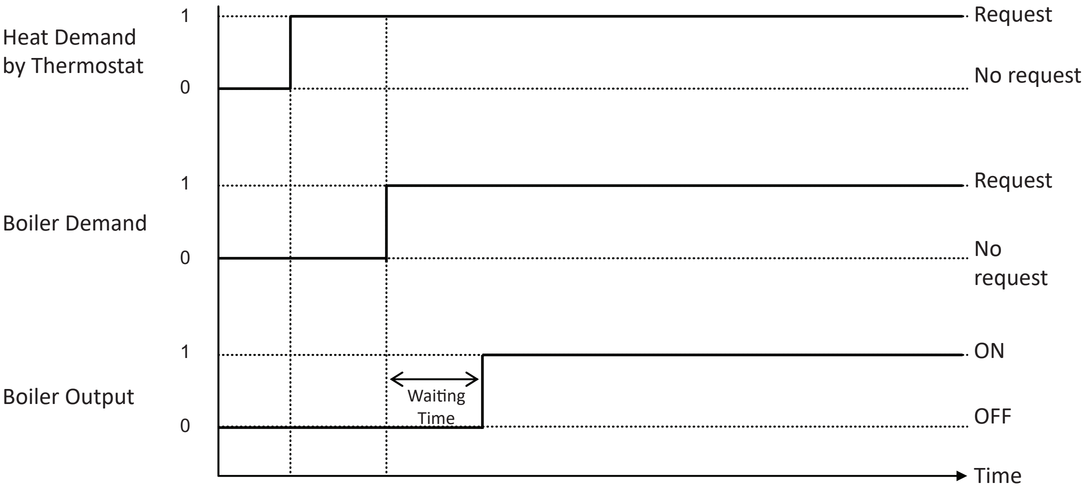
System Configuration – Complementary Heating - Boiler Combination

Description	Default Value	Range	Units
Bivalent Points	-5	-20~20	°C
Combination Mode	Parallel	Parallel/Serial	-
Supply setting Offset	4	0~10	°C
Minimum ON Time	2	1~30	min
Minimum OFF Time	5	1~30	min
Waiting Time	30	5~90	min
DHW by boiler (*)	Deactivated	Deactivated/Enabled	-
Waiting time for DHW (*)	45	OFF, 5~120	min

NOTE

(*) Only for **airH2O 800H**.





Operation conditions under which the boiler is not enabled:

1 **Demand OFF by room thermostat:**

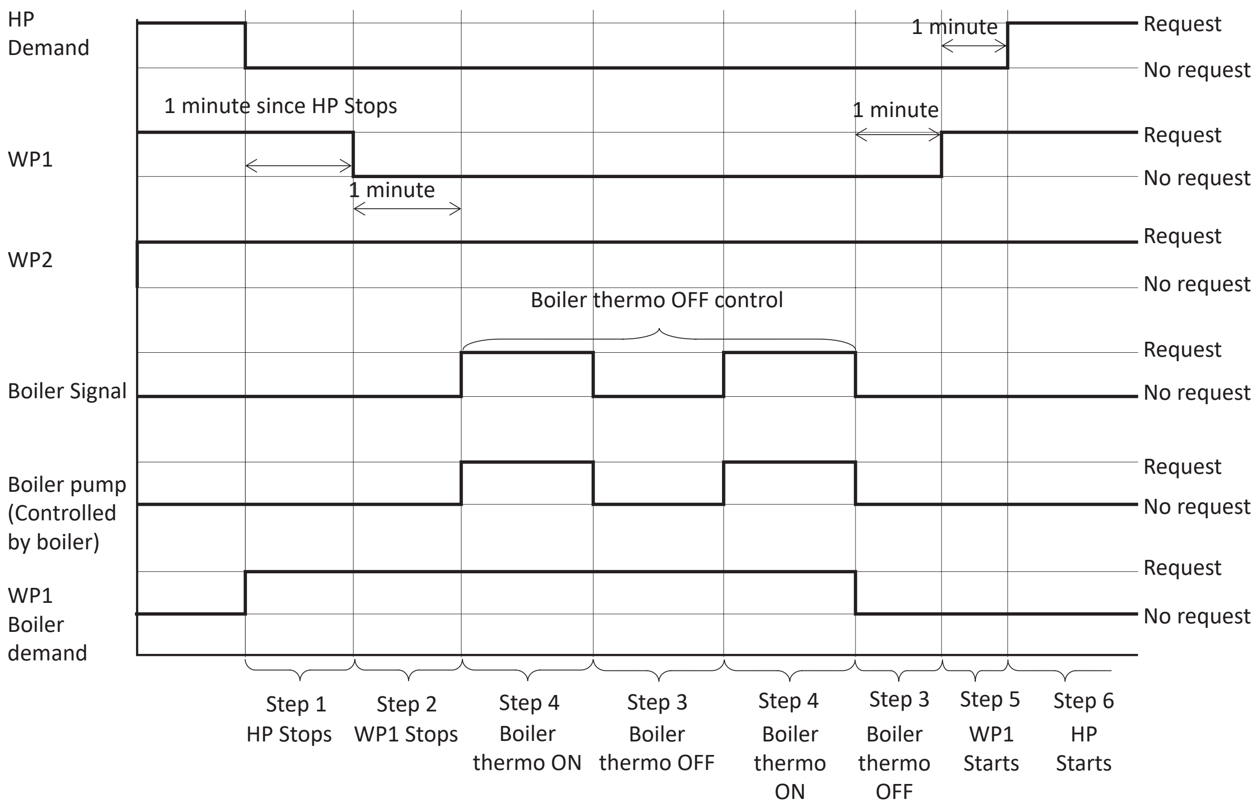
- If the room thermostat signals that there is no demand for heating, the boiler will not be enabled.

2 **Ambient temperature > bivalent points for boiler for more than 10 minutes:**

- If the ambient temperature remains higher than the bivalent points for the boiler for a duration exceeding 10 minutes, the boiler will not be activated.

These conditions ensure that the boiler remains inactive when there is no heating demand or when the ambient temperature is above the specified bivalent points for an extended period.

◆ Boiler time chart



DHW heating

The water set point for Domestic Hot Water (DHW) is set to 80 °C.

- **Operation conditions to enable boiler for DHW:**

1 **DHw by boiler enable:**

The boiler is enabled for DHW heating.

2 **Heat pump operation > boiler waiting time for DHW:**

The heat pump operation is ongoing, and the boiler is enabled for DHW heating after the specified waiting time.

3 **Same conditions as heater enabled conditions:**

The conditions for enabling the boiler for DHW are the same as those specified for the heater.

- **Operation conditions under boiler is not enabled:**

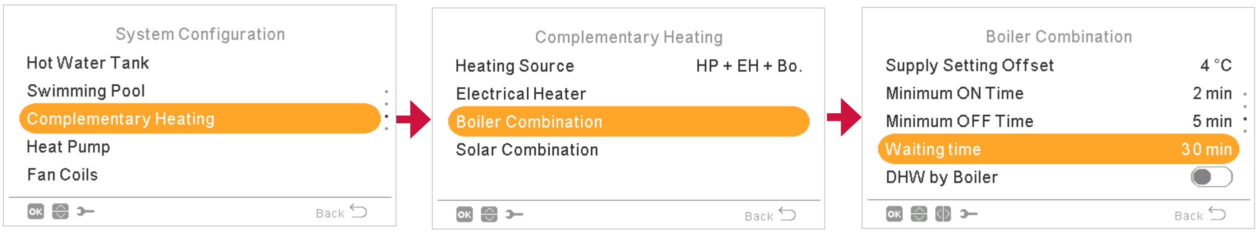
The same conditions under which heater is not enabled.

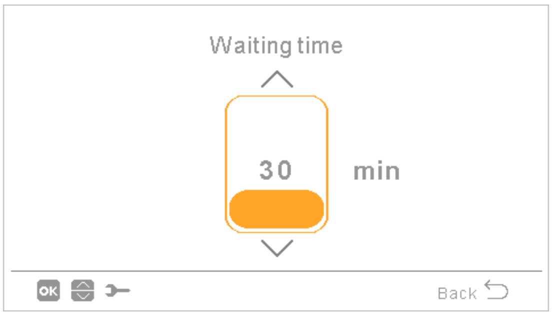
System Configuration – Complementary Heating - Boiler Combination

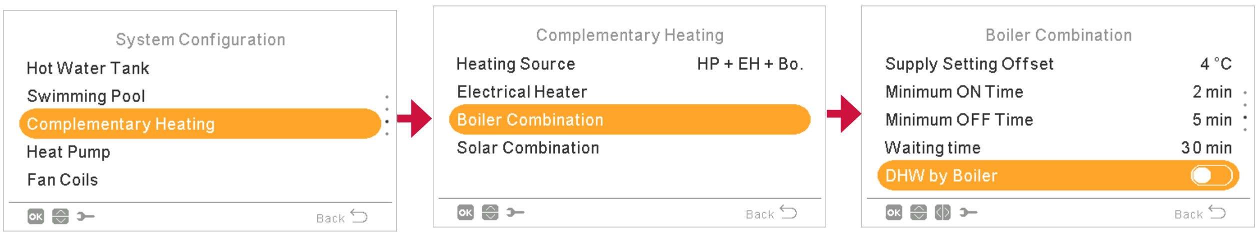
Description	Default Value	Range	Units
DHW by boiler(*)	Deactivated	Deactivated/Enabled	-
Waiting Time for DHW (min)	30	OFF, 5~120	min

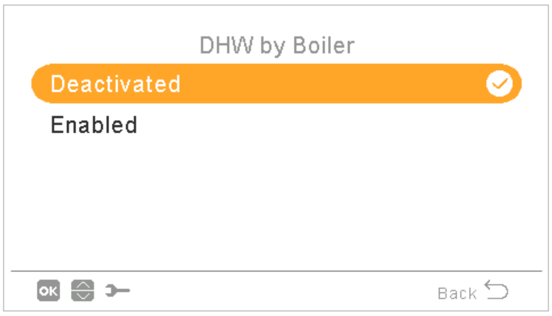
NOTE

(*) Only for **airH2O 800H**.









◆ Boiler Thermo ON/OFF control

Conditions for Thermo-ON

Conditions for turning ON the boiler at thermo ON conditions:

1 **Water temperature (TWO3) < boiler temperature setting (BTSET) - supply set point control offset:**

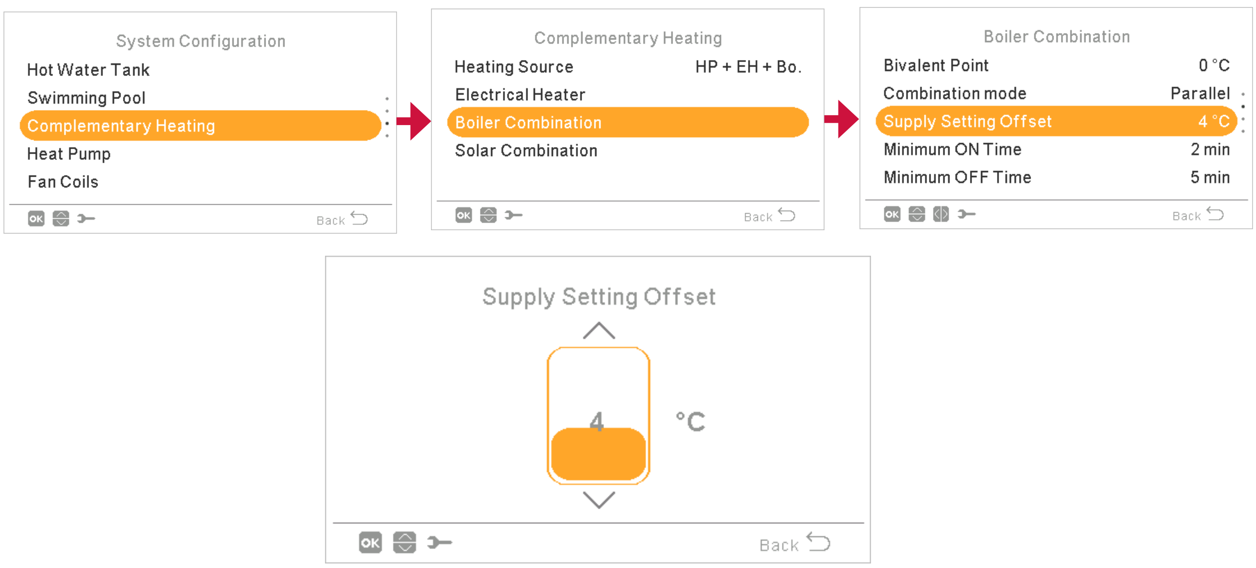
The boiler is activated if the water temperature (TWO3) is lower than the Boiler Temperature Setting (BTSET) reduced by the supply set point control offset.

2 **Space Heating is in Demand ON:**

The boiler is activated if there is a demand for space heating.

System Configuration – Complementary Heating - Boiler Combination

Description	Default Value	Range	Units
Supply setting offset	4	0~10	°C



Conditions for Thermo OFF

Conditions for turning OFF the boiler at Thermo-OFF conditions:

1 **Measured outlet temperature value (TWO3) ≥ boiler temperature setting (BTSET) + 5 °C:**

The boiler is deactivated if the measured outlet temperature value (TWO3) is greater than or equal to the Boiler Temperature Setting (BTSET) plus 5 °C. This condition takes precedence regardless of the minimum on time.

2 **Outlet water temperature = maximum water range temperature set by the installer (Tmax) + 2 °C:**

The boiler is turned off if the outlet water temperature equals or exceeds the maximum water range temperature set by the installer (Tmax) plus 2 °C.

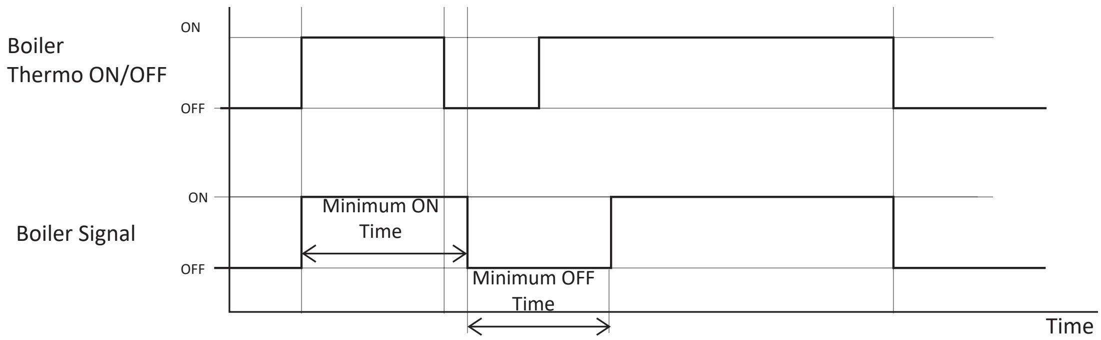
3 **Space Heating is in Demand OFF:**

The boiler is deactivated if there is no demand for space heating.

When boiler is enabled, water calculation is based in the difference between water outlet temperature (T_{WO3}) and the water target temperature (T_{WO}).

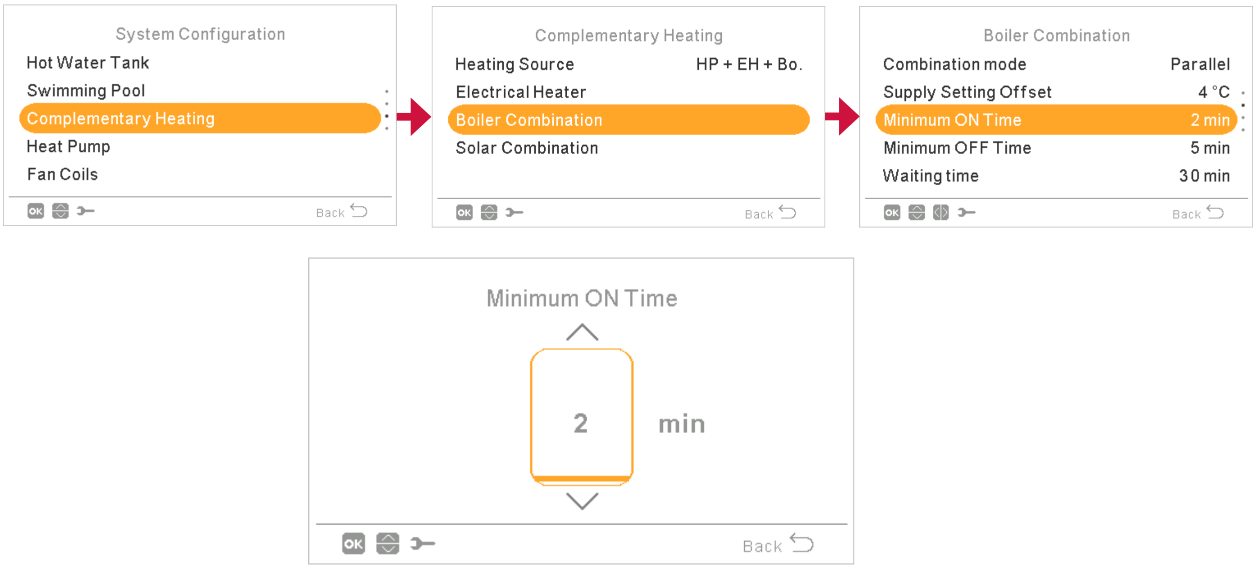
◆ Boiler minimum and maximum times

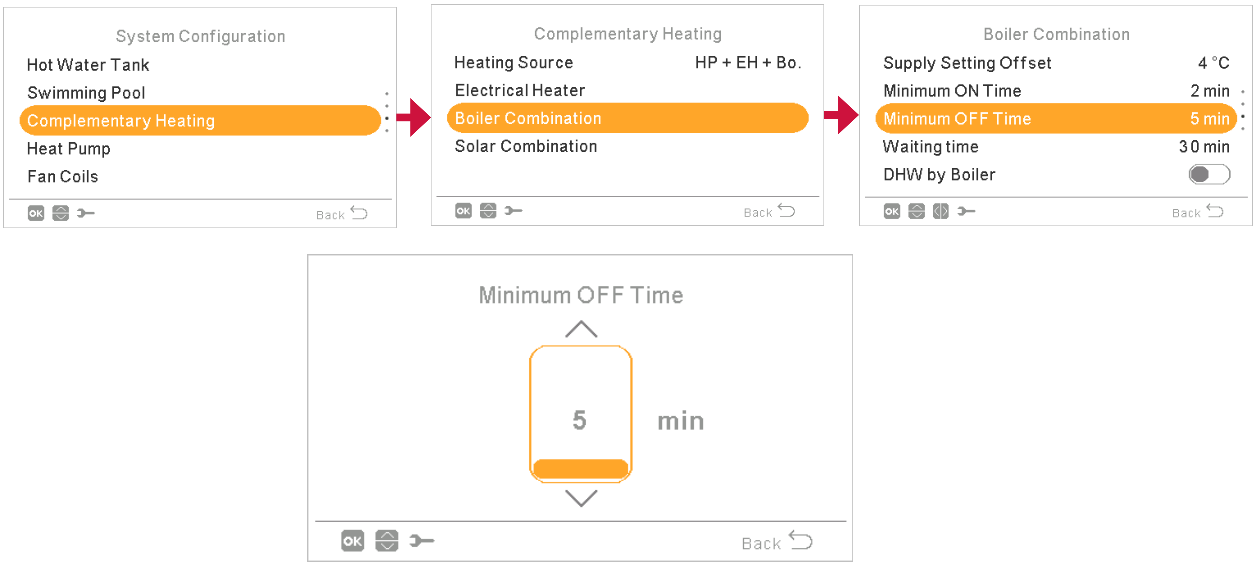
Boiler can only be stopped after minimum ON time has passed (BOon) and only can be started after minimum OFF time has passed (BOoff).



System Configuration – Complementary Heating - Boiler Combination

Description	Default Value	Range	Units
Minimum ON Time	2	1~30	min
Minimum OFF Time	5	1~30	min





NOTE

Unit protections (Tmax) have priority against "Boiler Minimum ON Time".

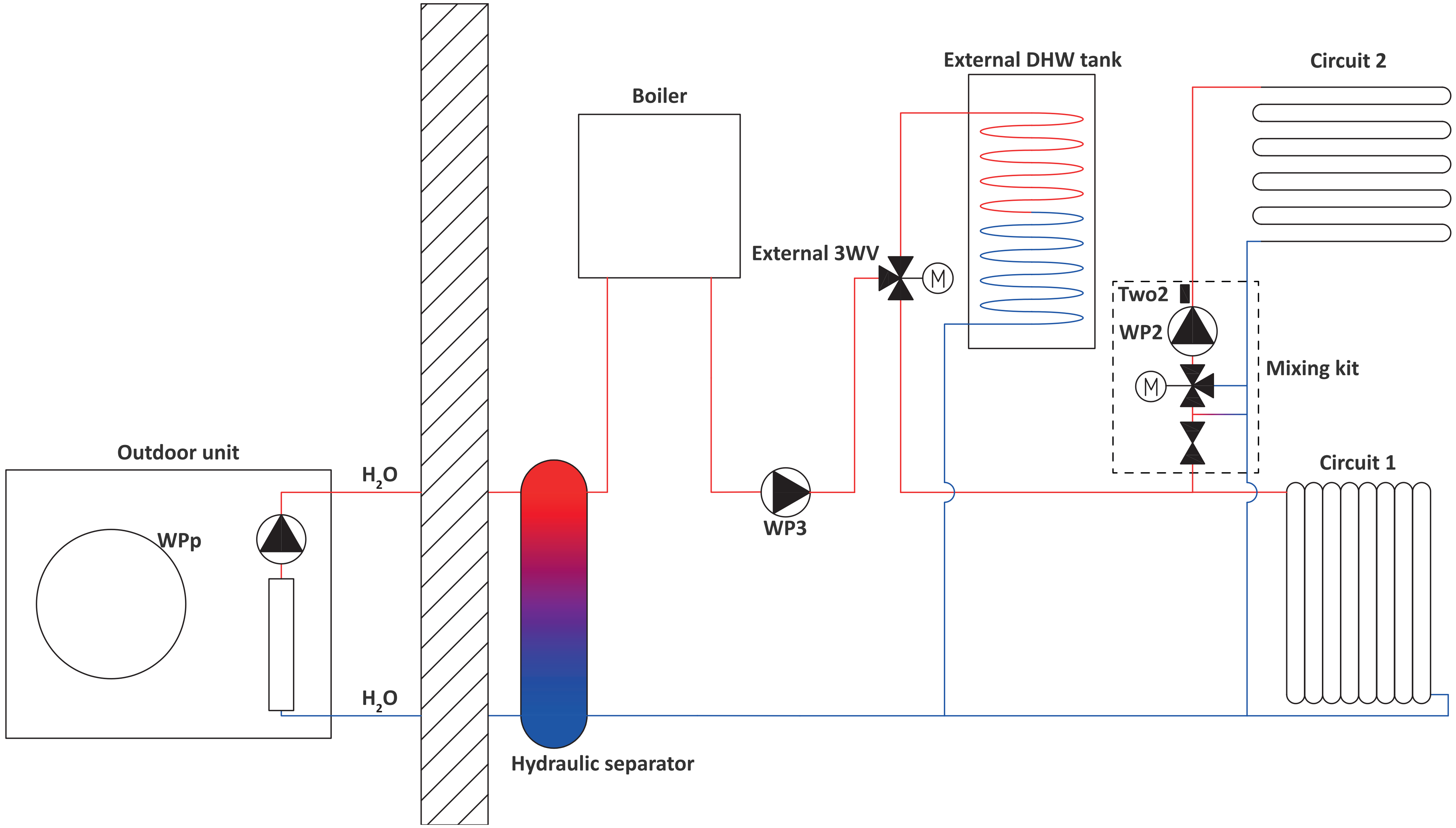
2.5.5.2 Boiler serial mode combination

In a boiler serial mode combination, the system is configured as a bivalent system where the boiler operates in series (serial) with the heat pump. To ensure proper hydraulic balancing, a hydraulic separator or buffer tank must be employed. Key features of the boiler serial mode combination include:

1 **Hydraulic separator or buffer tank:** A hydraulic separator or buffer tank is essential to maintain proper hydraulic balancing within the system.
2 **Use in retrofit applications:** This system is suitable for retrofit (upgrade) applications, functioning similarly to a mono-energetic system that uses a gas/oil boiler.
3 **Operation in series with heat pump:** The boiler operates in series with the heat pump. This means that the heat pump is the primary heat source, and the boiler serves to provide additional peak load capacity when needed.
4 **Peak load capacity:** The primary role of the boiler in this configuration is to supply additional peak load capacity, supporting the heat pump during periods of high demand.

Overall, the boiler in a serial mode combination works in collaboration with the heat pump, contributing supplemental heating capacity to meet peak loads while maintaining overall system efficiency.

Example for illustrative purpose only:



Outputs

The serial boiler exclusively responds to the boiler output signal. It does not affects all other outputs and, therefore, must operate as normal operation.

Description	Default Value	Range	Units
Bivalent point	-5	-20~20	°C
Combination mode	Parallel	Parallel/Serial	-
Supply setting Offset	4	0~10	°C
Minimum ON Time	2	1~30	min
Minimum OFF Time	5	1~30	min
Waiting Time	30	5~90	min
DHW by Boiler	Disabled	Disabled/Enabled	-
Wait time for DHW	45	OFF, 5~120	min
Heating source	HP Only	HP Only HP + Heater HP + Boiler HP+Heater+Boiler	-

Emergency mode

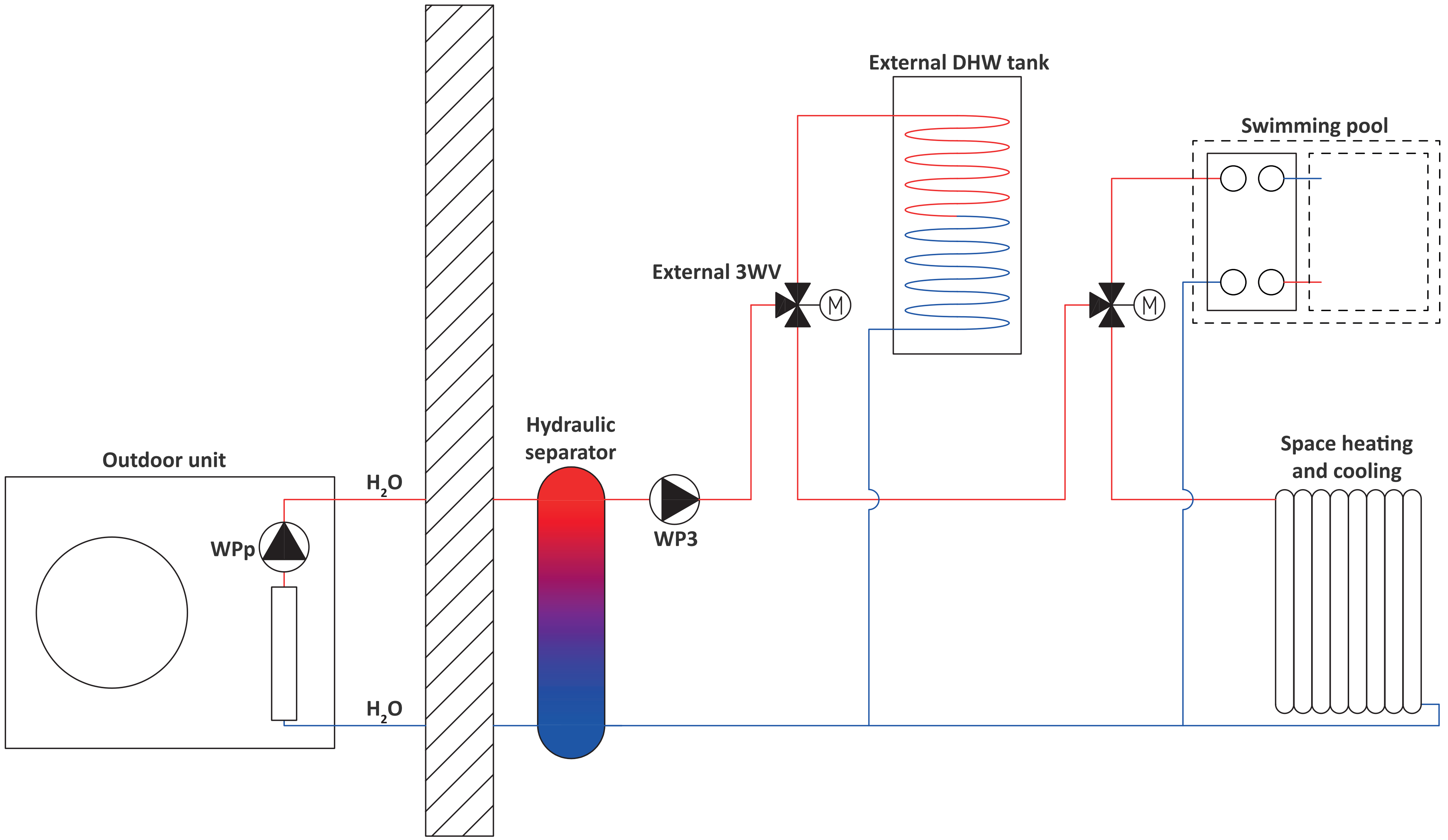
If the user activates the emergency mode, the boiler may operate under emergency conditions. In situations where there is a combination of a heater and boiler, the boiler takes priority during emergency mode.

2.6 Swimming pool

When the operation of the swimming pool is necessary, the swimming pool pump initiates its operation based on the feedback from the swimming pool input. During this scenario, the 3-way valve associated with the Domestic Hot Water Tank (DHWT) remains inactive, while the 3-way valve dedicated to the swimming pool alters its usual position, redirecting flow to the swimming pool heat exchanger. This adjustment enables the heating of the swimming pool water temperature to reach a comfortable level.

It is essential to note that the swimming pool operation holds the lowest priority within the system. It becomes feasible only when neither space heating, space cooling (if allowed) nor Domestic Hot Water Tank (DHWT) heating is required.

Example for illustrative purpose only:



Swimming pool function will only be enabled if all the following conditions are fulfilled:

- ✓ Swimming pool operation enabled by unit controller.
- ✓ Heat pump is turned OFF (or Thermo OFF) by any other system (DHW for instance).
- ✓ Swimming pool is enabled by swimming pool water pump feedback.

Swimming Pool Start Conditions:

The swimming pool operation will commence if the swimming pool temperature is lower than the swimming pool set point temperature minus 1 °C.

Swimming Pool Stop Conditions:

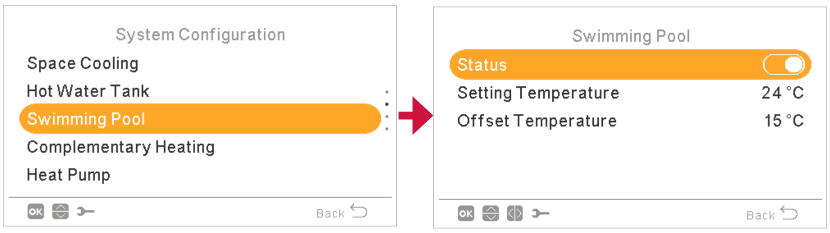
The swimming pool operation will cease if the swimming pool temperature exceeds the swimming pool set point temperature plus 1 °C.

NOTE

The unit is unable to initiate swimming pool mode unless there is active feedback from the swimming pool input. The presence of this feedback is a prerequisite for starting the unit in swimming pool mode.

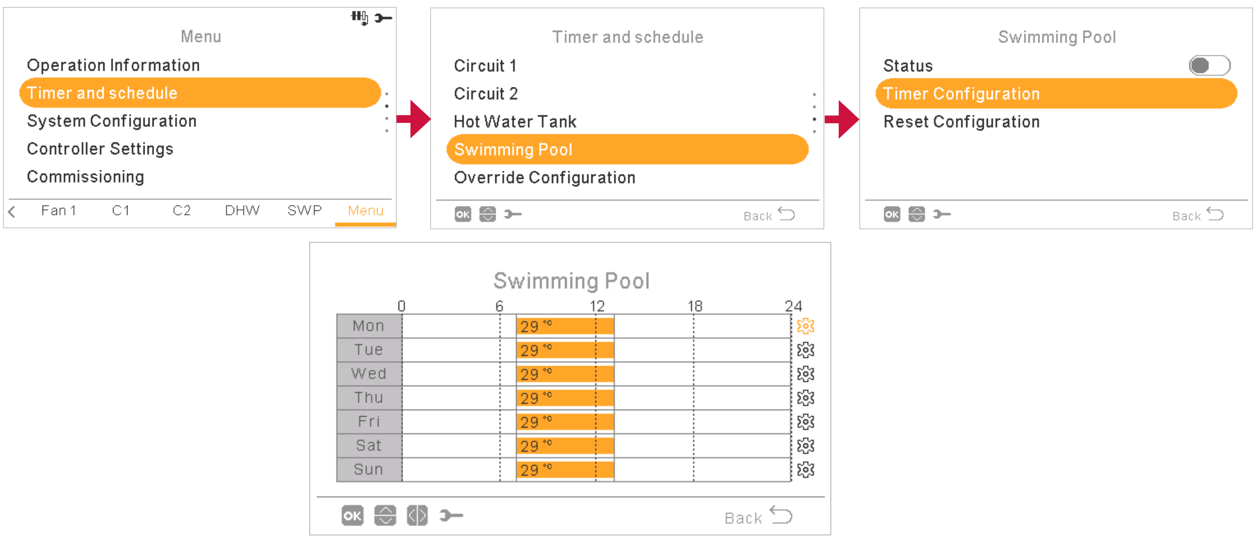
System Configuration – Swimming pool

Description	Default Value	Range	Units
Status	Deactivated	Deactivated / Enabled	-
Setting temperature	24	24~33	°C
Offset temperature	15	10~36	°C



◆ Swimming pool heating by timer

The unit supports the creation of up to 7 scenes, each containing distinct configurations. These scenes can be assigned to various parts of the day, forming a daily pattern. Following this, the established pattern can be assigned to each day of the week, enabling scheduled swimming pool heating based on the configured timer settings.



2.7 Solar combination

◆ Concept

The solar combination feature allows you to utilize solar energy to heat your domestic water whenever sunlight is available.

airH2O 800 systems offer various configurations to integrate with solar panels:

1 **Deactivated (Default Configuration):**

In this default setting, no solar kit is installed with the **airH2O 800** unit.

2 **Input Demand:**

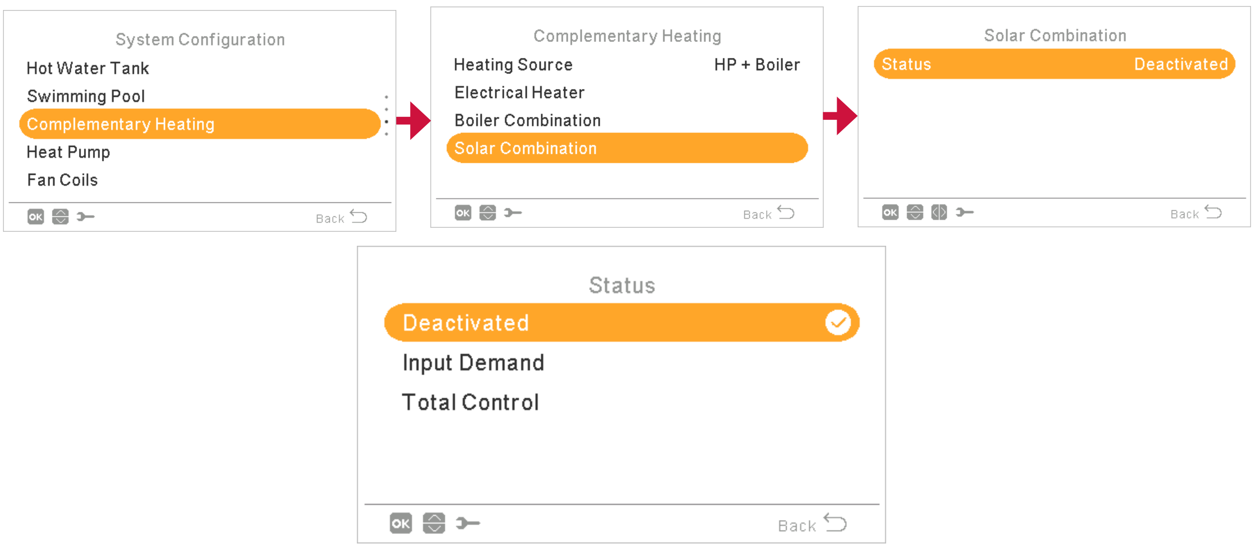
Alternative Domestic Hot Water (DHW) tank operation is managed by the solar system or the **airH2O 800** unit. Solar input has the capability to override DHW operations carried out by the **airH2O 800** unit.

3 **Total Control:**

In this mode, the **airH2O 800** unit functions as a Solar Control Station, assuming control over the entire system.

System Configuration – Complementary Heating

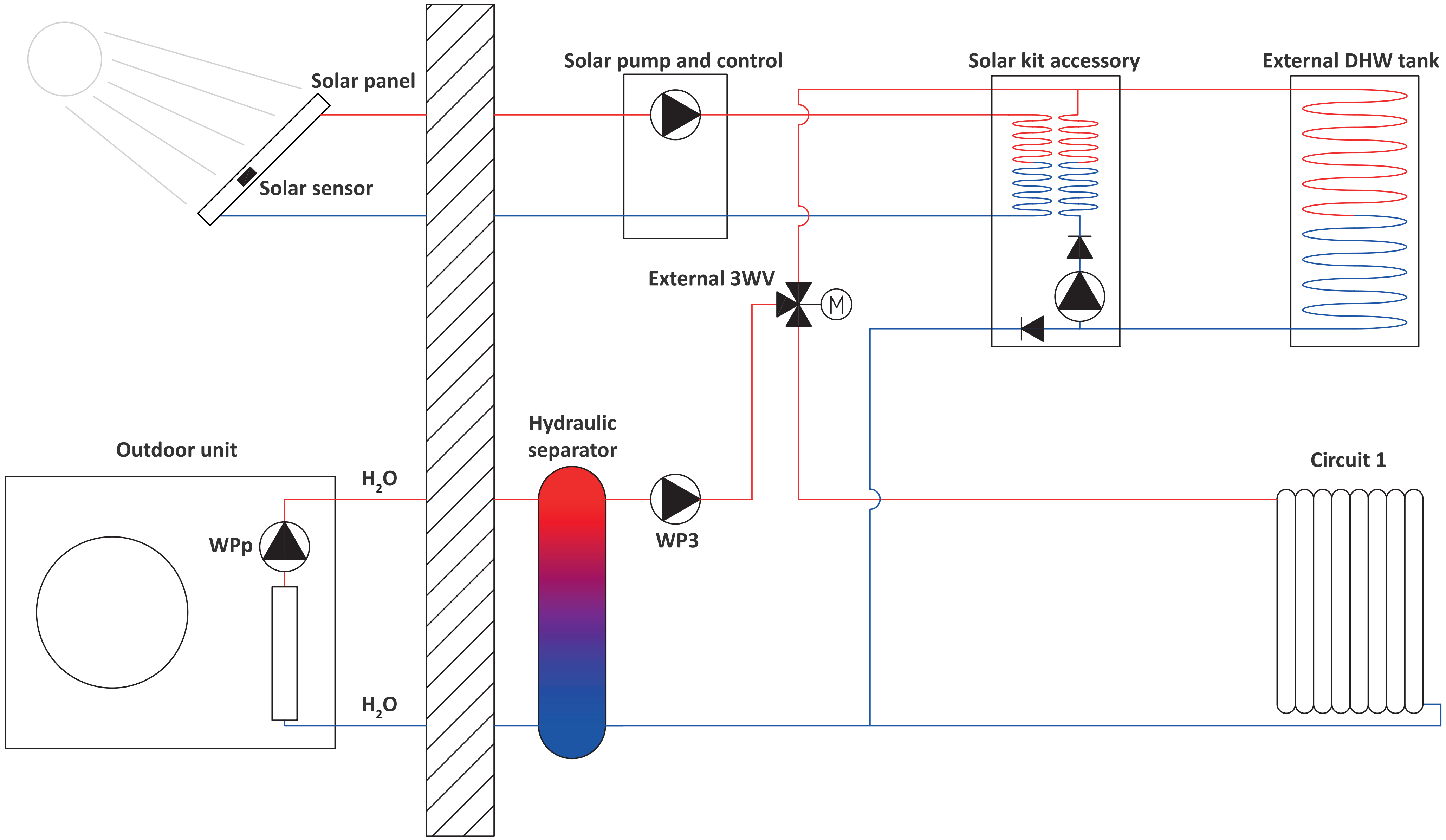
Description	Default Value	Range
Status	Deactivated	Deactivated Input Demand Total control



2.7.1 Solar combination by input demand

The solar kit is engineered to facilitate the transfer of heat from the solar panels to the heat exchanger of the domestic hot water tank. It is intended to be integrated into the **airH2O 800** system, as illustrated in the scheme below.

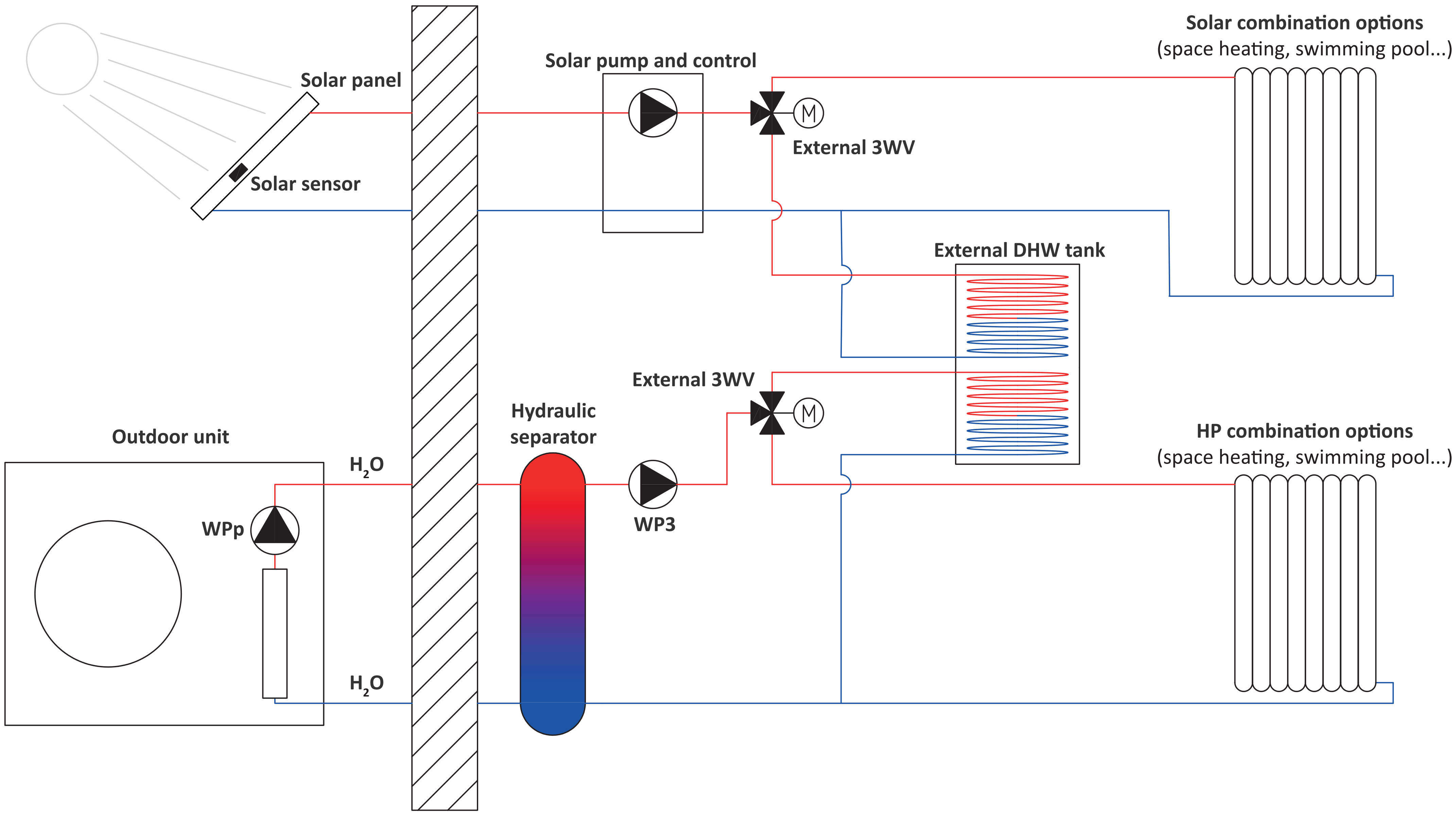
Example for illustrative purpose only:



Option 1

The solar panels collect heat from the sun. When the temperature of the glycol solution in the solar panel exceeds the water temperature in the domestic hot water tank, the pumps from the solar pump station and the solar kit activate to transfer the accumulated heat to the heat exchanger of the domestic hot water tank.

Example for illustrative purpose only:



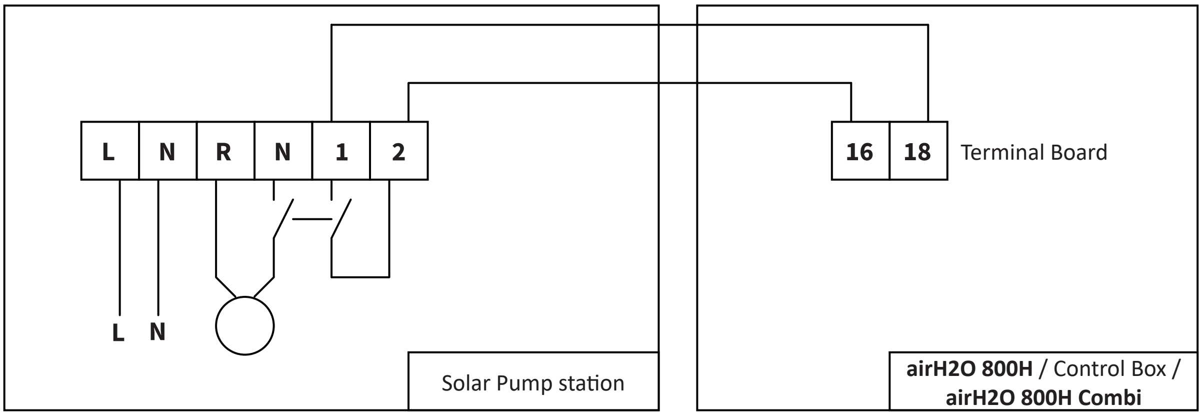
Option 2

The solar panels harvest heat from the sun. When the temperature of the glycol solution in the solar panel surpasses the water temperature in the domestic hot water tank, the pump of the solar pump station is activated, and the 3-way valve of the solar kit is redirected to the Sanitary Tank. Simultaneously, the Domestic Hot Water (DHW) 3-way valve is turned OFF, and the heat pump remains operational to heat the space if required.

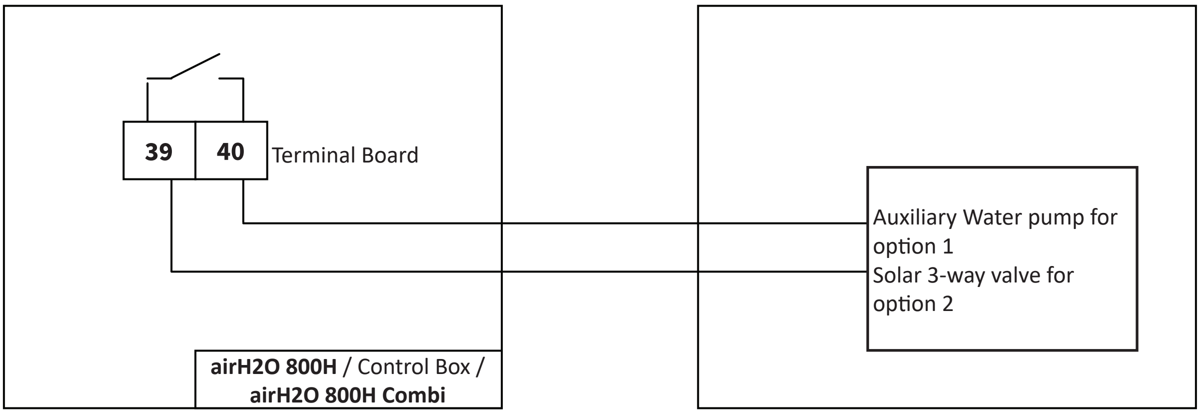
2.7.1.1 Solar installation requirements

◆ Electrical connection

The solar pump station features an auxiliary contact that closes during its operation to heat the domestic hot water tank.



When solar mode is enabled by the heat pump, and the glycol solution temperature in the solar panel exceeds the water temperature in the domestic hot water tank, one of the heat pump's outputs will be switched ON (terminals 39/40).



2.7.1.2 Solar station control

Solar module operations are performed by an external field supplied solar control unit.

Communication with **airH2O 800** unit is done through the input/output located at the terminal board of the **airH2O 800** unit:

- **Solar input:** It indicates that solar control unit is ready to operate (there is no alarm, there is enough solar energy available, etc.).
- **Solar output:** solar pump: it indicates that **airH2O 800** unit is requesting solar control unit to heat DHWT by solar energy, it is expected for solar Water pump to operate.

If the solar pump station has an ON/OFF/AUTO function, ensure it is set to AUTO. In AUTO mode, the pump activates automatically when the solar panel temperature rises significantly higher than the domestic hot water tank temperature and deactivates when the temperature difference decreases.

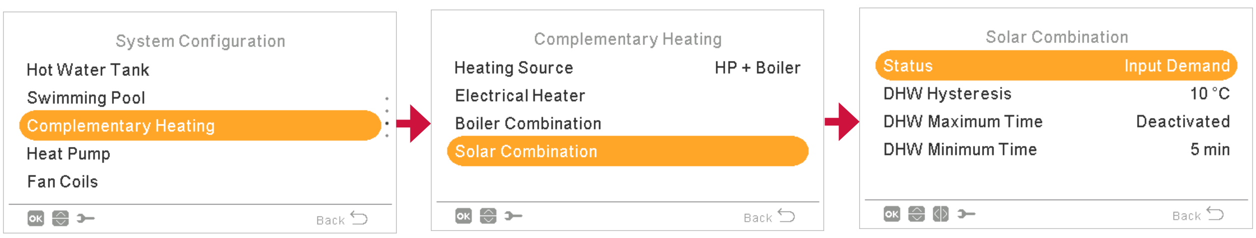
By default, the pump operation starts when the solar panel temperature is 10 °C higher than the domestic hot water tank temperature.

The pumps from the solar pump station and the solar kit stop operating when the solar panel temperature becomes lower than the domestic hot water tank temperature.

When the **airH2O 800** unit does not require solar operation, the DHWT operates under normal conditions.

System Configuration – Complementary Heating - Solar Combination

Description	Default Value	Range	Units
DHW Hysteresis	10	1 ~ 30	°C
DHW Maximum Time	OFF	OFF, 35~240	min
DHW Minimum Time	5	5~240	min



2.7.1.3 Solar start conditions

The **airH2O 800** unit initiates the request for solar heating (activates solar pump output) when all of the following conditions are met:

1 **DHWT Operation Enabled:**

Domestic Hot Water Tank (DHWT) operation is enabled, including timer settings.

2 **Status Set as "Input Demand":**

The status is configured as "Input Demand."

3 **Solar Input Contact Closed:**

The solar input contact is closed, indicating that the solar control unit is ready to operate.

4 **Minimum Time Requirement:**

More than the DHW Minimum Time has elapsed since the last solar request was completed.

5 **Temperature Conditions:**

- DHWT temperature (T_{DHWT}) is less than the DHWT Setting Temperature (T_{DHWTS}) minus DHW Hysteresis.
- $T_{DHWT} < T_{DHWTS}$ - DHW Hysteresis

Where:

- *T_{DHWT} = Domestic Hot Water Tank temperature (°C)*
- *T_{DHWTS} = Domestic Hot Water Tank temperature setting (°C) (default 45 °C)*
- *$T_{DHWTMAX}$ = Domestic Hot Water tank maximum supply temperature (°C) (default 70 °C)*
- *DHW Minimum time = Minimum time solar operation cannot be performed once it has been stopped due to DHW Maximum time or due to open solar input contact.*

If conditions are met, the heating of DHW by the heat pump is turned OFF, and the heating is performed by the solar station through the **airH2O 800** auxiliary output signal.

If T_{DHWT} exceeds $T_{DHWTMAX}$, the solar station cannot heat DHW to the maximum allowed temperature, and the **airH2O 800** auxiliary output is turned OFF.

2.7.1.4 Solar stop conditions

The **airH2O 800** unit ceases the request for solar heating (deactivates solar pump output) when all of the following conditions are fulfilled:

1 **DHWT not enabled:**

DHWT is not enabled, including timer settings.

2 **Status not set as "input demand":**

The status is not set as "input demand."

3 **DHWT maximum time exceeded:**

Configured DHW maximum time has elapsed since the solar request began.

4 **Solar input contact open:**

The solar input contact is open, indicating that the solar control unit is not ready to operate.

5 **Temperature condition:**

DHWT temperature (T_{DHWT}) is greater than the DHWT setting temperature (T_{DHWTS}).

NOTE

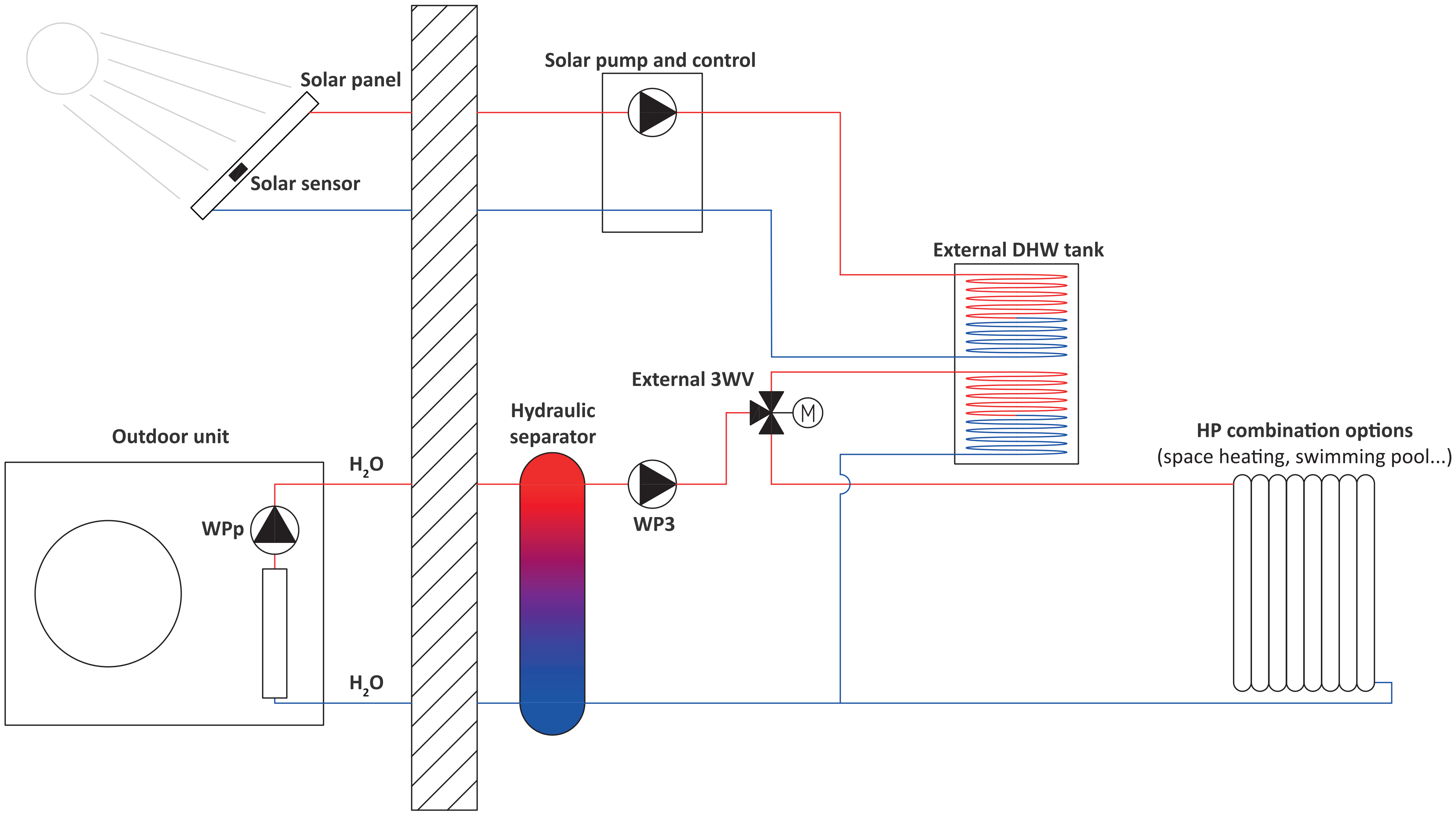
- *DHW maximum time is the maximum time solar operation can be performed once it has been started due to input demand. If "OFF" is selected, there is no time limitation.*
- *When heating DHW by solar power, DHW Timer has no effect.*

2.7.2 Total solar combination

In the total solar combination mode, the **airH2O 800** unit assumes control of the solar operation within the system, making decisions based on various temperatures.

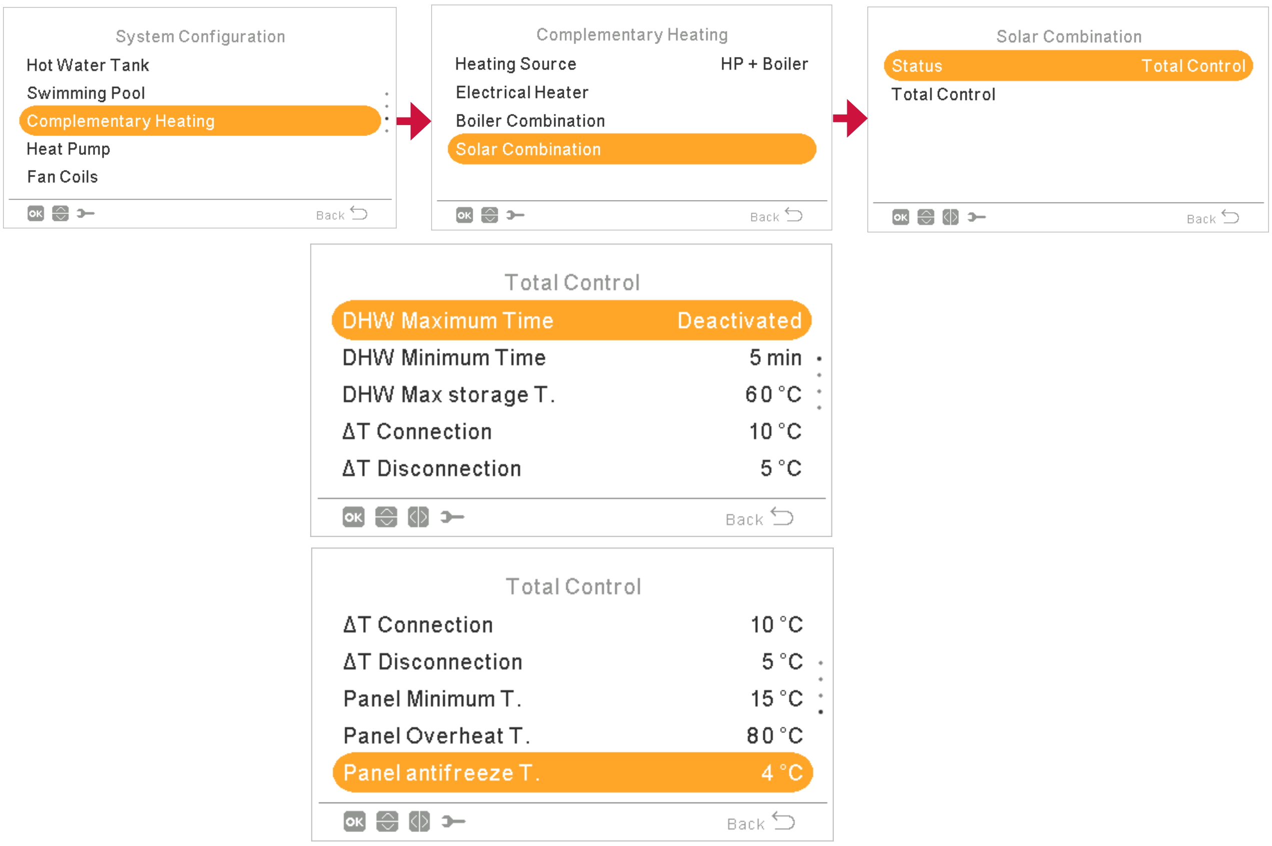
DHWT is heated by either the hot water that comes from the solar panels or the hot water that comes from the heat pump, depending on the solar temperature.

Example for illustrative purpose only:



The configuration should be done through the unit controller according to the following variables:

Description	Default Value	Range	Units
DHW Maximum time	OFF	OFF, 35 ~ 240	min
DHW Minimum time	5	5~240	min
DHW Max storage T	60	30 ~ 90	°C
ΔT Connection	10	1 ~ 30	°C
ΔT Disconnection	5	1 ~ ΔT Connection	°C
Panel Minimum T	15	1 ~ 60	°C
Panel Overheat T	80	80 ~ 120	°C
Panel antifreeze T	4	-20 ~ 10	°C



2.7.2.1 Inputs and outputs

airH2O 800 units use the following inputs and outputs located at the table board:

- Solar Pump Output: Unit performs solar operation and requires pump operation (this is selectable as “Optional Function”, explained in "Optional functions").
- Analogical Input - Solar Panel Sensor: Gives an analogical signal about the temperature of the solar panels (Selectable as “Optional functions”, explained in "Optional functions").

2.7.2.2 DHWT operation

Hot water from solar panels is utilized to heat the Domestic Hot Water (DHW) tank. While the DHW tank is being heated by hot water from the solar panels, the heat pump is not engaged in heating the DHW tank. **airH2O 800** units may switch to other operations, such as space heating, cooling, etc., during the DHWT operation.

2.7.2.3 Solar start conditions

The **airH2O 800** unit initiates the request for solar heating (activates solar pump output) when all of the following conditions are met:

1 **DHWT Operation Enabled:**

Domestic Hot Water Tank (DHWT) operation is enabled, including timer settings.

2 **Status Set as "Total Control":**

The status is configured as "Total Control."

3 **DHW Maximum Time Exceeded:**

Configured DHW Maximum Time has elapsed since the last solar request was completed.

4 **Solar Panel Sensor Temperature Conditions:**

- Solar panel sensor temperature is greater than T_{DHWT} + ΔT connection.
- Solar panel sensor temperature is greater than the Panel Minimum Temperature.

5 **DHWT Temperature Conditions:**

TDWHT (Domestic Hot Water Tank temperature) is less than T_{DHWMAX} (DHW maximum storage temperature) minus 5 °C.

6 **Panel overheat temperature:**

Solar panel sensor temperature should be less than the panel overheat temperature.

Where:

- *T_{DHWT}: Domestic hot water tank temperature (°C)*
- *TDHWTMAX = Domestic Hot Water tank maximum supply temperature (°C) (default 70 °C)*

NOTE

- *DHW minimum time is the minimum time solar operation cannot be performed once it has been stopped due to the low temperature at the solar panel.*
- *Regardless of the previous conditions, solar DHWT starts operation if the solar panel sensor temperature reads a lower temperature than the antifreeze panel temperature set through the unit controller, and the temperature of the DHWT is higher than 7 °C.*

2.7.2.4 Solar stop conditions

The **airH2O 800** unit stops requesting solar (deactivates solar pump output) when all of the following conditions are fulfilled:

1 **DHWT is Disabled:**

Domestic Hot Water Tank (DHWT) is disabled, including timer settings.

2 **Status Not Set as "Total Control":**

The status is not configured as "Total Control."

3 **DHW Maximum Time Exceeded:**

Configured DHW Maximum Time has elapsed since the last solar request began.

4 **Solar Panel Sensor Temperature Conditions:**

- Solar panel sensor temperature is less than T_{DHWT} + ΔT disconnection.
- Solar panel sensor temperature is greater than the Panel Minimum Temperature.

5 **DHWT Temperature Conditions:**

TDHWT (Domestic Hot Water Tank temperature) is greater than or equal to TDHWTMAX.

6 **Panel overheat temperature:**

Solar panel sensor temperature is greater than the panel overheat temperature.

NOTE

- *DHW maximum time is the maximum time solar operation can be performed once it has been started due to solar temperature conditions. If OFF is selected, there is no time limitation.*
- *Regardless of previous conditions, solar DHW cannot stop if the solar panel temperature is lower than the antifreeze temperature configured plus 2 °C, and T_{DHWT} is greater than or equal to 5 °C.*

2.8 Water pump control

Water pump	Description
WPp	Primary water pump. This water pump is present inside the **airH2O 800M** unit. This water pump is responsible of water recirculation between the plate exchanger and the consuming point (primary circuit flow). For those installations installing a Control Box, the consuming point will be the heating emitters or an additional buffer tank. On the other hand, in case of using **airH2O 800H/ airH2O 800H Combi** indoor units, the consuming point will be the in-built hydraulic separator.
WP1	This water pump is present inside the **airH2O 800H/airH2O 800H Combi** indoor units. It is responsible of water recirculation between the in-built hydraulic separator and the installation (secondary circuit flow).
WP2	Water pump used only when an additional circuit (circuit 2) for space heating or space cooling is used, in case of **airH2O 800H**, **airH2O 800H Combi** or Control Box. It ensures water circulation at circuit 2.
WP3	Water pump used in case **airH2O 800H**, **airH2O 800H Combi** or Control Box use an external hydraulic separator. It ensures water circulation from this external hydraulic separator to the distribution circuit. Note that, in case of declaring hydraulic separator for **H** and **H Combi** units, WP1 will ensure water circulation with the in-built hydraulic separator and the external one, while WP3 will ensure the recirculation between the external hydraulic separator and the installation.

2.8.1 Interaction between WPp and WP1 pumps

The indoor modules **airH2O 800H** and **airH2O 800H Combi** are equipped with a hydraulic separator. This hydraulic separator separates the water flow from the plate heat exchanger (primary circuit water flow, WPp pump) and the water flow towards the installation (secondary circuit water flow, WP1 pump).

To ensure proper heat exchange, the flow rate of the primary circuit must be higher than that of the secondary circuit. Thanks to the system's ability to read the flow rates of both pumps, they interact with each other by automatically adjusting their speeds to always guarantee an adequate temperature transfer.

To simplify commissioning and subsequent use of the installation, the installer must configure the appropriate control mode and speed based on the emitters on the consumption side via the PC-ARFH3E. This configuration will be applied to the WP1 pump. At this point, the WPp pump will automatically adjust to maintain the primary flow rate higher than the secondary flow rate.

NOTE

- In the event that the pressure drop on the primary side is too high and the WPp pump cannot ensure a higher primary flow rate than the secondary, the WP1 pump will automatically reduce its speed until the primary flow rate exceeds the secondary flow rate. During this process, it is necessary to check the final flow rate on the secondary side and verify that it still meets the requirements of the temperature emitters.
- If the automatic adjustment is not satisfactory, it can be disabled via the optional function FA. Please refer to the *"Optional functions"* chapter for more details.

In case of a system using a Control Box, the pump setting performed by means of the PC-ARFH3E directly adjusts the WPp since there is no WP1 to control.

2.8.2 Pumps configuration

2.8.2.1 Pumps setup

The pump setup feature provides installers with the flexibility to configure the operation of the secondary side water pump WP3.

There are two available configurations:

1 **Standard configuration:**

In the standard setup, WP3 functions as a secondary side pump and operates concurrently with the primary side pump WP1. Both pumps, WP1 and WP3, run simultaneously.

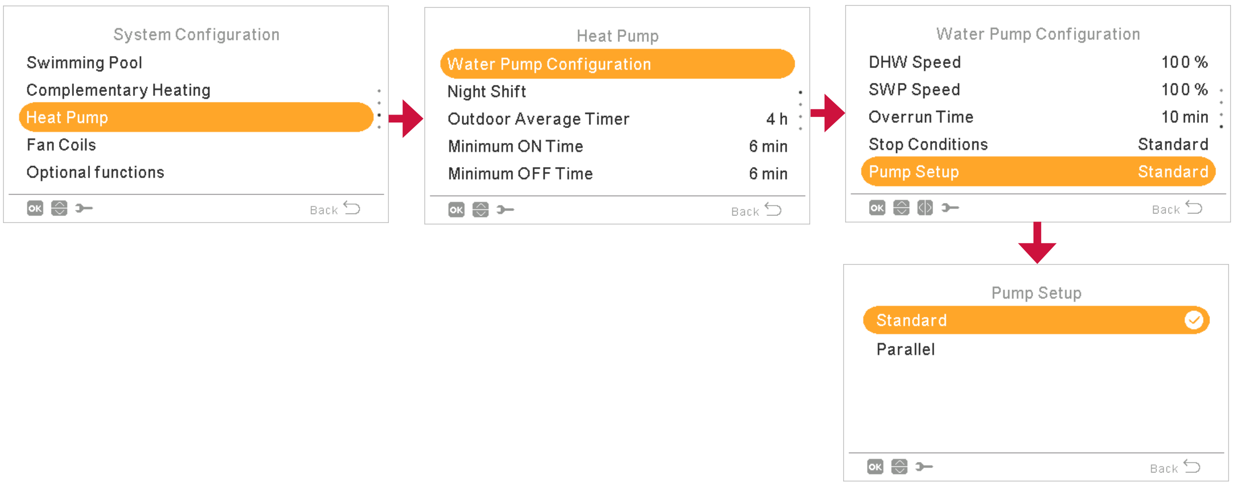
2 **Parallel configuration:**

In the parallel setup, WP3 is designated for circuit 1 operation, while WP2 is assigned to circuit 2. This arrangement allows for individual pump stoppage based on demand-off conditions. The activation of "ECO Pumps" (configured by DSW4-PIN5 = ON) is necessary for the pump stoppage to occur.

This function is available when hydraulic separator has been selected.

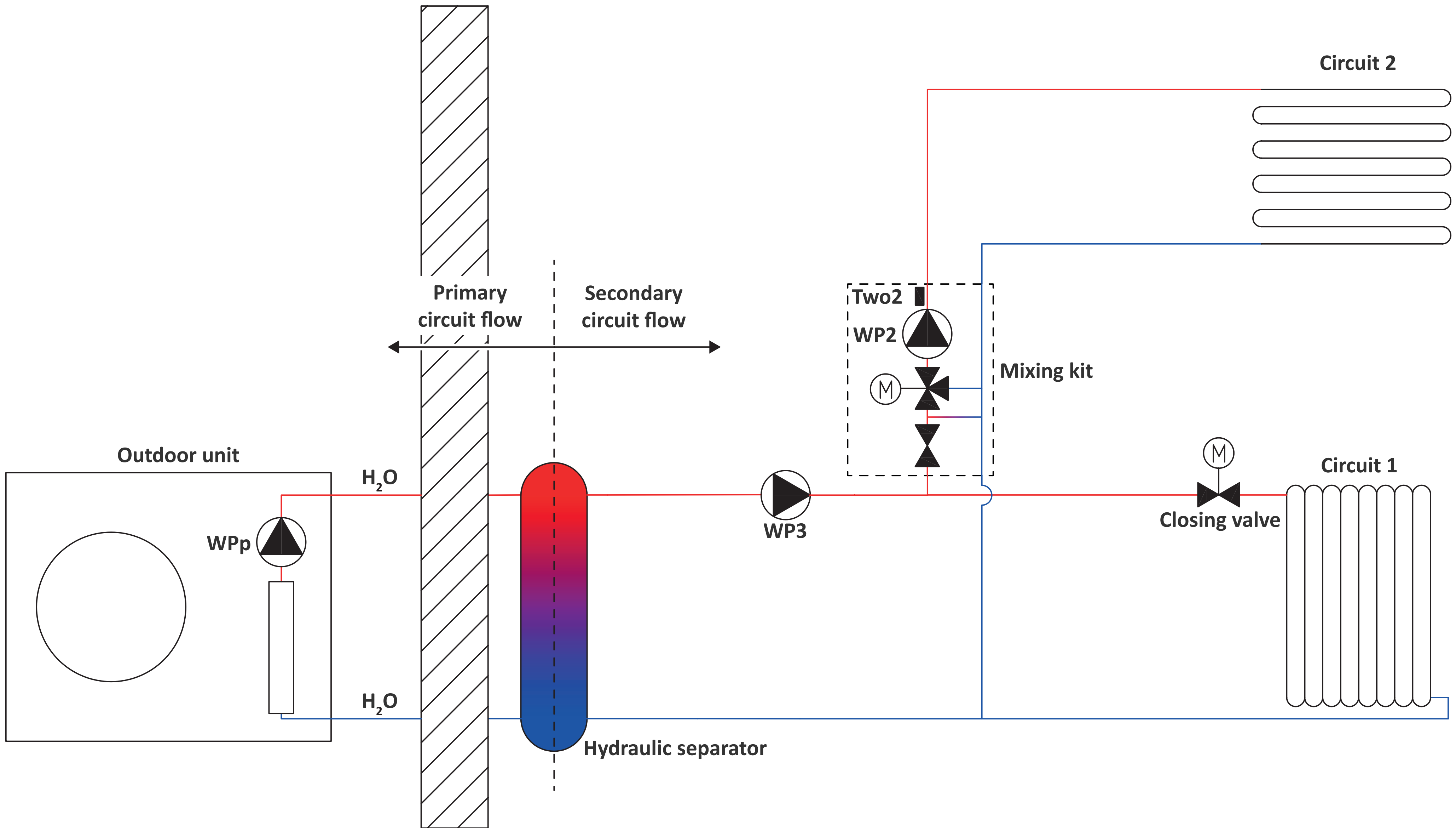
System Configuration → Heat Pump → Water Pump Configuration

Description	Default Value	Range
Pump Setup	Standard	Standard / Parallel



◆ Example 1: airH2O 800 standard hydraulic layout

- Pump Setup: Standard
- WPp and WP3 (and WP1 in the cases of **airH2O 800H** and **H Combi**) always needs to operate at the same time so the heat can be transferred to the secondary circuit flow.
- WP2 operates independently for circuit 2. If there is a Demand-OFF and "ECO Pumps" is set, then WP2 can stop.

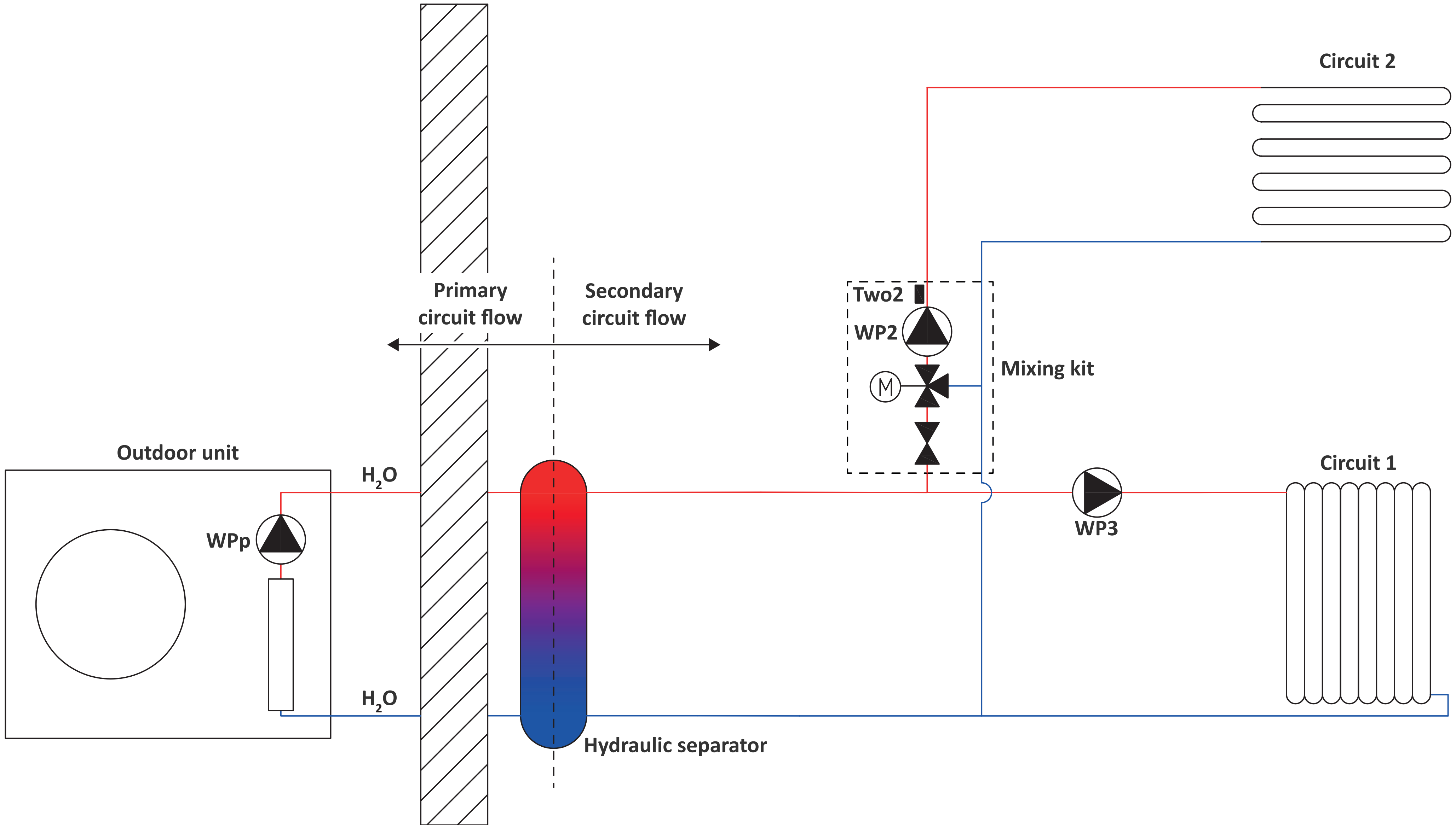


In this specific example, a system using a Control Box, an external hydraulic separator and WP3 is shown.

Because of the pump setup's characteristics, WP3 should remain operational whenever circuit 2 requires it, even when configuring pumps in an economic mode. This results in heating circuit 1 to the circuit 2 water setting temperature, even when there is no demand from circuit 1. To prevent this situation, a closing valve controlled by the indoor unit output must be installed to isolate circuit 1 when there is no demand from circuit 1, but only from circuit 2.

◆ Example 2: dedicated pumps for circuit 1 and circuit 2 in parallel

- Pump Setup: Parallel
- WPp needs to operate for the heat generation, and so does WP1 in the cases of **airH2O 800H** and **H Combi**.
- WP3 and WP2 operate independently for Circuit 1 and 2, respectively.
- If there is a Demand-OFF and "ECO Pumps" is set, then WP3 and WP2 can stop according to individual demand.



In this specific example, a system using a Control Box, an external hydraulic separator and WP3 is shown.

In this parallel pump setup, it is not necessary for WP3 to be active when circuit 2 is in demand, as both circuits are hydraulically independent. This implies that when either circuit is turned OFF, the pump associated with that specific circuit will stop without affecting the other circuit. Additionally, when configuring economic pumps, each pump will start and stop based on the demand in each zone.

NOTE

For this hydraulic layout Hitachi's "2nd Temperature kit" cannot be used. Use a field supplied mixing kit.

2.8.2.2 Pumps operations summary

- DHW tank position: post
- Pump setup: standard

DHW Tank Position: Post / Pump Setup: Standard	C1 Demand	C2 Demand	DHW Demand	WP1	WP2	WP3
	ON	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON
	OFF	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON
	ON	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	OFF	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	ON	ON	OFF	ON	ON	ON
	OFF	ON	OFF	ON	ON	ON
	ON	OFF	OFF	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	OFF	OFF	OFF	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)

- DHW Tank Position: Pre
- Pump Setup: Standard

	C1 Demand	C2 Demand	DHW Demand	WP1	WP2	WP3
DHW Tank Position: Pre / Pump Setup: Standard	ON	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)
	OFF	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)
	ON	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)
	OFF	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)
	ON	ON	OFF	ON	ON	ON
	OFF	ON	OFF	ON	ON	ON
	ON	OFF	OFF	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	OFF	OFF	OFF	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)

- DHW Tank Position: Post
- Pump Setup: Parallel

DHW Tank Position: Post / Pump Setup: Parallel	C1 Demand	C2 Demand	DHW Demand	WP1	WP2	WP3
	ON	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON
	OFF	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON
	ON	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	OFF	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	ON	ON	OFF	ON	ON	ON
	OFF	ON	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)
	ON	OFF	OFF	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	OFF	OFF	OFF	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)

- DHW Tank Position: Pre
- Pump Setup: Parallel

DHW Tank Position: Pre / Pump Setup: Parallel	C1 Demand	C2 Demand	DHW Demand	WP1	WP2	WP3
	ON	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)
	OFF	ON	ON	ON	ON (Pumps ON during DHW from LCD) OFF (Pumps OFF during DHW from LCD)	ON (Pumps during DHW: ON)OFF (Pumps during DHW: OFF)
	ON	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)
	OFF	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Pumps during DHW: ON)OFF (Pumps during DHW: OFF)
	ON	ON	OFF	ON	ON	ON
	OFF	ON	OFF	ON	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)
	ON	OFF	OFF	ON	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON
	OFF	OFF	OFF	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)	ON (Standard pumps DSW4-PIN5: OFF) OFF (ECO Pumps DSW4-PIN5: ON)

2.8.3 Pumps mode

The pump control can be configured in either Standard or Economic mode, determined by DSW4 PIN5.

1 **Standard mode:**

- When PIN is OFF, the pump operates in standard mode.
- The pump remains operational whenever space heating or cooling is enabled (switch ON).
- If space heating or cooling is disabled (switch OFF), the pump turns off. It only switches back on when domestic hot water is requested.

2 **Economic mode:**

- When PIN is ON, the pump operates in economic mode.
- In economic mode, the pump can stop when the entire system is not in operation (demand off for space heating and cooling, with no other ongoing operations).

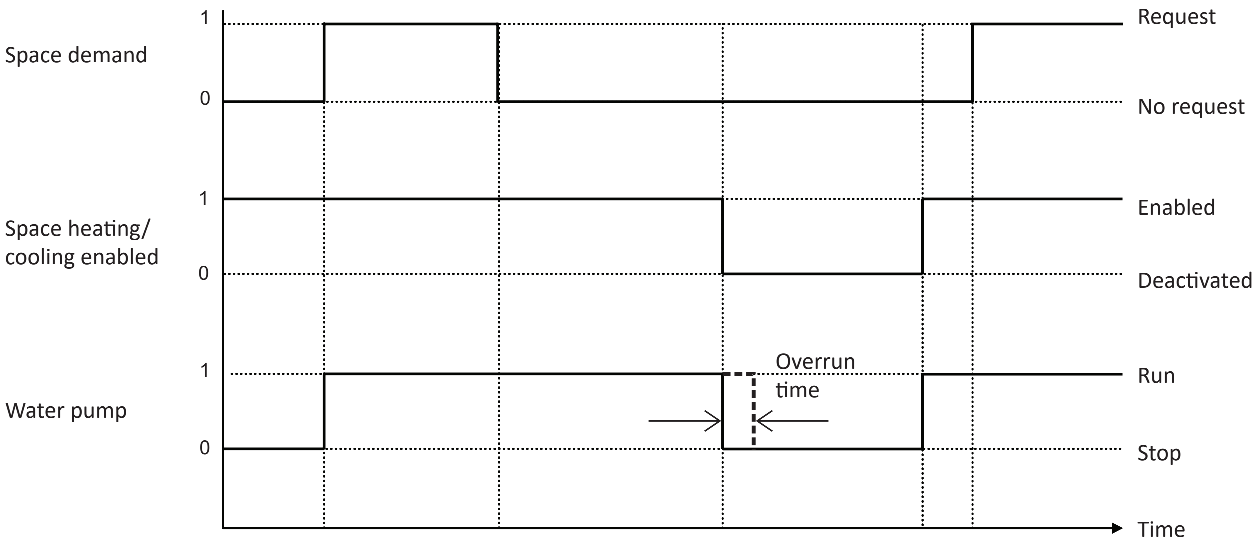
Pump stops when there is an alarm event.

2.8.3.1 Standard mode water pump operation

NOTE

- *Applicable for WP1, WP2 and WP3.*
- *WPp (primary water pump) follows the operation of WP1.*

When the system is configured in standard mode (always in operation), water pump works as shown in the graphic below:

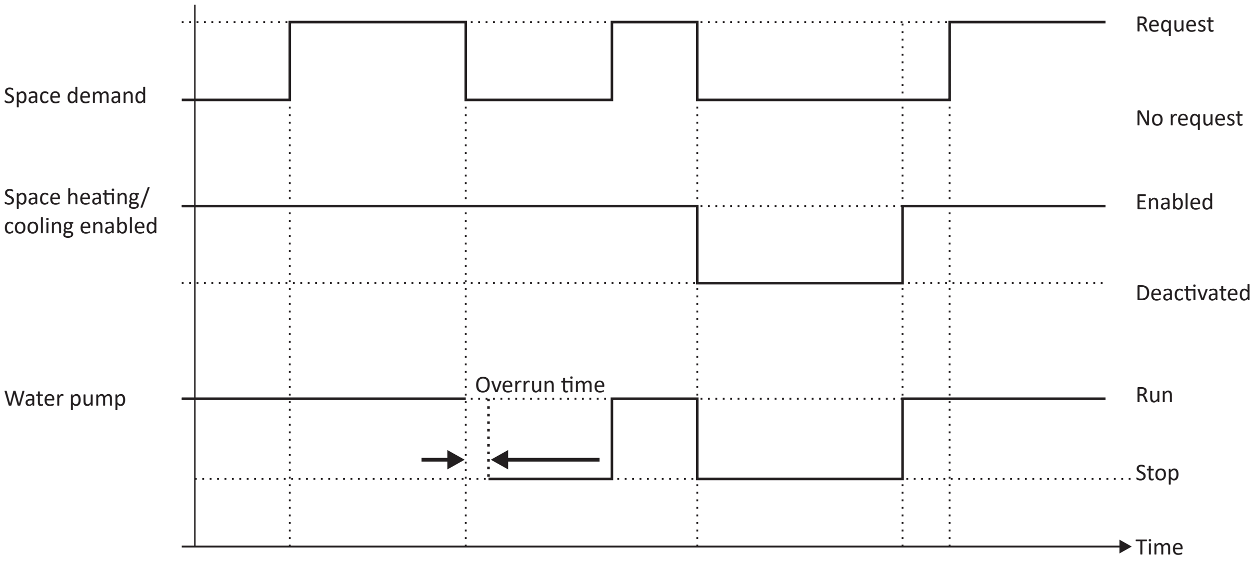


2.8.3.2 Economic mode water pump operation

NOTE

- *Applicable for WP1, WP2 and WP3.*
- *WPp (primary water pump) follows the operation of WP1.*

When the system is configured in economic mode, water pump works as shown in the graphic below:



Recirculation option

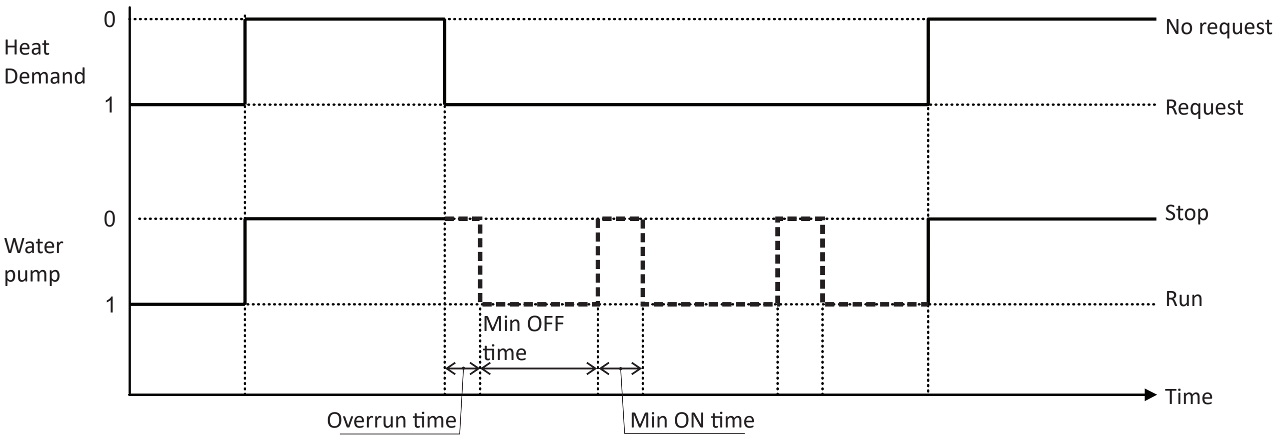
NOTE

- *Applicable for WP1, WP2 and WP3.*
- *WPp (primary water pump) follows the operation of WP1.*

When recirculation option is enabled (see "2.3.13.2 DHW re-circulation"), pump (both main and sub) will be operated regularly when they are stopped.

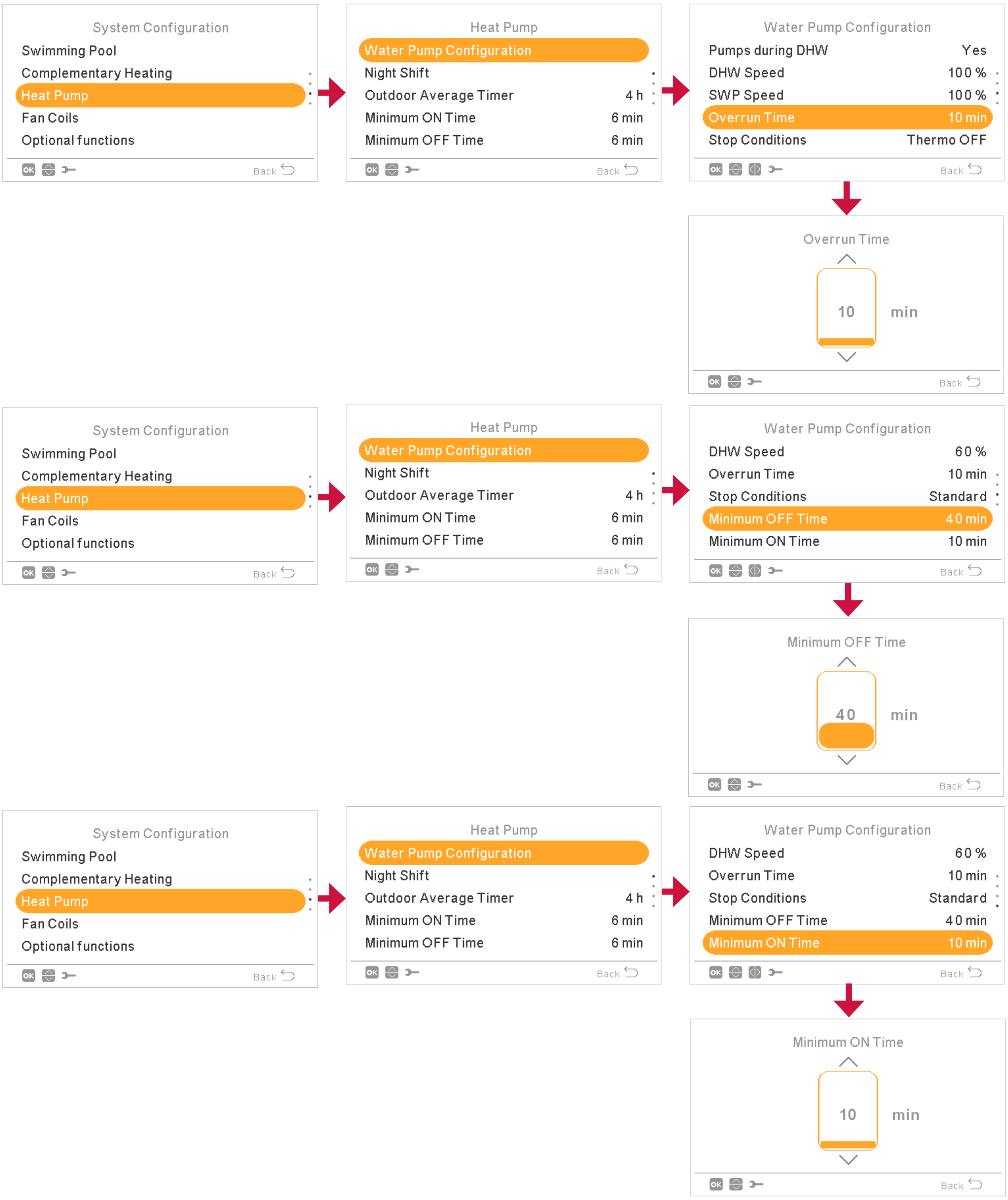
Once main pump is no longer required, it must continue operating during at least WPOvr time is passed since cease of requirement.

Each WPMinf minutes pump will be operated during WPMino minutes. Timer is independent for main and sub pumps.



System Configuration → Heat Pump → Water pump Configuration

Description	Default Value	Range	Units
Overrun time (WPOvr)	10	5~120	min
Minimum OFF Time (WPMinf)	40	0~120	min
Minimum ON Time (WPMino)	10	0~120	min



NOTE

If WPMino or WPMinf are set to 0, recirculation option is disabled.

2.8.4 Water pump control selection

NOTE

Applicable for WP1.

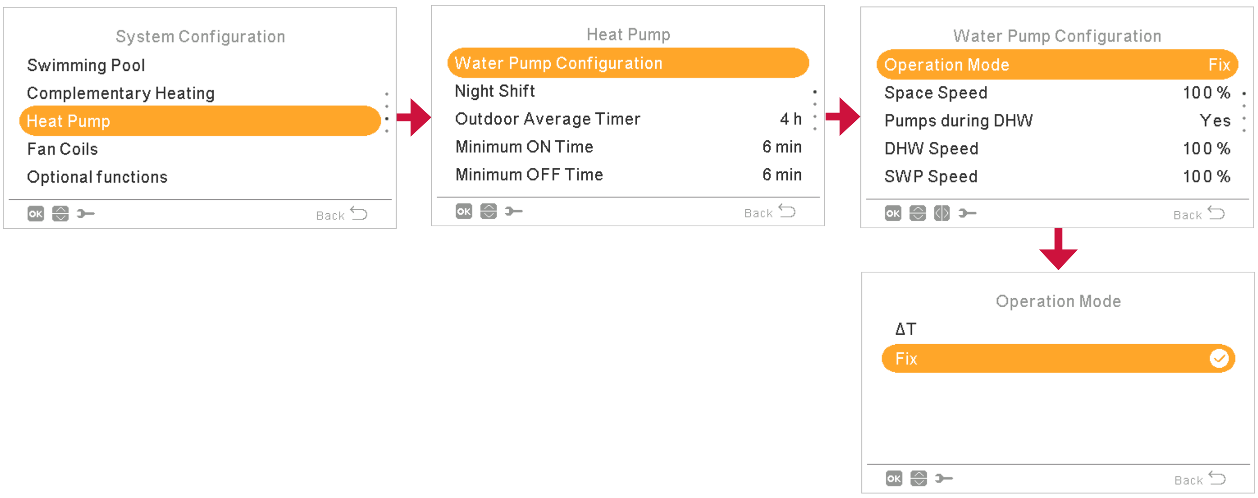
The settings for WP1 can be configured in two optional modes for space heating/cooling:

- Fixed speed value selected by installer.
- Control by ΔT by water inlet and water outlet temperature.

DHW and SWP operate only in fix mode.

System Configuration – Heat Pump – Water Pump Configuration

Description	Default Value	Range
Operation mode	Fix	Fix ΔT



2.8.4.1 Fixed water pump speed

NOTE

Applicable for WP1.

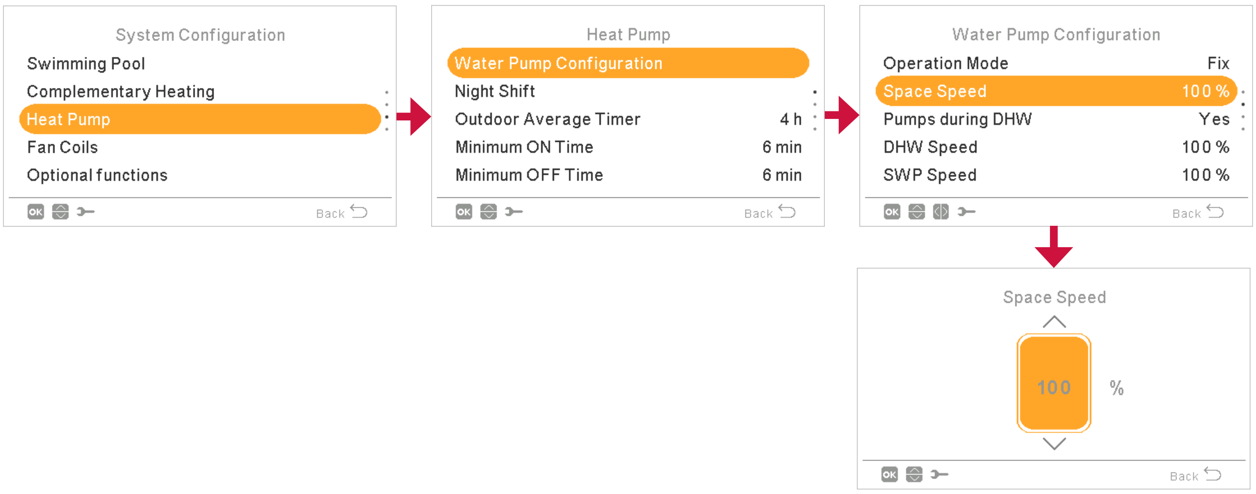
This feature is applicable for WP1 in space heating, cooling, DHW and SWP scenarios. Users have the flexibility to select a fixed output speed for the water pump in each of these scenarios., allowing for manual adjustment and control.

The configuration of this function should be done through the unit controller.

Space heating/cooling fix setting

System Configuration → Heat Pump → Water Pump Configuration

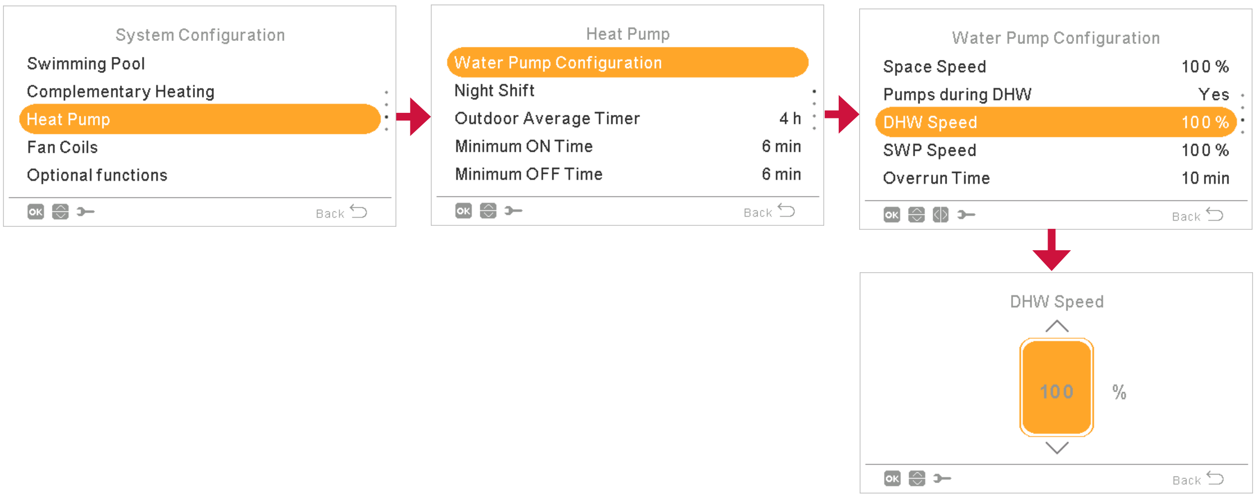
Description	Default Value	Range	Units
Space Speed (WPSS)	100	50~100	%



DHW water pump speed

System Configuration → Heat Pump → Water Pump Configuration

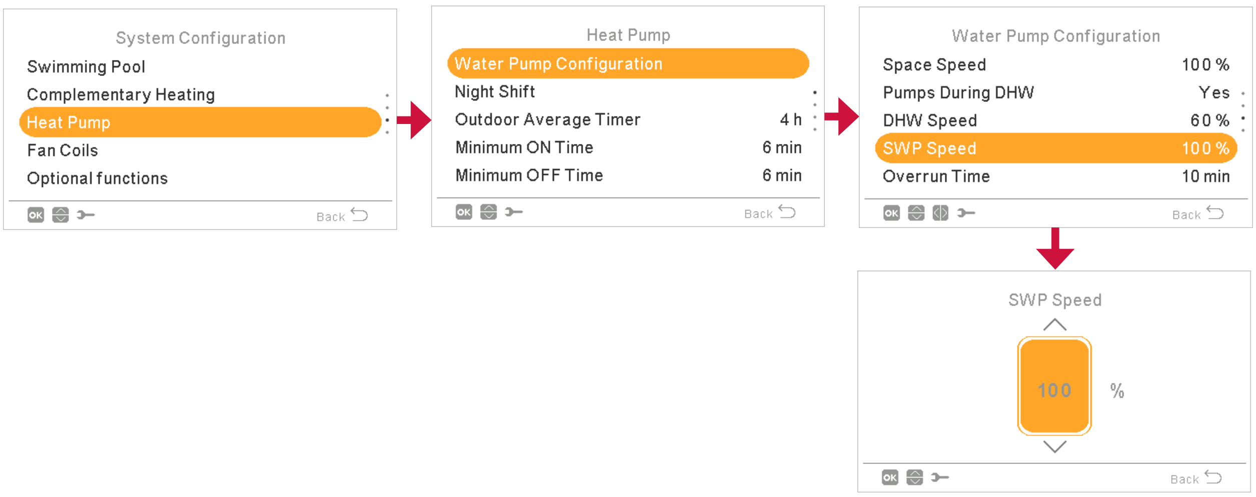
Description	Default Value	Range	Units
DHW Speed (WPDS)	100	50~100	%



SWP water pump speed

System Configuration → Heat Pump → Water Pump Configuration

Description	Default Value	Range	Units
SWP Speed (WPWS)	100	50~100	%



2.8.4.2 ΔT water pump control for space heating and cooling

The purpose of the ΔT water pump control is to optimize the operation of the water pump by adjusting its rotational speed. This adjustment aims to ensure the most efficient usage of the system.

The **airH2O 800** unit specifies the ideal temperature difference between the return and leaving water, depending on the set temperature. The water pump's velocity is modulated, either increased or decreased, to achieve the specified temperature difference.

This control mechanism is specifically applicable during space heating or space cooling operations.

◆ Space Heating

Setting temperature (Ttwo)	Desired ΔT = Two - Twi
Ttwo > 60 °C	10 °C
55 °C < Ttwo ≤ 60 °C	8 °C
45 °C < Ttwo ≤ 55 °C	7 °C
25 °C < Ttwo ≤ 45 °C	5 °C
25 °C ≤ Ttwo	3 °C

◆ Space Cooling

In the context of space cooling, the specified objective is to achieve a constant ΔT (Temperature Difference) of 5 °C. This means that the temperature difference between the return and leaving water during the cooling operation should be maintained at 5 °C for optimal performance. The system will adjust the water pump's rotational speed as needed to ensure that the desired ΔT of 5 °C is consistently achieved during space cooling.

2.8.5 Protection control

2.8.5.1 Anti freeze control (winter operation)

NOTE

Applicable for WP1, WP2 and WP3 (WPp follows the operation of WP1).

When in operation during winter, if the outlet water temperature drops to 5 °C or lower, and the unit remains in demand OFF operation with the water pump OFF, the system activates the water pump. This is done to safeguard the unit and pipe installation from freezing. The anti-freeze control is released when the water outlet temperature rises to 7 °C or higher.

Configuration

To enable the anti-freeze control mode, the user needs to set DSW4 PIN6 to ON. When this configuration is activated, the pump will operate when the specified conditions for anti-freeze control are fulfilled.

2.8.5.2 Stand-alone protection of primary water pump (WPp)

It implements a protection control to protect not only the plate exchanger, but also the water pipes located outside for those periods when the system is not in operation.

Constant pipe temperature check:

When outdoor ambient temperature is lower than 5 °C and the system is not in operation, WPp is started for 10 seconds every 10 minutes. The purpose of this control is to update water temperature sensor values and properly determine if the outdoor temperature is near freeze conditions.

Autonomous recirculation:

In case the water temperature reaches critical temperature values, WPp starts with the purpose to keep the water moving and avoid frost formation inside the plate exchanger. This operation starts WP1 operation as well.

2.8.5.3 Anti freeze control heater (WH, winter operation)

Specific to **airH2O 800M** units, there is a dedicated heater known as WH, designed to safeguard the heat exchanger from freezing during low-temperature conditions.

WH Activation:

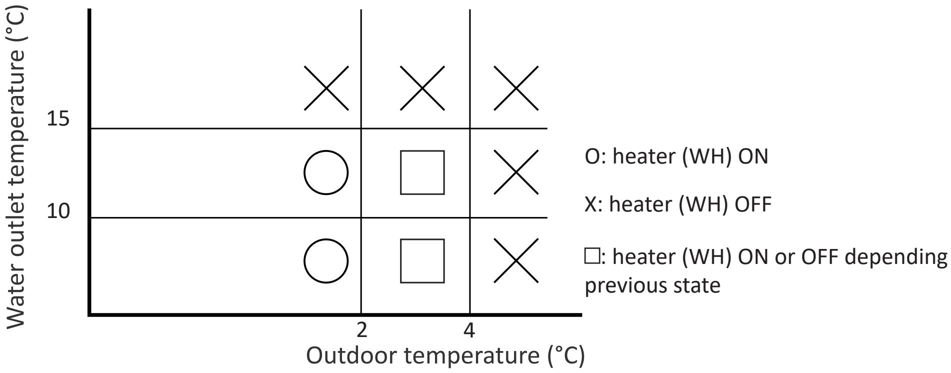
WH is turned ON if the following conditions are met:

- Water Outlet Temperature (Two) < 10 °C
- Ambient Temperature ≤ 2 °C
- Water pump is OFF

WH Deactivation:

WH is turned OFF if any of the following conditions occur:

- Water Outlet Temperature (Two) > 15 °C
- Ambient Temperature ≥ 4 °C
- Water pump is ON



NOTE

This function is not enabled when antifreeze control by water pump is enabled.

2.8.5.4 Pump seizure protection

NOTE

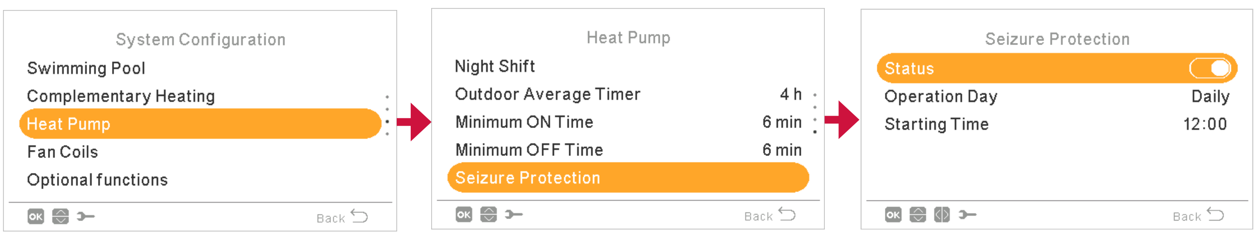
Applicable for WP1, WP2 and WP3.

This function, applicable for WP1, WP2, and WP3, is designed to prevent sticking of components caused by prolonged periods of inactivity. The protection mechanism involves running the components for a short duration every day or specific day of the week, specifically opening and closing mixing valves.

Pumps are switched ON for 1 minute during the seizure protection operation.

System Configuration – Heat Pump - Seizure Protection

Description	Default Value	Range	Units
Status	Deactivated	Deactivated/Enabled	-
Operation Day	Daily	Daily, Mon ~ Sun	day
Starting Time	12:00	00:00~23:50	hh:mm



NOTE

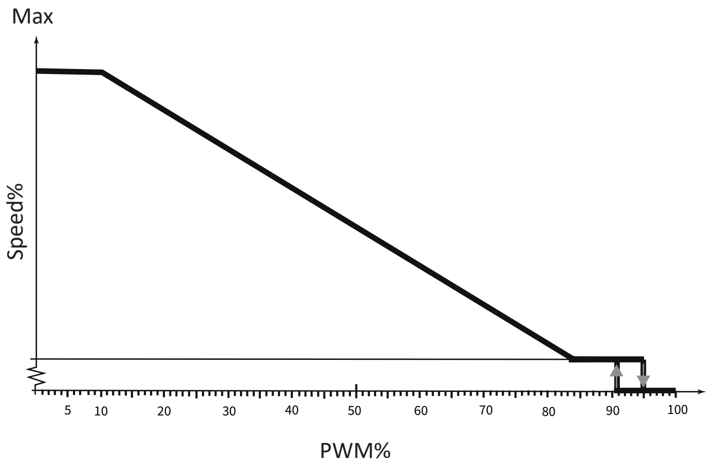
- *For AC Water pump (WP2 and WP3) switch ON the seizure protection for 10 minutes.*
- *For DC Water pump (WP1)switch ON the seizure protection at fixed speed for 10 minutes.*
- *DHW and SWP valves are not included in the seizure protection.*
- *The seizure protection is only applied at the specified day and in case that at the "Starting Time" the unit is OFF or in Demand OFF.*

2.8.6 Pump control signals

2.8.6.1 PWM Input signal

Pump target speed is selected in terms of a percentage. However, it is controlled by means of a pulse width modulated (PWM) signal.

The higher the target percentage is, the lower the PWM signal is. In case of a cable breakage, the pumps work at maximum speed to transfer heat from the primary heat exchanger.



PWM input signal (%)	Pump Action
≤10	The pump runs at maximum speed.
>10 / ≤ 84	The pump speed decreases linearly from maximum to minimum.
>84 / ≤ 91	The pump runs at minimum speed (operation)
>91 / 95	Hysteresis area: on/off
>95 / ≤ 100	Standby mode: off

2.8.6.2 PWM feedback signal

NOTE

Applicable for WPp and WP1.

This PWM (Pulse Width Modulation) feedback signal is specific to WPp and WP1 and provides important information to the pump controller. The integrated electronics within the pump process direct measurements and offer:

- Flow (Q): it is calculated using the parameters of rotation speed, power, and water temperature. The PWM duty cycle ranges from 5% to 75%.
- Pump Status

	PWM output signal (%)				
	0~70	75	85	90	95
Feedback type	Water flow	-	-	-	-
	-	Pump status	Pump status	Pump status	Pump status

NOTE

This feedback system is specific to WPp and WP1.

Water flow estimation control

NOTE

Applicable for WPp and WP1.

This control feature is specific to WP1 and involves the estimation of water flow. It's important to note the following details:

A correction value is applied to the estimated water flow, accounting for factors such as temperature, pump housing type, and duty point.

The correction function addresses variations in estimated flow due to temperature differences. At lower temperatures, the estimated flow may be higher than the real flow, and vice versa.

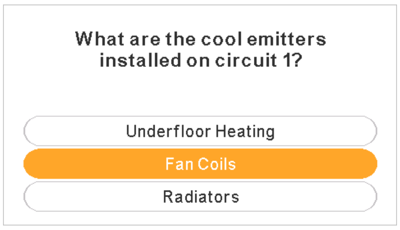
CAUTION

- *In cases involving* **airH2O 800M** *units and applications with glycol, the viscosity of water when glycol is added can impact flow estimation. Consequently, flow estimation cannot be guaranteed in these scenarios.*
- *Installers are responsible for ensuring the minimum water flow level using an external device in glycol applications.*
- *Certain optional functions, such as capacity calculation data and water pump control by ΔT°, cannot be used in glycol applications.*

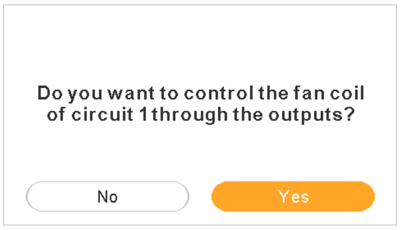
2.9 Fan coils control (only for PC-ARFH3E)

Control of fan coils is specifically available with the new thermostat PC-ARFH3E, functioning as a wired room thermostat.

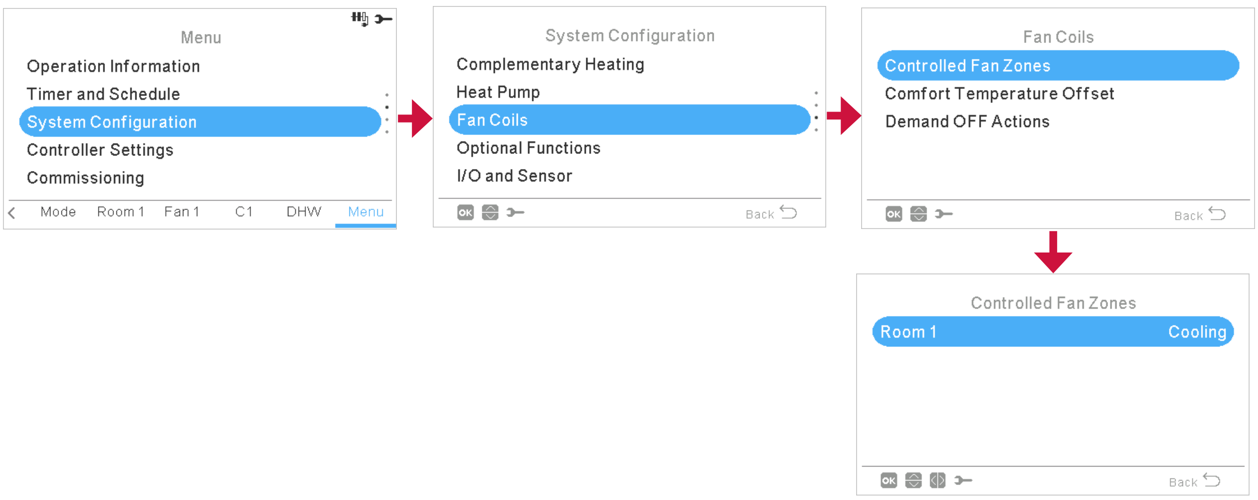
To enable fan coil outputs and the fan configuration icon on the main screen, the fan coil must be selected as an emitter in the wizard menu or within the LCD menu.



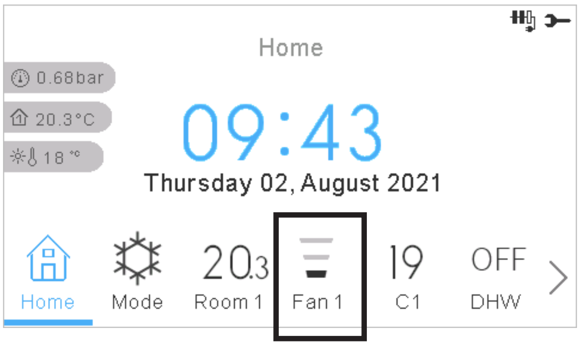
In case selected emitter is fan coil, wizard menu asks to control fan coil from **airH2O 800** LCD.



Alternatively this configuration can be also done inside System configuration, as follows:



When emitter declared is fan coil and fan coil is declared to be controlled from **airH2O 800** LCD, it is displayed fan velocity icon on room thermostat screen of each zone.



Example when LCD is Unit + Room 1

When selecting a velocity, software sets an output to high state. Also, in case ON/OFF button is pressed, zone is set in Demand OFF and Fan Coil's Fan stops.

2.9.1 Wiring to the fan coil motor

◆ airH2O 800H Combi

In the **airH2O 800H Combi**, there are configurable outputs designed for various functions, including fan coil motor control. Here are the key details for wiring the fan coil motor:

Output 1, Output 2 and Output 9:

- Live 230Vac
- Maximum 2.0 A for all 3 outputs at the same time

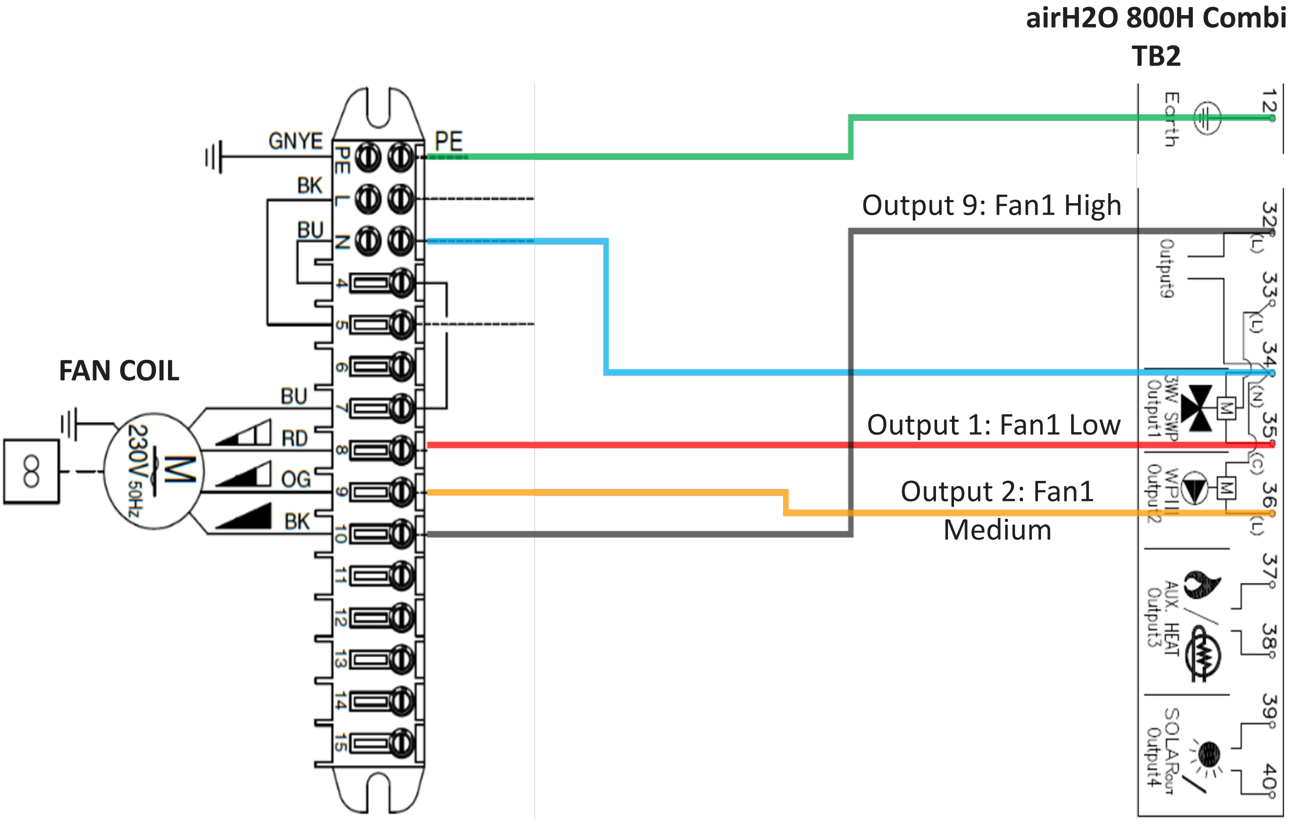
Outputs 3 and 4:

- Dry contact relay for 230Vac
- Maximum 2.5 A for every output

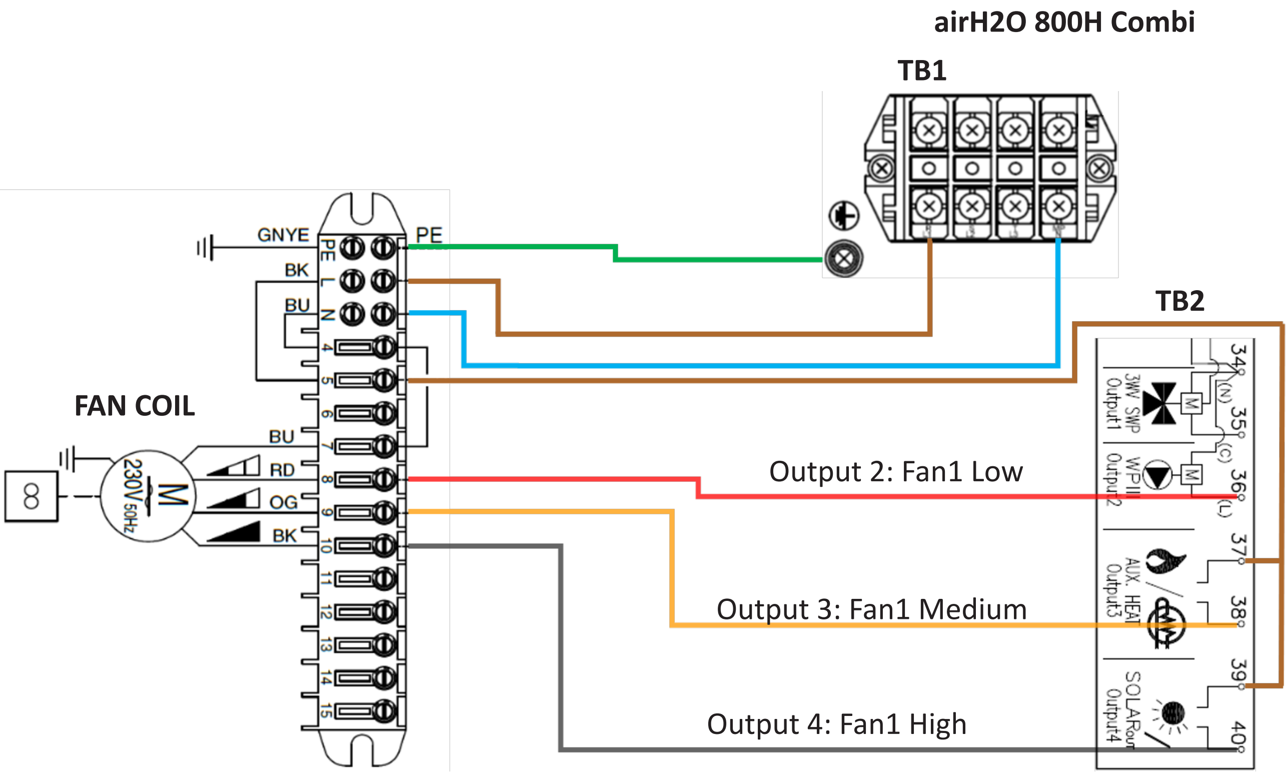
Considerations:

- The 3-speed fan motor control utilizes just one output at a time.
- When using outputs 1, 2, and 9 for the 3-speed fan control, ensure that the maximum fan-coil input current is less than 2.0 A.
- If outputs 1, 2, and/or 9 are used for controlling other devices, the total current (sum of fan motor current and other devices) must be less than 2.0 A. This includes devices connected to Auxiliary Power 28-29 terminals.
- Outputs 3 and 4 may be used for high or high/medium speed, with a maximum fan-coil input current of less than 2.5 A.

Fan coil connexion example 1: fan coil by outputs 1, 2 and 9



Fan coil connexion example 2: fan coil by outputs 2, 3 and 4



◆ airH2O 800H / Control Box

In the **airH2O 800H** and Control Box, there are configurable outputs designed for various functions, including fan coil motor control. Here are the key details for wiring the fan coil motor:

Output 1 and Output 2:

- Live 230Vac
- Maximum 2.0 A for all 3 outputs at the same time

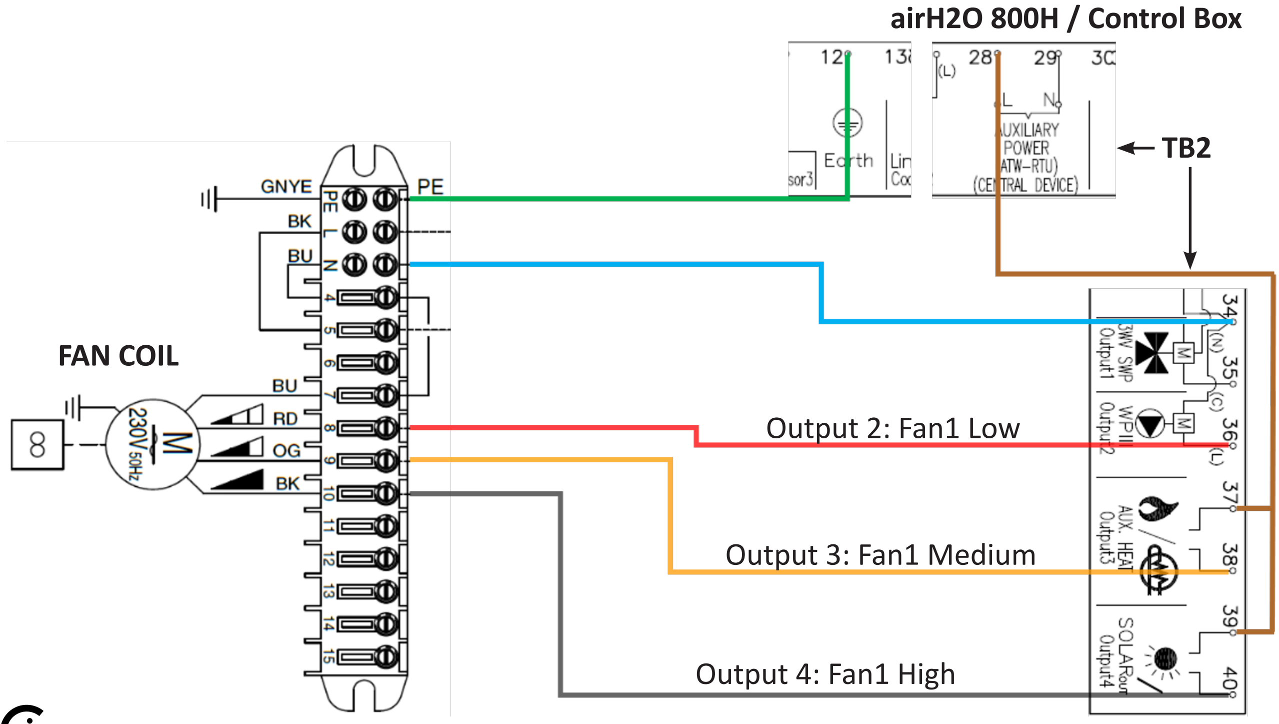
Outputs 3 and 4:

- Dry contact relay for 230Vac
- Maximum 2.5 A for every output

Considerations:

- The 3-speed fan motor control utilizes just one output at a time.
- When using outputs 1 and 2 for low or medium speed, ensure that the maximum fan-coil input current is less than 2.0 A.
- If outputs 1 and/or 2 are used to control other devices, the total current (sum of fan motor current and other devices) must be less than 2.0 A. This includes devices connected to Auxiliary Power 28-29 terminals.
- At least output 3 or 4 must be used for high speed, and the maximum fan-coil input current should be less than 2.5 A.

Fan coil connexion example: Fan coil by Outputs 2, 3 and 4

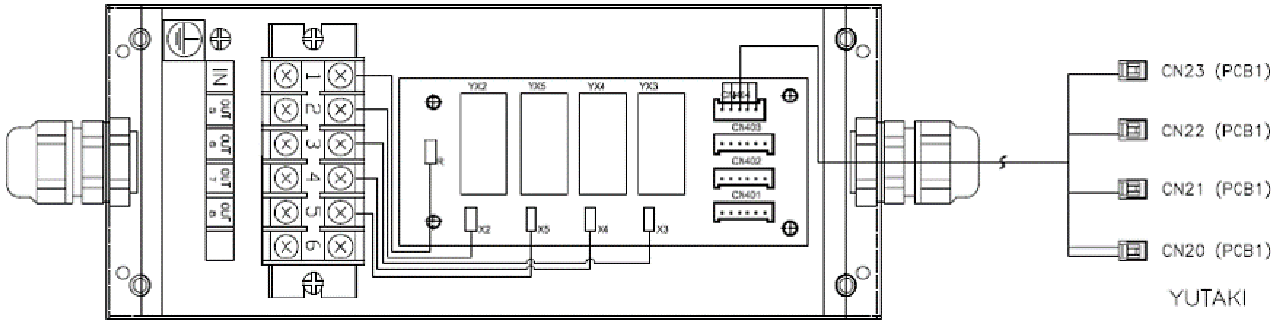


NOTE

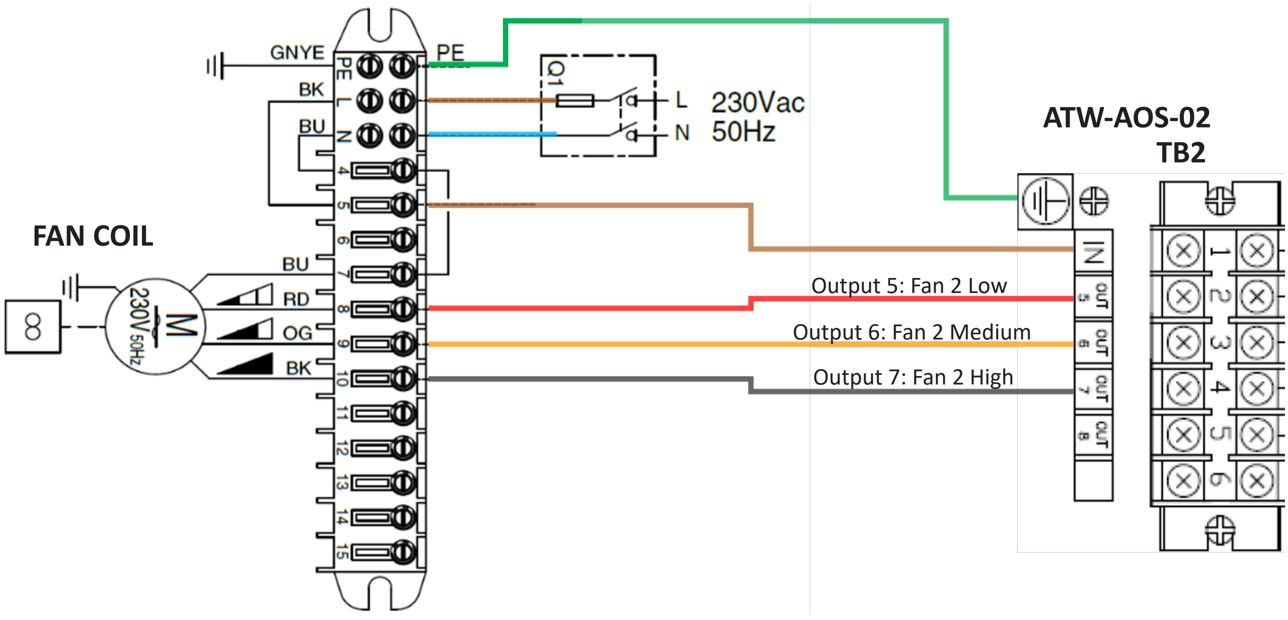
Notice that here no WP3 may be used, since output "WPIII" is already being used as "Output 2".

◆ Auxiliary output signal box ATW-AOS-02

- Additional control outputs 5, 6, 7 and 8 for **airH2O 800**.
- Dry contact relay, 230Vac input.
- Maximum total output: 10 A.
- Maximum individual output: 5 A.
- The maximum power input allowed for the fan motor is 5 A.



Fan coil connexion example: Fan coil by Outputs 5, 6 and 7



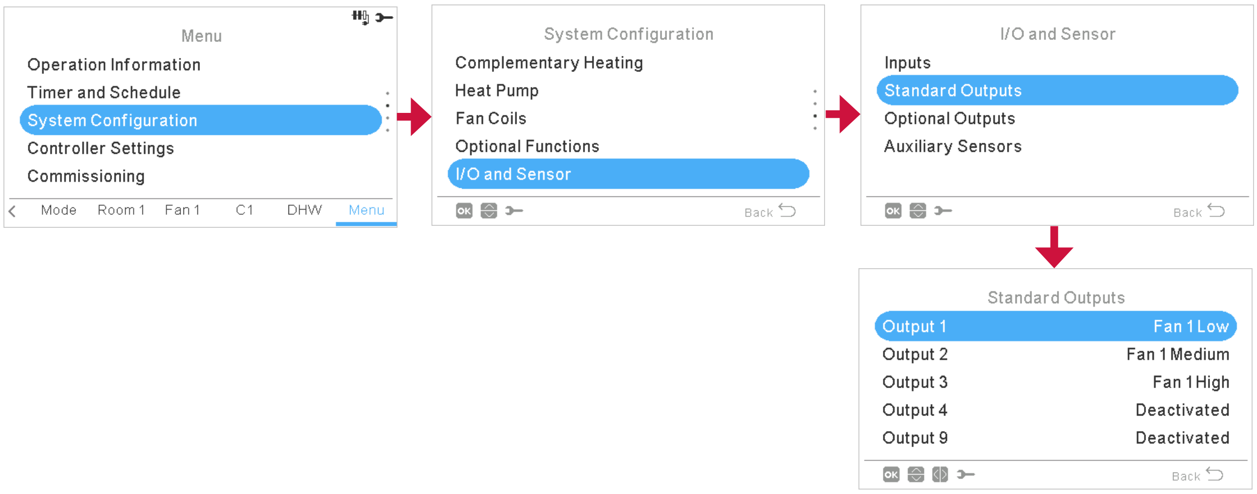
2.9.2 Selecting fan speed outputs

Into the I/O and Sensor menu we can find 2 different output menus:

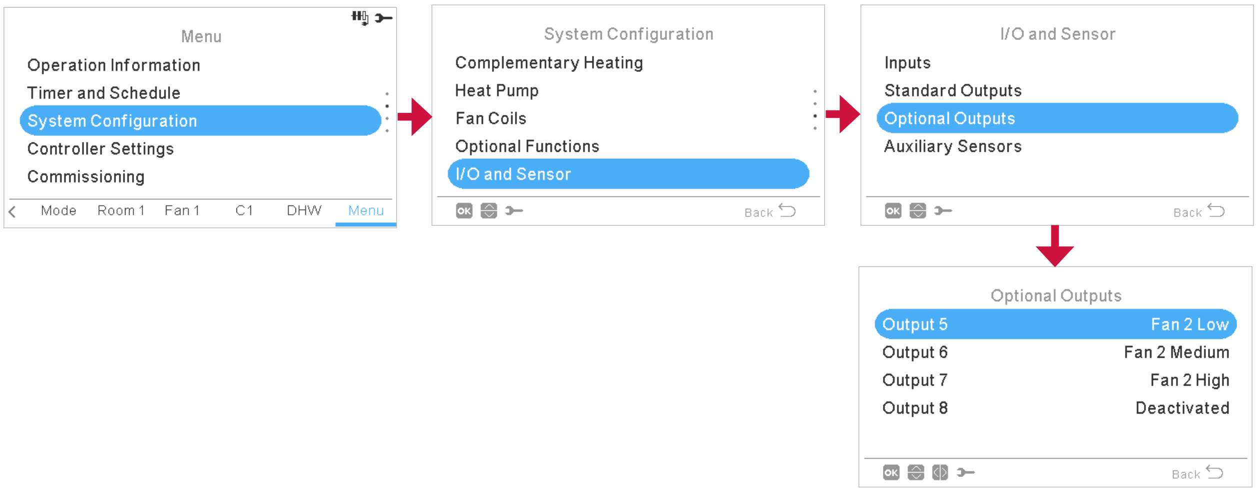
- Standard outputs: This is used to select the function of the own **airH2O 800** terminal board 2; Outputs 1, 2, 3, 4 (and 9 for **H Combi**).
- Optional outputs: This is used to select the function of the ATW-AOS-02 auxiliary output signal box; outputs 5, 6, 7 and 8.

In case of having 2 fan coils they are required up to 6 configurable outputs.

◆ Standard outputs for fan coil 1



◆ Optional outputs for fan coil 2



NOTE

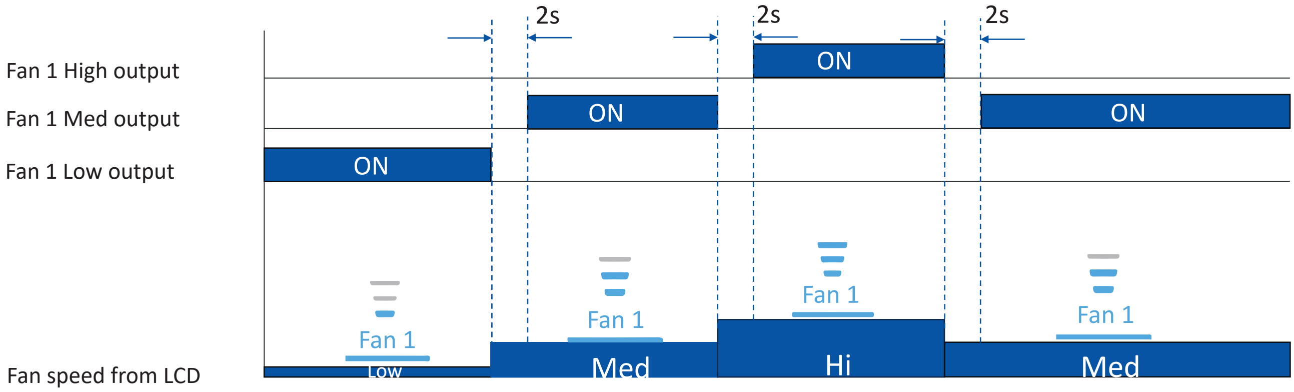
In case of requiring more optional outputs, it is required to purchase ATW-AOS-02 accessory.

2.9.2.1 Fan speed control

When selecting a fan speed from the LCD control on the **airH2O 800** system, the assigned output will activate.

To prevent potential switching problems and avoid damage, when the fan speed is changed, the currently active fan speed output is switched off. After a 2-second delay time, the new fan speed output will be activated.

The purpose of this control is to prevent simultaneous power supply to two different motor coils, which could potentially lead to damage.



- Fan AUTO mode can be selected as well
- High, Medium or Low fan speed will be decided according to the temperature difference:
  - ✓ Heating Δt = room setting temperature – room real ambient temperature
  - ✓ Cooling Δt = room real ambient temperature – room setting temperature
  - ✓ $\Delta t \geq 4$ °C → fan high
  - ✓ 1 °C < Δt < 4 °C → fan medium
  - ✓ $\Delta t \leq 1$ °C → fan low

2.9.3 Fan coil control options

When installing fan coils with **airH2O 800** systems, there are various customer requests and operational scenarios to consider. **airH2O 800** provides additional configuration options and outputs to adapt fan coil functionality to meet specific requirements:

1 **Different operation for cooling, heating, or both:**

Circuit 1 and Circuit 2 may require different operations for cooling only, heating only, or both. **airH2O 800** provides configurable options to accommodate diverse needs.

2 **Comfort control during heating:**

Fan operation during heating may cause discomfort if the water in the circuit isn't warm enough. Configuration options are available to address this concern, allowing for optimized fan operation during heating.

3 **Fan operation during demand OFF:**

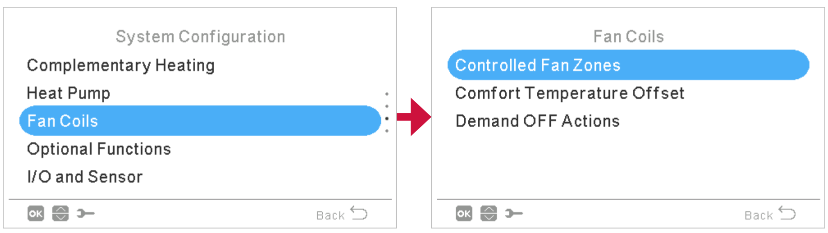
The fan may be required to stop or keep running during a demand off. **airH2O 800** offers configurable outputs and options to manage fan operation in alignment with demand off conditions.

4 **Dual-mode operation - cooling in summer, under-floor heating in winter:**

For scenarios where the fan coil is used for cooling in summer and under-floor heating in winter, a diverting valve must be controlled for switching between circuits. **airH2O 800** provides options to configure and control diverting valves based on operational needs.

5 **Fan control during room demand OFF:**

During room demand off, the fan can be configured to stop, or a 3-way valve can be controlled to bypass water. **airH2O 800** offers additional configuration options and outputs to adapt fan coil functionality during demand off periods.

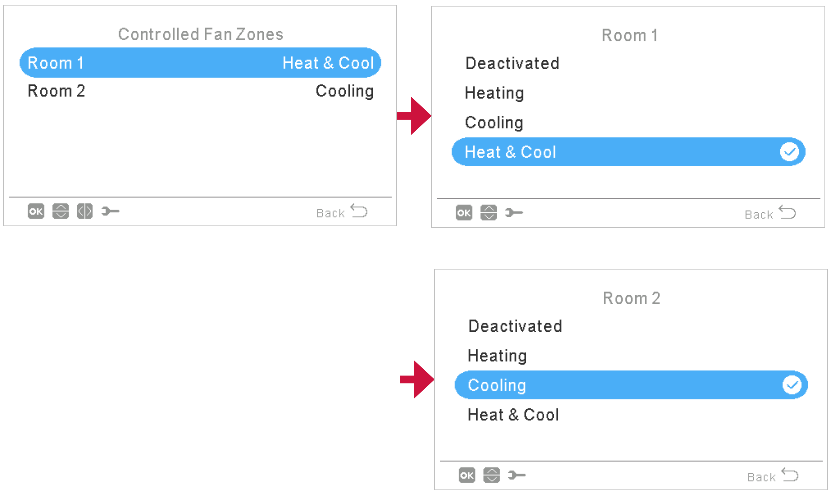


◆ Controlled fan zones

In the **airH2O 800** system, it is possible to declare and customize the operation of fan coils for each circuit.

- Disabled
- Heating
- Cooling
- Heating and cooling

Using the controlled fan zones menu is possible to change the initial fan coil declaration at any moment to adapt **airH2O 800** control to the existing fan coil installation.



◆ Comfort temperature offset

There's a specific function known as the "Comfort Temperature Offset" designed to enhance the comfort of heating operations during system startup, room demand-off, or defrost scenarios. The primary objective is to prevent discomfort caused by blowing air at cold or ambient temperatures.

The function allows you to define a water temperature offset below the set point target. This offset is used to determine when to stop fan operation.

1 **Discomfort Prevention:**

During system startup, room demand-off, or defrost scenarios, where the water temperature may not be high enough to provide comfortable heating, the comfort temperature offset comes into play.

The offset helps avoid blowing cold or ambient air, preventing discomfort for occupants.

2 **Individual Fan Settings:**

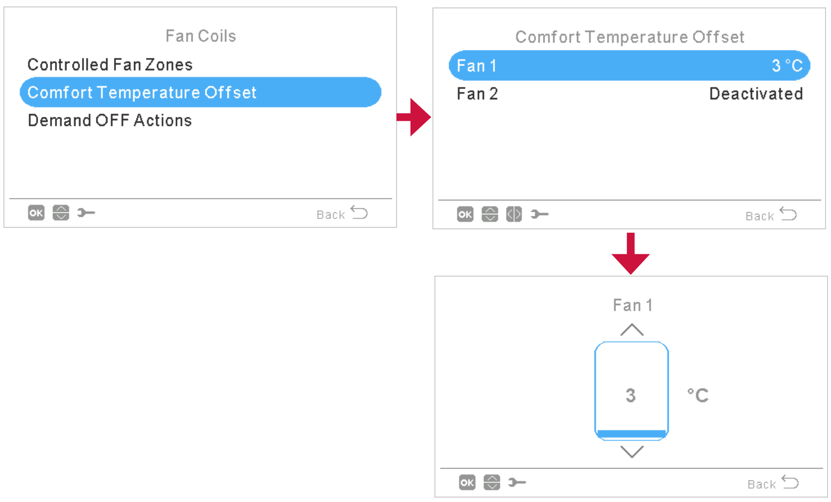
Fan 1 and Fan 2 can be individually set with different offset values. This customization allows you to tailor the comfort temperature offset based on the requirements or characteristics of each fan.

3 **Sensor-Based Control:**

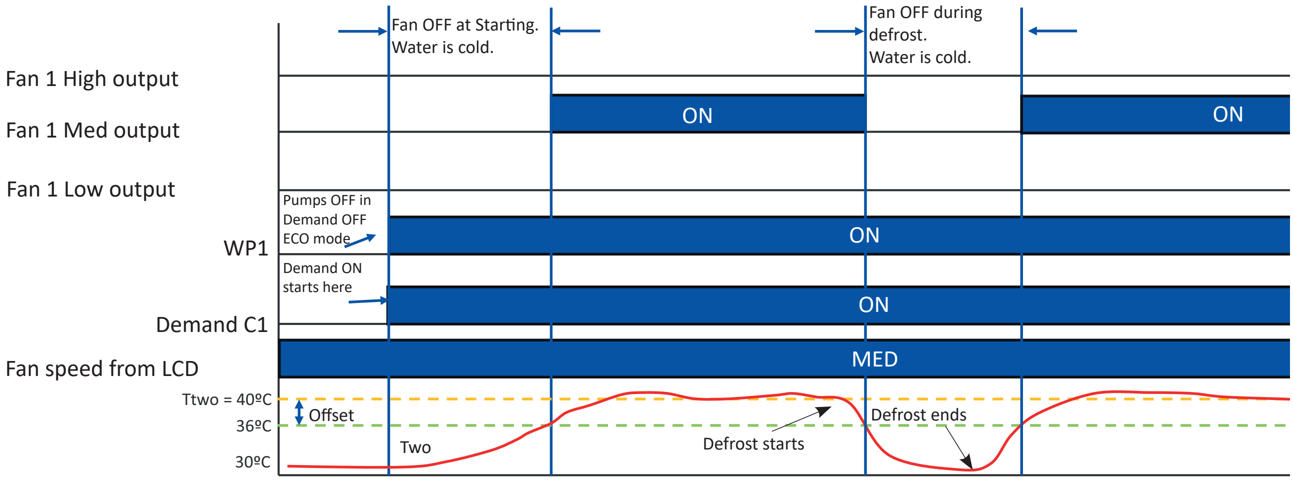
Circuit 1 is controlled by Sensor Two, and Circuit 2 is controlled by Sensor Two2. This ensures that the system adapts fan operation based on the specific conditions detected by these sensors.

4 **Limitation to Cooling Mode:**

The comfort temperature offset feature is designed for heating mode scenarios and does not apply to cooling mode.



◆ Example of comfort temperature offset:



Example to illustrate how the comfort temperature offset works:

Sensor Ttwo Setting:

- Ttwo is set at 40 °C.

Comfort Temperature Offset:

- An offset of 4 °C is applied.

Calculation:

- If Ttwo is less than 36 °C (40 °C - 4 °C), the fan operation will be stopped.

Scenario:

If, during system startup, room demand-off, or defrost, Ttwo measures a temperature below 36 °C, the comfort temperature offset function will trigger.

The system will stop fan operation to prevent blowing cold or ambient air, ensuring user comfort.

Different Circuits:

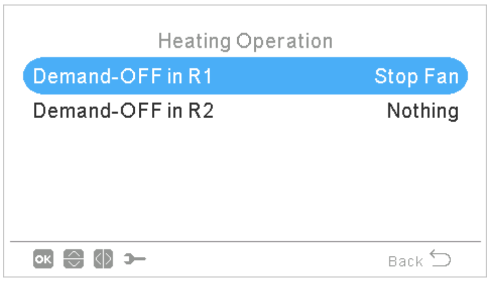
In the case of Circuit 2 (C2), the temperature judgment is done using both Ttwo and Two2 sensors.

◆ Demand OFF actions

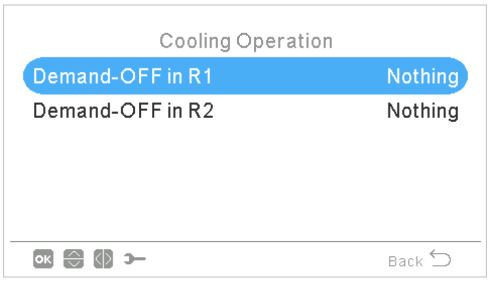
Room 1 and Room 2 may be switched to Demand OFF under two conditions:

- Room temperature is satisfied, heating/cooling is not required at that moment.
- Domestic Hot Water (DHW) operation is requested.

The Demand OFF actions menu allows you to select whether the fan must stop or continue operating for each room 1 and room 2 individually in both heating and cooling modes.



Demand OFF actions for room 1 and 2 in heating mode



Demand OFF actions for room 1 and 2 in cooling mode

- During demand OFF, the outputs for the fan coil are set to 0 if the "stop fan" option is selected. This ensures that the fan is effectively turned off when required.
- Demand OFF can occur due to various triggers, including DHW operation, Swimming Pool operation, or demand OFF initiated by room temperature.

2.9.4 Constant heat / constant cool output

The **airH2O 800** system introduces two new output definitions: Constant Heating and Constant Cooling. These outputs provide continuous control for specific hydraulic layouts by keeping the selected output permanently ON based on the system's heating or cooling mode. Here are the key features of these outputs:

1 **Constant heating:**

The Constant Heating output is always ON when the **airH2O 800** is in heating mode.

This status is maintained continuously regardless of Defrost, Thermo ON/OFF, or Demand ON/OFF conditions.

2 **Constant cooling:**

The Constant Cooling output is always ON when the **airH2O 800** is in cooling mode.

Similar to Constant Heating, this status is maintained permanently, unaffected by Defrost, Thermo ON/OFF, or Demand ON/OFF conditions.

3 **Customization for hydraulic layout:**

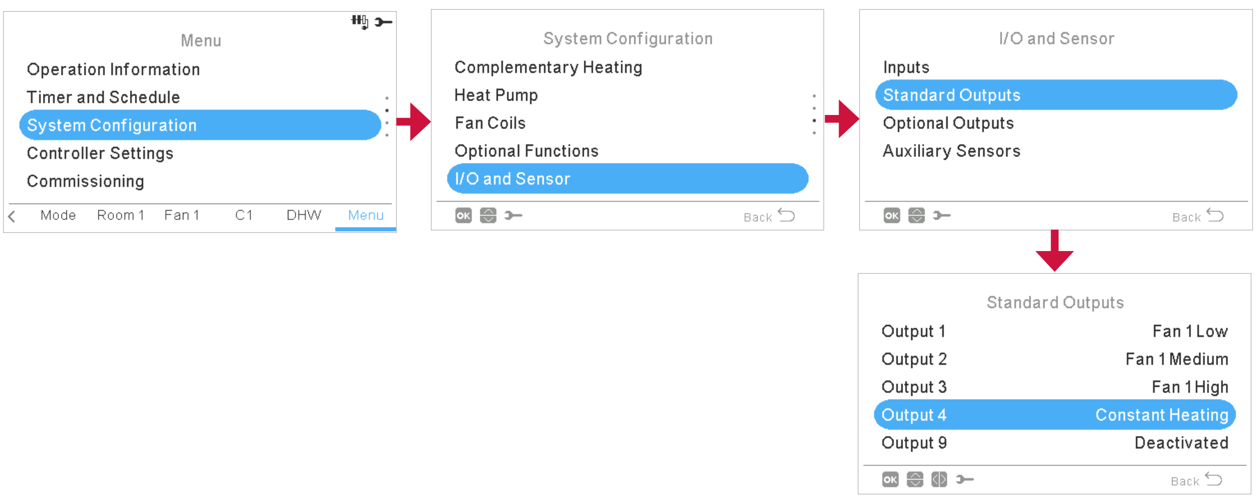
These outputs provide a means to customize the hydraulic layout by controlling diverting valves. For example:

- In winter, the Constant Heating output can be used for under-floor heating.
- In summer, the Constant Cooling output can be utilized for fan coil cooling.

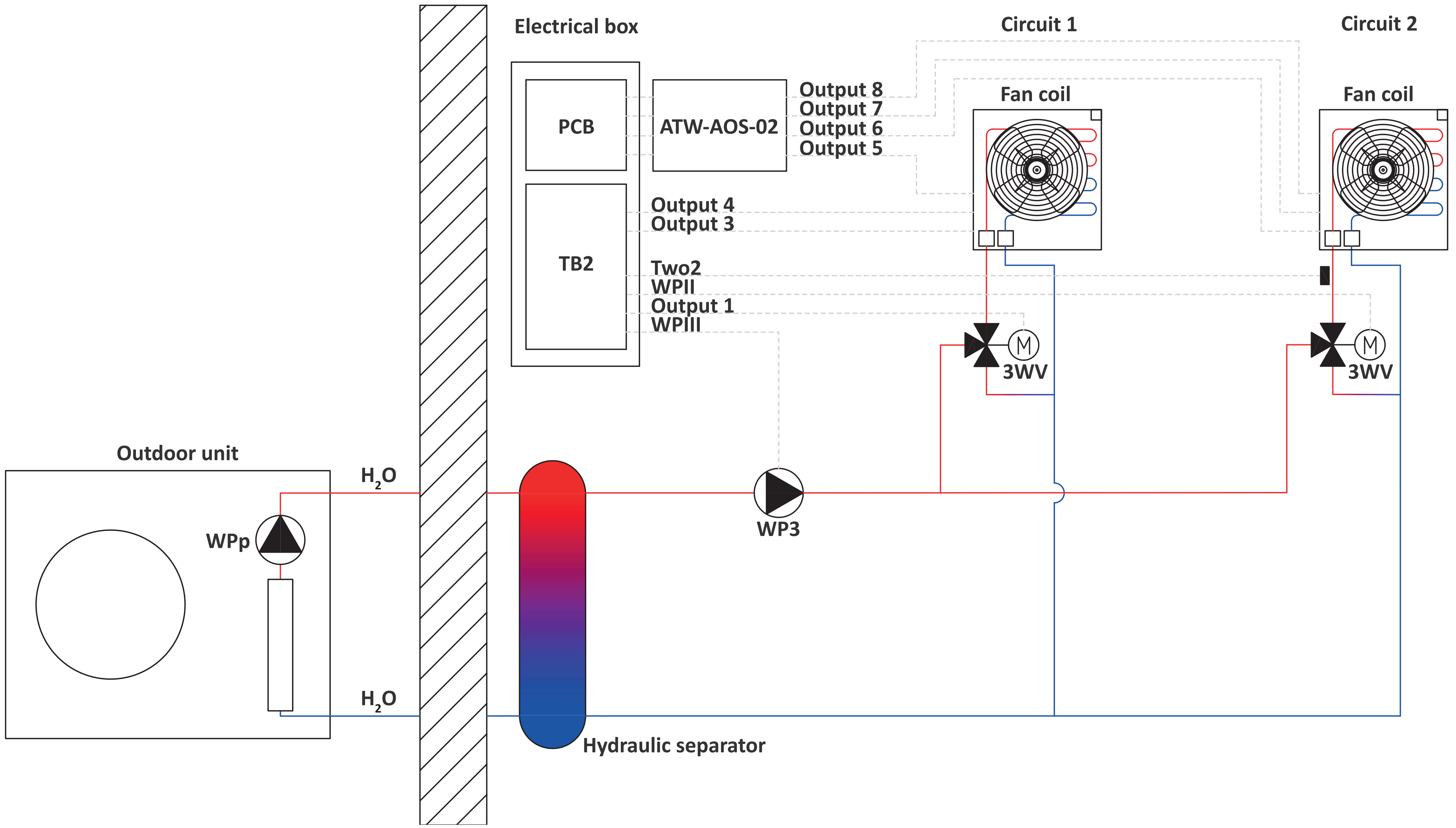
Diverting valves can be controlled to direct water to different emitters based on the heating or cooling mode.

4 **Circuit consideration:**

Although emitters may be different, they are considered part of the same circuit (C1 or C2) from the **airH2O 800** system's perspective.



◆ Example 1: Circuit 1 and 2: fan coil with bypass valve



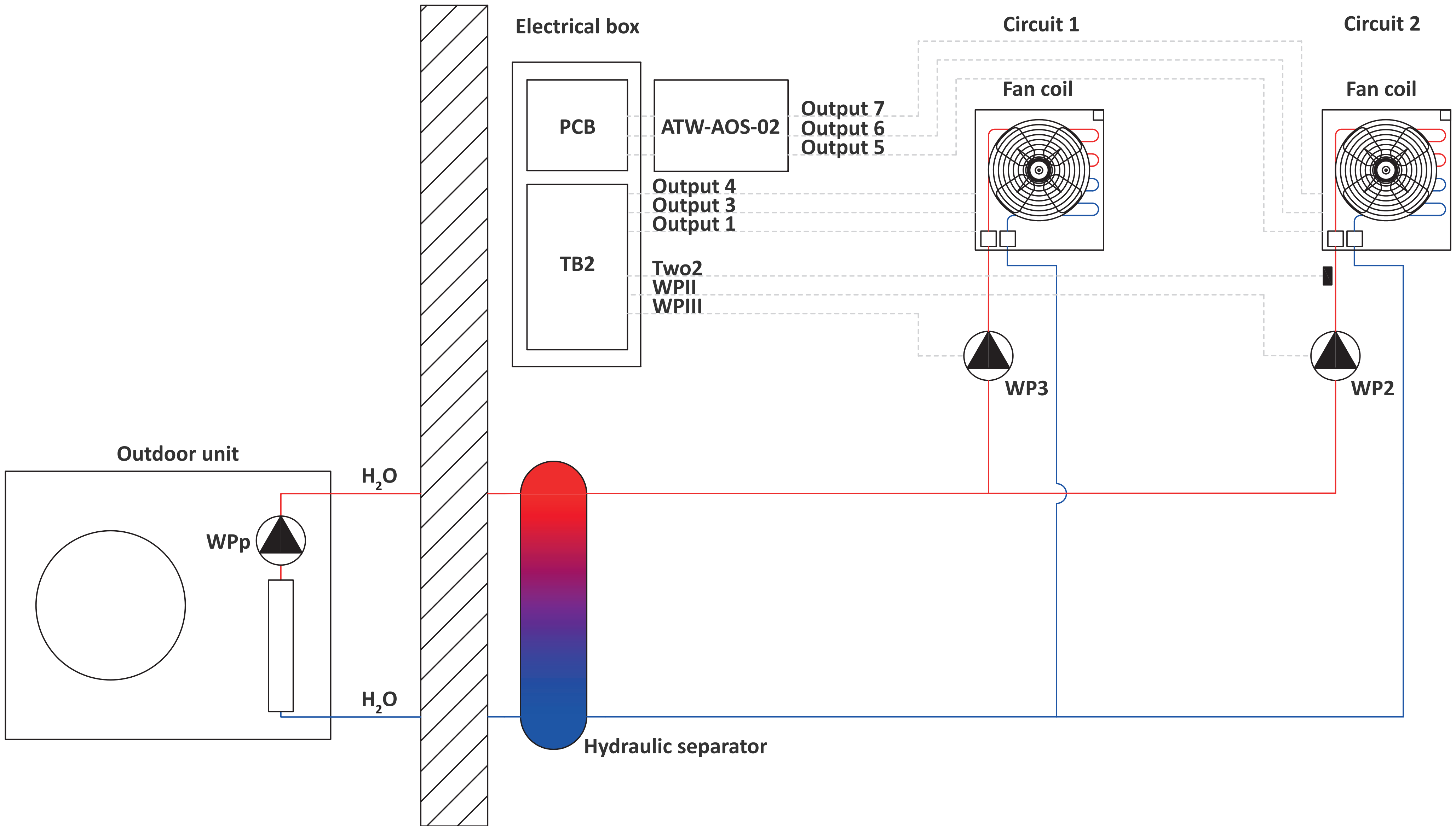
In this specific example, a system using a Control Box, an external hydraulic separator and WP3 is shown.

	Circuit 1		Circuit 2	
	Signal	Configuration	Signal	Configuration
3WV	Output 1	Dem.-ON C1	WPII	-
Fan coil	Output 3	Fan 1 Low	Output 6 (*)	Fan 2 Low
	Output 4	Fan 1 Medium	Output 7 (*)	Fan 2 Medium
	Output 5 (*)	Fan 1 High	Output 8 (*)	Fan 2 High
Thermistor	-		Two2	-

NOTE

- *(*): The auxiliary output signal box ATW-AOS-02 is required for using additional outputs 5 to 8.*
- *The activation of "ECO Pumps" (configured by DSW4-PIN5 = ON) and "Pumps setup" being configured to "Serial" is required.*
- *"Output 2" cannot be used here since its connections are shared with "WPIII" (see "3.9.2 Output signals and output ports"), which in this case is being used to control WP3 to circulate the secondary water flow.*

◆ Example 2: Circuit 1 and 2: fan coil with parallel pumps



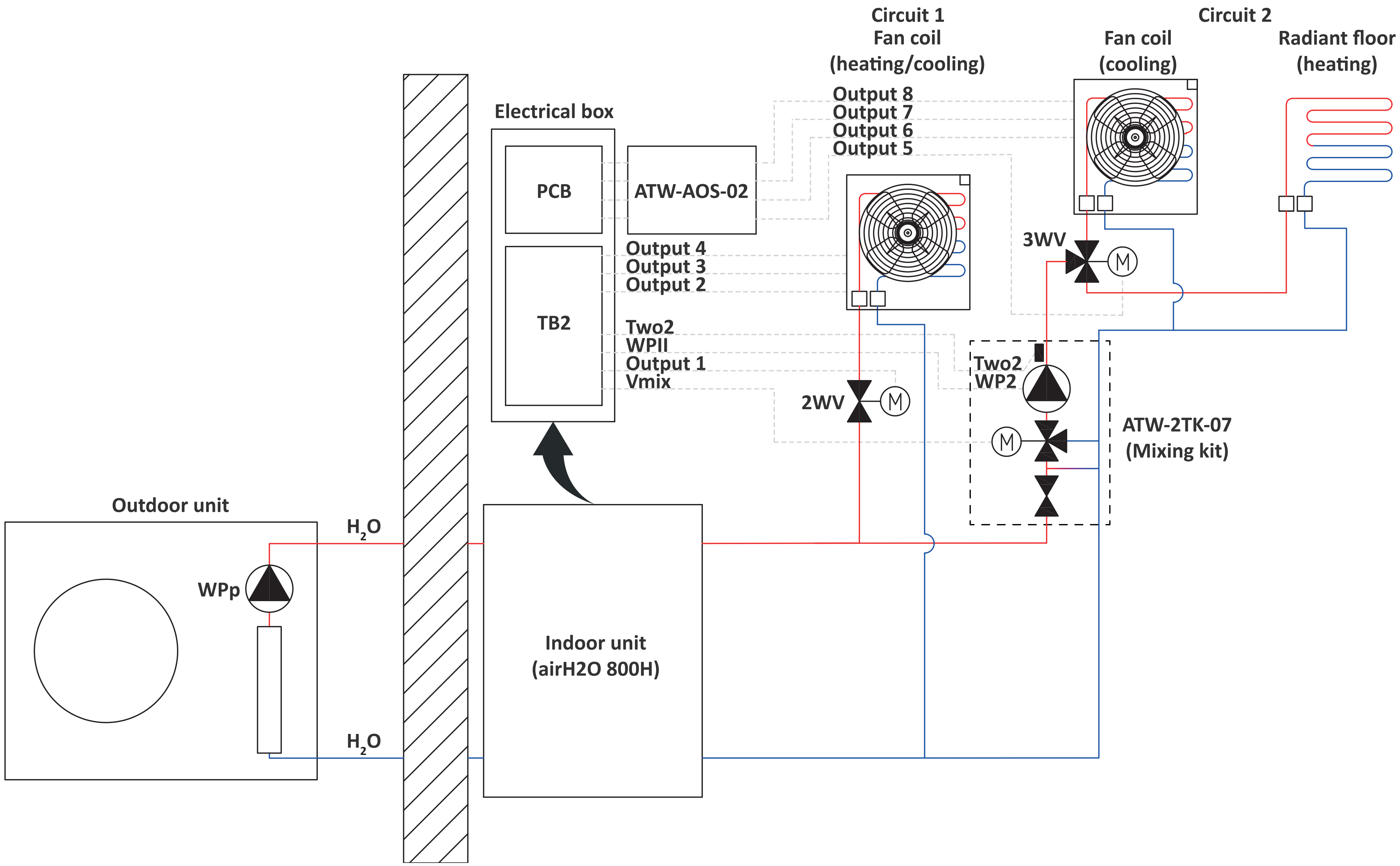
In this specific example, a system using a Control Box, an external hydraulic separator and WP3 is shown.

	Circuit 1		Circuit 2	
	Signal	Configuration	Signal	Configuration
WP	WPIII	-	WPII	-
Fan coil	Output 1	Fan 1 Low	Output 5 (*)	Fan 2 Low
	Output 3	Fan 1 Medium	Output 6 (*)	Fan 2 Medium
	Output 4	Fan 1 High	Output 7 (*)	Fan 2 High
Thermistor	-		Two2	-

NOTE

- *(*): The auxiliary output signal box ATW-AOS-02 is required for using additional outputs 5 to 8.*
- *The activation of "ECO Pumps" (configured by DSW4-PIN5 = ON) and "Pumps setup" being configured to "Parallel" is required.*
- *"Output 2" cannot be used here since its connections are shared with "WPIII" (see "3.9.2 Output signals and output ports"), which in this case is being used to control WP3 to circulate the Circuit 1 water flow.*

◆ Example 3: Circuit 1: fan coil heat/cool, Circuit 2: Under-floor heating + fan coil for cooling



In this specific example, a system using an ***airH2O 800H*** *is shown.*

	Circuit 1		Circuit 2	
	Signal	Configuration	Signal	Configuration
2WV	Output 1	Dem.-ON C1	-	
Fan coil	Output 2	Fan 1 Low	Output 6 (*)	Fan 2 Low
	Output 3	Fan 1 Medium	Output 7 (*)	Fan 2 Medium
	Output 4	Fan 1 High	Output 8 (*)	Fan 2 High
Mixing kit (**)	-		Two2	-
	-		WPII	-
	-		Vmix	-
3WV	-		Output 5 (*)	Constant heat (***)

NOTE

- *(*): The auxiliary output signal box ATW-AOS-02 is required for using additional outputs 5 to 8.*
- *This example has been represented using an* ***airH2O 800H****, as the output "WPIII" (used in the previous examples to control WP3) had to be freed to be used as "Output 2".*
- *(**): The 2nd zone mixing kit ATW-2TK-07 is required for the radiant floor heating (ATW-2TK-08 in case of using an* ***airH2O 800H Combi****).*
- *(***): "Constant Cool" output can be used instead. Output selection has to be done according to the 3WV mounting orientation.*
- *The activation of "ECO Pumps" (configured by DSW4-PIN5 = ON) and "Pumps setup" being configured to "Serial" is required.*

Additional configurations

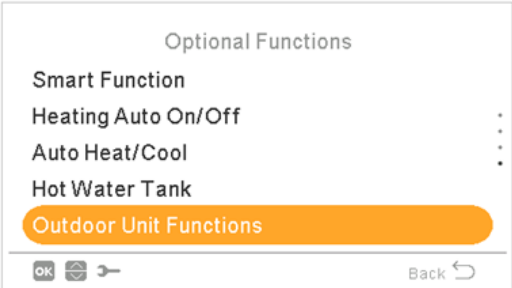
3.1 Additional configurations for commissioning

3.1.1 Outdoor unit functions

Configuring outdoor optional functions is as simple as introducing new values to the LCD and they are transferred to the outdoor unit. This new way to set optional function avoids outdoor unit manipulation.

The adjustment of optional functions can be performed manually via the controller, through data transfer with NFC, or via the CSNET Home Pro platform.

From the following menu, the optional function list can be accessed:



The following image shows “CH” as an example:

3.1.2 Unit test run

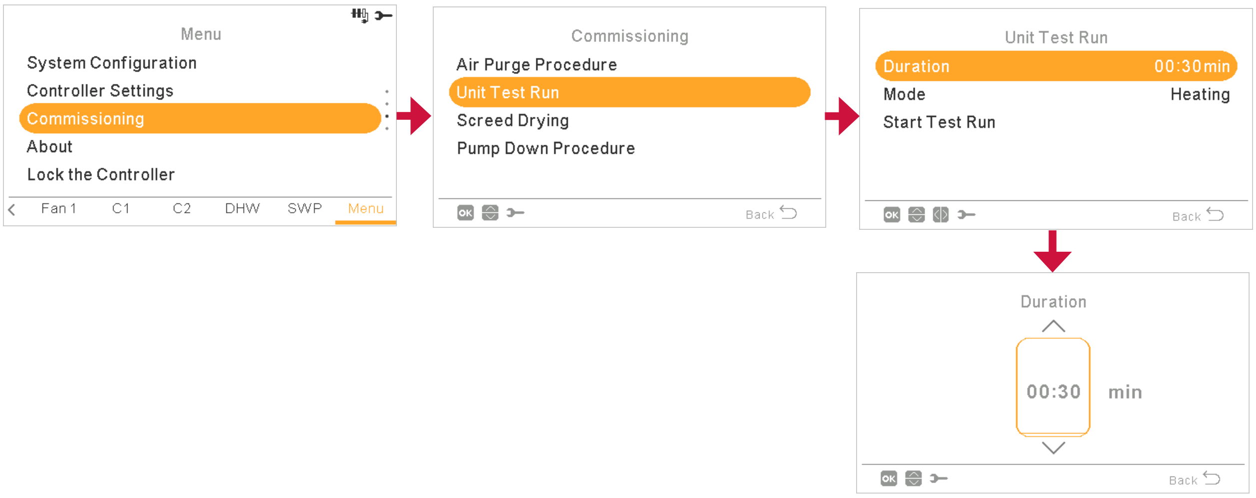
Test run is a working mode used when commissioning the installation. Some settings are made to let the installer an easy job.

During the test run, the unit operates with the compressor ON at cooling or heating mode, fixing the compressor frequency at the rated frequency for the test run. The activation for the test run can be initiated through the unit controller selection.

Activation through unit controller:

Commissioning → Unit Test Run

Description	Default Value	Range	Steps	Units
Duration	00:30	00:30~12:00	00:10	min
Mode	Heating	Cooling ~ Heating	-	-
Start Test Run	-	-	-	-



3.1.3 Air purge

During the commissioning and installation of the unit, it is crucial to eliminate all air in the water circuit. The air purge function facilitates this process. When activated, the pump operates independently of the unit's actual operation, initiating the removal of air in the water circuit.

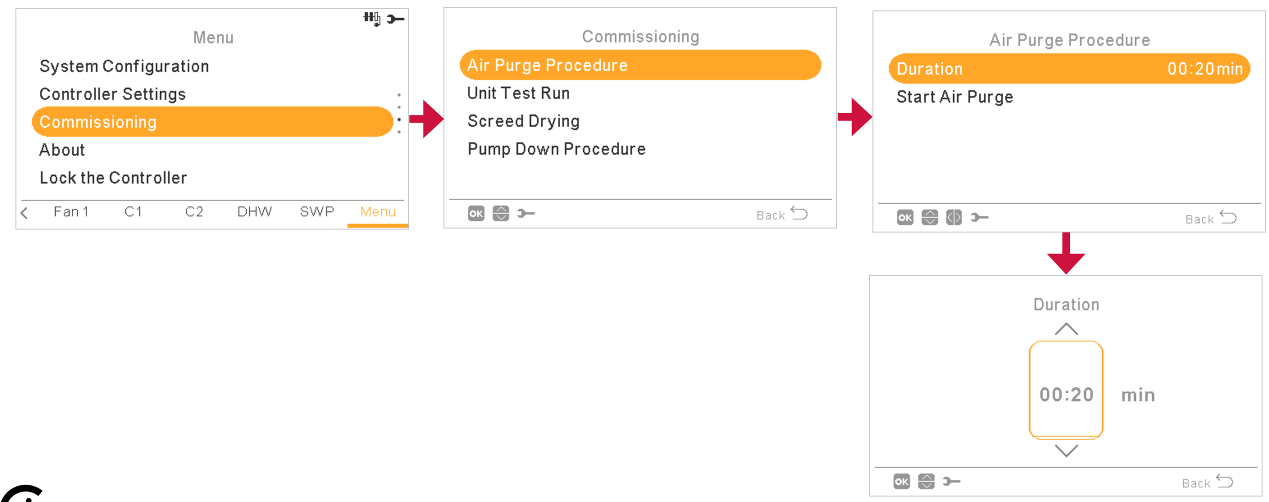
The unit automatically adjusts the pump speed and the position of the 3-way valve between space heating or domestic hot water heating mode during the air purge mode.

NOTE

- *The air purge function stops automatically after a defined duration.*
- *Operation with the compressor OFF at cooling or heating mode.*
- *Heater OFF during air purge operation.*

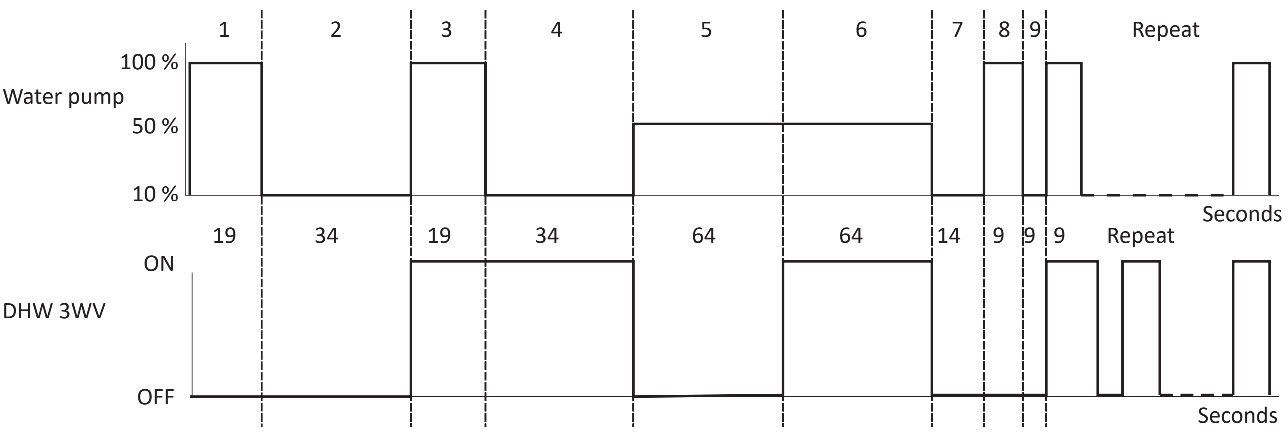
Commissioning → Air Purge Procedure

Description	Default Value	Range	Steps	Units
Duration	00:20	00:20~00:30	00:10	min



NOTE

- *After finishing the procedure, the unit comes back to normal operation.*
- *Pressure and flow alarms are ignored during this operation.*



3.1.4 3WV move for tank filling

By means of DSW4#2 being set to ON, the 3WV (3-way valve) is forced in tank position. This option becomes useful when it is required to fill the circuit with water for the first time. Set DSW4#2 to OFF position before starting operation.

3.1.5 Floor screed drying function

This function is used exclusively for the process of drying a newly applied screed to the floor heating system. The water temperature set-point follows a predetermined schedule upon activation of the floor screed drying function.

◆ Standard Mode

The Standard Mode is defined in 2 phases. The first phase lasts for 3 days after screed drying activation, and the second phase lasts for 4 days. During the first phase, a default setting temperature of 25 °C is established, and for the second phase, a default temperature of 55 °C is set. The setting temperatures for each phase can be adjusted.

◆ Custom Mode

The Custom Mode is defined in 2 phases as well. The main difference is that the duration of each phase (1 or 2) can be adjusted. Also, the Custom Mode allows not only for a fixed setting but also for a linear transition between an initial setting temperature and a final setting temperature. Such a temperature transition will take place over the determined duration of each phase.

Refer to section *"2.2.11 Screed drying function"* for detailed information.

3.1.6 Hot start control release

Allows installers to bypass the pre-heating phase of the unit when it is cold, enabling immediate start-up.

NOTE

Before the first compressor start-up, make sure that the unit has been powered ON for at least 90 minutes to ensure the proper temperature of the compressor.

Only in the case where 90 minutes cannot be waited since power ON and it is required to start the unit immediately, hot start control release function can be used.

To skip the Hot start control, optional function HT shall be activated by means of the CSNET Home Pro or by means of the Outdoor unit function setting via LCD.

Refer to section *“3.10.2 Outdoor crankcase heater management”* for complementary information.

CAUTION

Repeatedly starting the compressor in cold mode will eventually damage it. Make sure the optional HT function is reset to 0 after the operation is complete.

3.1.7 Remote defrost request

During commissioning or maintenance tasks, it may be useful to force a defrost operation. This operation can be performed from the indoor unit PCB by pressing PSW1 and PSW4 at the same time.

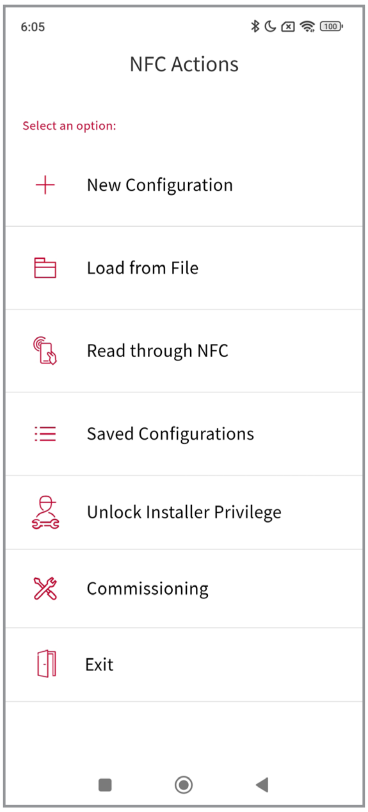
When defrost operation is requested from the indoor unit PSW, the 7-segment display of the indoor unit shows “dF”

Defrost operation at the outdoor unit starts 2 minutes after the “dF” indication is displayed, if the conditions to enter into forced defrost are fulfilled.

3.1.8 NFC Configuration

By means of the NFC technology, it is possible to configure the unit controller, the room thermostat and the outdoor unit optional functions as well as to start specific operations during commissioning.

These operations are performed through the CSNET Home app:



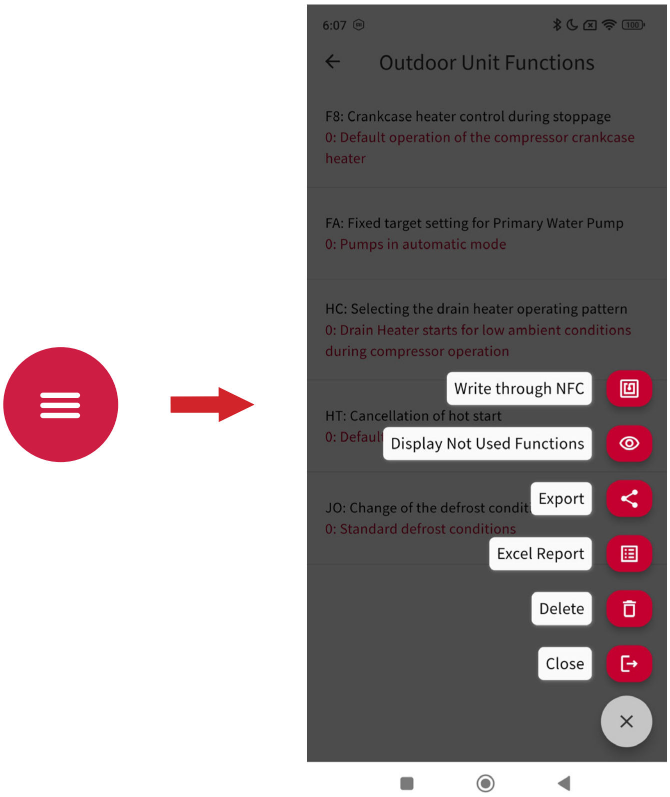
◆ New Configuration

This option allows to configure the unit controller, the room thermostat or the outdoor unit optional functions. Whichever the selected operation is, the application will request to configure basic installation parameters.

Once the “New Configuration” has been set up, it allows to give a name to save it to the internal memory of the application with the purpose to share it or reuse it in the future.

All new created configurations are stored inside the *“Saved Configurations”* option.

In case the configuration is modified, it can be rewritten again through NFC thanks to the toolbox options:



The toolbox is accessible in any screen when a NFC project is being edited, by clicking on the red button. It offers different functionalities depending on the current screen.

◆ Load from File

NFC projects can be shared as a file through any of the available applications and systems on your smartphone.

The functionality imports a NFC project file from the smartphone.

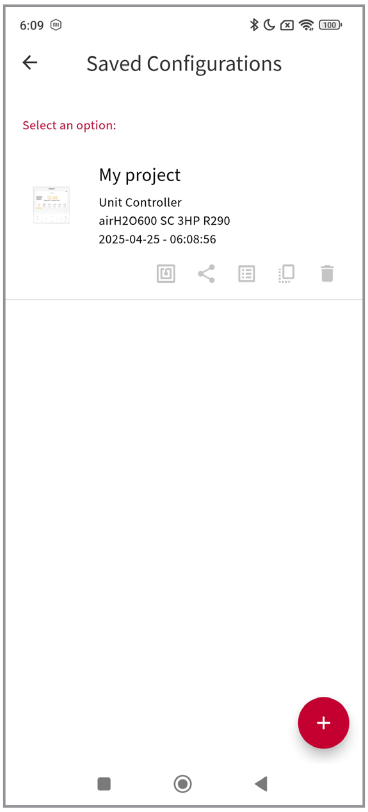
◆ Read through NFC

This option allows to read all the parameters of the unit controller or the room thermostat. Follow the instructions on the CSNET Home application to complete the procedure.

Once the procedure has been completed, the application allows the possibility to name the read configuration in order to be stored, shared or modified.

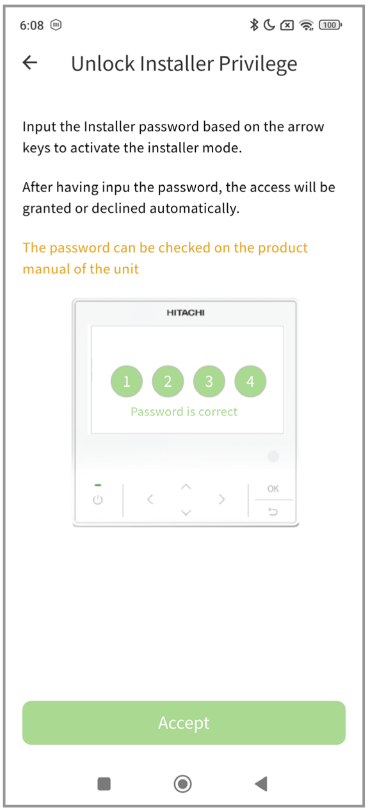
◆ Saved Configurations

All saved NFC projects are stored inside this option:



◆ Unlock Installer Privilege

By unlocking installer privileges, more options are allowed to be modified.



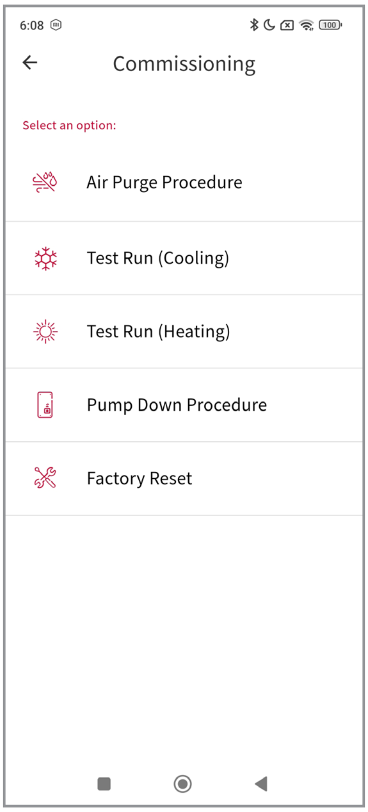
NOTE

- *Modifying parameters reserved to installers without having the proper knowledge may generate system abnormalities.*
- *The password to unlock the installer privileges is the same as the one on the LCD (**> v < >**).*

◆ Commissioning:

By means of this screen it is possible to trigger useful actions during commissioning such as:

- Air purge
- Cooling test run
- Heating test run
- Pump down procedure
- Factory reset of the unit controller



3.2 Additional configurations to protect the system

3.2.1 Unit and pipes freeze protection control

By means of the DSW4#6 it is possible to enable the control that protects the unit and water pipes from freezing conditions. During period of inactivity where water pump is OFF, this control checks the temperature of the water sensors. In case the temperature decreases close to the freeze point, water pump is started with the purpose to move the water.

Refer to section *“2.8.5.1 Anti freeze control (winter operation)”* for detailed information.

3.2.2 Seizure protection for hydraulic components

By means of this function, water components such as water pumps and 3-way valve are started once a day during inactivity period to protect against the seizure during long inactivity times.

Refer to section *“2.8.5.4 Pump seizure protection”* for detailed information.

3.3 Additional configurations: User comfort for space heating and space cooling

This section collects all functions the purpose of which is to enhance comfort of the user:

3.3.1 User offset

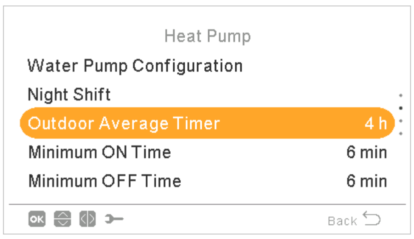
If the water temperature setting for zones, as determined by the OTC curve or gradient, does not meet the immediate requirements, the user has the option to apply a ±5 °C offset from the Unit LCD without the need to modify advanced parameters.

Refer to section *“User offsets for gradient or points”* for detailed information.

3.3.2 Outdoor temperature average timer

The average timer corrects the influence of ambient temperature variations. The weather-dependent set point calculation is done on the average outdoor temperature. The outdoor temperature is averaged over the selected time period.

In this image the average timer has been set to 4 hours:



NOTE

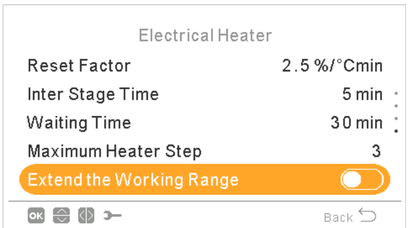
For more information, refer to “2.2.8 Outdoor temperature compensation control”.

3.3.3 Electric heater usage to extend water temperature setting (space heating only)

Due to the characteristics of the refrigerant at low ambient temperatures plus the limitations of the compressor in terms of the allowed pressure ratio, the working range understood as the maximum outlet water temperature the system is able to provide, is limited at a given outdoor ambient temperature. Thanks to the in-built electric heaters with **airH2O 800H** and **airH2O 800H Combi** units (except the **airH2O 800H** for boiler combination version), this working range limitation is extended since some of the temperature will be provided by means of the heater.

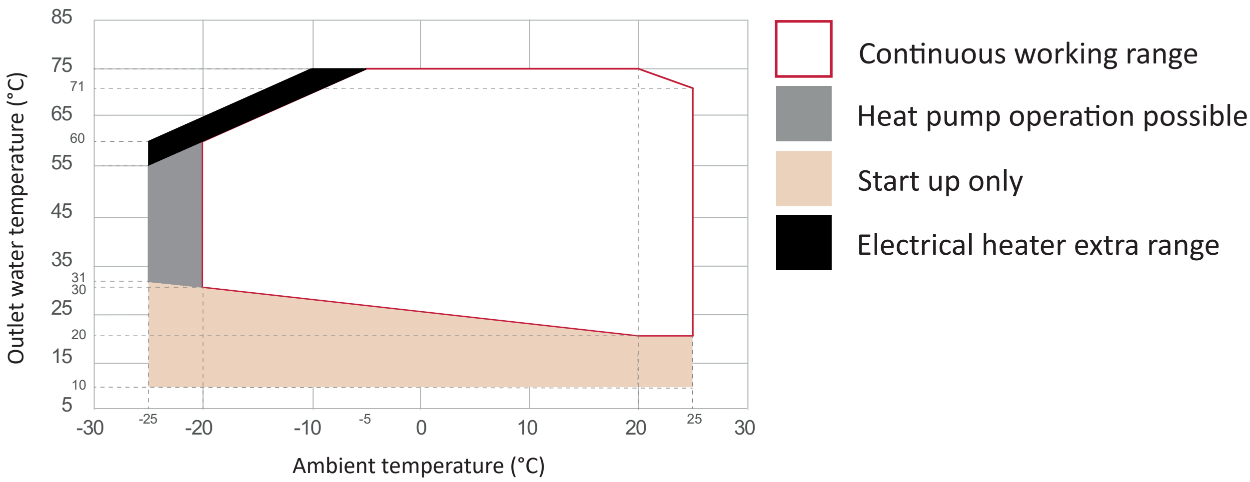
Therefore, for **airH2O 800H** and **airH2O 800H Combi** models, the LCD shows the following menu:

Menu -> System Configurations -> Complementary Heater -> Electrical Heater:



By selecting “Extend the Working Range” setting on the LCD, the electrical heater can be used to provide extra water temperature at low ambient temperature conditions where the maximum temperature that can be provided by the heat pump is reduced due to thermodynamic limitations.

Once activated, the electrical heater is used to allow a maximum temperature difference of 5 °C on the zone where there is a limitation of the working range:



As an example, at -20 °C, the heat pump will operate to provide water temperature at 60 °C whereas the electric heater is allowed to provide up to 65 °C. In case the heat pump reaches 61 °C or the electric heater reaches 66 °C, the system would switch to Thermo OFF. Note that the outdoor unit will always be limited by the standard working range since it is the maximum it can be provided in function of the compressor and refrigerant characteristics.

3.3.4 Emergency operation

The emergency operation feature allows the use of an electric heater or boiler in case of an outdoor unit fault or when certain alarms appear in the indoor unit. By means of the LCD, it can be selected which functionality is allowed to operate in emergency mode.

- **Domestic Hot Water (DHW)**: The hot water will be heated by means of the DHW electric heater.
- **Space Heating**: Space heating will be provided by the space heater or boiler.

◆ Configuration

Before using the heaters or boilers in emergency mode, ensure that:

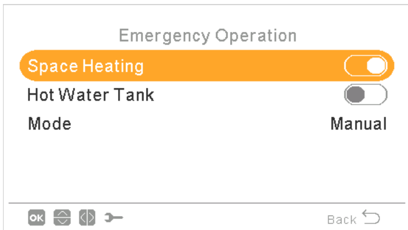
- The domestic hot water (DHW) heater is allowed by means of the DSW4#3 (set to 1).
- The space heating heater is allowed by means of the DSW4#7 and selected as a Heating Source at “Menu -> System configuration -> Complementary Heating”.

◆ Operation Modes

The user can select the emergency operation mode: Automatic or Manual.

- **Manual Mode**: The activation of the emergency operation must be done manually by the user. This activation can be performed at any time, regardless of whether an alarm is present or not.
- **Automatic Mode**: The emergency operation will be activated automatically in case any compatible alarm appears.

Emergency operation menu can be found at “Menu -> System configuration -> Optional Functions -> Emergency Operation”.



In this example, only Space Heating heater is allowed to operate during emergency mode and its activation is set to Manual.

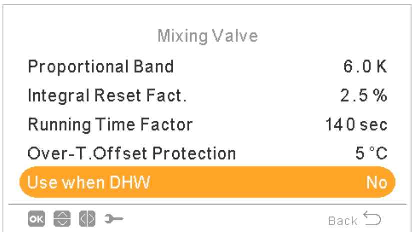
◆ Alarms compatible with emergency operation

Operation mode	Emergency operation is allowed in case
DHW operation	An alarm code different than 10 or 16 appears.
Space Heating operation	There is communication alarm between indoor and outdoor units (alarm code 03) or there is an outdoor unit alarm different than 75, 76, 11, 12, 13, 26, 83, 84, 90, 49 or 71.

3.3.5 Mixing valve regulation during DHW operation

For those installations with C1 and C2 circuits where C1 circuit has a very high inertia, it becomes possible to allow the mixing kit valve to regulate even during DHW operation with the purpose to keep providing energy to C2 circuit. In the same way, in case there is not enough inertia on the system, by means of the LCD configuration it can be specified that mixing kit is closed during tank operation with the purpose to avoid energy loss on C2.

This configuration can be made by means of the unit controller at “Menu -> System Configuration -> Space Heating/Cooling -> Circuit 2 -> Mixing Valve”



In case “Use when DHW” is set to “No”, it means that the mixing valve will remain closed during DHW operation. Otherwise, in case “Yes” is selected, the Mixing valve will continue the regulation according to Two2 and Ttwo for C2.

3.4 Additional configurations when using Hitachi wired or wireless thermostat

3.4.1 Room temperature compensation

The purpose of this functionality is to improve user comfort by adjusting water temperature on the installation. After **airH2O 800** has determined the proper water temperature setting by means of the OTC curve or gradient, the water temperature setting is afterwards increased or decreased in function of the room temperature setting and the real room temperature as follows:

- ✓ In Heating mode:
  - In case room temperature is above room temperature setting, water temperature setting is decreased with the purpose to reduce the thermal load and therefore reduce the power consumption.
  - In case room temperature is below room temperature setting, water temperature setting is increased with the purpose to speed-up heating operation and achieve desired room temperature as fast as possible.
- ✓ In Cooling mode:
  - In case room temperature is below room temperature setting, water temperature setting is increased with the purpose to reduce the thermal load and therefore reduce the power consumption.
  - In case room temperature is above room temperature setting, water temperature setting is decreased with the purpose to speed-up cooling operation and achieve desired room temperature as fast as possible.

Refer to section *"2.2.15 Room temperature compensation control"* for detailed information.

3.4.2 Room temperature demand OFF adjustment

With the purpose to allow heat pump regulation and therefore reduce power consumption it is possible to adjust the amount of degrees it is allowed to overpass room temperature setting before performing demand OFF.

It is also possible to "Deactivate" this control. When deactivated, system does never perform demand OFF operation. In that case, thanks to room temperature compensation control, water setting temperature is adjusted and system stops the heat pump by Thermo-OFF after reducing the compressor frequency as much as possible and therefore reduce power consumption of the unit.

Refer to section *"2.2.14.2 Demand ON/OFF by a room thermostat"* for detailed information.

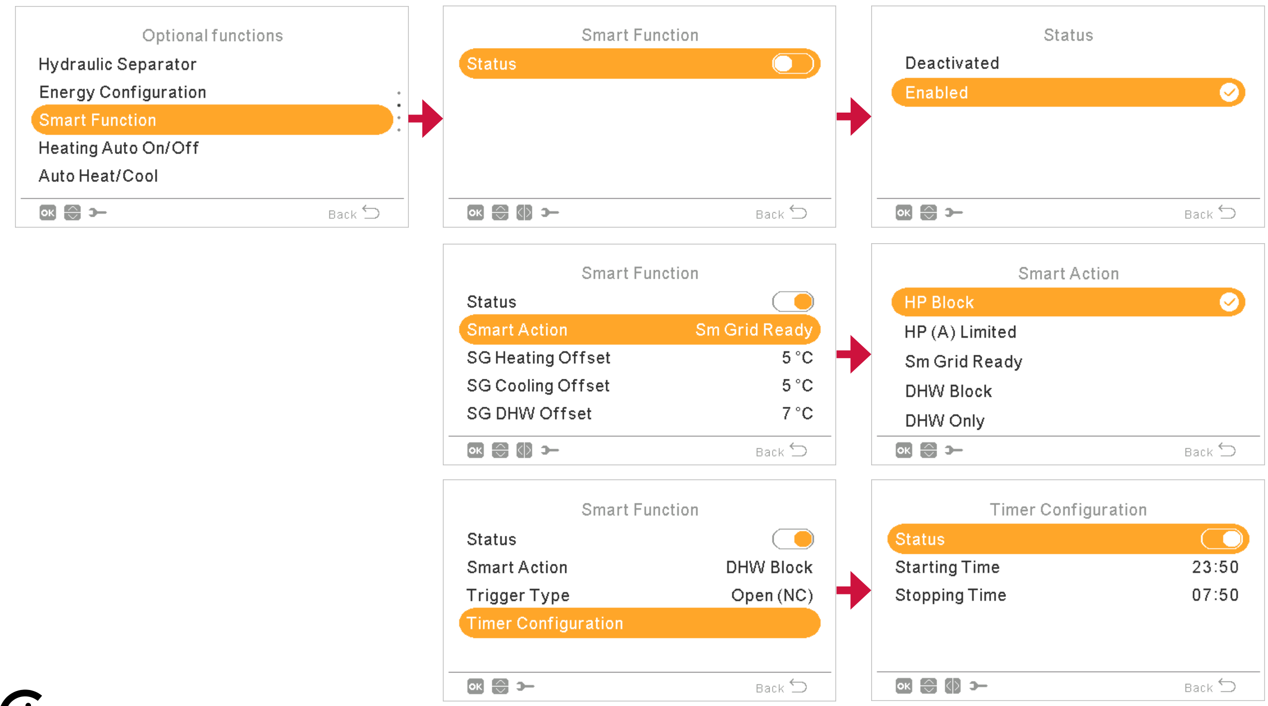
3.5 Additional configurations for power consumption or noise reduction

3.5.1 Smart Function

The Smart Function serves a dual purpose, providing the ability to either block or limit the heat pump's operation or increase demand based on electricity availability. This feature adds a layer of intelligent control, allowing users to optimise energy usage and adapt the heat pump's behaviour according to specific operational needs or external factors, such as electricity availability constraints.

System configuration → Optional functions → Smart function

Description	Default Value	Range	Units
Status	Deactivated	Deactivated / Enabled	-
Smart Action	HP block	(0) HP Block (1) HP Limited (A) (2) SG. Grid Ready (3) DHW Block (4) DHW Only	-
Timer Configuration (for (0), (1), (3) and (4))	Deactivated	Deactivated / Enabled	-
Trigger Type (for (0), (1), (3) and (4))	Closed	Closed (NO) / Open (NC)	-
Start Boiler (for (0))	Deactivated	Deactivated / Enabled	-
Start DHW Heater (for (0))	Deactivated	Deactivated / Enabled	-
Limitation by Ampere (for (1))	50	3~60	A
SG Heating Offset (for (2))	5	1~15	°C
SG Cooling Offset (for (2))	5	1~15	°C
SG DHW Offset (for (2))	7	1~30	°C



NOTE

The activation of the Smart Function may be performed by 2 means:

- *The "Smart Action / SG1" input activation (refer to "List of available inputs"), or,*
- *The "Timer Configuration" option, which allows it between the selected moments each day.*

HP Block (0)

The heat pump is prohibited in any condition (space heating, cooling, DHW, swimming pool) when the signal is active. If “Start Boiler” is set to enabled, boiler operation is forced during action. If “Start DHW Heater” is set to enabled, DHW is enabled to operate but only with heater.

HP (A) Limited (1)

The current consumption is limited to the ampere value when the signal is active. This function applies to both cooling and heating operations. Current data is based on the real current (A) from the outdoor unit, comprising compressor, indoor unit theoretical calculation, electronic consumptions, heater steps, and second-cycle compressor current (A). When using this function with an electrical heater, ensure 1-phase indoor unit power connection is indicated by DSW (DSW1#1: OFF).

SG Ready (2)

The SG Grid is awarded to the heat pump series, integrating control technology for smart grid usage through two digital inputs (see *“List of available inputs”*). It allows four operation modes:

Item	Inputs		Action	Description
	SG1	SG2		
1	Open	Open	Standard HP mode	SG is not activated.
2	Closed	Open	External blocking mode	Heat pump is forbidden in any condition (space heating, cooling, dhw, swimming pool) when signal is active in any case.
3	Open	Closed	Low price mode	Space heating: increase water temperature setting by + *SG heating offset*. Space cooling: decrease water temperature setting by - *SG heating offset* DHW: Increase DHWT temperature setting by + *SG DHWT offset*
4	Closed	Closed	Overcapacity mode	Space heating: Ttwo=Wcmax (maximum water temperature) Space cooling: Ttwo=Wcmin (minimum water temperature for space cooling) DHW: Tdhws=Tdhwmax (maximum water temperature)

DHW Block (3)

DHW operation is forbidden when the signal is active.

DHW only (4)

Heat pump operation for any condition except DHW is forbidden when the signal is active. DHW operation is allowed normally.

3.5.2 Night shift

Night shift operation mode reduces the compressor load in order to reduce environmental noise during night. Such compressor load reduction implies a fan rpm reduction as well. The Night shift activation can be performed by setting a daily timer, by inputting an input signal or by means of the "Silent Mode" button through CSNET Home application.

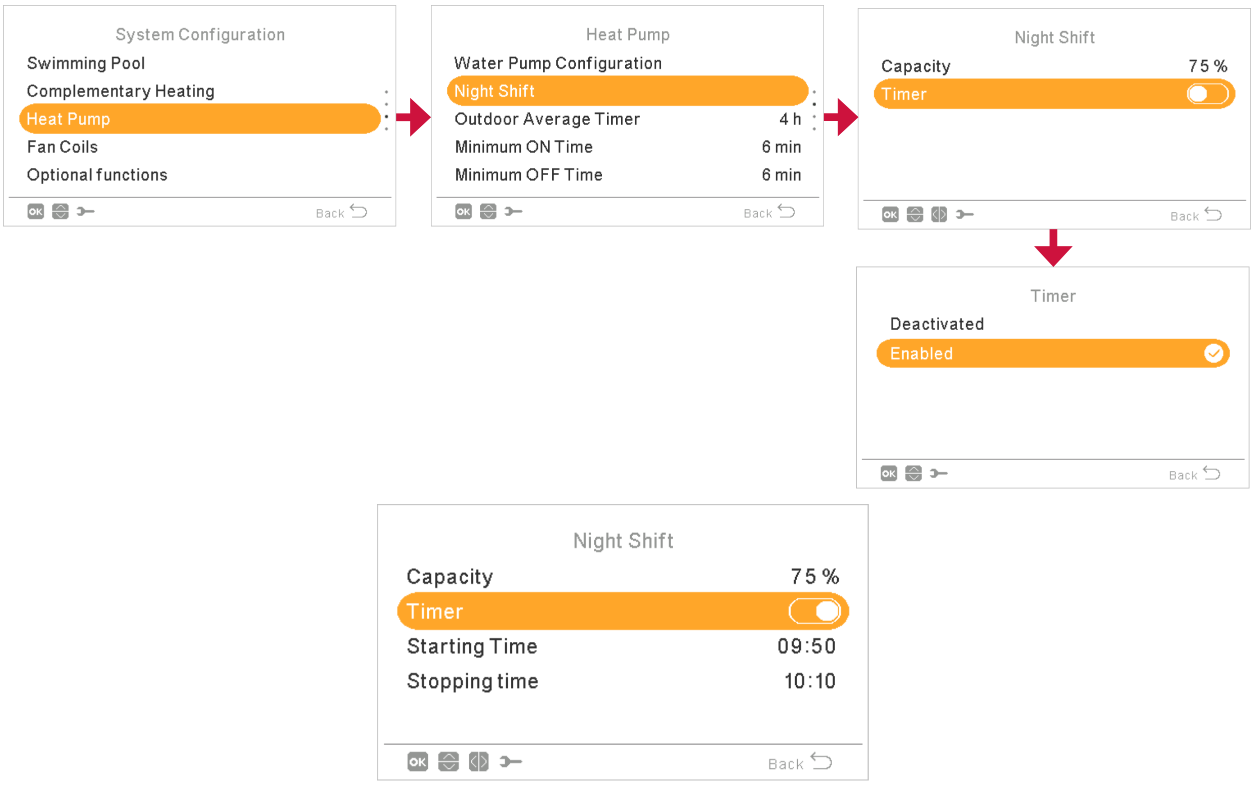
When night shift function is active, the capacity of the **airH2O 800** unit is reduced to the percentage defined in the menu and night shift icon is displayed in the general notifications zone of the unit controller (in case the Night shift mode has been activated from the CSNET Home application, the icon displayed is the following one:):

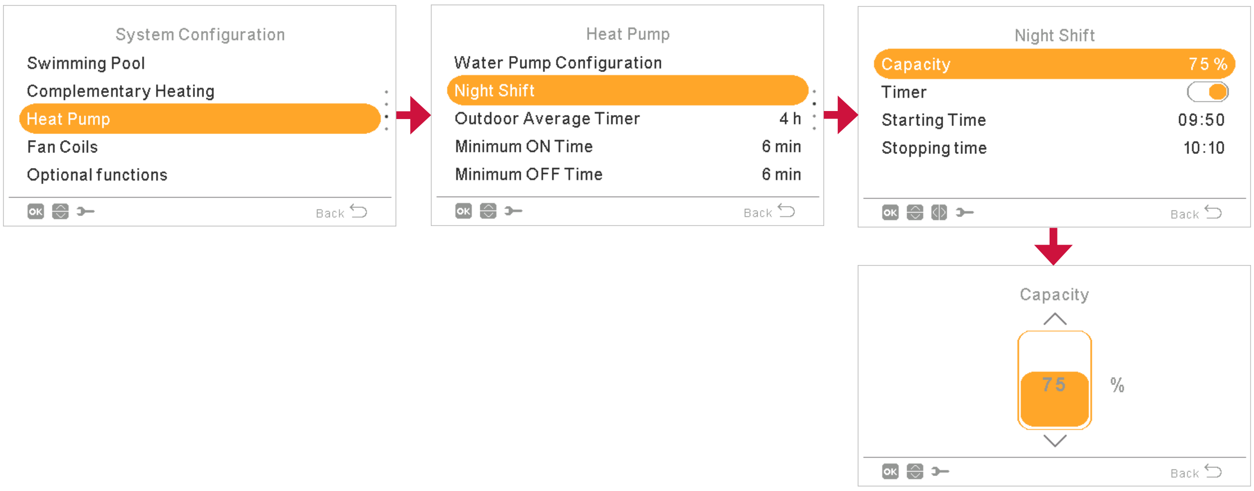
System Configuration → Heat Pump → Night Shift

Description	Default Value	Range	Units
Capacity	75	40~100	%
Timer	Deactivated	Deactivated / Enabled	-
Starting time	20:00	00:00 to 23:50	00:10
Stopping time	08:00	00:00 to 23:50	00:10

Night shift menu allows the user to configure:

- The activation or deactivation of the night shift timer(status),
- The starting/stopping time,
- And the capacity of the unit while the night shift is active.





Night shift function can be configured as a daily timer or launched by means of the CSNET Home application, an input signal or from the favourite button (only for PC-ARFH1E1):

Night shift function from favourite button (only for PC-ARFH1E1)

Night shift can be configured from the unit controller (when PC-ARFH1E1 is set as master) to be launched from the favourite button. Then, favourite button works like an ON/OFF button:

- When night shift timer is enabled at the night shift menu, favourite button lets start or stop the night shift function before the specified time. The night shift cycle ends when the timer arrives to the stopping time. The timer cycle starts again the next day.
- When night shift timer is not enabled at the night shift menu, favourite button starts or stops the night shift function like an ON/OFF switch. When favourite button launches night shift function, this works until favourite button is pressed again.

NOTE

- *This function is available for heating, cooling, DHW and swimming pool applications.*
- *In case of defrost and compressor protection operation, this function is not applicable.*
- *Protection of the indoor or outdoor unit can override this function.*

3.5.3 Economic offset water setting

Water temperature for space heating and cooling can be modified with the purpose to reduce power consumption of the system. Economic mode can be launched by means of a timer or by an input function.

Refer to section *"2.2.7 Water ECO offset"* for detailed information.

3.5.4 Reduction of the maximum heating step

Electric heater has 3 steps. All **airH2O 800** controls that use electrical heaters are allowed to use all 3 steps unless they are limited with a maximum value configured on the LCD.

Refer to section *"2.4.4 Heater step control"* for detailed information.

3.5.5 Power meter data control

Power meter data control involves measuring the real power consumption of the system. This can be achieved by connecting an external power meter. The number of pulses generated by the power meter must be configured through the unit controller.

With this, every input pulse is added into its corresponding operation mode (heating, cooling, DHW operation, etc.).

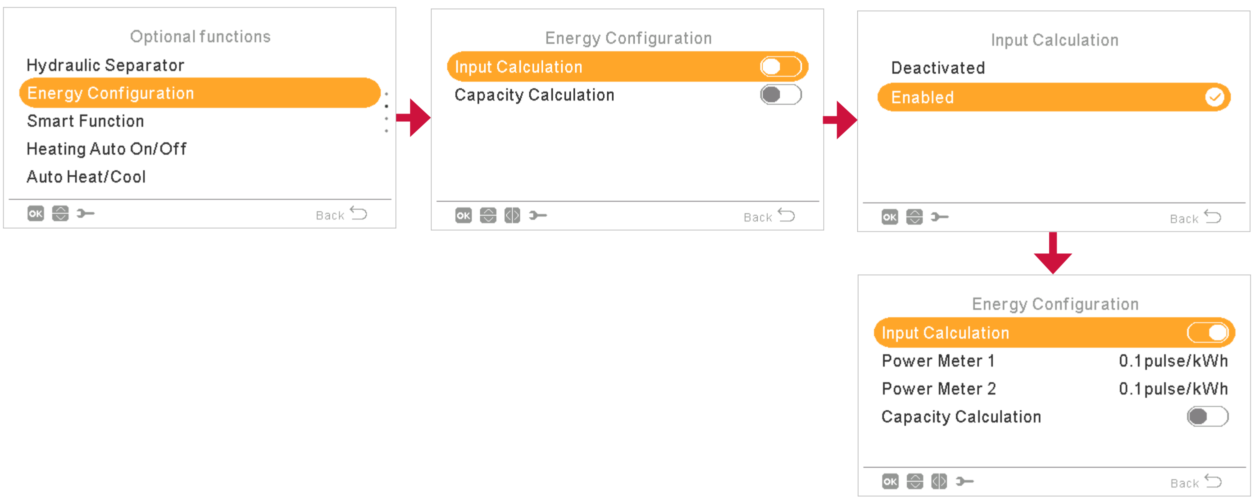
2 options are possible with this function:

- Only one power meter device for the whole installation (indoor unit + outdoor unit).
- Use of 2 separated power meter devices: one for the outdoor unit and another one for the indoor unit.

User can enable or disable the power meter data control from the unit controller (PC-ARFH3E), as explained below:

System configuration → Optional functions → Energy configuration

Description	Default Value	Range	Units
Input calculation	Deactivated	Deactivated/Enabled	-
Power meter 1 (PM1)	Deactivated	0.1 / 1 / 10 / 100 / 1000	pulse/kWh
Power meter 2 (PM2)	Deactivated	0.1 / 1 / 10 / 100 / 1000	pulse/kWh



NOTE

If "Input calculation" is enabled but no external power meter is connected (power meter 1 (PM1) and power meter 2 (PM2) are deactivated), the ***airH2O 800*** *unit performs an estimation of the consumption, considering factors such as the compressor, tank heaters, space heating heaters, compressor crankcase heater, WP1, and electronics. This estimation may vary from the real consumption measured by an external power meter.*

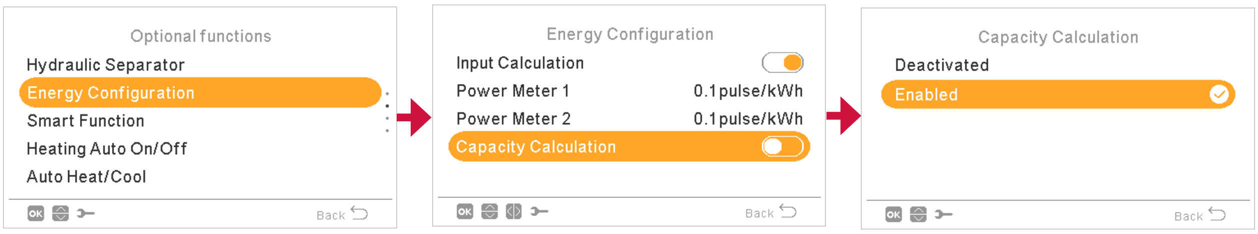
3.5.6 Capacity calculation

The capacity calculation function utilizes water temperature at the inlet and outlet along with water flow level to estimate the system's capacity.

This feature provides screens displaying the values in kWh for each zone, including Heating, Cooling, Domestic Hot Water (DHW), Swimming Pool, and their total. Additionally, it allows users to view these values on a monthly basis.

System configuration → Optional functions → Energy Configuration → Capacity Calculation

Description	Default Value	Range
Capacity configuration (CAPCo)	Deactivated	Deactivated/Enabled

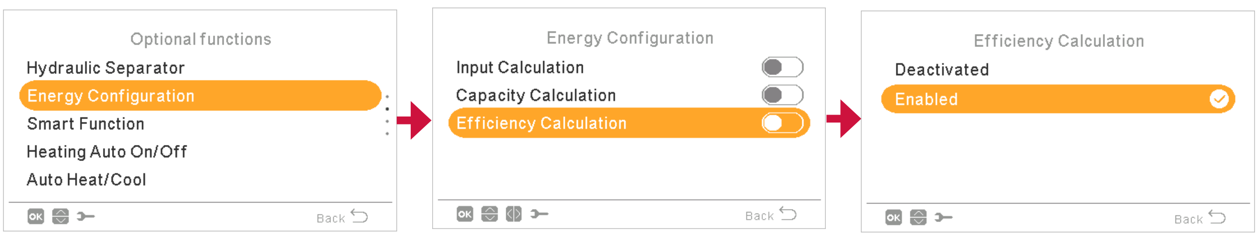


3.5.7 Efficiency calculation

The system is able to calculate the energy efficiency of the system. This data is obtained from the energy consumed divided by the capacity provided by the unit. Having values higher than 1 implies that the system is able to provide more energy than the energy consumed. Usage of electric heaters reduce this figure.

System configuration → Optional functions → Energy Configuration → Efficiency Calculation

Description	Default Value	Range
Efficiency Calculation	Deactivated	Deactivated/Enabled



NOTE

Since capacity and input counters may not always align in the same time frame, this can slightly affect the accuracy of the result.

3.6 Additional configurations for unit operation

3.6.1 Heating auto ON/OFF

At higher outside temperatures, it does not make sense to keep heating the building. The **airH2O 800** system will switch the heating off when the daily average outdoor temperature of previously day rises above the Summer Switch Auto ON/OFF Activation Temperature.

Refer to section *"2.2.12 Heating auto ON/OFF"* for detailed information.

3.6.2 Auto Heat/Cool

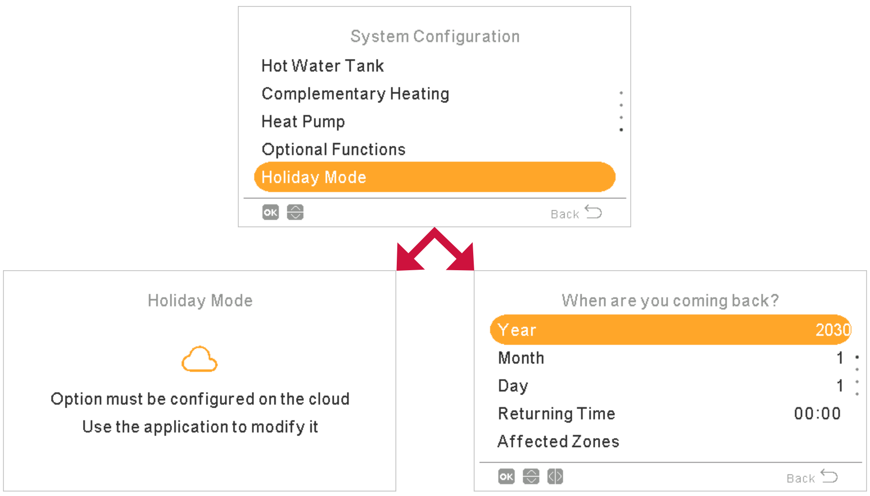
Only available for cooling and heating models and with cooling mode enabled. By using Auto Summer Switch-OFF average, user can use auto heat/cool mode. The end-user sets the desired operation mode on the user interface: Heating, Cooling or Automatic.

Refer to section *"2.2.13 Auto Heat/Cool (only for units with cooling kit installed)"* for detailed information.

3.6.3 Holiday mode

This menu lets the user specify a date and hour for the room setting to be OFF with the configured setting.

System configuration → Holiday Mode



NOTE

Depending on the system having an IOT device connected or not, the configuration will be performed by means of the CSNET app or directly at the LCD controller, respectively

3.6.4 Temperature offset determination for Thermo-ON transition

Depending on temperature conditions and the load of the system, the heat pump performs transitions to Thermo-OFF's.

By means of Heating Thermo-ON Offset and Cooling Thermo-ON offset, editable from the LCD, it is possible to configure the required temperature change of the Twi sensor to perform again the Thermo-ON's operation compared with the value of Twi at the moment of the Thermo-OFF's transition.

The higher the setting is, the lower the number of Thermo-ON transitions will be and therefore the energy consumption will decrease. On the other hand, the efficiency of the next Thermo-ON operation will increase since operation will be longer than before and the system will adapt the provided capacity to the real load of the installation.

More precisely, when Thermo-OFF happens water inlet temperature value is registered (Twi_{INST}); then, the new Thermo-ON will happen when the water inlet value decreases by an offset ($THON_{OFFSET}$) selected on this screen.

Refer to section *"2.2.5.1 Increase the interval between compressor operations after Thermo-OFF"* for detailed information.

3.6.5 Remote management of the unit

Thanks to the ATW-IOT-02 device, the unit can be managed remotely by means of the CSNET Home app or monitored by the installers from the CSNET Home Pro app.

The application is available at the Apple Store, Google Play Store or at www.csnetmanager.com. Follow the instructions within the app to connect the unit.

GET IT ON Google Play

Download on the App Store

www.csnetmanager.com

3.7 Additional configurations to customise the hydraulic installation

3.7.1 Hydraulic separator

In the case of the Hydrosplit system, a hydraulic separator, buffer tank and water pumps are already featured. In the case of the Control Box system, there is only a water pump that can be directly connected to the installation. In some cases, the **airH2O 800** system may not be sized for a bigger heating installation (insufficient water pump). In this case, an additional hydraulic separator or buffer tank and a water pump have to be used to ensure proper water pump dimensioning.
An additional water sensor (Two3) is needed for boiler combination control (automatically added when boiler combination is enabled).

Refer to section *"2.2.9 Hydraulic separator"* for detailed information.

3.7.2 DHW tank position

Whenever there is an additional buffer tank or hydraulic separator, user can select the position of the DHW external tank with respect to the hydraulic separator. This means that it is possible to place the 3WV and DHW tank before or after the hydraulic separator. In case the 3WV valve and DHW tank are placed before the buffer tank, only the tank's coil will be heated up to the required temperature instead of increasing also the temperature of the whole buffer tank whenever DHW operation is performed.

Refer to section *"2.2.9.1 DHW tank position (for Control box and airH2O 800H only)"* for detailed information.

3.7.3 Pumps setup

This option allows to configure between 2 hydraulic schemes when an additional hydraulic separator is used. Standard configuration forces WP3 to operate whenever there is demand from Circuit 2. On the other hand, Parallel configuration, allows to connect WP3 and WP2 to the buffer tank, and operation of WP3 is independent to the operation of WP2.

Refer to section *"2.8.2.1 Pumps setup"* for detailed information.

3.7.4 Stop conditions setting for WP1

For specific installations where **airH2O 800** unit is installed to feed a big buffer tank, **airH2O 800** unit is working in constant demand ON and only stopping when water temperature reaches setting temperature.

Refer to section *"2.2.10 Installation with big buffer tank"* for detailed information.

3.7.5 Fan coil management

In case fan coil is selected as a heating/cooling emitter, fan speeds can be controlled from the room thermostat and the fan coil's fan speeds are controlled from the **airH2O 800** optional outputs.

Refer to section *"2.9 Fan coils control (only for PC-ARFH3E)"* for detailed information.

3.8 Additional configurations for DHW operation

3.8.1 DHW Anti Legionella protection

A specific setting is available to protect the DHW system against legionella, which raises up the DHW temperature over the normal DHW tank temperature setting (using the electric heater of the DHW tank and/or the heat pump) on a periodic basis.

Refer to section *"2.3.13.1 DHW Anti Legionella protection"* for detailed information.

3.8.2 DHW re-circulation

This function allows the activation of the water pump for the re-circulation of the hot water from the DHW tank by means of the heat pump. This function can also be used with the anti-legionella protection function.

Refer to section *"2.3.13.2 DHW re-circulation"* for detailed information.

3.8.3 DHW boost

With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW.

Refer to section *"2.3.13.3 DHW boost"* for detailed information.

3.8.4 Demand

DHW operation has 3 different modes, ECONOMIC (only for **airH2O 800H Combi** units), STANDARD and HIGH DEMAND :

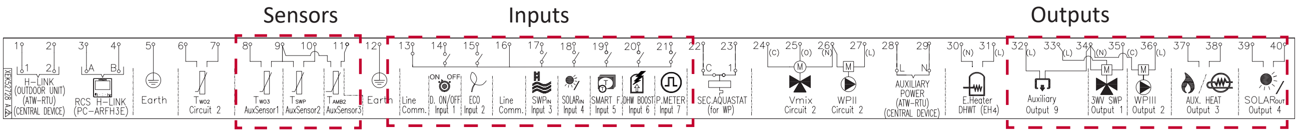
- ✓ ECONOMIC mode: The heating of the domestic hot water shall be started when water temperature in tank is low enough for the heat pump to be started measured with the top most tank thermistor. DHW is always started heated by the heat pump. Using this mode, it is reduced the amount of heating up procedures.
- ✓ STANDARD mode: Behaves the same as ECONOMIC mode but it is used the lowest tank sensor to judge water temperature inside tank. This functionality ensures higher quantity of water already heated inside of tank and heating-up process are more frequent.
- ✓ HIGH DEMAND mode: The heating of the domestic hot water is started if differential is bigger than T_{DHWON}. It will be started with water tank heater only unless water temperature in tank goes below heat pump starting temperature measured with the lowest sensor on tank.

Refer to section *"2.3.5 DHW operation mode"* for detailed information.

3.9 Optional external input, output and sensor configuration signals

The system has 7 input and 4 output optional signals (in case of **airH2O 800H** and Control Box) or 5 output optional signals (in case of **airH2O 800H Combi**) and 4 additional output signals when using the auxiliary output signal box (ATW-AOS-02). The new **airH2O 800** series allow different ports to be configured for those I/O signals, as well.

The user can configure those input signals to perform different functions from the unit controller.

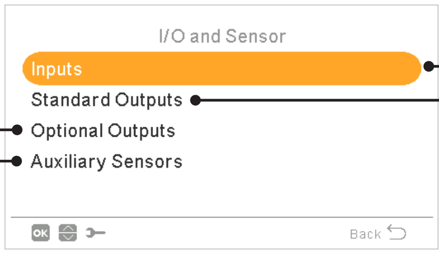


airH2O 800H Combi *Terminal Board 2*

The following input, output and sensor functions can be selected in the “I/O and Sensor” menu of the controller:

Optional Outputs:
There are 4 additional available outputs to set. These 4 additional outputs are not wired to the **airH2O 800** terminal board. In order to use them, an accessory (ATW-AOS-02) is required. Its configuration follows the same constraints as “Standard outputs”.

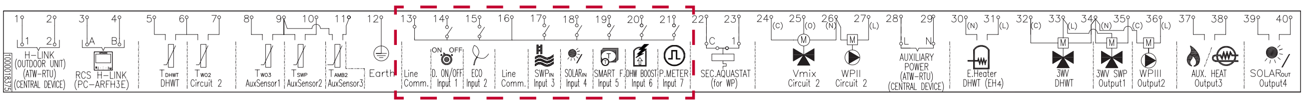
Auxiliary Sensors:
There are 7 available auxiliary sensors to set.



Inputs:
The system allows to set 7 inputs depending on the operations and preferences of the installation.

Standard Outputs:
There are 4 available outputs for **airH2O 800H** and Control Box, and 5 for **airH2O 800H Combi** models to set already wired to the terminal board. There are conditions of setting depending on the installation.

3.9.1 Input signals and input ports



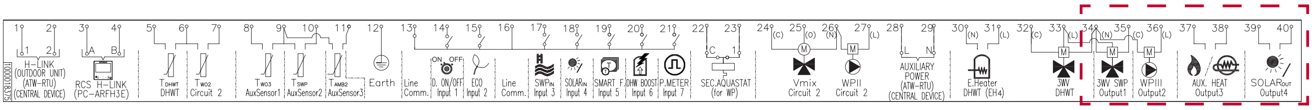
airH2O 800H *and Control Box Terminal Board 2*

Name	Port	Input
Input 1	#13 and 14	230 V
Input 2	#13 and 15	230 V
Input 3	#16 and 17	230 V
Input 4	#16 and 18	230 V
Input 5	#16 and 19	230 V
Input 6	#16 and 20	230 V
Input 7	#16 and 21	230 V

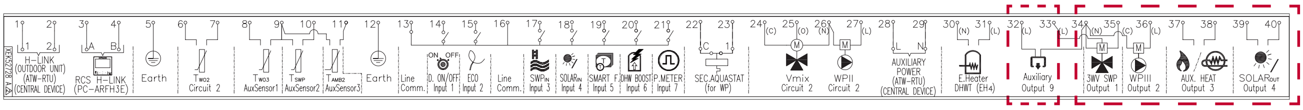
◆ List of available inputs

Deactivated	
Demand-ON/OFF	By default in input 1. Send Demand-ON or OFF Operation to Circuit 1 and Circuit 2.
Smart Action (SG1)	Fixed in input 5 if smart action is enabled. This function must be used to block or limit the heat pump when restricted by Electric company. It allows an external Smart switch device to switch off or reduce consumption of the heat pump during time of peak electricity demand. In case Smart action is configured as Smart Grid Ready (SG1), an adittional input is required to be configured as SG2. These 2 inputs allow 4 diferent operation modes: Standard HP mode, External blocking mode, Low price mode, Overcapacity mode.
Swimming pool	Fixed in input 3 if swimming pool is enabled. Input used to let **airH2O 800** know swimming pool is in Demand-ON conditions.
Solar	Fixed in input 4 if solar is enabled. In case of combining **airH2O 800** with solar panels, this input is used as a feedback for solar station ready operation.
Operation mode	Cool/Heat must be changed by an input of an external contact signal. Contact signal is edge detection; Cool/Heat changeover by unit controller is also available.
DHW boost	Fixed in input 6 if DHW Boost is enabled. With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW.
Power meter 1	Input used as kWh pulse count for Energy data recording.
Demand-ON/OFF C1	Send Demand-ON or OFF Operation only to Circuit 1.
Demand-ON/OFF C2	Send Demand-ON or OFF Operation only to Circuit 2.
Forced Heating	Forced Heating Demand by input of contact signal from outside.
Forced Cooling	Forced Cooling Demand by input of contact signal from outside.
Power meter 2	Input used as kWh pulse count for Energy data recording.
ECO mode C1 and C2	Water temperature setting for Circuit 1 and Circuit 2 is reduced by ECO operation mode (default 3 °C) by input of contact signal from outside.
ECO mode C1	By default in input 2, if there is Circuit 1 in the installation. Water temperature setting for Circuit 1 is reduced by ECO operation mode (default 3 °C) by input of contact signal from outside.
ECO mode C2	Water temperature setting for Circuit 2 is reduced by ECO operation mode (default 3 °C) by input of contact signal from outside.
Force OFF	Force OFF operation for unit. RCS will continue as normally set but will show indication that operation is forbidden.
Smart Grid Ready (SG2)	In case Smart action is configured as Smart Grid Ready (SG1), this input is used as a digital input 2 and allows four different operating modes.
Night shift	Set the unit in Night shift mode.
Drain pump	In case of configuring this input, alarm is triggered in case input contact is opened. This input can be linked to drain pump kit accessory located at drain pan which by means of a NC contact, notifies there is possibility of water overflow.

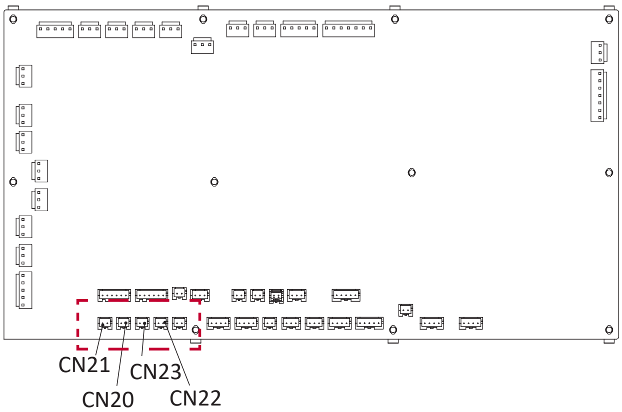
3.9.2 Output signals and output ports



airH2O 800H *and Control Box Terminal Board 2*



airH2O 800H Combi *Terminal Board 2*



airH2O 800H, **airH2O 800H Combi** *and Control Box PCB*

◆ Standard Outputs

Name	Port	Output
Output 1	#34 and 35	230 V
Output 2	#34 and 36	230 V
Output 3	#37 and 38	Free voltage signal
Output 4	#39 and 40	Free voltage signal
Output 9 (only for **airH2O 800H Combi**)	#32 and 34	230 V

◆ Optional Outputs

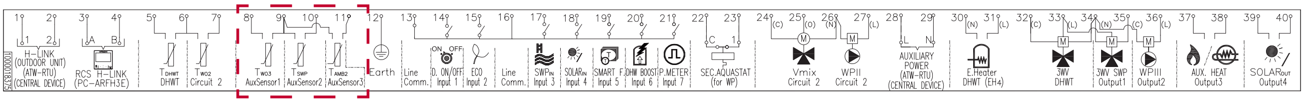
Name	Port	Output
Output 5	CN20 #1-2	12 VDC signal
Output 6	CN21 #1-2	12 VDC signal
Output 7	CN22 #1-2	12 VDC signal
Output 8	CN23 #1-2	12 VDC signal

◆ List of available outputs

Deactivated	
3WV SWP	Fixed in output 1 if swimming pool is enabled. In case of combining **airH2O 800** with swimming pool, this output is used to drive 3 way valve swimming pools.
WP3	Fixed in output 2 if buffer tank is installed. In case of combining **airH2O 800** with boiler or hydraulic separator, this output is used to drive water pump 3.
Boiler combination	Fixed in output 3 if boiler is enabled. In case of combining **airH2O 800** with boiler, this output is used to switch it ON.
Solar pump	Fixed in output 4 if solar pump is enabled. In case of combining **airH2O 800** with solar panel, this output is used to drive water pump station .
Alarm signal	By default in output 5. Output when an “Alarm Code” is received from indoor unit or outdoor unit.
Operation signal	By default in output 6. Output in case that "Thermo-ON" signal in any condition.
Cooling signal	By default in output 7. Output in case that "Thermo-ON" signal in Cooling operation.
Demand-ON signal circuit 1	By default in output 8. Signal is enabled when Circuit 1 is operating in Demand-ON.
Heating signal	Output in case that "Thermo-ON" signal in Heating operation.
DHW signal	Output in case that "Thermo-ON" signal in DHW operation.
Solar overheat	Output in case that solar temperature signal is active when solar overheat (only when solar combination status is total control).
Defrost	Output if the operation state of the outdoor unit when is defrosting.
DHW re-circulation pump	In case of re-circulation pump enabled for DHW tank.
Heater Relay 1	Not available
Heater Relay 2	Not available
Fan 1 Low speed	Output for fan coil speed.
Fan 1 Medium speed	Output for fan coil speed.
Fan 1 High speed	Output for fan coil speed.
Fan 2 Low speed	Output for fan coil speed.
Fan 2 Medium speed	Output for fan coil speed.
Fan 2 High speed	Output for fan coil speed.
Constant heat	Output in high state whenever operation mode from unit controller is in heating mode.
Constant cool	Output in high state whenever operation mode from unit controller is in cooling mode.

3.9.3 Additional functions by accessory sensor

Hitachi offers to its users the option to add more functions to the inputs from signals coming from some specific sensors. The configuration for this purpose is explained below:



airH2O 800H *and Control Box Terminal Board 2*

3.9.3.1 Function of sensors

Deactivated	
T_{WO3} sensor	Fixed in sensor 1 if boiler is installed. T_{wo3} sensor is required when there is external an heating source or useful to track better temperature when there is a hydraulic separator or buffer tank.
Swimming pool	Fixed in sensor 2 if swimming pool is installed. When combining **airH2O 800** with swimming pool, this sensor is used to read the temperature from the water of the swimming pool.
Solar panel sensor	When combining **airH2O 800** with solar panels, this sensor is used to read the temperature from the solar panel.
C1 + C2 ambient sensor	If Aux1 and Aux2 sensors are both connected and enabled at the unit controller configuration, the detection of ambient temperature value is carried out by these sensors. The ambient temperature setting for each circuit is set from the unit controller or central platform. The temperature value detected by each sensor is applied to the corresponding circuit.
C1 ambient sensor	If Aux1 and Aux2 sensors are both connected and enabled at the unit controller configuration, the detection of ambient temperature value is carried out by these sensors. The ambient temperature setting for each circuit is set from the unit controller or central platform. The temperature value detected by each sensor is applied to the Circuit 1.
C2 ambient sensor	If Aux1 and Aux2 sensors are both connected and enabled at the unit controller configuration, the detection of ambient temperature value is carried out by these sensors. The ambient temperature setting for each circuit is set from the unit controller or central platform. The temperature value detected by each sensor is applied to the Circuit 2.
Outdoor sensor	By default sensor 3. An outside temperature sensor can be directly connected to the controller in case the heat pump is located in a position not suitable for this measurement.

3.10 Outdoor unit optional functions

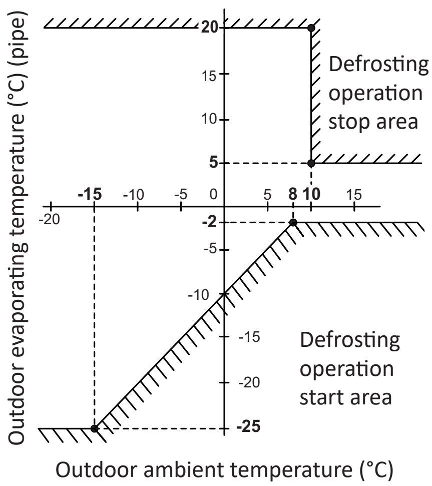
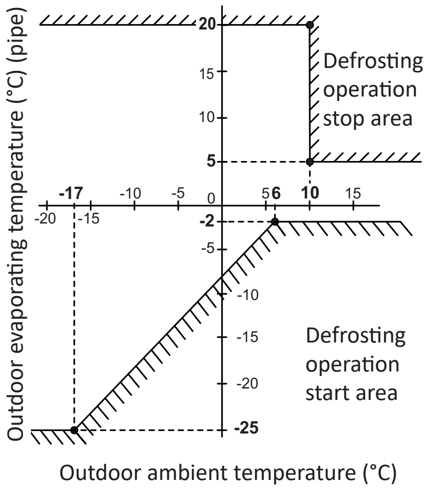
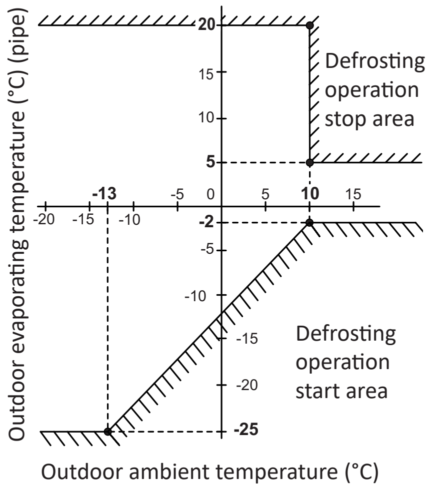
NOTE

The setting of the outdoor unit optional functions is done via the LCD controller or the CSNET Home Pro application.

3.10.1 Change of defrost condition

◆ do - Change of defrost condition

- **Description:** This function enables the adjustment of temperature conditions to induce an earlier defrosting operation for do : 1. It proves particularly beneficial in installations located in extremely cold regions where continuous frost formation occurs. Initiating an earlier defrosting operation minimises the accumulation of frost, ensuring higher heating capacity values. do : 2 allows the unit to defrost on those environments where there is lack of humidity and the outdoor unit heat exchanger degradation is low.

Standard specifications (factory default state)	Cold region	Dry region
Function selection setting do : 0	Function selection setting do : 1	Function selection setting do : 2
		

CAUTION

Do not modify this setting unless there is a specific issue to be solved.

3.10.2 Outdoor crankcase heater management

◆ F8 - Crankcase heater control during stoppage:

- **Description:** This optional function enables the stoppage of the crankcase heater in the outdoor unit when the **airH2O 800** unit is turned OFF or in “Demand-OFF” mode.

◆ Hr - Cancellation of hot start:

- **Description:** When the FB function is activated, the crankcase heater remains OFF when the **airH2O 800** unit is OFF or in Demand-OFF. Upon the **airH2O 800** unit requesting the outdoor unit to start, the outdoor unit initiates a compressor pre-heating operation. During this pre-heating, the crankcase heater is switched ON, and compressor operation is temporarily forced OFF. This forced OFF state is released once the compressor reaches a sufficient temperature to start operation, a process that may last up to 4 hours.
  Enabling optional function Hr to 1: Allows the outdoor unit to skip the compressor pre-heating operation and start immediately when operation is requested. This means the compressor will start with a crankcase temperature lower than its optimal value. Caution is advised, especially in situations where compressor starting at ambient temperatures below 10 °C is expected, as low oil viscosity may lead to compressor damage.

3.10.3 Fixed target setting for primary water pump

◆ FA - Fixed target setting for primary water pump

The primary water pump speed control has been designed to be self-adjusted. The autonomous control is designed to ensure a water flow higher than the secondary water flow with the purpose to guarantee a proper temperature transfer between primary and secondary water loops and also guarantee the nominal flow for the heat pump. On the other hand, the secondary water pump located at the indoor unit reduces its water pump speed in case the primary water pump speed is already set at its maximum speed and yet the primary water flow is lower than the secondary water flow.

With this scenario, the only water pump setting to be done is the one of the secondary water pump, which is adjusted by means of the LCD with the purpose to fulfil the flow requirements of the selected emitters.

In case the autonomous water pump speed control is desired to be disabled, software allows to fix the primary water pump speed setting by means of the optional function FA as follows:

FA	Setting
0	ODU pump Free mode
1	Pump 100 %
2	Pump 90 %
3	Pump 80 %
4	Pump 70 %
5	Pump 60 %
6	Pump 50 %

When the value of FA optional function is set, flow control for primary and secondary water loop are isolated and pumps operate according to the configured target speed. Primary water pump at outdoor unit follows FA optional function and secondary wate pump at indoor unit follows pump target speed configured on the LCD. Under this conditions the control that forces that primary water flow to be bigger than secondary water flow is disabled and water flow adjustment shall be done manually.

When system is using Control Box, there is no secondary water pump managed by the indoor unit. In this case the adjustment of the primary water pump located at the outdoor unit is done by means of the indoor unit LCD. Note that the target is set on the indoor unit LCD. However, in case the flow provided by the outdoor unit is not the desired one, the primary water pump target can also be adjusted according to the FA optional function.

3.10.4 Selecting the drain heater operating pattern

◆ Hc - Selecting the drain heater operating pattern

This parameter allows to select the operating pattern of the drain heater in function of the desired usage.

- HC = 0, this is the default value. The drain heater is switched ON when ambient temperature is lower than 5 °C and only when the outdoor unit is in operation performing defrosts cycles. The purpose of this setting is to avoid frost formation at the base of the unit when ice is melted during the defrost operation.
- HC = 1, this setting allows the deactivation of the drain heater.
- HC = 2, this setting forces a constant operation of the drain heater based on ambient temperature only. This means that it will be switched ON when ambient temperature is lower than 5 °C in any case and it will only be switched OFF in case ambient temperature is higher than 5 °C. This setting is designed to be applied for extreme cold climate conditions where it is desired to avoid frost formation at the base of the unit even when it is not in operation. In this case it could be created due to the accumulation of snow.

3.10.5 Outdoor fan management

◆ F4 - Outdoor unit maximum fan step reduction for noise reduction (heating mode only)

Description: In heating mode, the outdoor unit fan is controlled to operate at the lowest possible speed while still maintaining the required system capacity.

If the fan speed becomes uncomfortable due to noise, the optional function F4 allows to limit the maximum fan step. This helps reduce noise levels by capping the maximum fan step as follows:

F4	Fan step reduction
0	0
1	1
2	2
3	3

NOTE

Limiting the maximum fan step reduces the airflow of the outdoor unit. As a result, the interval between defrost operations becomes shorter, and the heating capacity may decrease.

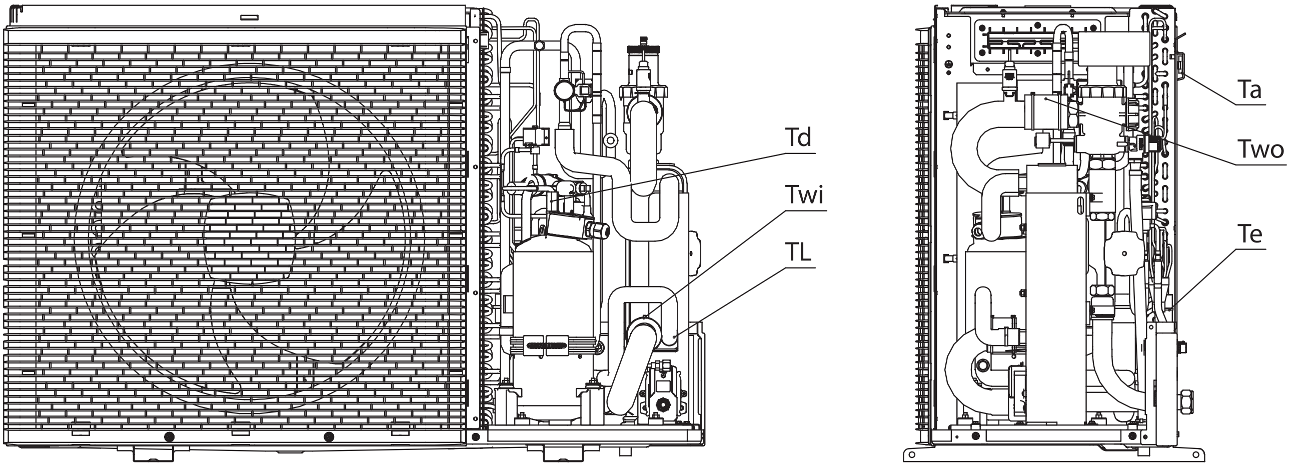
Electrical checks of the main parts

4.1 Thermistors

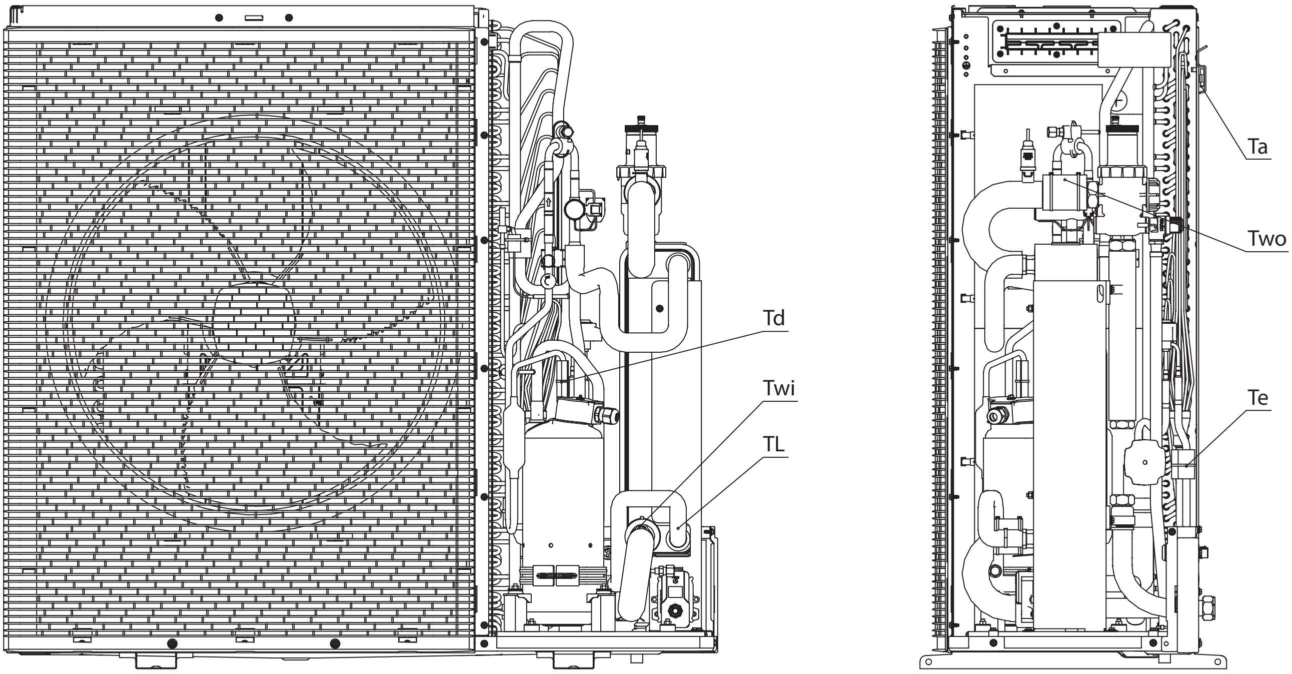
4.1.1 Outdoor units

4.1.1.1 Thermistors for airH2O 800M - RASM-(2-6)(V)TW2E

RASM-(2-3.5)VTW2E

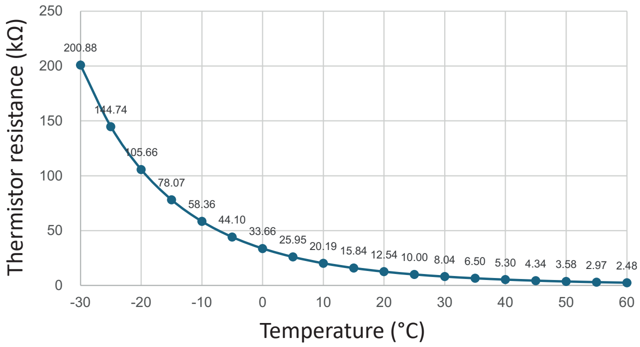


RASM-(4-6)(V)TW2E

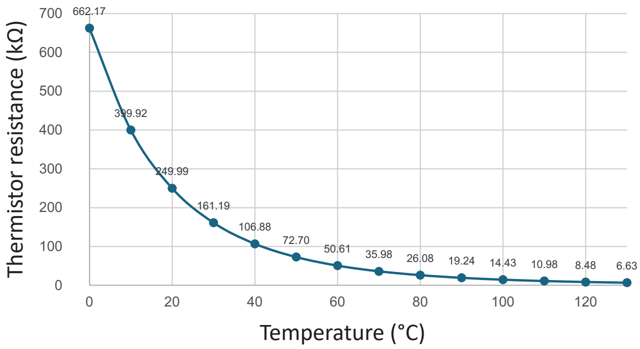


Component		Aerial connector
Mark	Name	Mark
Ta	Thermistor for ambient temperature	CN22
Te	Thermistor for evaporation temperature	CN21
Td	Thermistor for discharge temperature	CN20
TL	Thermistor for liquid temperature	CN23
Two	Thermistor for water output temperature	CN25
Twi	Thermistor for water input temperature	

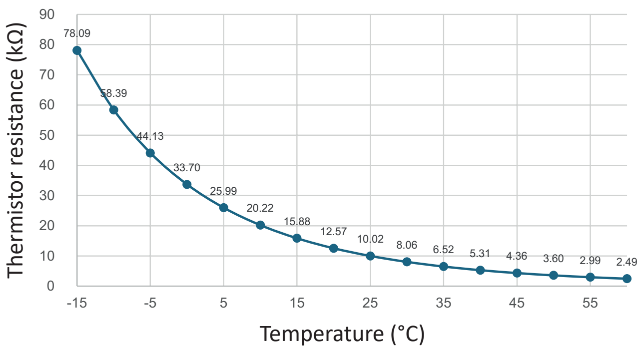
◆ Thermistor for ambient (Ta) and evaporation (Te) temperatures



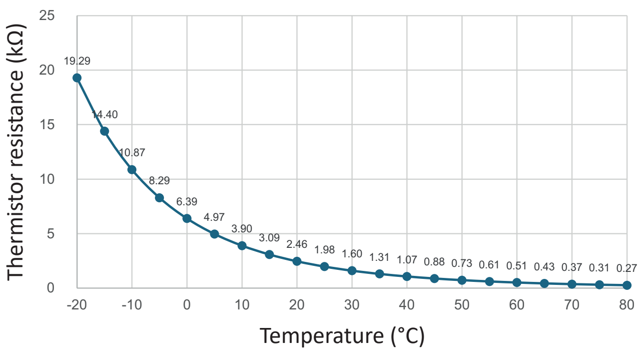
◆ Thermistor for discharge gas temperature (Td)



◆ Thermistor for liquid pipe temperature (TL)

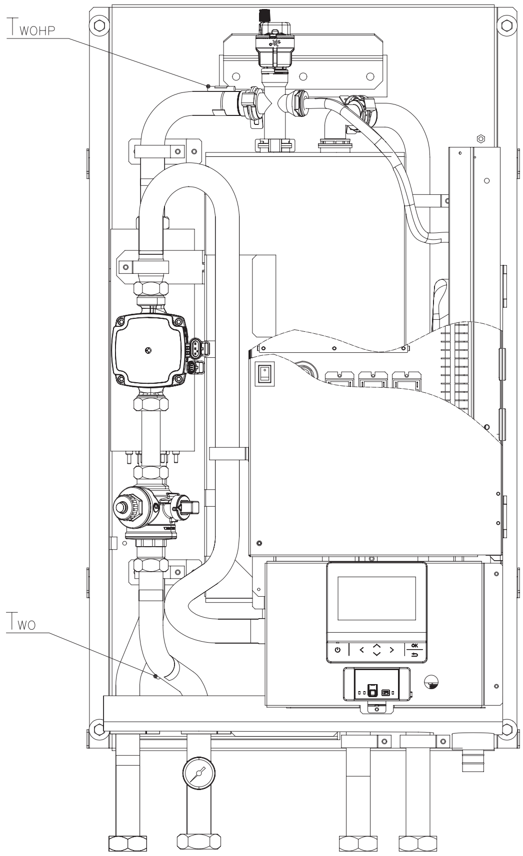
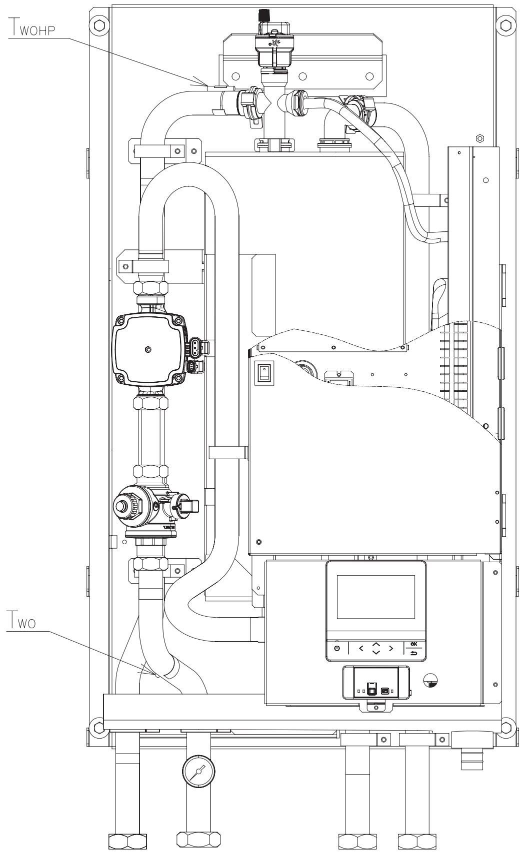


◆ Thermistor for water input (Twi) and water output (Two) temperatures



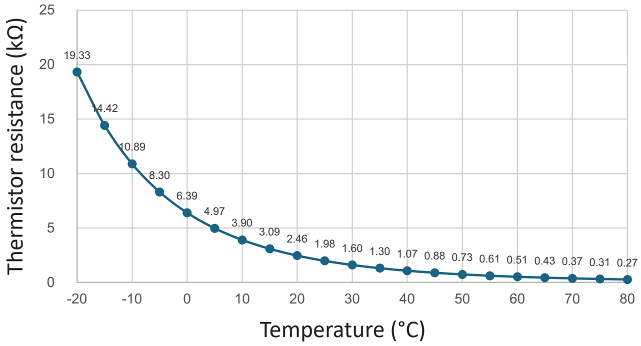
4.1.2 Indoor units - Hydrosplit system

4.1.2.1 Thermistors for airH2O 800H - HWM-W2E(-B)

HWM-W2E	HWM-W2E-B
	

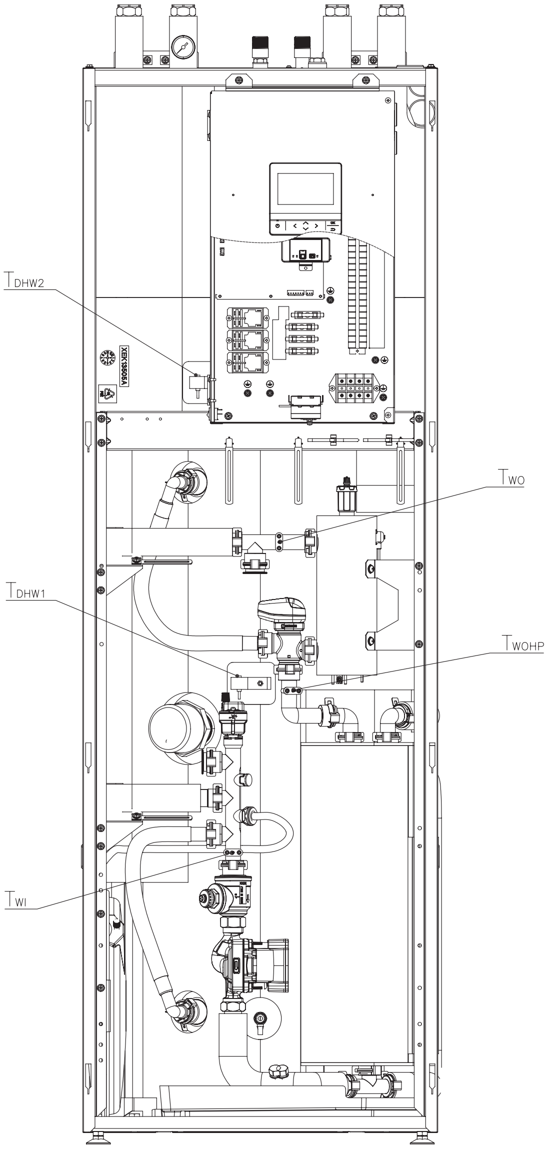
Component		PCB connector
Mark	Name	Mark
T_{WO}	Water output thermistor	CN13
T_{WOHP}	PHEX water output thermistor	CN11

◆ Thermistor for water output (T_{WO}) and PHEX water output (T_{WOHP}) temperatures



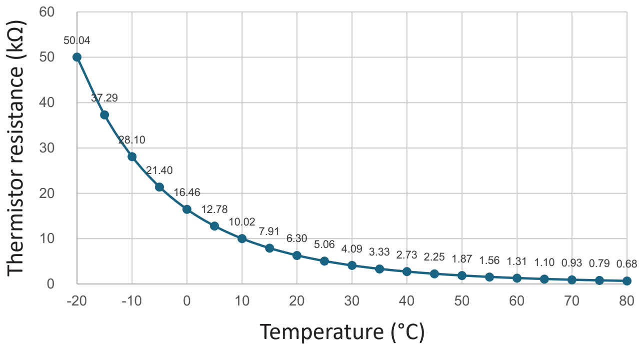
4.1.2.2 Thermistors for airH2O 800H Combi - HWD-W2E-220S(-K)

HWD-W2E-220S(-K)

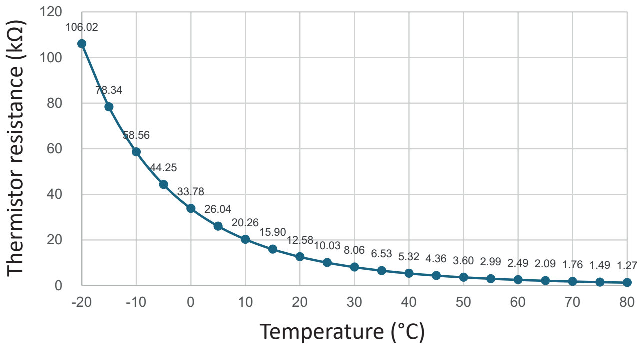


Component		PCB connector
Mark	Name	Mark
T_{WI}	Water input thermistor	CN9
T_{WO}	Water output thermistor	CN13
T_{WOHP}	PHEX water output thermistor	CN11
T_{DHW1}	DHW tank lower thermistor	CN10
T_{DHW2}	DHW tank upper thermistor	CN18

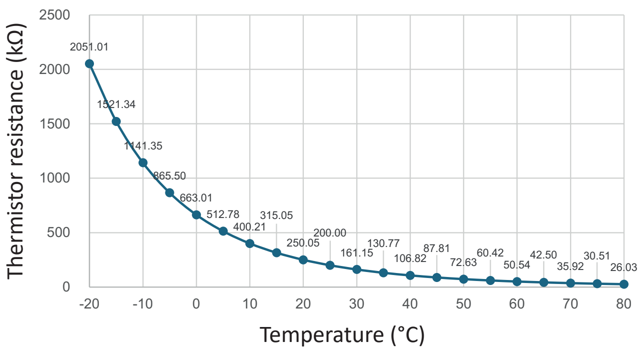
◆ Thermistor for water input (T_{WI}), water output (T_{WO}) and PHEX water output (T_{WOHP}) temperatures



◆ Thermistor for DHW tank lower temperature (T_{DHWT1})

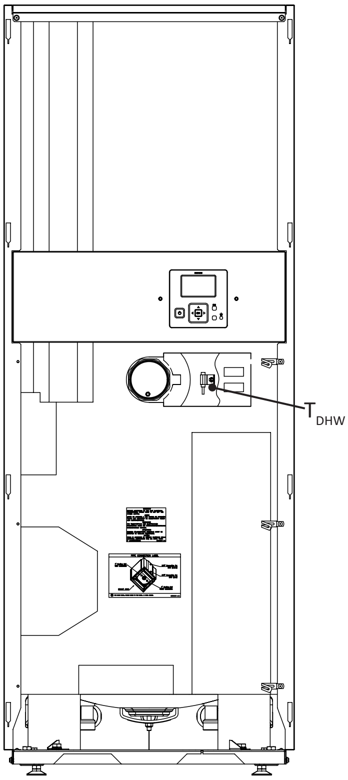


◆ Thermistor for DHW tank upper temperature (T_{DHWT2})

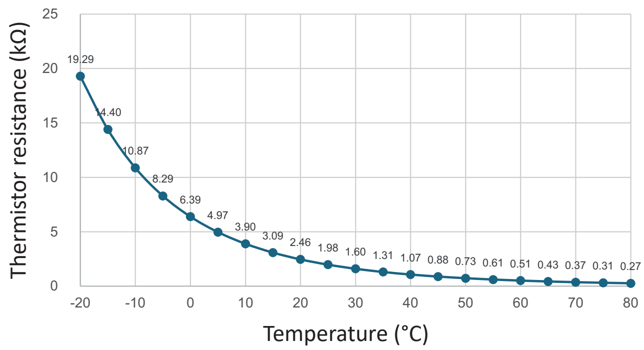


4.1.3 Thermistor for Domestic Hot Water Tank (DHWT)

DHWS(200-260)S-2.7H2E

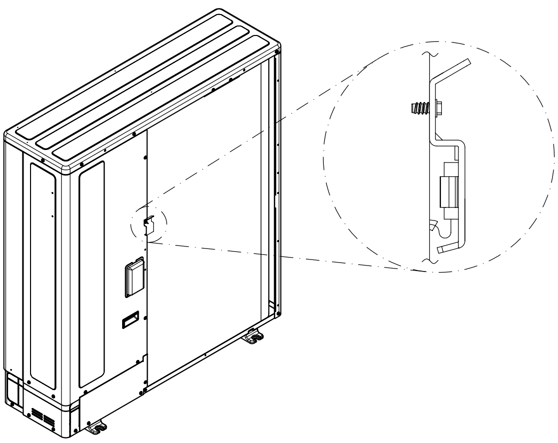


	Component	TB2
Mark	Name	Terminals
T_{DHW}	DHW tank thermistor	5-6

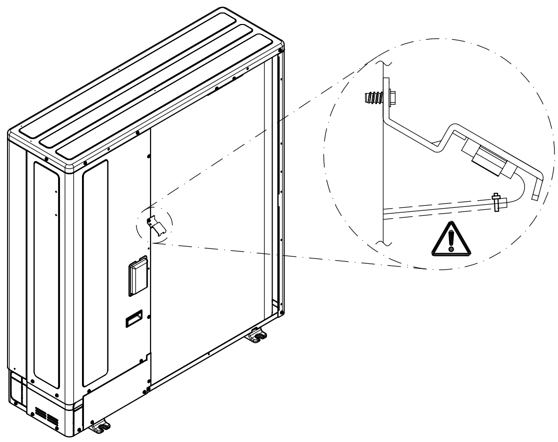


4.1.4 Adjusting the ambient sensor holder position

The ambient thermistor can be positioned in two ways (standard or separate). In the separate position, the unit's performance (defrost cycles) is enhanced, especially in prolonged periods of persistent low temperatures preventing the accumulation of ice or frost, that can ocur in the original position.



Standard position



Separate position

4.2 Pressure protection device

The pressure protection device is essential for preventing potential damage to the compressor and components within the refrigeration cycle caused by excessively high discharge pressure. Activation occurs if the discharge pressure surpasses 3.0 MPa, initiating protection control and halting the compressor.

If the discharge pressure exceeds 2.8 MPa, there is the possibility of activating protection control, offering an additional layer of safeguarding.

During heating operations, automatic control of the gas by-pass circuit and outdoor fan air volume ensure that high pressure does not increase excessively. The gas by-pass circuit, comprising a solenoid valve and capillary tube for flow adjustment, plays a key role in preventing excessive pressure by directing high-pressure gas to the low-pressure side.

1 **Pd pressure sensor**
2 **PSH pressure switch**
3 **Ps pressure sensor**

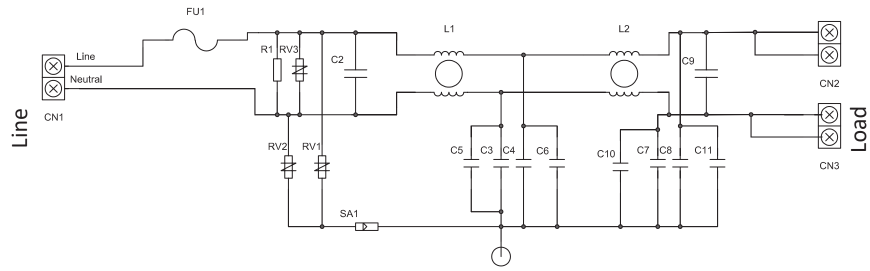
NOTE

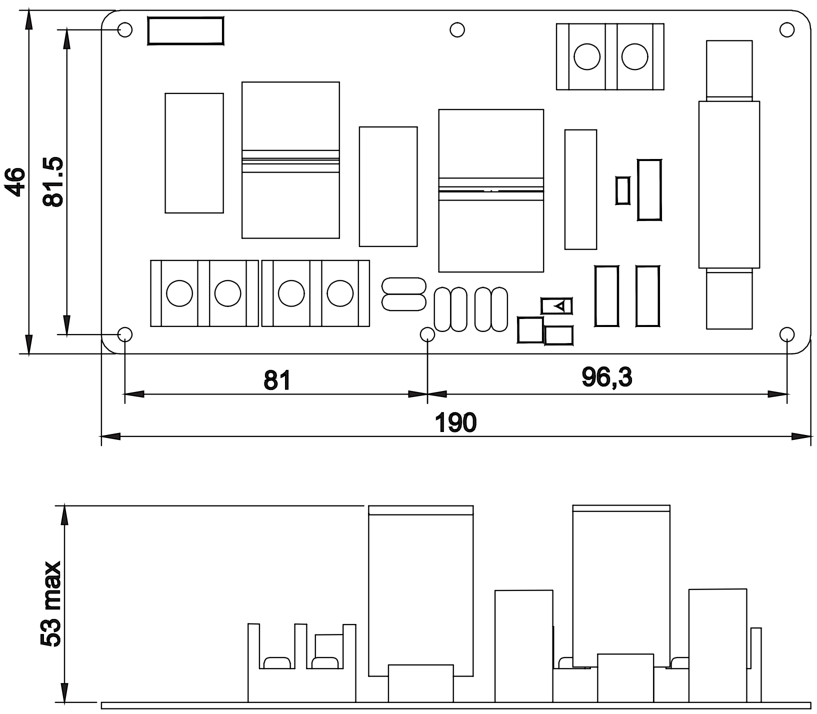
This figure is only for illustration purposes and corresponds to RASM-(2-3.5)VTW2E units. RASM-(4-6)(V)TW2E units may differ.

4.3 Noise filter (NF)

The noise filter decreases the leakage of noise made by the inverter to the power supply side. Terminals indicated with “LOAD” are connected to the inverter side and terminals indicated with “LINE” to the power supply side.

4.3.1 Noise filter for RASM-(2-6)VTW2E

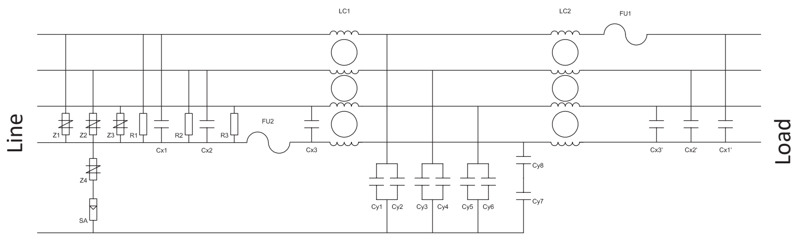
Items	Specifications
Model	FLT-075B-T
Rated voltage / current	250 VAC / 40 A
Permissible temperature range	-30 °C to 70 °C
Circuit diagram	

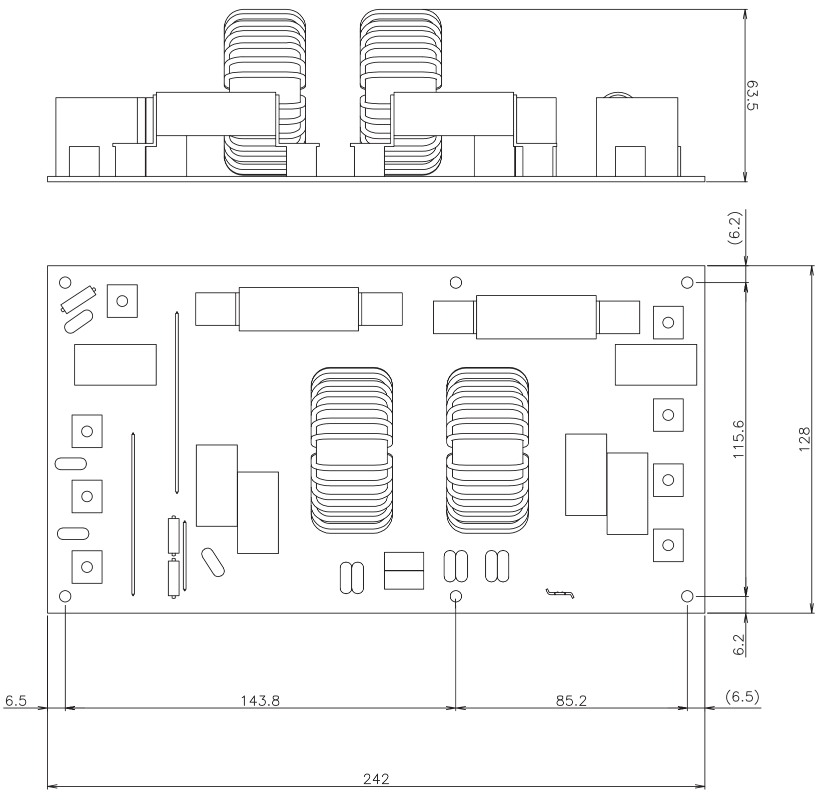


i **NOTE**

All figures only for illustration purpose. The actual product may differ.

4.3.2 Noise filter for RASM-(4-6)TW2E

Items	Specifications
Model	NF167ES-T
Rated voltage / current	380 VAC / 15 A
Permissible temperature range	-25 °C to 65 °C
Circuit diagram	



NOTE

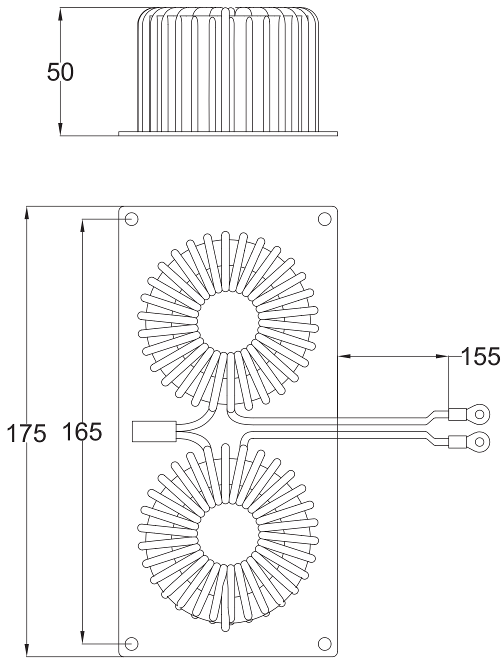
All figures only for illustration purpose. The actual product may differ.

4.4 Reactor (DCL)

This part is used for changing alternating current to direct current for the inverter.

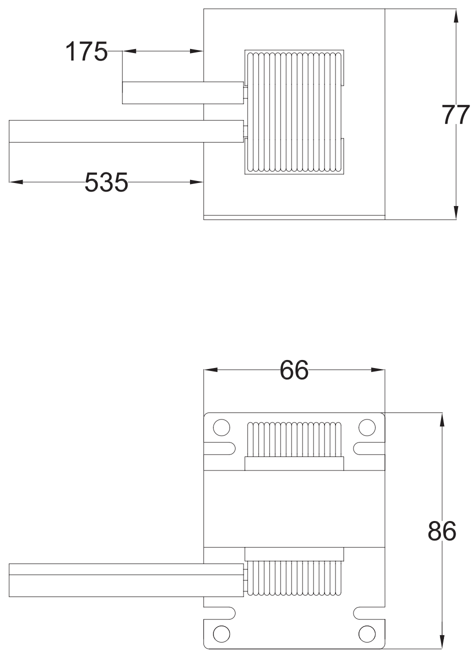
4.4.1 Reactor (DCL) for RASM-(2-6)VTW2E

Items	Specifications
Inductance	0.2 mH
Rated current	40 A
DC Resistance	40 mΩ (max.)
Permissible temperature range	-40 °C to 90 °C



4.4.2 Reactor (DCL) for RASM-(4-6)TW2E

Items	Specifications
Inductance	0.5 mH
Rated current	35 A
DC Resistance	27 mΩ
Permissible temperature range	-25 °C to 60 °C



4.5 Rotary compressor for RASM-(2-6)(V)TW2E units

The rotary compressor used in RASM-(2-6)(V)TW2E units is designed with specific features to ensure reliability, low vibration, and low sound. Also, this compressor has an injection port that allows the extension of the working range at lower ambient temperatures. Here is an overview of the principle of compression for this rotary compressor.

◆ Key Features:

1 **Reliability:**

The rotary compressor is engineered to provide a reliable mechanism, ensuring stable and efficient operation within the specified range of RASM-(2-6)(V)TW2E units.

◆ Principle of Compression:

1. Gas inhale:

The gas is inhaled from the suction port.

2. Compression:

The inhaled gas is then compressed by reducing the volume of the gas. At mid compression, an additional heated gas injection can occur to improve the discharge gas properties.

3. Minimum compression space:

The compression space at the end of the path is minimum, where the gas is compressed to its maximum.

4. Gas discharge:

The gas is discharged through the discharge port.

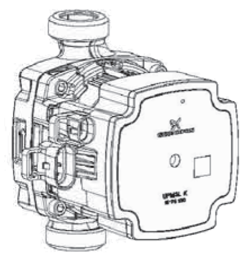
5. Repetitive cycle

The above procedures of suction, compression, and discharge are repeated continuously in a cycle to maintain the required compression and operation.

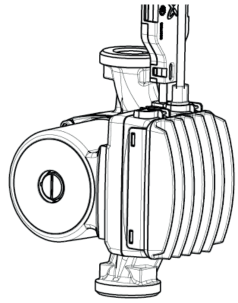
4.6 Water pump

		airH2O 800M
Power	Energy efficiency Index (EEI)	≤ 0.20
	Max delivery Head	7.5 m
	Max Volume flow	4.0 m^3/h
Permitted field of application	Temperature range for applications at max temperature limit values	Of 60 °C = -10 to 130 °C Of 70 °C = -10 to 110 °C
	Max static pressure	PN 10
Electrical Connection	Mains connection	~230 V +10%-15%, 50/60 Hz (IEC 60038)
	Low voltage directive	2014/35/EC Conform
	Protection Class	IPX4D
	Insulation Class	F
	Motor data	UPM3L K
	Speed (rpm) (RS**/7.0iPWM1)	560/5990
	Power consumption (W)	2.0-75
	Current at ~230 V (A)	0.04-0.60

PWM input signal	airH2O 800M
≤10	Maximum speed: Max.
<10/≤84	Variable speed: min to max
>84/≤91	Minimum speed: min
>91/≤95	Hysteresis area: ON/OFF
>95/≤100	Stand-by mode: OFF



PWM input signal	airH2O 800H / H Combi
≤10	Maximum speed
<10/≤84	Variable speed
>84/≤91	Minimum speed
>91/≤95	Hysteresis area
>95/≤100	Stand-by mode (STOP)



Servicing

5.1 Safety introduction

DANGER

- ***Before performing any of the service operations described in this chapter, turn all the main switches off and place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.***
- ***In case of blocked or stuck parts, use appropriated tools and eventually lubricants to release them.***
- ***In case of sharped edged parts as covers use security gloves to avoid getting injured.***
- ***When performing brazing work, convenient eye protection must be worn, besides security gloves.***
- ***Check and be sure that all voltage is off for at least 1 minute before any electrical maintenance.***

NOTE

- *All compressors are connected by brazing. Check for flammable materials around when using a burner for pipe connections to prevent oil inside existing pipes from igniting.*
- *Avoid exposing the refrigerant cycle to the atmosphere for an extended period to prevent water and foreign particles from entering. Quickly replace the compressor; if exposed, seal the suction and discharge pipes.*
- *Remove the cap from the compressor just before replacement. Seal the suction and discharge pipes with tape to protect from foreign particles. Remove the tape at the pipe connection.*

5.1.1 R290 safety instructions

Explanation of symbols displayed on the indoor unit or outdoor unit:

A3 WARNING

This symbol shows that this equipment uses a flammable refrigerant (A3).

If the refrigerant is leaked, together with an external ignition source, there is a possibility of ignition.

CAUTION

This symbol shows that the Operation Manual should be read carefully.

CAUTION

This symbol shows that a service personnel should be handling this equipment with reference to the Installation Manual.

CAUTION

This symbol shows that there is information included in the Operation Manual and/or Installation Manual.

WARNING

- ***Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.***
- ***The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).***
- ***Do not pierce or burn.***
- ***Be aware that the R290 refrigerant might not contain an odour.***
- ***Do not disconnect the pipe connection after checking the leak otherwise it may cause refrigerant leakage.***

◆ Installation (Space)

WARNING

In cases that require mechanical ventilation, ventilation openings shall be kept clear of obstruction.

CAUTION

- *Compliance with national gas regulations shall be observed.*
- *When disposing of the product is used, be based on national regulations, properly processed.*
- *An unventilated area where the appliance using flammable refrigerants is installed shall be so constructed that should any refrigerant leak, it will not stagnate so as to create a fire or*

explosion hazard

➢ *The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation;*

➢ *The appliance shall be stored in a room without continuously operating open flames (for example an operating gas appliance) and ignition sources (for example an operating electric heater).*

- *Avoid other potential continuously operating sources known to cause ignition of the refrigerant used.*
- *The appliance shall be stored so as to prevent mechanical damage from occurring.*
- *Handling, installation, cleaning and servicing shall be performed according to the related technical documentation.*
- *Disposal shall be performed according to national regulations.*
- *The appliance is intended to be installed at altitudes below 2000 m.*

◆ Servicing

Service personnel

⚠ **CAUTION**

- *Any person who is involved with working on or breaking into a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority, which authorizes their competence to handle refrigerants safely in accordance with an industry recognized assessment specification.*
- *Servicing shall only be performed as recommended by the equipment manufacturer. Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of the person competent in the use of flammable refrigerants.*
- *Servicing shall be performed only as recommended by the manufacturer.*

Checks to the area

⚠ **CAUTION**

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the refrigerating system, the precautions in "Work procedure" to "Checks to electrical devices" shall be complied with prior to conducting work on the system.

Work procedure

⚠ **CAUTION**

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapour being present while the work is being performed.

General work area

⚠ **CAUTION**

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

Checking for presence of refrigerant

⚠ **CAUTION**

- *The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres.*
- *Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. non sparking, adequately sealed or intrinsically safe.*

Presence of fire extinguisher

⚠ **CAUTION**

- *If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand.*
- *Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.*

No ignition sources

⚠ **CAUTION**

- *No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion.*
- *All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space.*
- *Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.*
- *Electrical components that can arc or spark, which are not considered ignition sources shall only be replaced with parts specified by the appliance manufacturer. Replacement with other parts may result in the ignition of refrigerant in the event of a leak*

Ventilated area

⚠ **CAUTION**

- *Ensure that the area is in the open or that it is adequately ventilated before breaking into the* *system or conducting any hot work.*

- *A degree of ventilation shall continue during the period that the work is carried out.*
- *The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.*

WARNING

- ***Precautions shall be taken to avoid excessive vibration or pulsation to the unit and the installation.***
- ***Protection devices, piping and fittings shall be protected as far as possible against adverse environmental effects, for example the danger of water collecting and freezing in relief pipes or the accumulation of dirt and debris.***

Checks to the refrigeration equipment

CAUTION

- *Where electrical components are being changed, they shall be fit for the purpose and to the correct specification.*
- *At all times the manufacturer's maintenance and service guidelines shall be followed.*
- *If in doubt consult the manufacturer's technical department for assistance.*
- *The following checks shall be applied to installations using flammable refrigerants:*
  - ➢ *The charge size is in accordance with the room size within which the refrigerant containing parts are installed.*
  - ➢ *The ventilation machinery and outlets are operating adequately and are not obstructed.*
  - ➢ *If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.*
- *Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.*
- *Refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.*

Checks to electrical devices

CAUTION

- *Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures.*
- *If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with.*
- *If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used.*

- *This shall be reported to the owner of the equipment so all parties are advised.*
- *Initial safety checks shall include:*
  - ➢ *That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking.*
  - ➢ *That no live electrical components and wiring are exposed while charging, recovering or purging the system.*
  - ➢ *That there is continuity of earth bonding.*

Integrated leak detector

⚠ **CAUTION**

- *Installing a supplementary leak detector is not necessary as the unit comes with an integrated one from factory.*
- *In case of installing an external detector, follow the manufacturer's instructions and take into consideration:*
  - ➢ *How and where to install and connect the refrigerant sensor including how to verify correct installation by test.*
  - ➢ *Recommended periodic service and maintenance procedures.*
  - ➢ *The life of the refrigerant sensor and instruction on how to replace it.*

◆ Sealed electrical components

⚠ **CAUTION**

Sealed electrical components shall not be repaired, except by personnel trained according to IEC 60079-15:2017 or the latest version.

◆ Cabling

⚠ **CAUTION**

- *Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects.*
- *The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.*

◆ Detection of flammable refrigerants

⚠ **CAUTION**

- *Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks.*
- *A halide torch (or any other detector using a naked flame) shall not be used.*

◆ Acceptable leak detection methods

⚠ **CAUTION**

- *Electronic leak detectors shall be used to detect flammable refrigerant leaks, taking into account that the sensitivity can be inadequate, or can need re-calibration (detection equipment shall be calibrated in a refrigerant-free area).*
- *Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used.*
- *Leak detection equipment shall be set at a percentage of the LFL (LFL_{R290} = 0.038 kg/m³) of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25 % maximum) is confirmed.*
- *Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine can react with the refrigerant and corrode the copper pipe-work.*
- *If a leak is suspected, all naked flames shall be removed/extinguished.*
- *If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.*
- *Removal of refrigerant shall be done according to the next clause.*

◆ Removal and evacuation

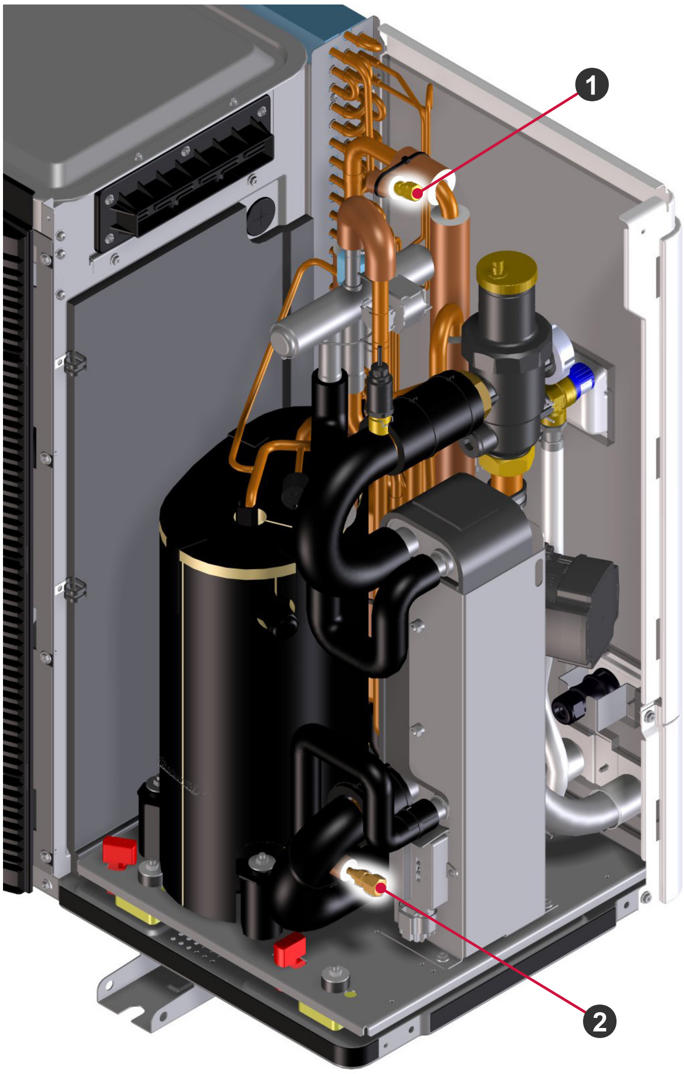
⚠ **CAUTION**

- *When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, it is important that best practice is followed since flammability is a consideration.*
- *The following procedure shall be adhered to:*
  - ➢ *safely remove refrigerant following local and national regulations*
  - ➢ *evacuate*
  - ➢ *purge the circuit with inert gas*
  - ➢ *evacuate*
  - ➢ *continuously flush with inert gas when using flame to open circuit*
- *The refrigerant charge shall be recovered into the correct recovery cylinders.*
- *The manufacturer shall specify the inert gases that can be used. Compressed air or oxygen shall not be used for purging refrigerant system.*
- *Purging on the refrigerant circuit shall be achieved by breaking the vacuum in the system with inert gas and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum.*
- *This process shall be repeated until no refrigerant is within the system.*

- *The system shall be vented down to atmospheric pressure to enable work to take place.*
- *Ensure that the outlet of the vacuum pump is not close to any ignition sources and there is ventilation available.*

NOTE

Use both check joints to perform the removal and evacuation procedure.



1 **Gas side check joint**

2 **Liquid side check joint**

◆ Charging procedures

CAUTION

- *In addition to conventional charging procedures, the following requirements shall be followed:*
  - *Ensure that contamination of different refrigerants does not occur when using charging equipment.*
  - *Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in*

them.

- ➢ *Cylinders shall be kept upright.*
- ➢ *Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.*
- ➢ *Label the system when charging is complete (if not already labelled).*
- ➢ *Extreme care shall be taken not to overfill the refrigeration system.*

- *Prior to recharging the system it shall be pressure tested with OFN (oxygen free nitrogen).*
- *The system shall be leak tested on completion of charging but prior to commissioning.*
- *A follow up leak test shall be carried out prior to leaving the site.*

NOTE

Use the liquid side check joint to perform the charging procedure.

◆ Decommissioning

CAUTION

- *Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its details.*
- *It is recommended good practice that all refrigerants are recovered safely.*
- *Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant.*
- *It is essential that electrical power is available before the task is commenced.*

a) Become familiar with the equipment and its operation.

b) Isolate the system electrically.

c) Before attempting the procedure ensure that:

- ➢ *mechanical handling equipment is available, if required, for handling refrigerant cylinders;*
- ➢ *all personal protective equipment is available and being used correctly;*
- ➢ *the recovery process is supervised at all times by a competent person;*
- ➢ *recovery equipment and cylinders conform to the appropriate standards.*

d) Pump down refrigerant system, if possible.

e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.

f) Make sure that cylinder is situated on the scales before recovery takes place.

g) Start the recovery machine and operate in accordance with manufacturer's instructions.

h) Do not overfill cylinders (no more than 80 % volume liquid charge).

i) Do not exceed the maximum working pressure of the cylinder, even temporarily.

j) When the cylinders have been filled correctly and the process is completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the *equipment are closed off.*

k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

◆ Labelling

⚠ **CAUTION**

- *Equipment shall be labelled stating that it has been decommissioned and emptied of refrigerant.*
- *The label shall be dated and signed.*
- *Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.*

◆ Recovery

⚠ **CAUTION**

- *When removing refrigerant from a system, either for servicing or decommissioning, it is required to follow good practice so that all refrigerants are removed safely.*
- *When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed.*
- *Ensure that the correct number of cylinders for holding the total system charge are available.*
- *All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant).*
- *Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order.*
- *Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.*
- *The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. Consult the manufacturer if in doubt.*
- *In addition, a set of calibrated weighing scales shall be available and in good working order.*
- *Hoses shall be complete with leak-free disconnect couplings and in good condition.*
- *The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant Waste Transfer Note arranged.*
- *Do not mix refrigerants in recovery units and especially not in cylinders.*
- *If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant.*
- *The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process*
- *Draining of oil from a system shall be carried out safely.*

5.2 Servicing on airH2O 800 refrigerant circuit

All work described in this section must be performed only by qualified personnel, certified in accordance with the F-gas Regulation 2024/573 and any applicable national/local regulations.

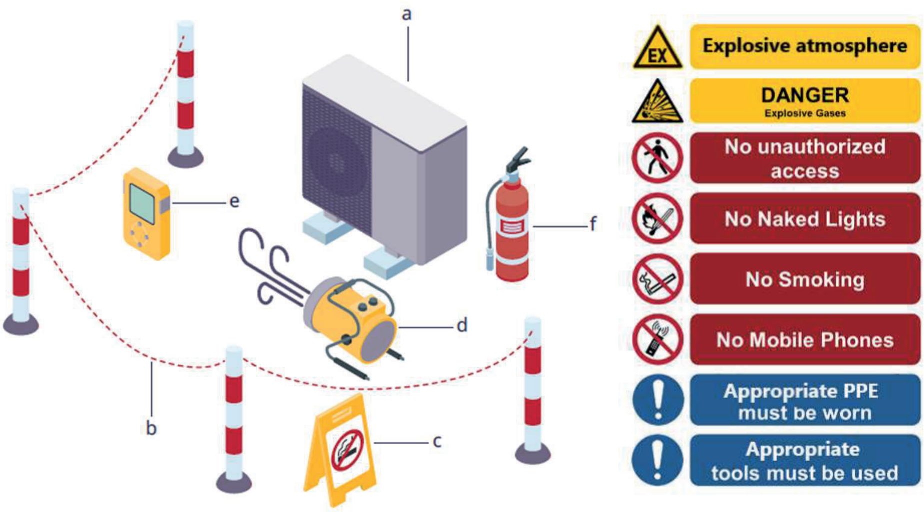
5.2.1 Maintenance, service and repair

Additional safety instructions specific to maintenance, service and repair are recommended below:

- To minimize risk, an on-site risk assessment should be executed in accordance with the installation instructions before carrying routine work on the equipment.
- All persons in the immediate vicinity must be informed of the potential risks and requested to comply with the safety measures. The immediate vicinity must be considered to be at least the safety zone described in the installation instructions.
- Place information signs at the boundaries of the safety zone.
- The personal gas detector and the HC (hydrocarbons) certified leak detector must be set and calibrated in advance in a neutral environment to maximum 20 % of the lower explosive limit (LEL) as specified in the operating instructions of the detector.
- Before opening control boxes and control cabinets, the device must be completely de-energized and capacitors must be discharged. It must be taken into account that there can be capacitors or batteries which might be charged after turning off the power.
- Always carry out work on the open refrigerating system under constant inert gas purge (see *"Inert gas purging process"*). Examples of inert gas are nitrogen, argon and carbon dioxide.

When opening the refrigerant circuit or in the presence of an explosive atmosphere, adequate ventilation must be provided, ignition sources must be avoided and constant monitoring of the presence of the refrigerant is necessary. An illustration of an example of a safety zone is shown below:

Letter	Item
a	Heat pump
b	Bollards
c	Safety sign
d	ATEX approved fan
e	Gas detector
f	Fire extinguisher



Please note that the safety zone must be evaluated according to the leakage rate and on-site condition and shall be marked according to ISO 7010:2019.

Be aware buildings and building openings might be present within the safety zone.

Ensure sufficient ventilation at the safety zone to make sure any leaking refrigerant is diluted. If insufficient ventilation is available, an ATEX approved fan should be used.

Ensure that personal protective equipment (PPE) and tools do not pose an ignition source hazard (see *"5.2.2 Personal protective equipment (PPE)"* and *"5.2.3 Tools and safety equipment"*).

◆ Refrigerant recovery from the system

- Ensure suitable recovery cylinders, recovery equipment and vacuum pump are used by checking capacity and R290 refrigerant.
- During recovery, check all valves and hoses with an appropriate leak detector to detect any leaking refrigerant. It is recommended to vacuum the refrigerant circuit up to 300 Pa.
- The recovery process might need to be repeated using the inert purging process described below as a small amount of the refrigerant might be present in the compressor oil after recovery (a minimum of 3 times).
- After the recovery, it is recommended to open the valves on the hoses in a well-ventilated outside area to remove any remaining refrigerant.
- Monitor the recovery operation at all times.

◆ Inert gas purging process

- Connect the refrigerant circuit and inert gas cylinder using the regulator. Attach an appropriate hose from the circuit's vent to a safe discharge area.
- Open the regulator valve on the inert gas cylinder to 1.0 barG, and flush inert gas through the entire system or the section being repaired until no flammable refrigerant concentration is detected in the discharge area.
- Move the connection point on the refrigerant circuit to a location as far from the original point as possible, and flush again until no flammable refrigerant concentration is detected.
- Repeat this process, as also described in ISO 22712 and ISO 5149-4, of changing connection points and flushing until there is no detectable flammable refrigerant concentration.
- This flushing ensures that no refrigerant remains trapped in the oil. To prevent hazards from evaporating propane bound in the oil, inert gas must continuously flow through the circuit during work on the heat pump system.
- When flushing, use a leak detector and continuously monitor to ensure no flammable cloud concentrates at the outlet. In the area where the gas is vented, residual refrigerant gas with inert gas can be diluted with the ATEX approved fan and must be free from ignition sources or alternatively can be burned off with a mobile gas flare.

Do not open the system until the refrigerant has been completely removed.

5.2.2 Personal protective equipment (PPE)

Examples of PPE below are not exhaustive. National legislation needs to be checked for the necessary PPE.

Item	Image
Personal gas detector Minimal detection of LEL + O_2	
ESD safety wristband for safe earthing (on outside unit)	 
S3+ ESD working shoes according to EN ISO 20345:2022 and a resistance ranging between 0.1 MΩ and 100 MΩ according to ISO IEC 61340 (yellow ESD logo)	 
Safety clothing in conformity with the provisions of PPE Regulation (EU) 2016/425 (Cat III) and satisfies the essential health and safety requirements set out in the relevant harmonised standard(s): EN ISO 11612 A1+A2, B1, C1, E3, F1 EN ISO 11611 Class 1 A1+A2 EN 1149-5	
Non-brazing safety glasses DIN 166 minimal 2C - 1.2 for non brazing	
Working gloves If only mechanical risk exists use work gloves according to EN 388 and EN 16530	
Helmet in case of working in locations where debris can fall according to EN 50365	
Hearing protection conform EN 352:2020	
Fall protection	
Brazing safety glasses DIN 166 + DIN 169 1.7 minimal for brazing	
Working gloves Use when filling or draining refrigerant and during work involving pipes are opened in which refrigerant may be present Viton (viton-butyl) gloves as protection against the risk of frostbite and also against chemical risks, in accordance with EN 374:2016 and if possible EN 16530	

5.2.3 Tools and safety equipment

Examples of tools below are not exhaustive. National legislation need to be checked for the necessary tools.

Item	Image
EX-marked leak detectors	
Spark-free screwdriver to open unit	
Fire extinguisher with an ABC rating Minimal rating 34A 233B C	
R290-approved vacuum pump	
Measuring scale with 2 decimal digit accuracy for checking reclaimed refrigerant R290-compliant version	
Meterset certified for A3 refrigerants such as R290	
R290-certified hose with special leak-free connectors	
27 L cylinder suitable for R290	
Inert gas (N_2/Ar/CO_2) bottle for flushing, welding and pressure test	
Mobile gas flare	
Torchset to repair installation	 
ATEX-approved fan to be able to dilute the mixture	
Tool to close off pipe in case leaking unit needs to be replaced and transported Not possible to transport leaking units according to ADR	
Bollards with 25 m of chain	
Safety sign according to ISO 7010	
Storage	 

5.3 Outdoor units - airH2O 800M - RASM-(2-6)(V)TW2E

DANGER

Electrical hazard. Risk of death.

- ***Before performing any of the service operations described in this chapter, turn all the main switches off and place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.***
- ***Check and be sure that all voltage is off for at least 1 minute before any electrical maintenance.***

CAUTION

Crush hazards. Can cause serious injuries.

- *In case of sharped edged parts, as covers, use security gloves to avoid getting injured.*
- *In case of blocked or stuck parts, use appropriated tools and eventually lubricants to release them.*
- *When performing brazing work, besides security gloves it is a must to wear convenient eye protection.*
- *Do not put any strange material (sticks, etc) into the air inlet and outlet. These units have high speed rotating fans and it is dangerous that any object touches them.*

Electrical hazard. Can cause serious injuries.

- *Do not pour water into the unit. These products are equipped with electrical parts. If water contacts with electrical components then it will cause a serious electrical shock.*
- *Do not open the service cover or access the unit without disconnecting the main power supply.*
- *In case of fire turn OFF the main switch, put out the fire at once and contact your service contractor.*

Flammable liquids and objects. Fire risk.

- *Check to ensure whether there are flammable things around or not when using a burner for pipe connections, if not, oil existing inside the pipes may ignite.*
- *Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one meter from the system.*

NOTE

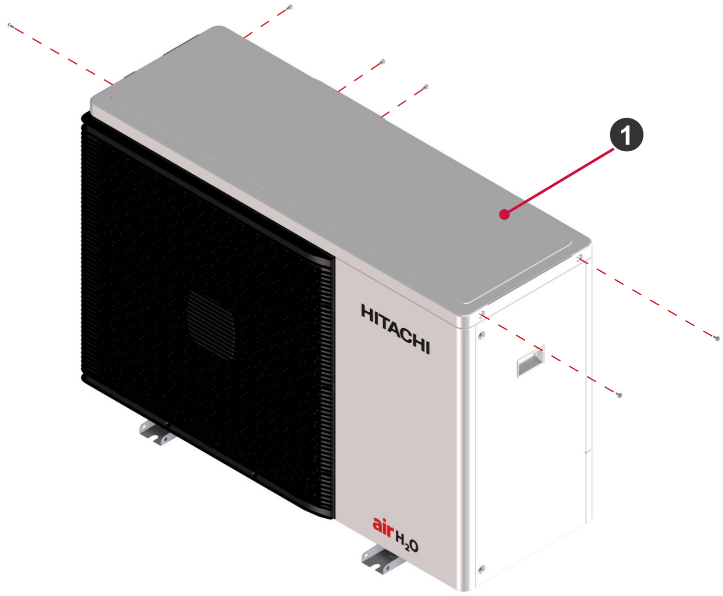
- *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing compressor, replace it quickly. If exposed for a long period, seal the suction pipe and discharge pipe.*
- *Remove the cap for the compressor just before replacing the compressor. Before mounting the compressor, seal the suction pipe and discharge pipe with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.*
- *If circuit breaker or fuse is often activated, stop the system and contact your service contractor.*

5.3.1 Structural and water cycle components

5.3.1.1 Removing the upper cover

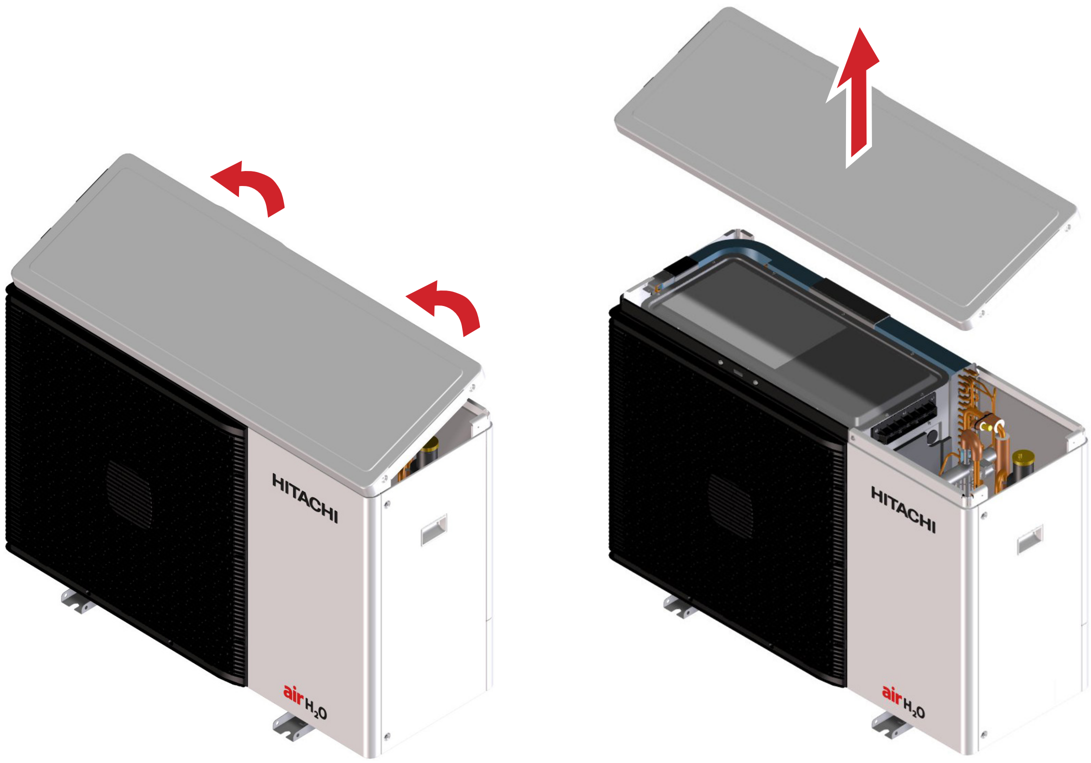
Removing the upper cover (1) allows to perform maintenance or checks on internal components, including the electrical box (if properly instructed and allowed to do so).

1 Locate and unscrew the 6 screws securing the upper cover.



1 **Upper cover**

2 Carefully tilt the upper cover as shown and pull upwards to remove it.



⚠ **CAUTION**

Pay attention of no falling off the upper cover.

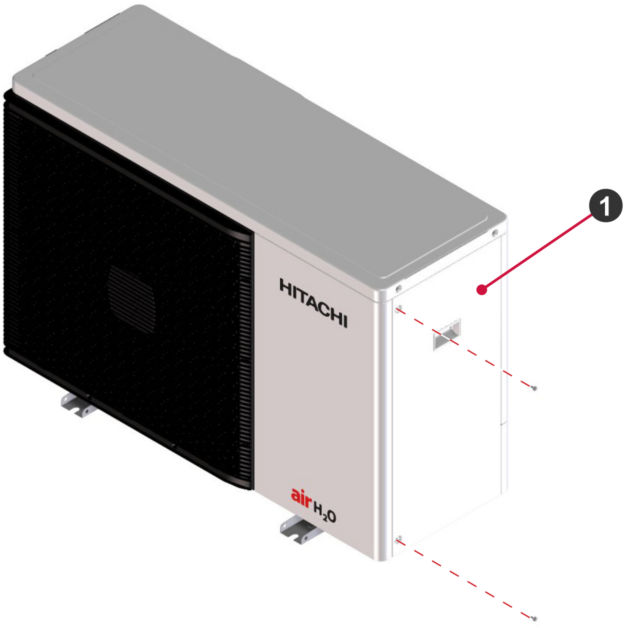
5.3.1.2 Removing the service cover

NOTE

Service cover needs to be removed for most of operations inside the outdoor unit.

To remove the service cover (1), follow these steps:

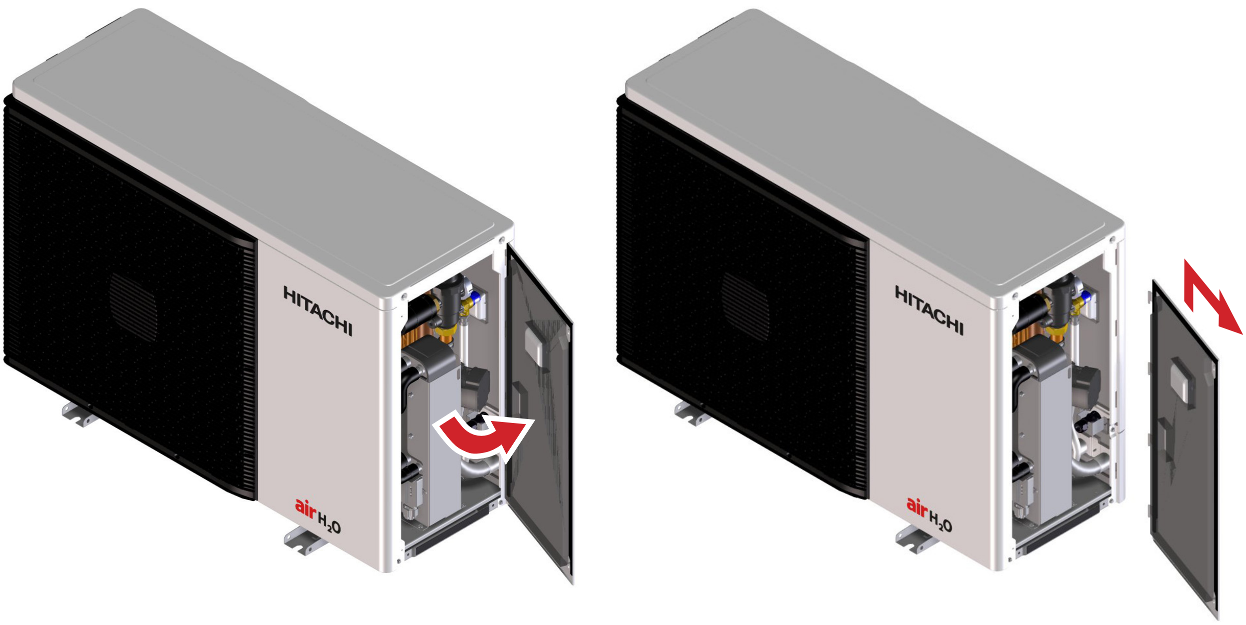
1 Unscrew the 2/3 screws securing the service cover.



1 **Service cover**

2 Rotate the cover to release it.

3 Pull the cover upwards and then backwards to fully remove it.

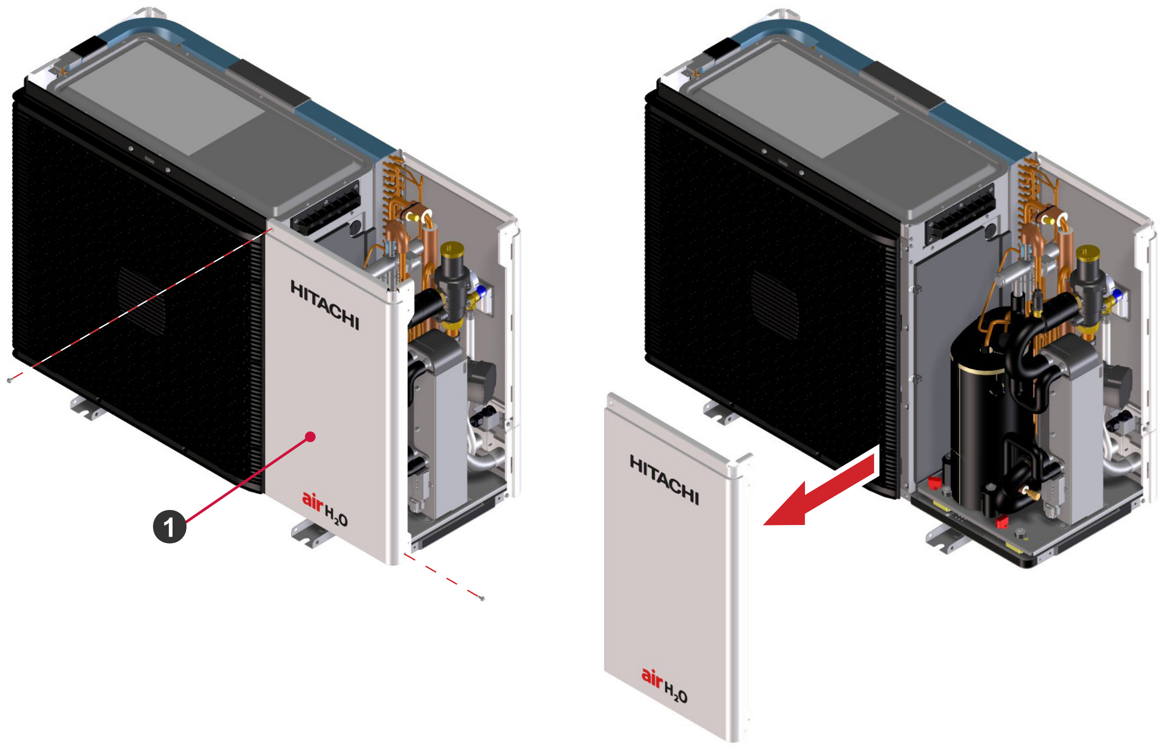


5.3.1.3 Removing the front cover

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Unscrew the 2 screws securing the front cover (1).
4 Pull the cover backwards to disengage it.

⚠ **CAUTION**

Pay attention to prevent the front cover from falling off during the removal process.



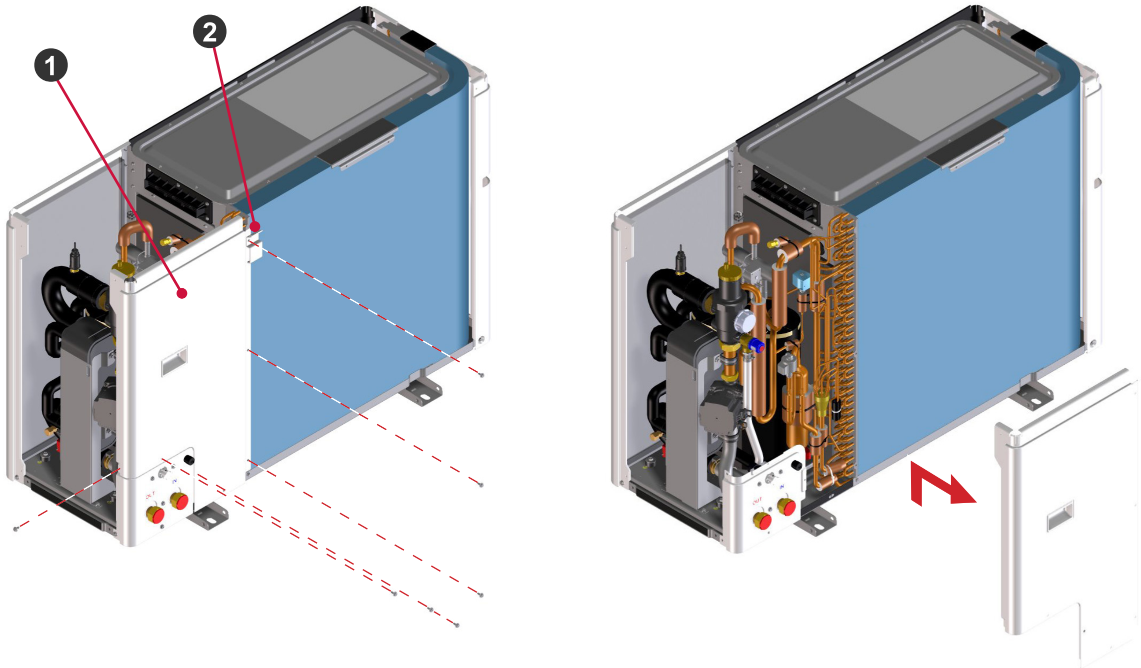
1 **Front cover**

5.3.1.4 Removing the rear cover

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Unscrew the 7 screws securing the rear cover (1): 1 screw at the right side and 6 screws at the rear side. Take into account that the uppermost screw is shared with the ambient temperature thermistor holder (2).
4 Slide the rear cover slightly upwards.
5 Pull the rear cover backwards to disengage it.

CAUTION

Pay attention to prevent the rear cover from falling off during the removal process.

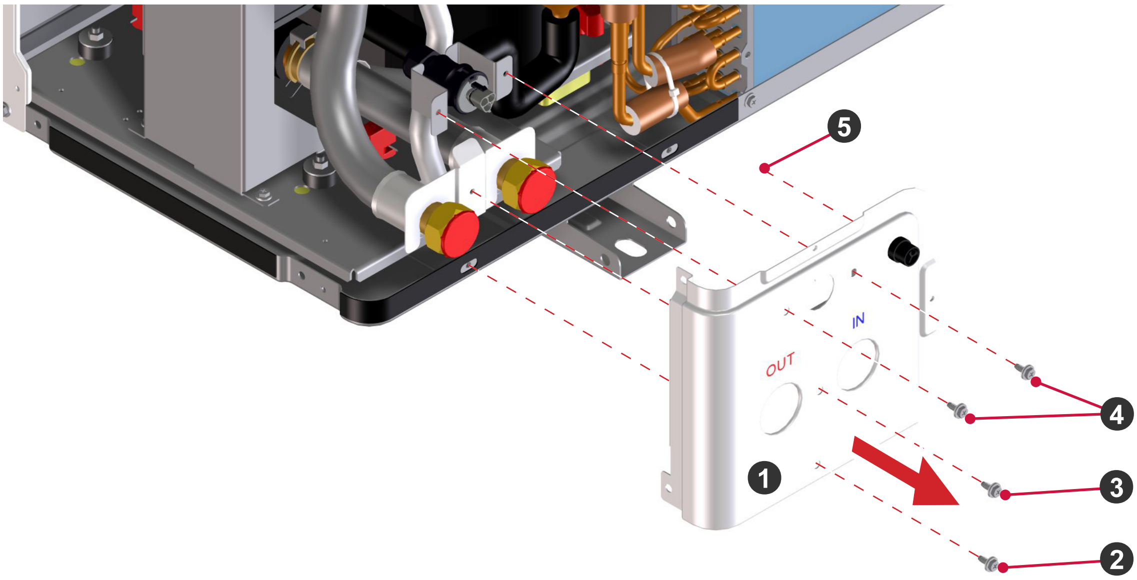


1 Rear cover

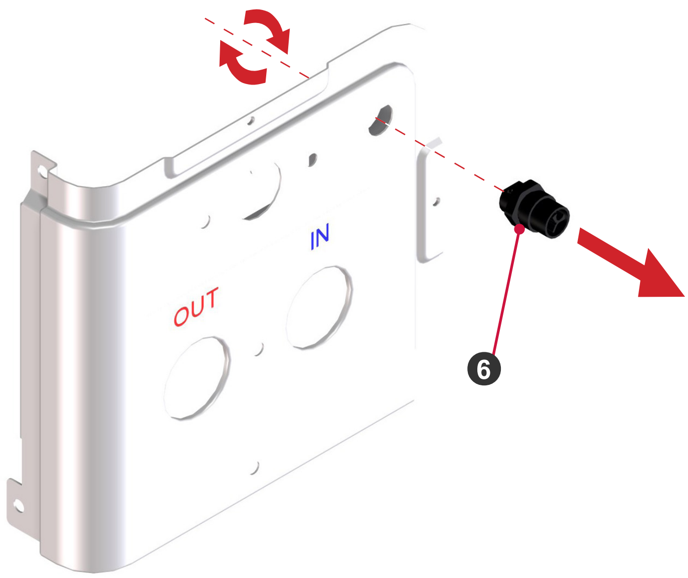
2 Ambient temperature thermistor holder

5.3.1.5 Removing the rear pipe cover

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
4 Locate and disconnect the H-LINK aerial connector (5, CN15).
5 Remove the 2 screws (4) fixing the power connector to the rear pipe cover (1).
6 Remove the screw (3) fixing the water piping to the rear pipe cover.
7 Remove the screw (2) fixing the rear pipe cover to the unit.
8 Pull the cover backwards and remove it:



9 Remove the H-LINK port (6) by detaching the nut behind the cover and sliding the cable through the hole:

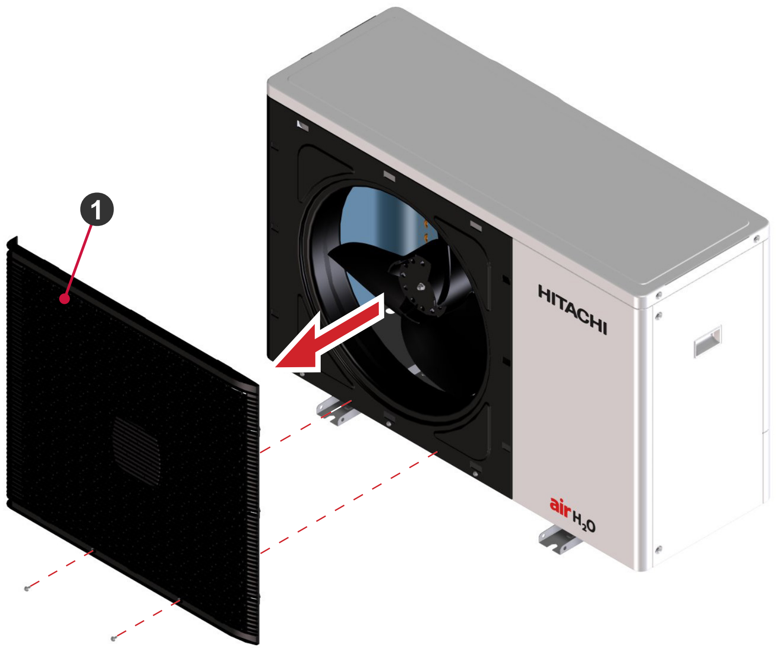


1 **Rear pipe cover**	3 **Piping fixing screw**
2 **Cover fixing screw**	4 **Power connector screws**
5 **H-LINK aerial connector**	6 **H-LINK port**

5.3.1.6 Removing the fan grille

1 Remove the 2 screws that fix the fan grille (1) to its support.

2 Pull backwards and detach it.



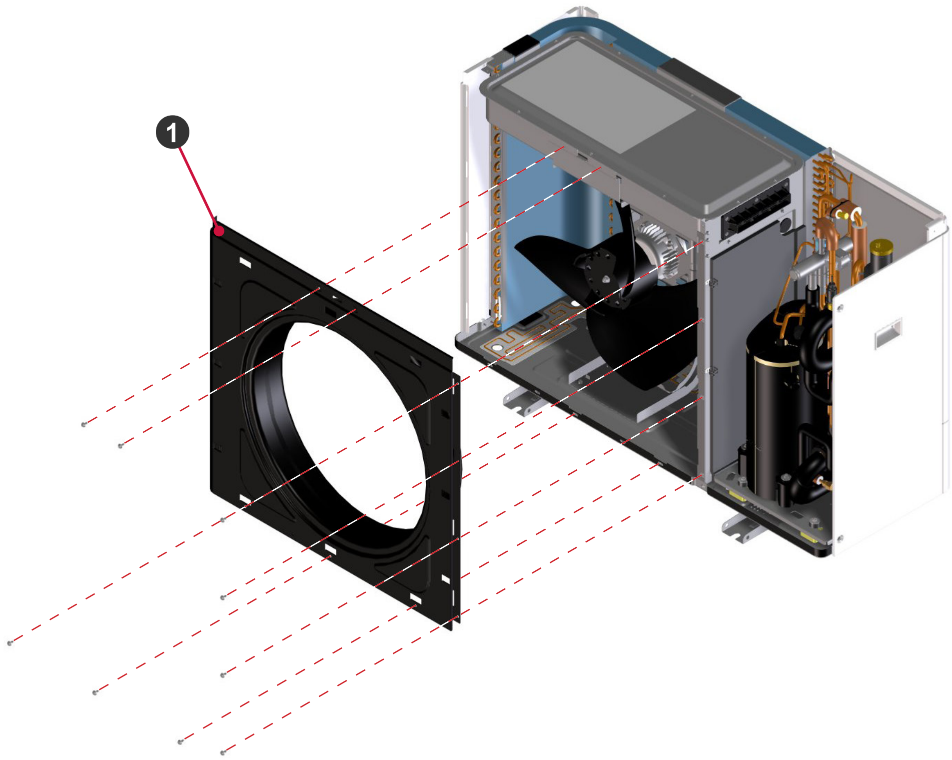
1 **Fan grille**

5.3.1.7 Removing the fan shroud

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
3 Remove the fan grille as explained in *"5.3.1.6 Removing the fan grille"*.
4 Remove the 9 screws that fix the fan shroud (1) to the frame.
5 Pull backwards and detach it:

⚠ CAUTION

Pay attention to prevent the fan shroud from falling off during the removal process.



1 **Fan shroud**

5.3.1.8 Removing the compressor insulation covers

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the sound insulation cap (1) on top of the compressor.
5 Open and remove the sound insulation cover (2) wrapped around the compressor:

1 Sound insulation cap

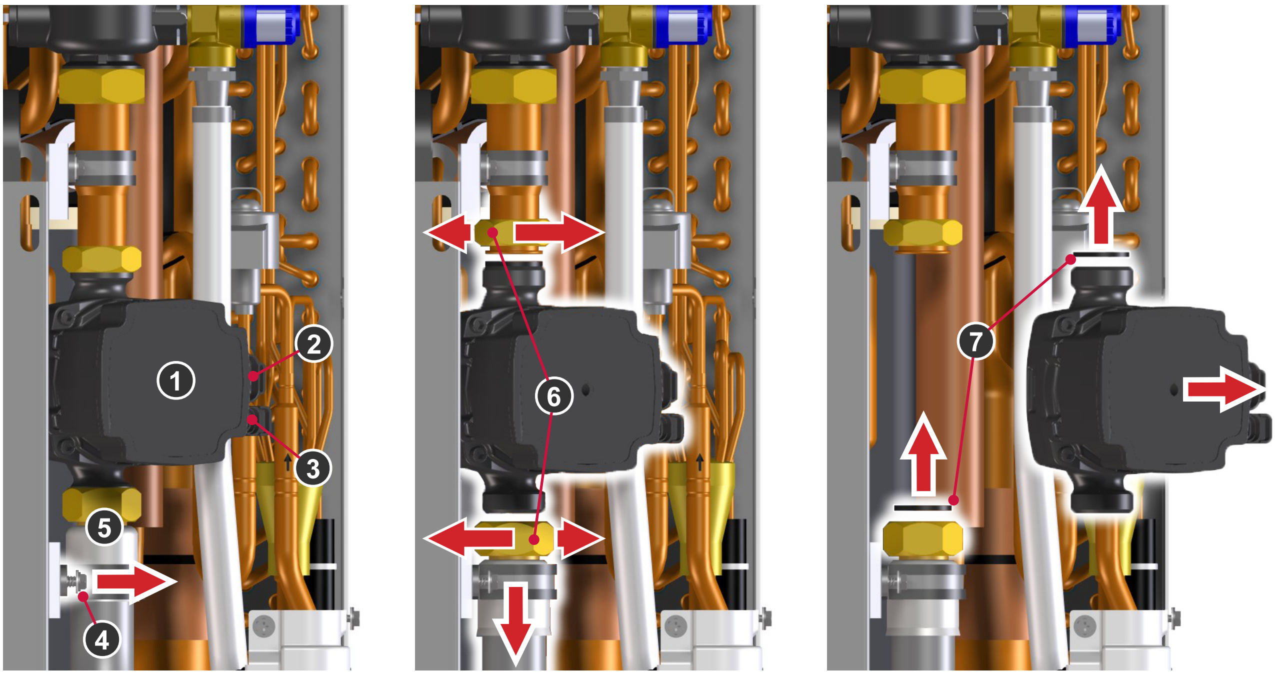
2 Sound insulation cover

5.3.1.9 Removing the water pump - WP1

1. Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2. Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3. Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
4. Drain the water circuit of the unit, as explained in *"Maintenance"* in section *"7.1.2.3 Draining operation"*.
5. Disconnect both the power (2) and the control (3) wiring connectors at the water pump (1, WP1).
6. Partially loosen the lower clamp screw (4) that holds the outlet flexible pipe (5), so it can slide inside the clamp but cannot fall.
7. Loosen the piping fixing nuts (6) and remove the water pump:

NOTE

- *To easier unfasten the lower nut, simultaneously slide the flexible pipe some millimetres downwards.*
- *Do not forget to collect the 2 rubber gaskets (7).*



1 **Water pump (WP1)**

2 **Power wiring connector**

3 **Control wiring connector**

4 **Lower clamp screw**

5 **Outlet flexible pipe**

6 **Piping fixing nuts**

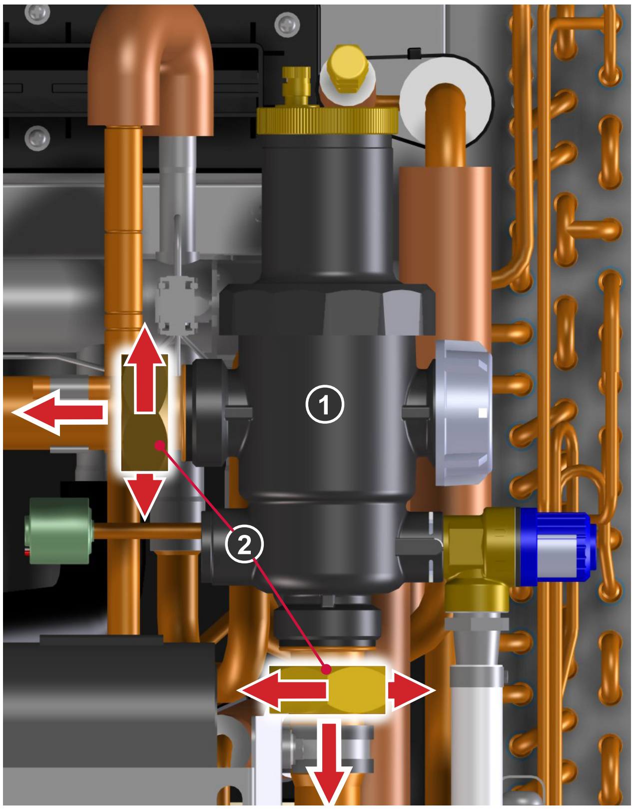
7 **Piping connection gaskets**

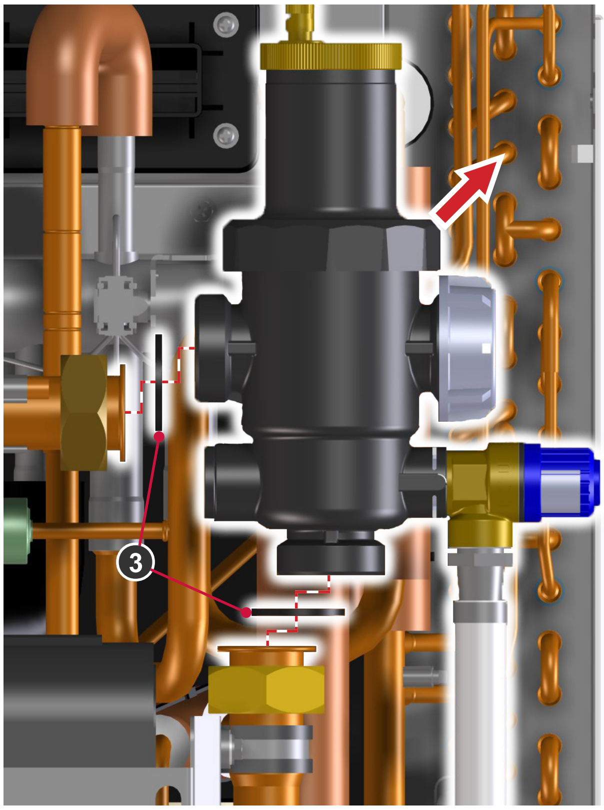
5.3.1.10 Removing the degasser

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
4 Drain the water circuit of the unit, as explained in *"Maintenance"* in section *"7.1.2.3 Draining operation"*.
5 Loosen the piping fixing nuts (2) and remove the degasser (1):

NOTE

Do not forget to collect the 2 rubber gaskets (3).





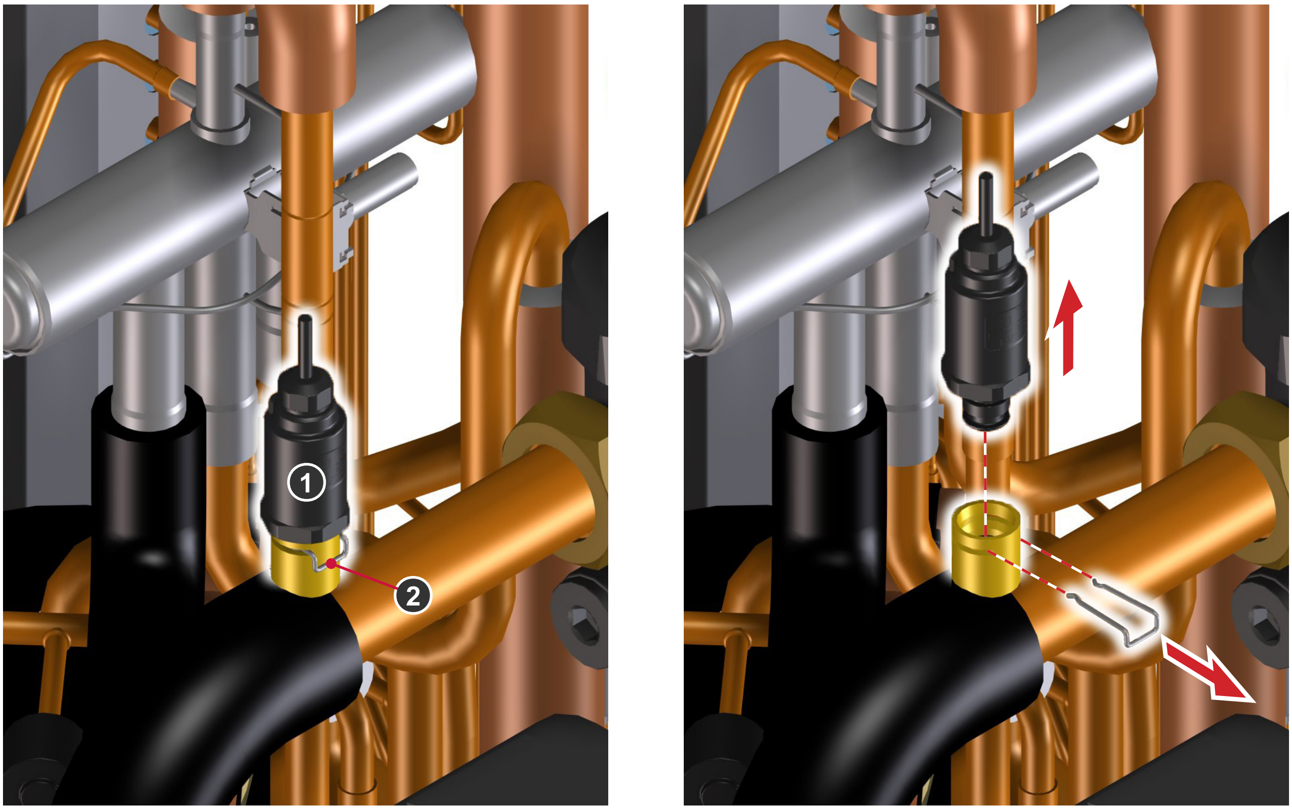
1 **Degasser**

2 **Piping fixing nuts**

3 **Piping connection gaskets**

5.3.1.11 Removing the pressure sensor (water side) - PSW

1 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
2 Drain the water circuit of the unit, as explained in *"Maintenance"* in section *"7.1.2.3 Draining operation"*.
3 Disconnect the CN37 aerial connector.
4 Remove the retaining clip (2) that holds the PSW (1) to the water piping.
5 Remove the PSW:



1 **Pressure sensor, water side (PSW)**

2 **PSW retaining clip**

5.3.2 Refrigerant cycle components

◆ Considerations

During the removal of the defective component, continuously supply dry nitrogen to the refrigerant circuit to avoid oxidation of the refrigerant piping and additional oxygen ingress. Ensure proper securing operation following the procedures stated at *"5.1.1 R290 safety instructions"*.

It is recommended to replace components using the cutting method by means of a pipe cutter tool. Where this procedure might not be feasible (e. g. pressure switch), use the brazing method following all the safety operation previously explained at *"5.1 Safety introduction"*.

Check the servicing procedure of the specific component for more details.

Cutting method

1 Open the required valves on the refrigerant hoses and manifold gauge.
2 Cut and remove the component pipe using a pipe cutter tool.
3 Wait a certain time to let any dissolved R290 vent through the opening holes (use an allowed leak detector to ensure there is no more refrigerant).
4 Supply dry nitrogen.
5 Start brazing new components following brazing standard procedures.
6 Stop the nitrogen supply once finished.
7 Proceed with vacuum operation and refrigerant introduction as explained in *"Charging procedures"*.

Brazing method

⚠ **CAUTION**

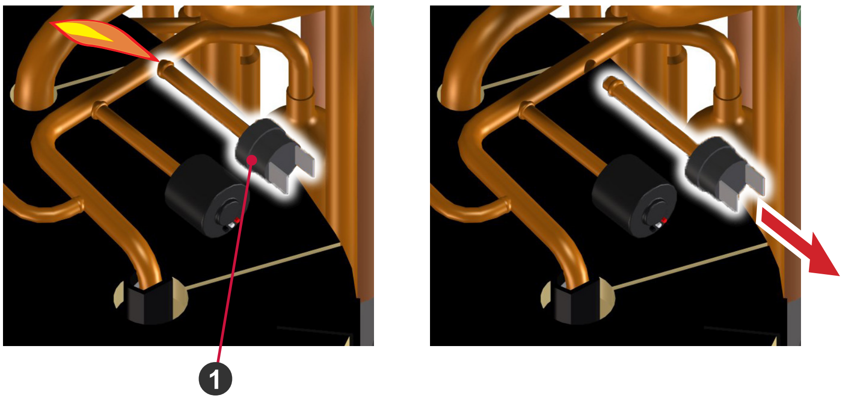
- *Refer to the table for the recommended amount of brazing material. If using more brazing material than the recommended amount, it may drop into the pipes.*
- *When brazing the pipes, prevent oxidized scale formation by nitrogen substitution.*

Thickness of brazing material	Piping diameter (refrigerant cycle side) (mm)						
	Ø 6.35	Ø 9.52	Ø 12.7	Ø 15.88	Ø 19.05	Ø 22.2	Ø 28.2
Ø 1.6 mm	25	30	35	75	100	110	225
Ø 2.0 mm	15	15	20	45	55	70	135
Ø 2.4 mm	10	10	15	30	35	45	90

1 Open the required valves on the refrigerant hoses and manifold gauge.
2 Supply dry nitrogen to the refrigerant circuit.
3 Wrap a wet rag around the surrounding components to avoid any damage due to excessive heat.
4 Heat the brazing point(s) using an oxygen acetylene torch and remove the component pipe(s) from the refrigerant pipe(s) using pliers.
5 Stop the nitrogen supply once finished.
6 Proceed with vacuum operation and refrigerant introduction as explained in *"Charging procedures"*.

5.3.2.1 Removing the pressure switch - PSH

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
5 Collect the refrigerant from the check joints according to the section *"Maintenance"* in section *"7.1.3 Evacuation and refrigerant charge procedure"*.
6 Disconnect the faston terminals at the PSH pressure switch (CN17 aerial connector).
7 Clear any piece of insulation that may get burned when performing unwelding procedures.
8 Remove the pressure switch (1) with a blow torch (see illustration):



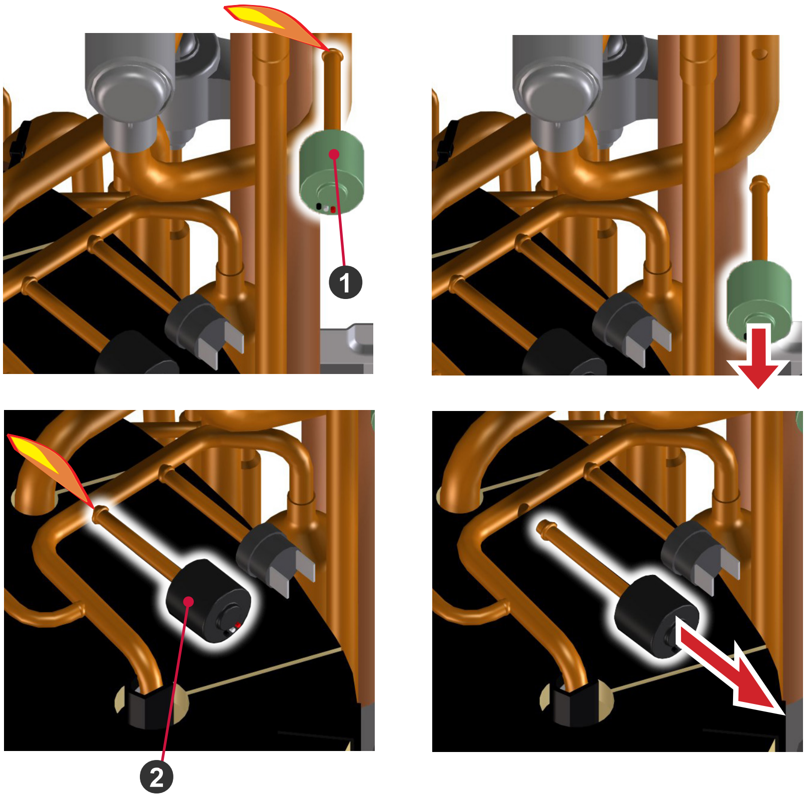
1 **PSH pressure switch**

DANGER

- *High pressures. Explosion risk.*
- *Do not change the high pressure switch locally or change the high pressure cut-out set value locally. If changed, it will cause serious injury or death due to explosion.*
- *Do not attempt to turn service valve rod beyond its stop.*

5.3.2.2 Removing the pressure sensors - Pd and Ps

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
5 Collect the refrigerant from the check joints according to the section *"Maintenance"* in section *"7.1.3 Evacuation and refrigerant charge procedure"*.
6 Disconnect the sensor aerial connector:
   - ✓ CN18 for Ps pressure sensor (1, suction side).
   - ✓ CN19 for Pd pressure sensor (2, discharge side).
7 Clear any piece of insulation that may get burned when performing unwelding procedures.
8 Remove the pressure sensor with a blow torch (see illustrations):



1 Ps pressure sensor

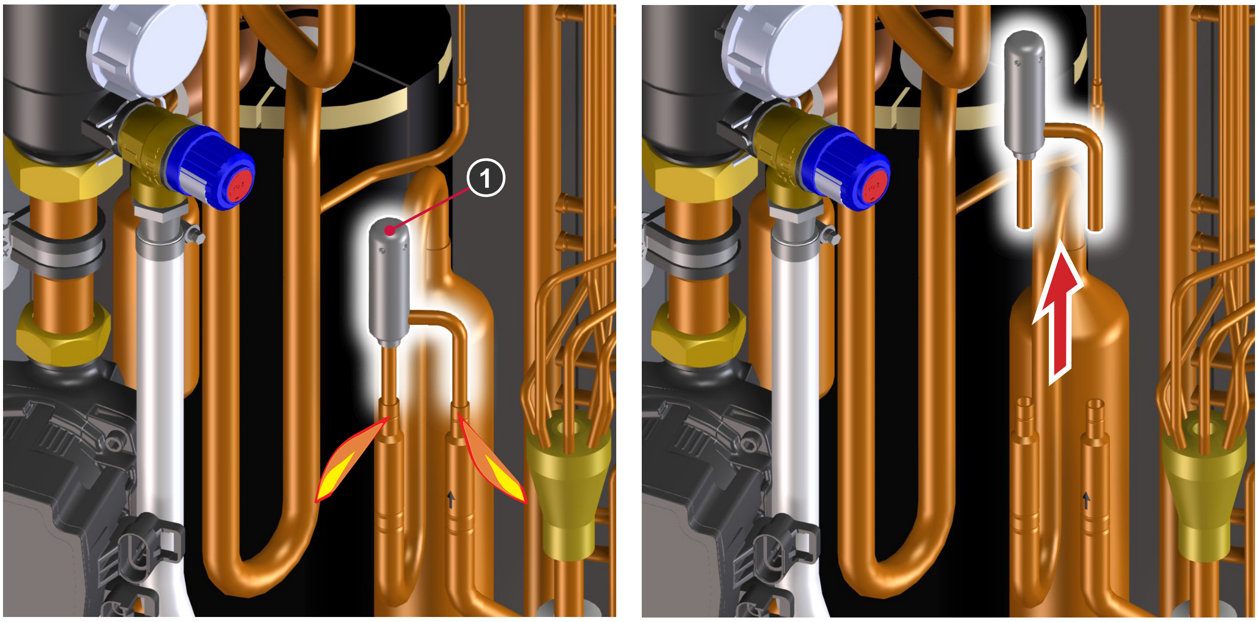
2 Pd pressure sensor

⚠ **DANGER**

- *High pressures. Explosion risk.*
- *Do not attempt to turn service valve rod beyond its stop.*

5.3.2.3 Removing the expansion valve

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
5 Collect the refrigerant from the check joints according to the section *"Maintenance"* in section *"7.1.3 Evacuation and refrigerant charge procedure"*.
6 Remove the expansion valve coil as explained in *"5.3.3.2 Removing the expansion valve coil"*.
7 Clear any piece of insulation that may get burned when performing unwelding procedures.
8 Protect the strainers with a wet cloth.
9 Heat the brazed connection between the expansion valve (1) and the piping with a brazing unit until the brazing is undone.
10 Remove the pipes from the expansion valve:

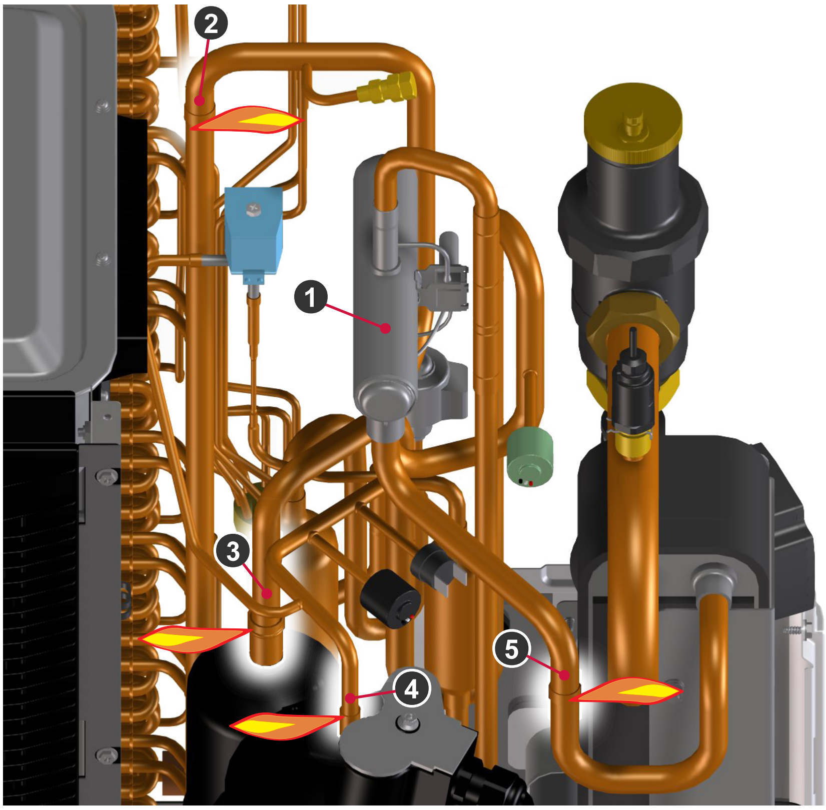


1 Epansion valve

11 Seal the pipes with a tape to protect the cycle assembly from dust.
12 Remove the expansion valve from the assembly and install the new one.
13 Protect the new expansion valve with a wet cloth.
14 Braze the connections between the expansion valve and the piping until the valve is properly installed.
15 Allow the brazing to cool down for a few minutes.
16 Remove all used protections and wet cloths.
17 Assemble the expansion valve coil as explained in *"5.3.3.2 Removing the expansion valve coil"*.
18 Charge new refrigerant as explained in *"7.1.3 Evacuation and refrigerant charge procedure"*.

5.3.2.4 Removing the 4-way valve

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
5 Collect the refrigerant from the check joints according to the section *"Maintenance"* in section *"7.1.3 Evacuation and refrigerant charge procedure"*.
6 Remove the 4-way valve coil as explained in *"5.3.3.3 Removing the 4-way valve coil"*.
7 Move all cables and remove the necessary components to leave the working area free.
8 Clear any piece of insulation that may get burned when performing unwelding procedures.
9 Protect the connecting wires and pipe insulation with a wet cloth.
10 Charge the stop valve for liquid with nitrogen and refill the reversing valve piping.
11 Heat the brazed connections (2, 3, 4, and 5) between the reversing valve (1) and the piping with a brazing unit until the brazing is undone:



1 **4-way valve (or 4WV, or reversing valve)**

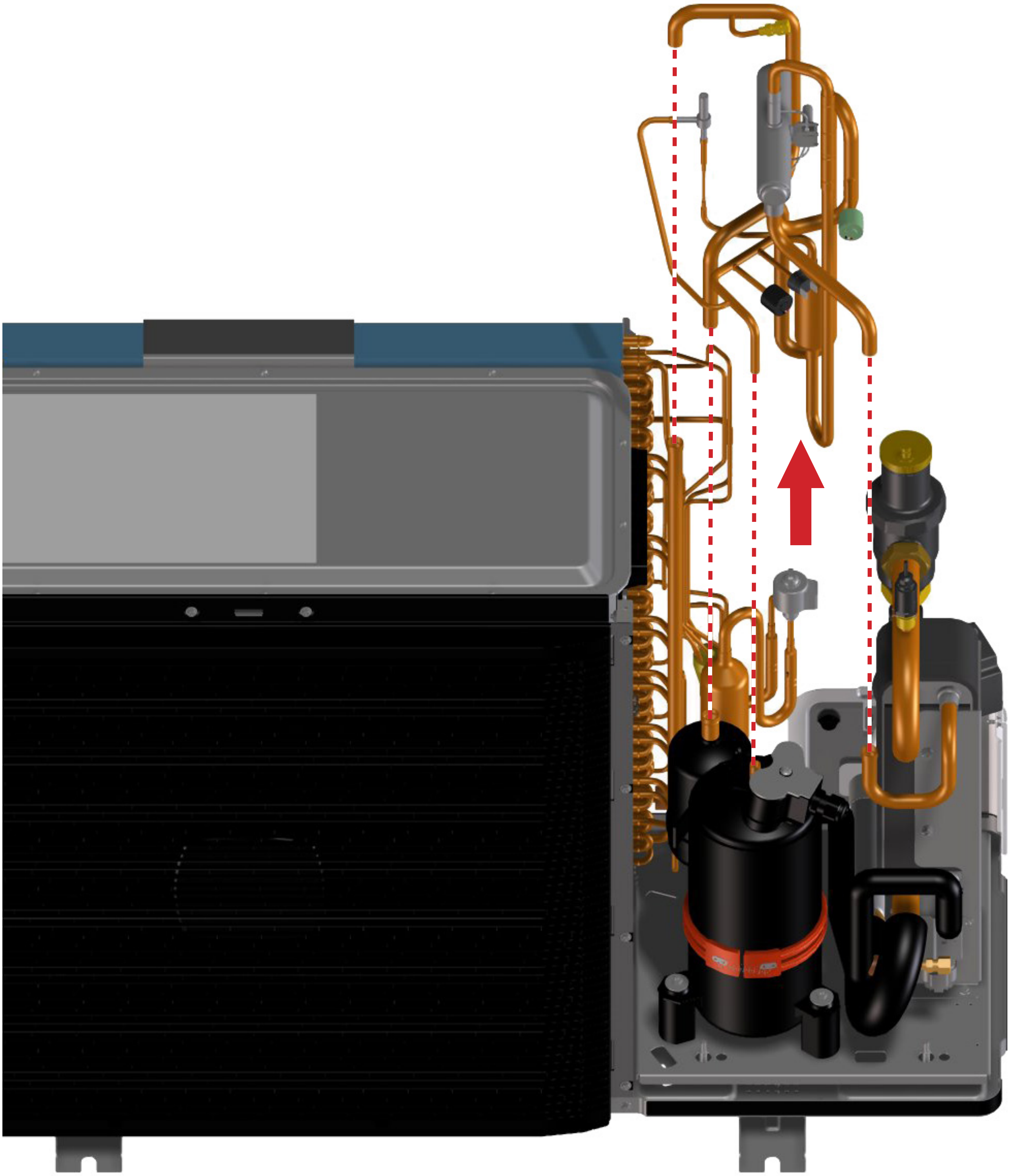
2 **Condenser piping connection**

3 **Compressor suction piping connection**

4 **Compressor discharge piping connection**

5 **PHEX piping connection**

12 Extract from the assembly the valve together with the still attached pipes:

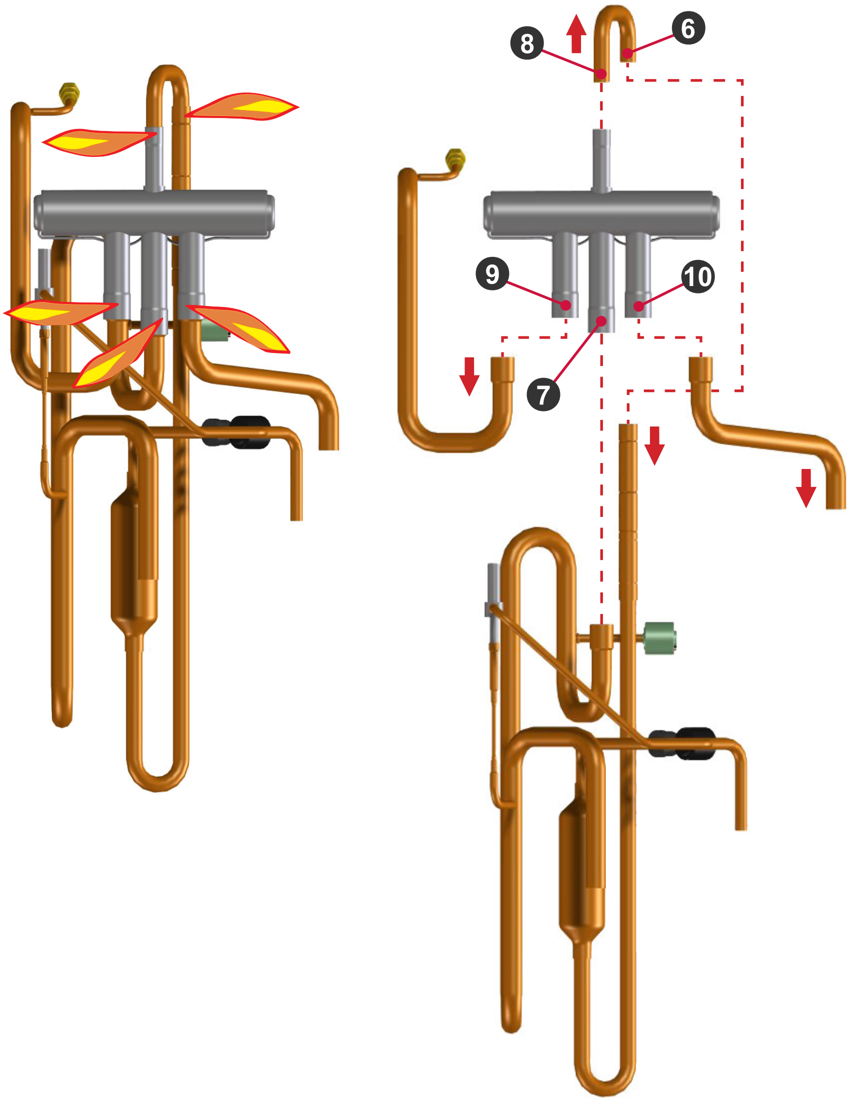


13 Seal the pipes with tape to protect the cycle assembly from dust.

14 Remove the remaining pipes from the reversing valve:

NOTE

Proceed with the unbrazing at 6 and 7 prior to 8.



6 **Discharge piping - C-pipe connection**

7 **Suction piping - 4WV connection**

8 **C-pipe - 4WV connection**

9 **Condenser - 4WV connection**

10 **PHEX - 4WV connection**

15 Seal the pipes with tape to protect them and the reversing valve from dust.

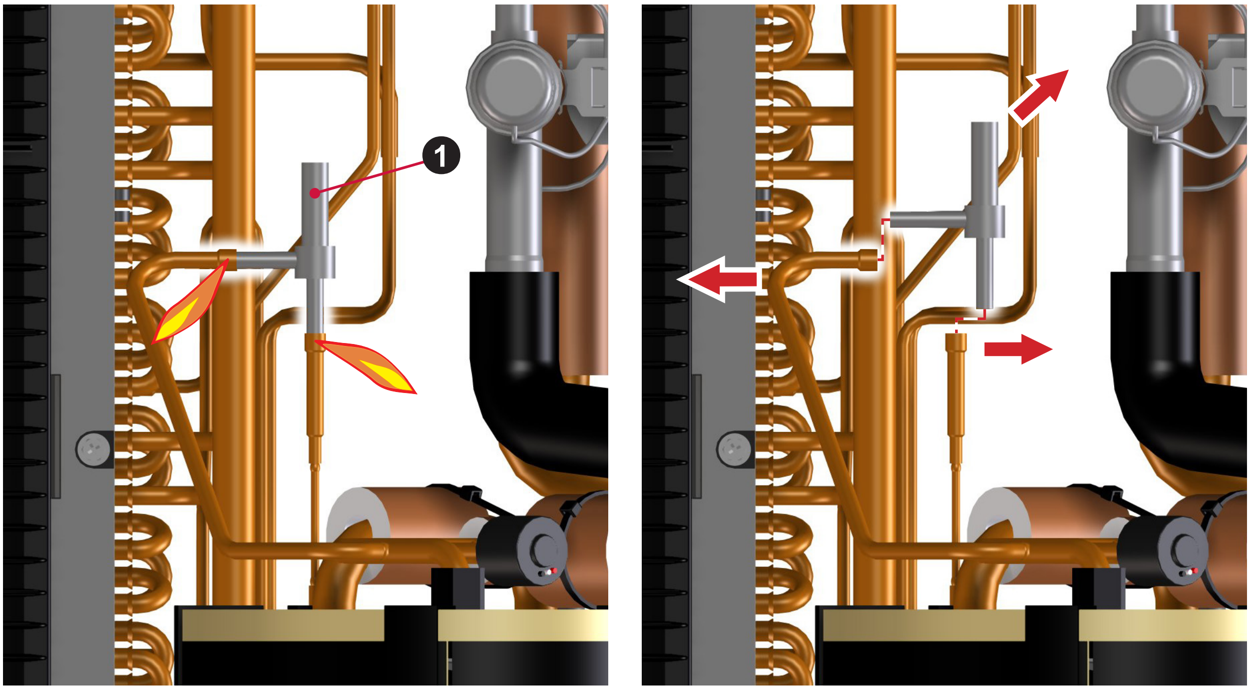
16 Replace the 4WV with a new one proceeding in reverse way than disassembling.

5.3.2.5 Removing the solenoid valve - SVA

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
5 Collect the refrigerant from the check joints according to the section *"Maintenance"* in section *"7.1.3 Evacuation and refrigerant charge procedure"*.
6 Remove the solenoid valve coil (SVA) as explained in *"5.3.3.4 Removing the solenoid valve coil - SVA"*.
7 Move all cables and remove the necessary components to leave the working area free.
8 Clear any piece of insulation that may get burned when performing unwelding procedures.
9 Protect the connecting wires, pipe insulation and strainers with a wet cloth.
10 Heat the brazed connection between the solenoid valve (1) and the piping with a brazing unit until the brazing is undone.
11 Remove the pipes from the solenoid valve:

⚠ **CAUTION**

The pipes will need to be slightly moved away in order for the valve to be removed. Avoid forcing and deforming them while doing so.

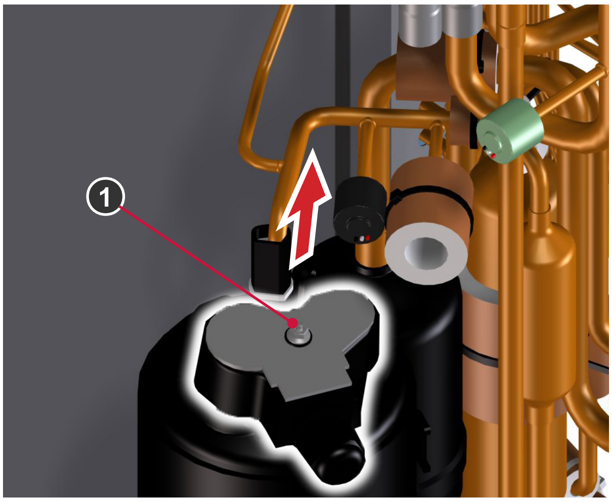


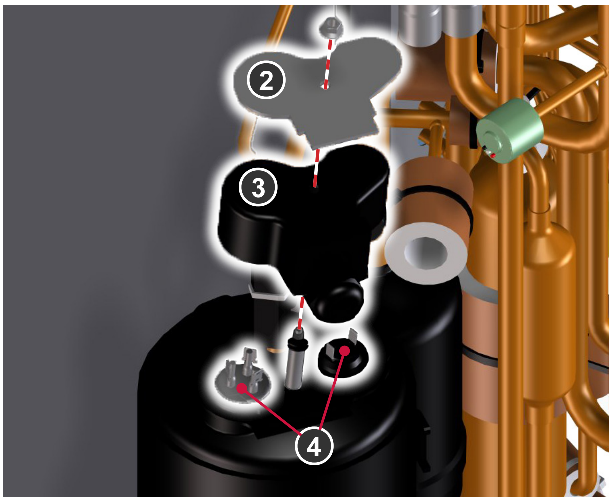
12 Seal the pipes with tape to protect the solenoid valve and the cycle assembly from dust.
13 Remove the solenoid valve from the assembly and install the new one.

1 **Solenoid valve (SVA)**

5.3.2.6 Removing the compressor

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
5 Remove the compression insulation covers as explained in *"5.3.1.8 Removing the compressor insulation covers"*.
6 Remove the crankcase heater as explained in *"5.3.3.5 Removing the crankcase heater"*.
7 Collect the refrigerant from the check joints according to the section *"Maintenance"* in section *"7.1.3 Evacuation and refrigerant charge procedure"*.
8 Remove the terminal box plate (2) and cover (3), fixed to the compressor body with a single nut (1).
9 Identify and disconnect the compressor wires (4) within the terminal box:





NOTE

Check and take note of each terminal number and indications for its correct connection at the reassembling process. If wires are connected in incorrect order, it will lead to a compressor failure.

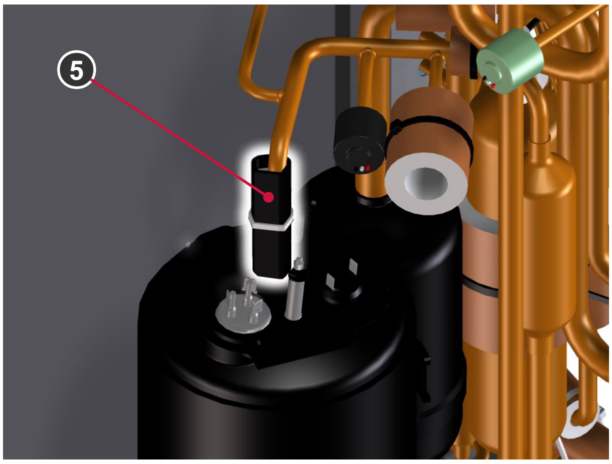
1 **Terminal box cover nut**

2 **Terminal box plate**

3 **Terminal box cover**

4 **Compressor wires connections**

10 Remove the rubber cap and the thermistor (5) on the compressor discharge pipe:



5 Rubber cap and discharge thermistor (Td)

NOTE

- *Compressor piping must be connected by brazing. Ensure no flammable materials are around before heating with a burner, as the oil inside the piping may flame up.*
- *Avoid exposing the refrigerant cycle to the atmosphere for an extended period to prevent water and foreign particles from entering the refrigerant cycle. After removing the compressor, replace it quickly. If exposed to the ambiance for a long period, seal both suction and discharge pipes.*
- *Remove the cap for the compressor just before replacing it. Before assembling the compressor, seal the suction pipe and discharge pipe with tape to protect the compressor interior from foreign particles. Remove the tape when connecting the pipes.*
- *When reassembling, match the terminal number with the mark band number. If the wiring is connected incorrectly, the compressor may be damaged due to reverse rotation.*
- *If there is a clearance between the oil heater and the compressor due to wire overlapping, excessive heat is generated. The oil heater may fail due to overheating. Take this into account when mounting the reassembled oil heater.*
- *If the oil heater lead wire is caught on the spring, the lead wire may be cut due to vibration. Pay attention to the lead wire during reassembly.*

⚠ CAUTION

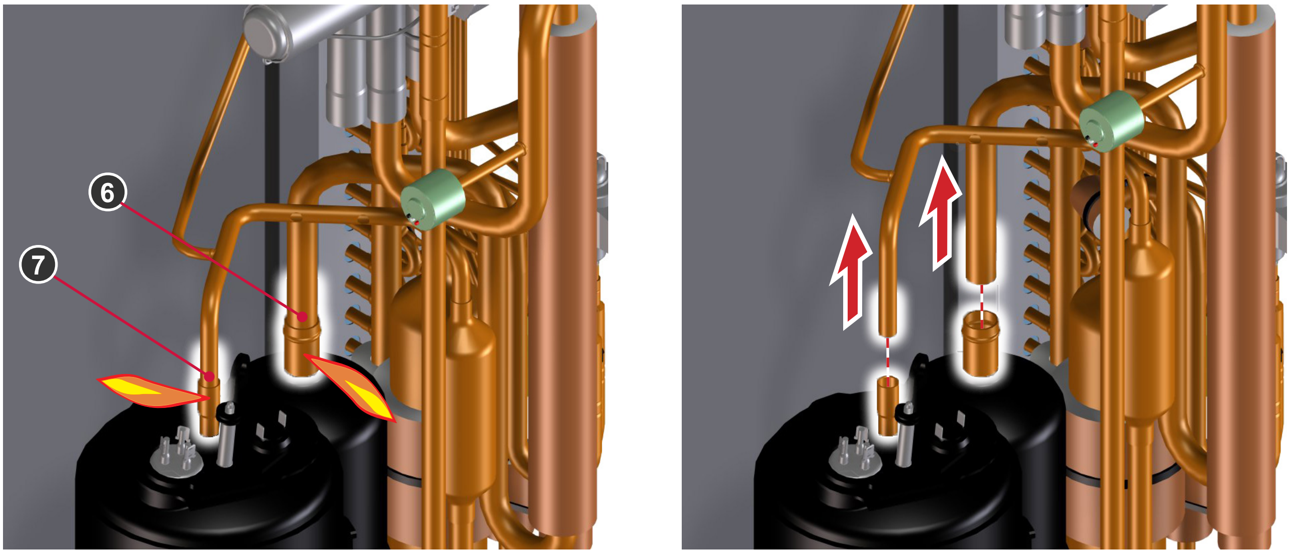
Flammable objects. Fire risk. All compressor pipes must be brazed to be connected to the refrigerant circuit. Ensure that all the surrounding is free of flammable objects and liquids when performing piping brazing work.

11 Heat the brazed connections between the compressor and the pipes with a brazing unit until the brazing is undone.

⚠ CAUTION

- *Remove suction and discharge pipes from the compressor. Isolate wires and electrical components during brazing to protect them from the burner flame.*
- *File away remaining brazing material on the end of refrigerant pipes.*
- *Be cautious to avoid filed brazing material entering the pipes.*

12 Remove the suction pipe (6) and discharge pipe (7) from the compressor:



6 Suction pipe **7 Discharge pipe**

13 Seal the suction pipes with tape to protect the compressor from dust.

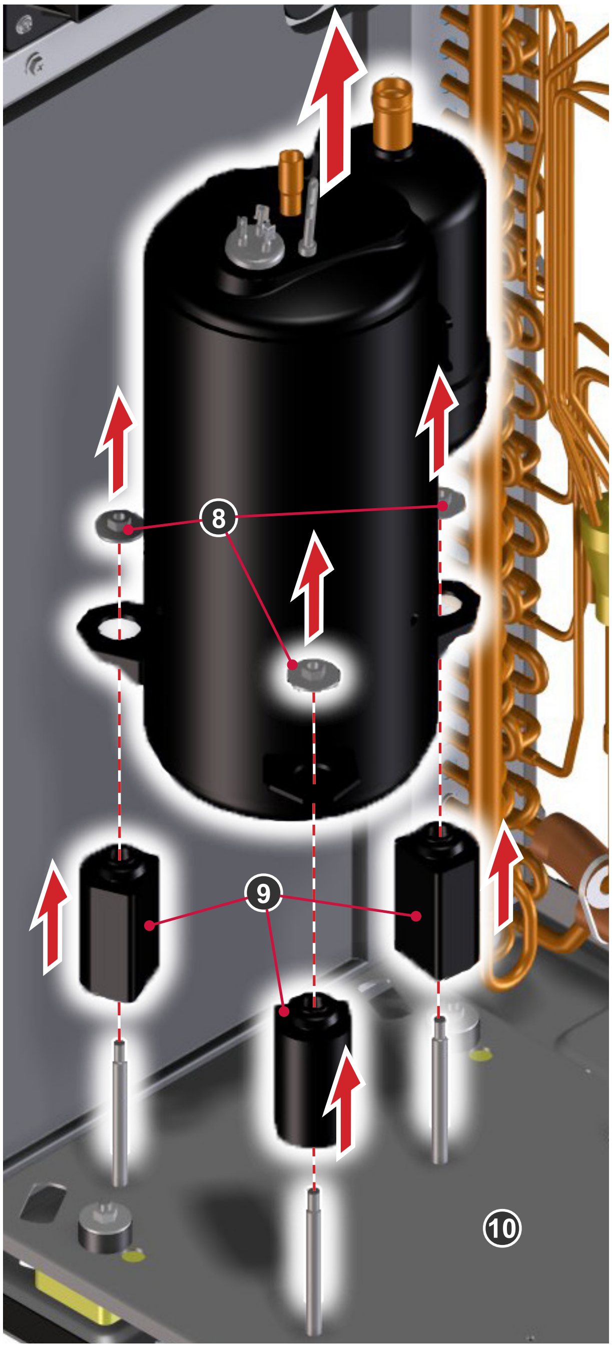
14 Use an oil drain pan or similar to collect any remaining refrigerant oil spills.

NOTE

Avoid discarding the oil collected with the oil drain pan and similar containers. Measure the oil quantity after collection for accurate assessment and recording.

15 Seal the pipe end of the discharge pipe with tapes to avoid spilling out the refrigerant oil remaining inside the compressor.

16 Remove the 3 special nuts (8) which fix the compressor and the vibration-proof rubbers (9) to the compressor support assembly (10).



8 Special nuts

9 Vibration-proof rubbers

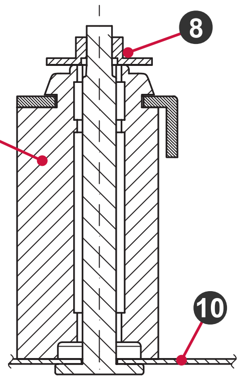
10 Compressor support assembly

⚠ **CAUTION**

- *When removing the compressor, take special care not to touch with the surrounding pipes. If contacted, the pipes may be deformed.*
- *The compressor is a heavy component, two personnel are recommended to handle it.*

17 Remove the compressor by lifting it up with a forward incline.

18 Remove the old vibration-proof rubbers.



19 Install the new vibration-proof rubbers.

⚠ **CAUTION**

- *Compressor piping must be connected by brazing. Ensure no flammable materials are around before heating with a burner, as the oil inside the piping may flame up.*
- *The replacement of the compressor should be done immediately after removing. Seal the suction and discharge pipes when the refrigerant cycle is left unattached for a long period.*
- *For piping during reassembly, ensure that the compressor terminal numbers and wiring mark band codes match.*
- *When mounting the new compressor on the base, take special care not to contact the piping. If contacted, piping may deform.*

20 Place the new compressor in its place.

21 Protect the compressor side piping with a wet cloth.

NOTE

A wet cloth will cool the compressor side piping in order to avoid the brazing material from entering the compressor.

22 Remove the tapes of new compressor right before brazing and face the piping with the compressor.

23 Insert the pipes fully in to prevent brazing material from entering them.

24 Charge the check joints with nitrogen and refill the compressor piping.

NOTE

- *Be sure to separate the blazing burner flame sufficiently from the wires and electrical components around the brazed part in order to avoid burning.*

- *PAY CLOSE ATTENTION not to let the filler metal enter into the compressor which may result in compressor damage.*
- *Refer to the table indicated in "Brazing method" for the recommended amount of brazing material . If using more brazing than the recommended amount, it may drop into the pipes.*

25 Braze the connection between the compressor and the pipes with a brazing unit, according to the following order.

  a. Discharge pipe

  b. Suction pipe

26 Install the vibration-proof rubber and tighten the 3 nuts for fixing the compressor.

  ✓ Tightening torque: 6 N·m

27 Assemble the wires and tighten the screws U, V and W for compressor wires.

  ✓ Tightening torque: 2.5 N·m

28 Assemble the terminal box and tighten the closing nut.

  ✓ Tightening torque: 4 N·m

29 Assemble the crankcase heater without torsion and gap to the compressor.

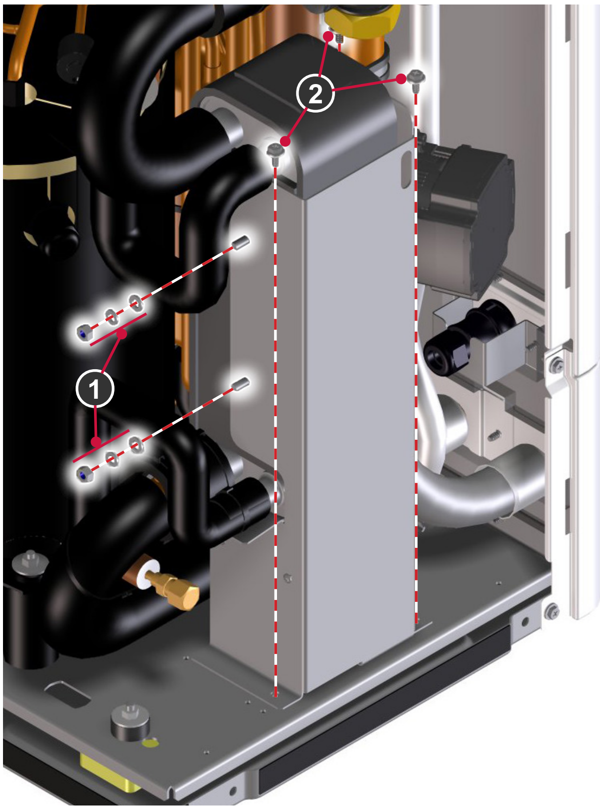
30 Carefully wrap the sound insulation cover around the assembled components.

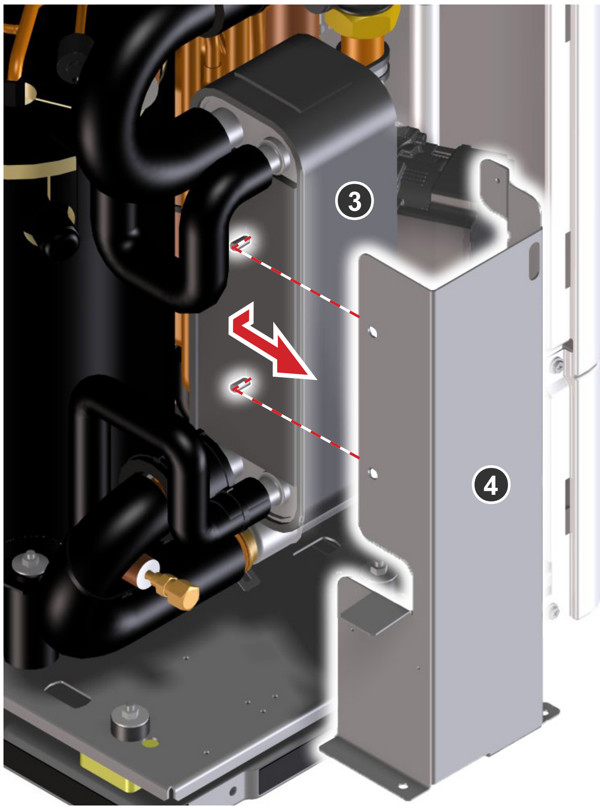
31 Place the sound insulation cap on top of the assembled components.

32 To conclude the process of changing the compressor, it is necessary to assemble all components in the reverse order of disassembly.

5.3.2.7 Removing the plate heat exchanger - PHEX

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
5 Collect the refrigerant from the check joints according to the section *"Maintenance"* in section *"7.1.3 Evacuation and refrigerant charge procedure"*.
6 Drain the water circuit of the unit, as explained in *"Maintenance"* in section *"7.1.2.3 Draining operation"*.
7 Remove the 2 nuts and 4 washers (1) that attach the PHEX (3) to its support (4).
8 Remove the PHEX support, moving it first towards the piping, thus extracting it from the PHEX studs.
9 Remove the 3 screws (2) that attach the support to the base plate:





1 PHEX - support nuts and washers

2 Support - base plate screws

3 Plate heat exchanger (PHEX)

4 PHEX support

10 Place some solid and stable temporary support (5) under the PHEX during the following unwelding procedure, so the piping is not forced and therefore bent in any way.

11 Disconnect the water heater (WH) aerial connector (CN34).

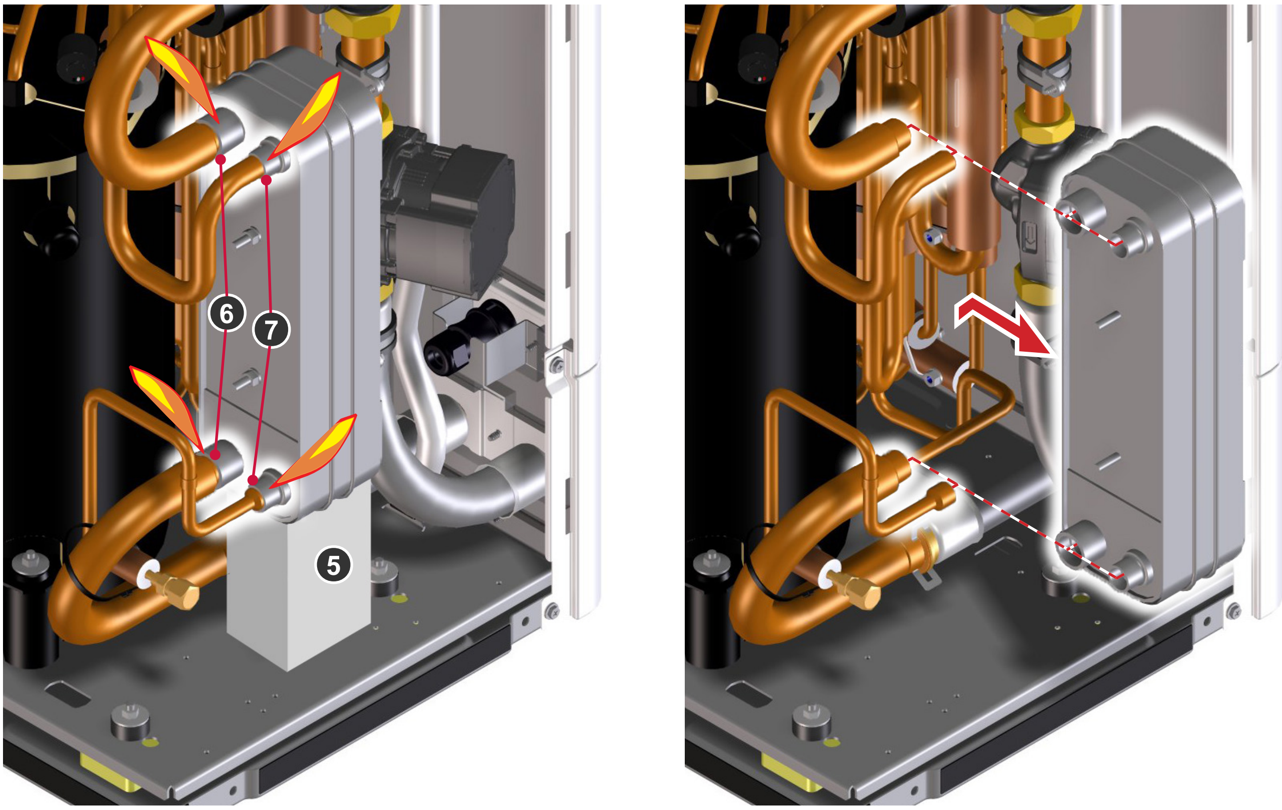
12 Move all cables and remove the necessary components to leave the working area free.

13 Clear any piece of insulation that may get burned when performing unwelding procedures.

14 Protect the connecting wires, pipe insulation and strainers with a wet cloth.

15 Heat the brazed connection between both the water (6) and the refrigerant (7) piping and the PHEX with a brazing unit until the brazing is undone.

16 Remove the PHEX from the piping:



5 **PHEX temporary support**

6 **Water piping connections**

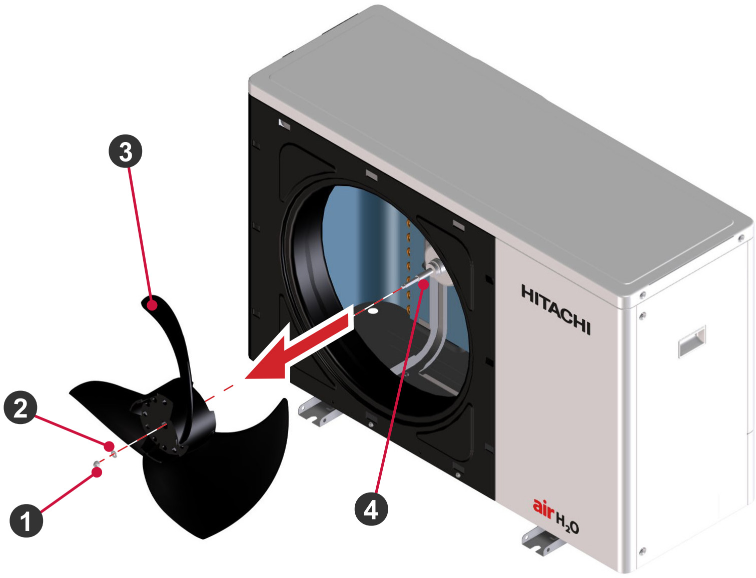
7 **Refrigerant piping connections**

5.3.3 Electrical components

5.3.3.1 Removing the fan propeller and motor

RASM-(2-3.5)VTW2E

1 Detach the fan grille following the instructions in *"5.3.1.6 Removing the fan grille"*.
2 Remove the cap nut (1) and washer (2) that secure the fan propeller (3) to the fan shaft (4).
3 Pull the fan propeller backwards to remove it.



1 **Cap nut**

2 **Washer**

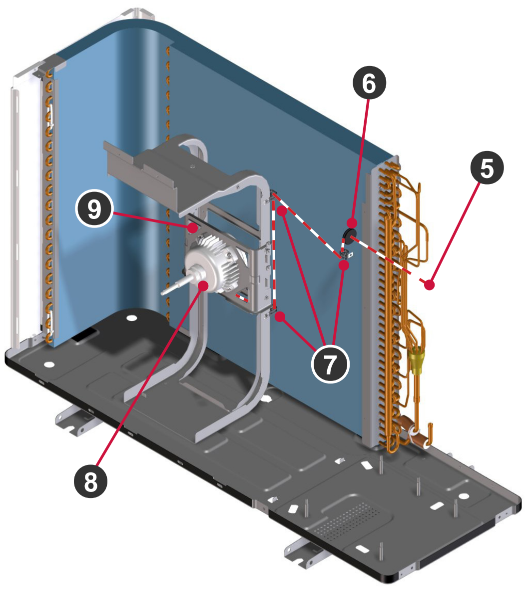
3 **Fan propeller**

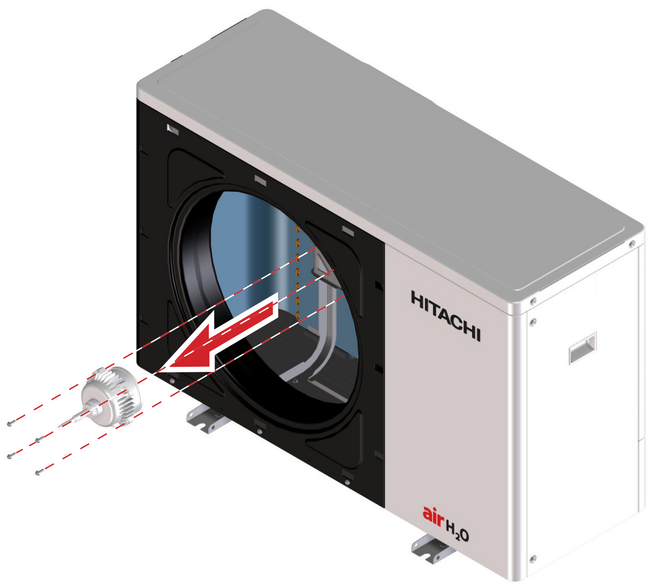
4 **Fan shaft**

4 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
5 Locate and disconnect the CN40 and CN41 aerial connectors (5).
6 Pass them through the grommet (6) on the partition wall (hidden in the picture for illustrative purposes).
7 Unfasten the wiring from the clamps (7) securing it in place.
8 Unscrew the 4 screws fixing the fan motor (8) to its support (9).
9 Finally, remove the fan motor.

CAUTION

- *Pay attention to prevent the fan motor from falling off during the removal process. For this reason, it is recommended to first remove the 2 lower screws.*
- *When reassembling, take into account that the motor should be positioned with the specs sticker pointing upwards while the wires should point downwards.*





5 **CN40 and CN41 aerial connectors**

6 **Grommet**

7 **Wiring clamps**

8 **Fan motor**

9 **Fan motor support**

RASM-(4-6)(V)TW2E

1 Detach the fan grille following the instructions in *"5.3.1.6 Removing the fan grille"*.
2 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
3 Locate and disconnect the CN40 and CN41 aerial connectors (1).
4 Pass them through the grommet (2) on the partition wall (hidden in the picture for illustrative purposes).
5 Unfasten the wiring from the clamps (3) securing it in place.

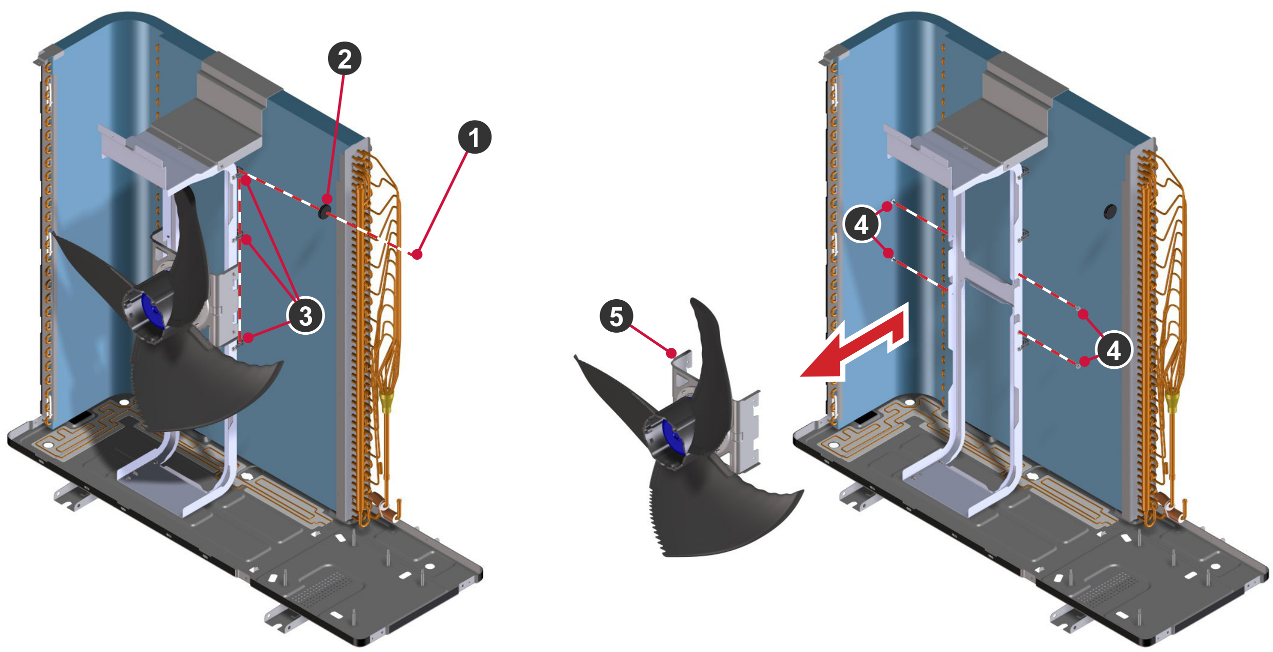
NOTE

Unlike in the case of the smaller units, in the bigger ones both the fan and its motor are removed together as an assembly from its location inside the unit.

CAUTION

Pay attention to prevent the fan-motor assembly from falling off during the removal process.

6 Unscrew the 4 screws (4) fixing the fan-motor assembly support (5) to the unit structure.
7 Lift it a bit before removing it backwards:



1 CN40 and CN41 aerial connectors

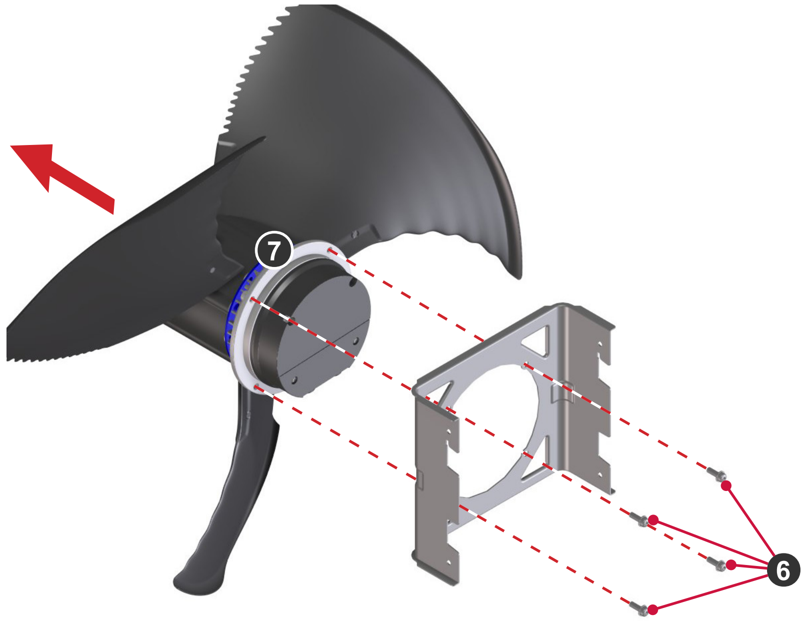
2 Grommet

3 Wiring clamps

4 Fan-motor assembly support screws

5 Fan-motor assembly support

8 Unscrew the 4 screws (6) fixing the fan-motor assembly (7) to its support and separate them.



6 **Fan-motor assembly screws**

7 **Fan-motor assembly**

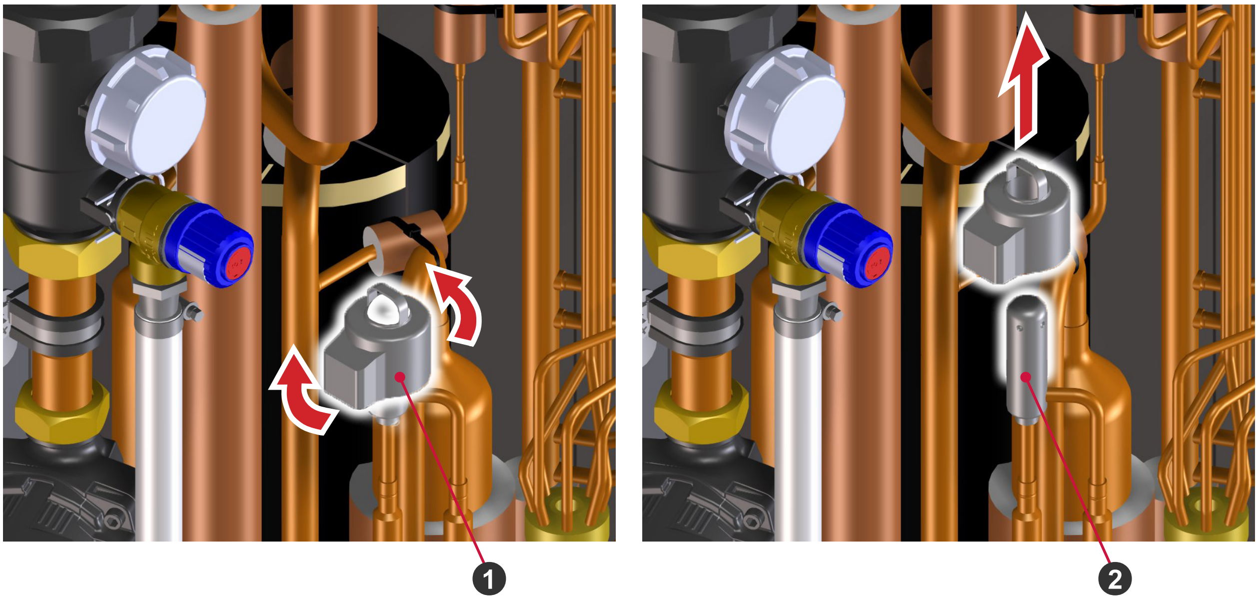
5.3.3.2 Removing the expansion valve coil

1 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
2 Disconnect the CN32 aerial connector.
3 Cut the necessary plastic ties to remove the expansion valve coil wire.

NOTE

- *Rotating the expansion valve coil while pulling it upward facilitates disassembly.*
- *As the available space is limited, it may be advisable to remove the upper cover too, as explained in "5.3.1.1 Removing the upper cover".*

4 Disassemble the expansion valve coil (1) with his wire:



1 Epansion valve coil

2 Expansion valve

5 Assemble the new expansion valve coil by inserting the expansion valve (2) inside.

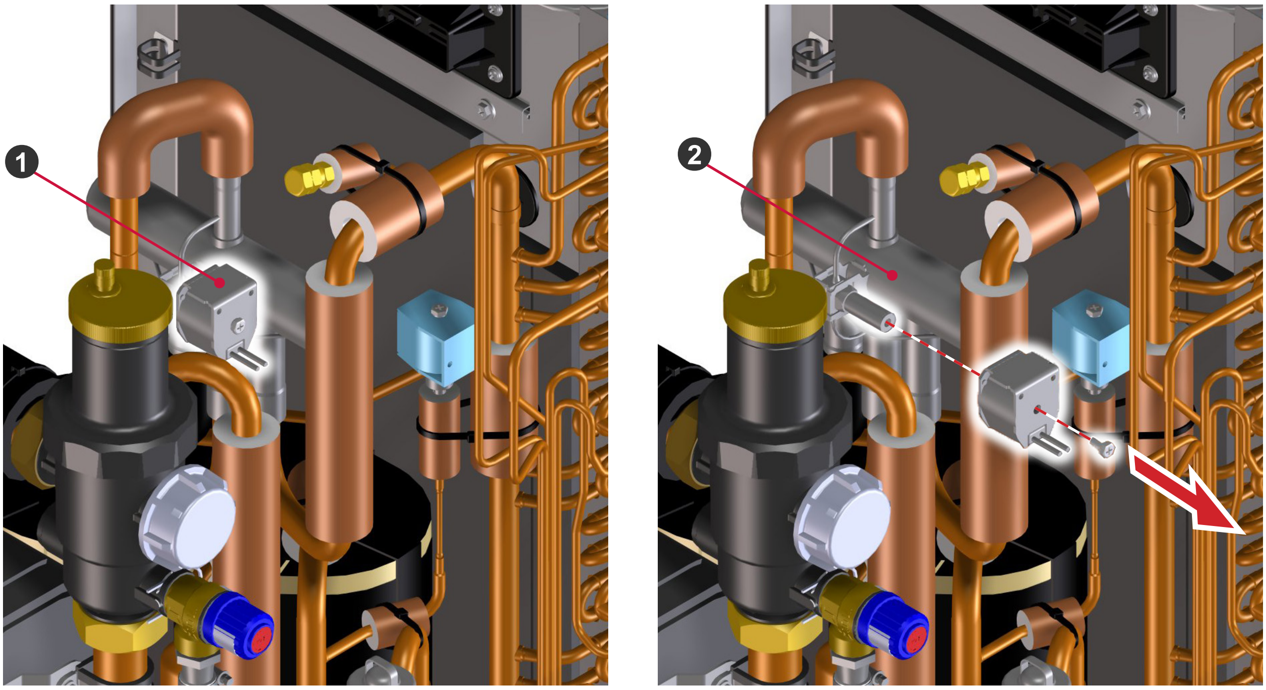
NOTE

- *The expansion valve coil is equipped with a lock mechanism.*
- *Avoid applying excessive force when pressing the coil into the slot to prevent damage to the piping or deformation of the coil bracket, ensuring proper fixation.*

6 Rotate the expansion valve coil until the sound of locking is heard.
7 Connect the CN32 aerial connector.
8 Fix the expansion valve coil wire with plastic ties as it was originally.

5.3.3.3 Removing the 4-way valve coil

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
4 Disconnect the CN30 aerial connector.
5 Cut the necessary plastic ties to remove the 4-way valve coil wire.
6 Remove the screw that fixes the coil (1) to the 4-way valve (2).
7 Disassemble the valve coil with his wire and install the new one.

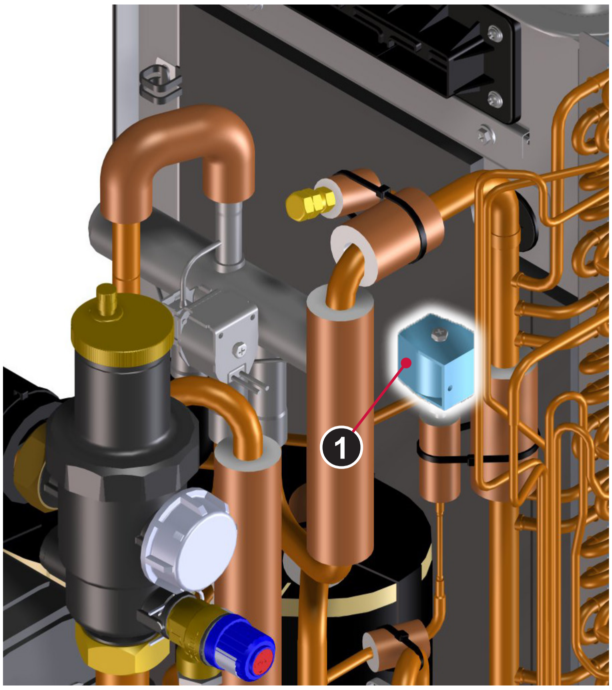


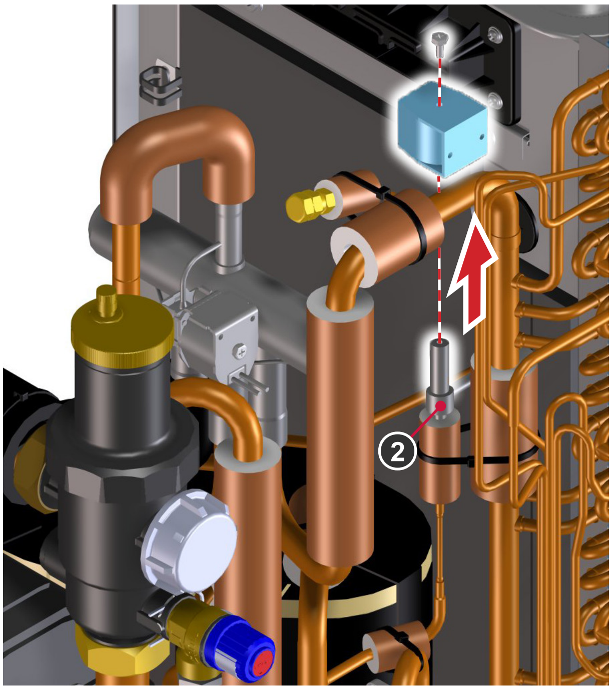
1 4-way valve coil

2 4-way valve (or 4WV, or reversing valve)

5.3.3.4 Removing the solenoid valve coil - SVA

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Disconnect the CN29 aerial connector.
3 Cut the necessary plastic ties to remove the solenoid valve coil wire.
4 Remove the screw that fixes the coil (1) to the solenoid valve (2).
5 Disassemble the valve coil with his wire and install the new one.



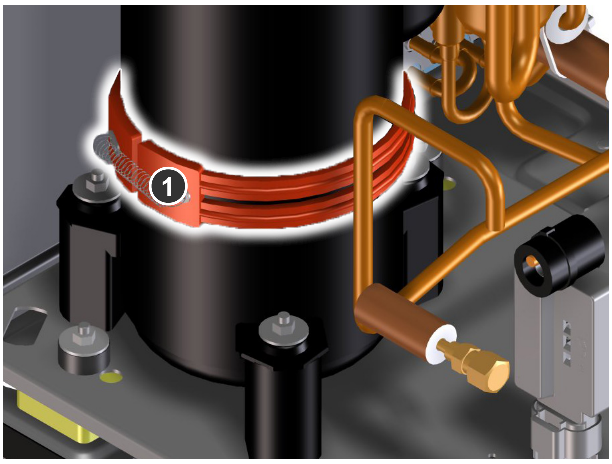


1 **Solenoid valve coil**

2 **Solenoid valve (SVA)**

5.3.3.5 Removing the crankcase heater

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3 Remove the front cover as explained in *"5.3.1.3 Removing the front cover"*.
4 Remove the compression insulation covers as explained in *"5.3.1.8 Removing the compressor insulation covers"*.
5 Disconnect the CN28 aerial connector.
6 Cut the necessary plastic ties to remove the crankcase heater wire.
7 Remove the crankcase heater (1, oil heater on the lower case):



1 Crankcase heater

5.3.3.6 Removing the water heater - WH

1 Remove the PHEX (❶) as explained in *"5.3.2.7 Removing the plate heat exchanger - PHEX"*.

2 As the water heater (❷, WH) is attached to the PHEX by means of aluminium tape, find the one ending that overlaps the rest of the tape. Start unwrapping it until it is completely detached:

❶ **Plate heat exchanger (PHEX)**

❷ **Water heater (WH)**

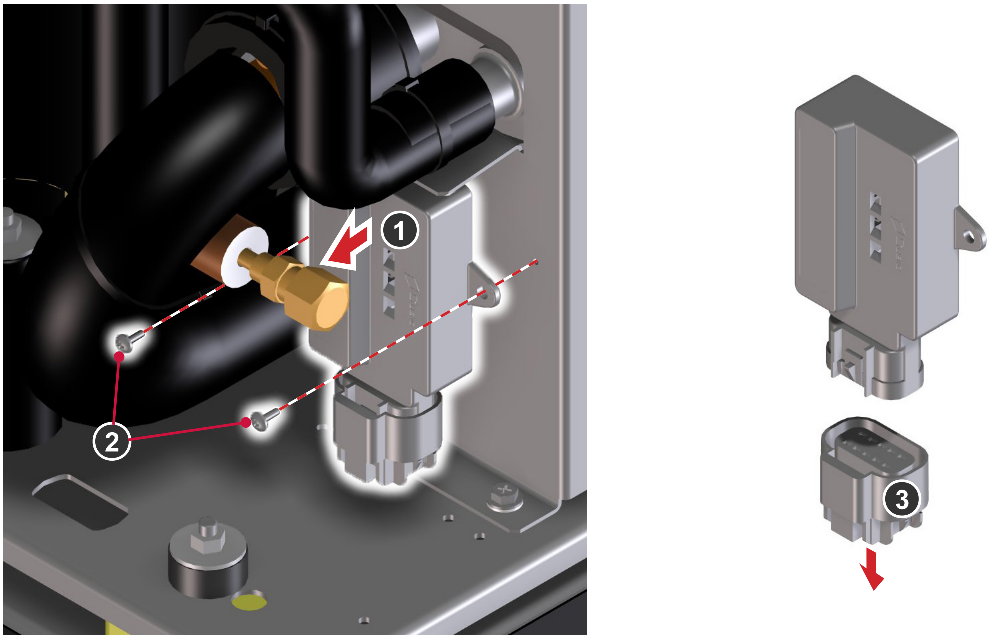
5.3.3.7 Removing the refrigerant leak sensor - LkS

1 Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.

2 Remove the 2 screws (2) that attach the refrigerant leak sensor (1, LkS) to its support.

3 Remove the LkS.

4 Disconnect the leak sensor connector (3):



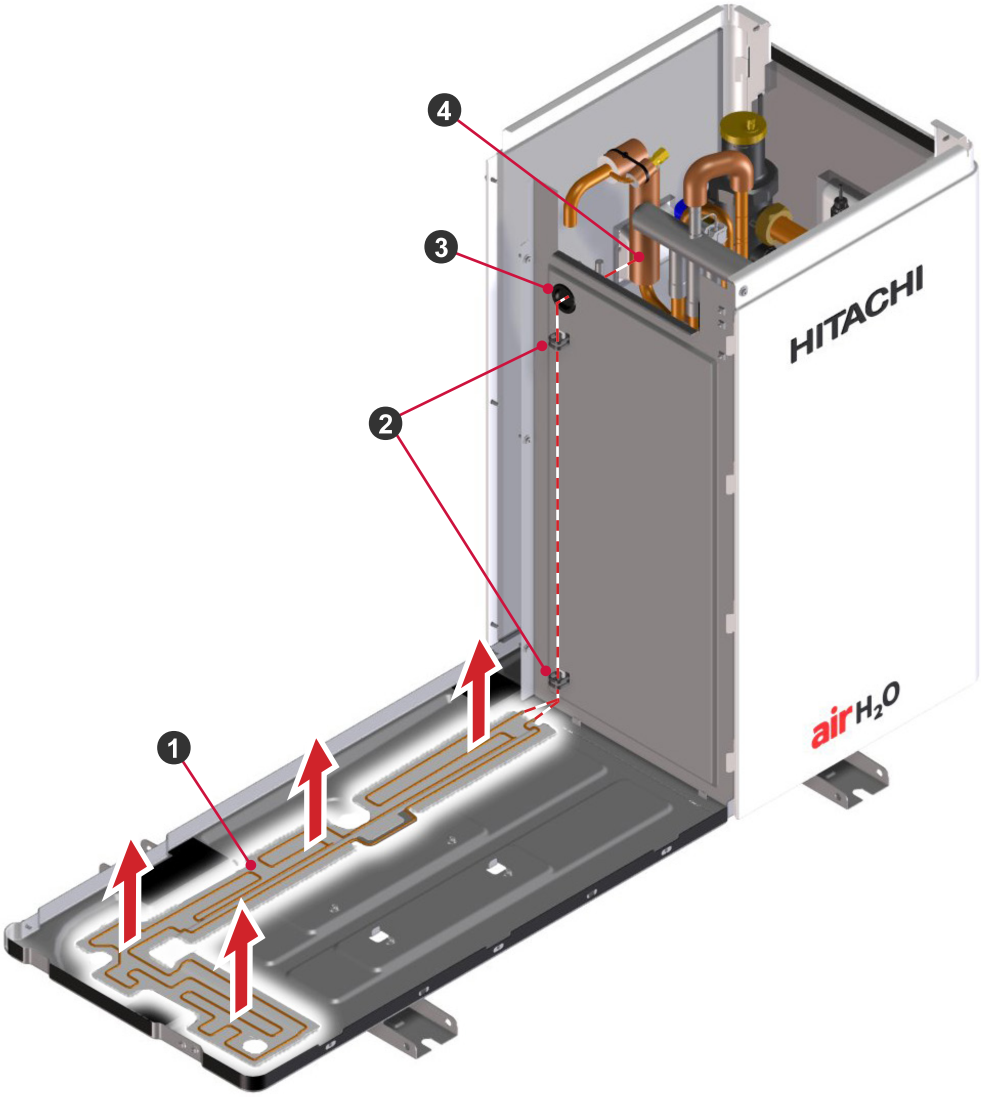
1 Leak sensor (LkS)

2 LkS crews

3 LkS connector

5.3.3.8 Removing the drain heater (accessory) - DH

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Remove the fan grille as explained in *"5.3.1.6 Removing the fan grille"*.
3 Remove the fan shroud as explained in *"5.3.1.7 Removing the fan shroud"*.
4 Locate and disconnect the CN33 aerial connector (4).
5 Pass it through the grommet (3) on the partition wall.
6 Unfasten the wiring from the clamps (2) securing it in place.
7 Detach the drain heater (1, DH) from the base plate:



1 **Drain heater (DH)**

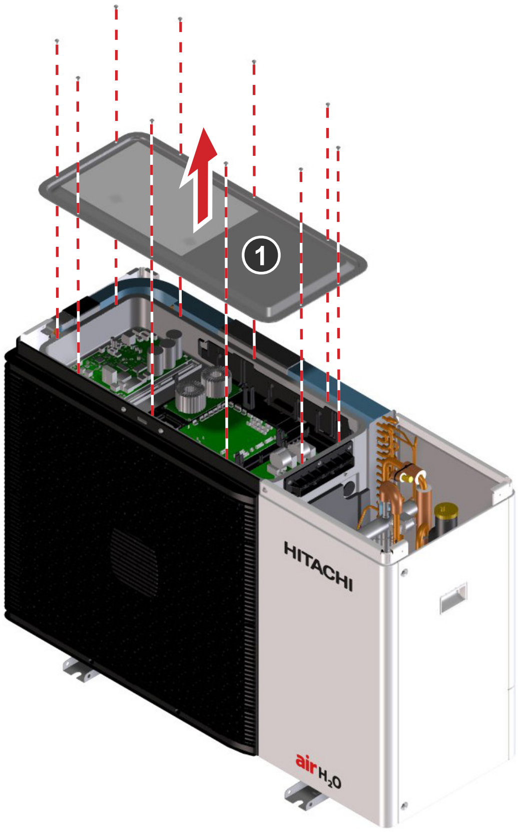
2 **Wiring clamps**

3 **Grommet**

4 **CN33 aerial connector**

5.3.3.9 Opening the electrical box

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Unfasten the 10 screws securing the electrical box cover (1).
3 Carefully pull the electrical box cover upwards to remove it.



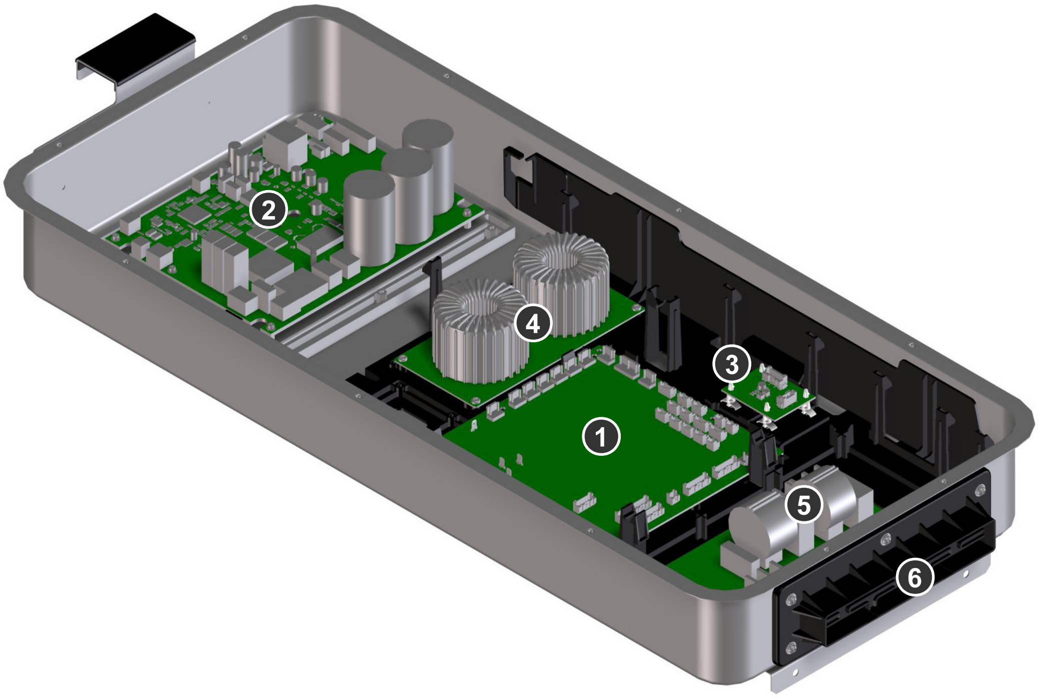
1 **Electrical box cover**

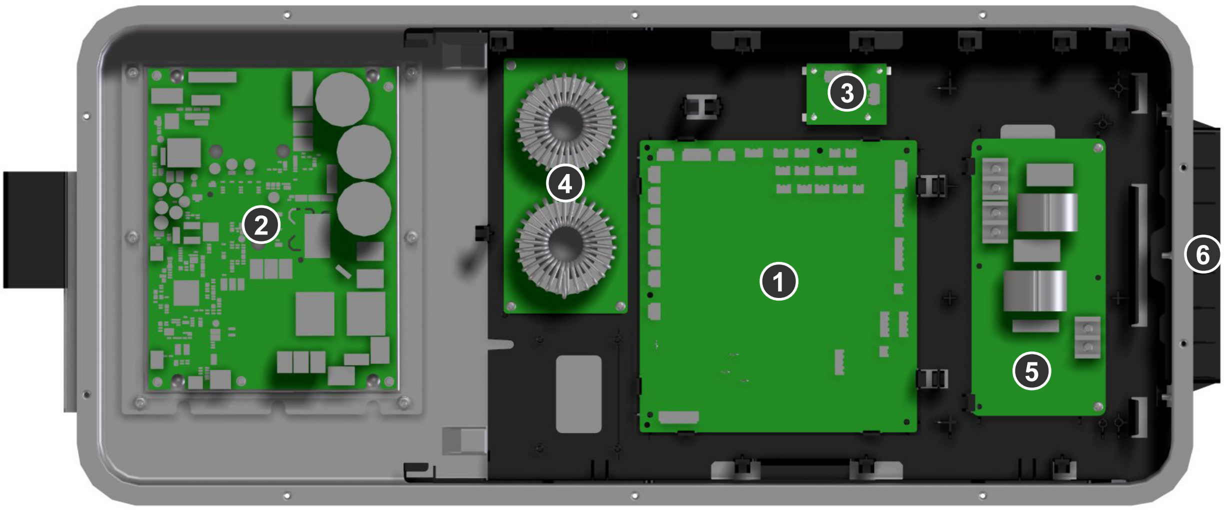
DANGER

- ***Ensure that all the electrical box cover screws have been fastened with a tightening torque of 1.3 ±10% N·m.***
- ***Ensure that the electrical box cover seals are fully seated and secure to prevent the ingress of a flammable atmosphere. Replace the electrical box cover if defective seals are detected.***

◆ Location of components

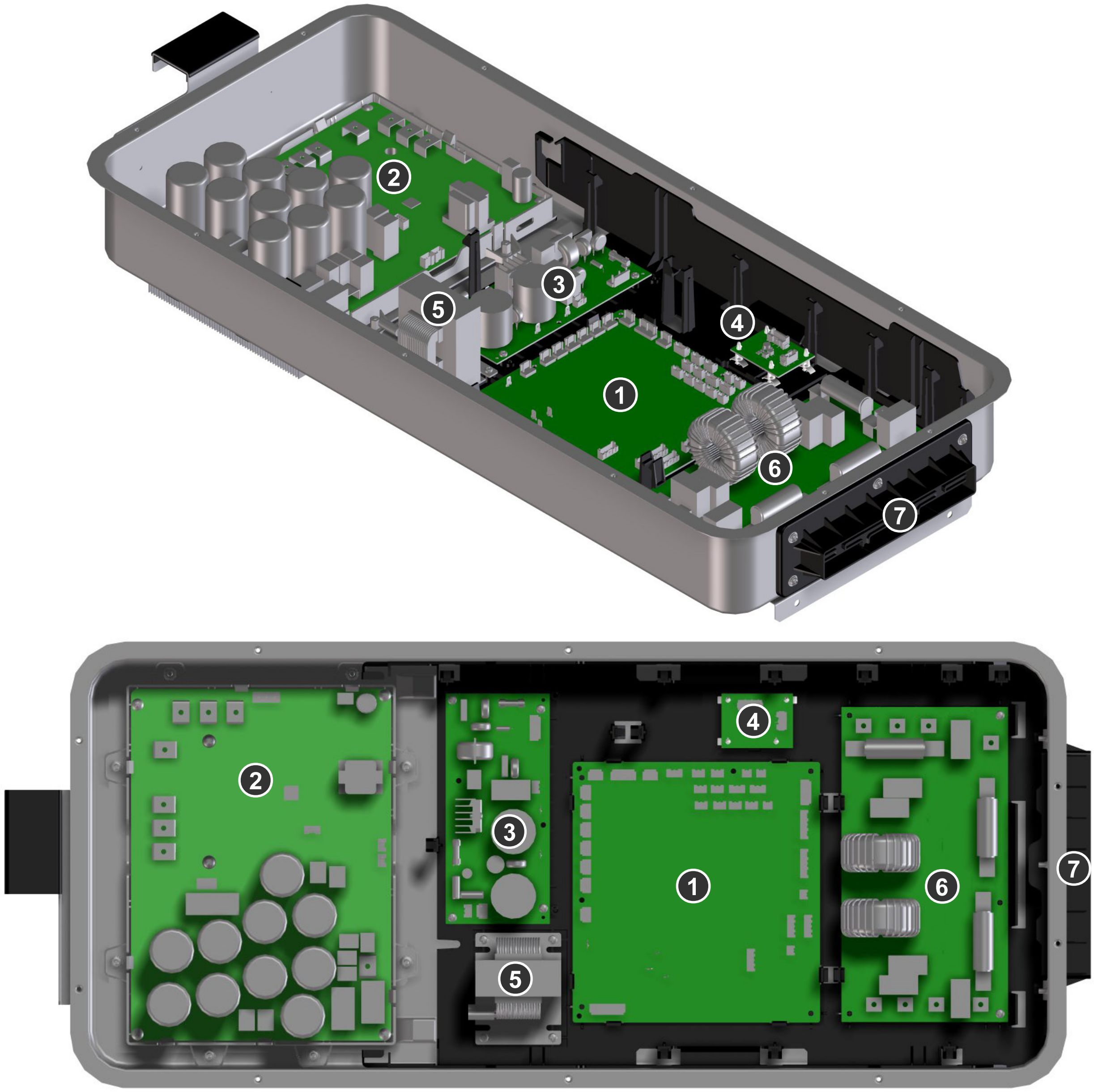
Monophase electrical box (~ 230 V 50 Hz)





1. Main control board (PCB1)
2. Inverter board (PCB2)
3. Fan control board (PCB4, only for 4-6 HP)
4. Reactor
5. Noise filter
6. Resin mould

3-phase electrical box (3N~ 400 V 50 Hz)

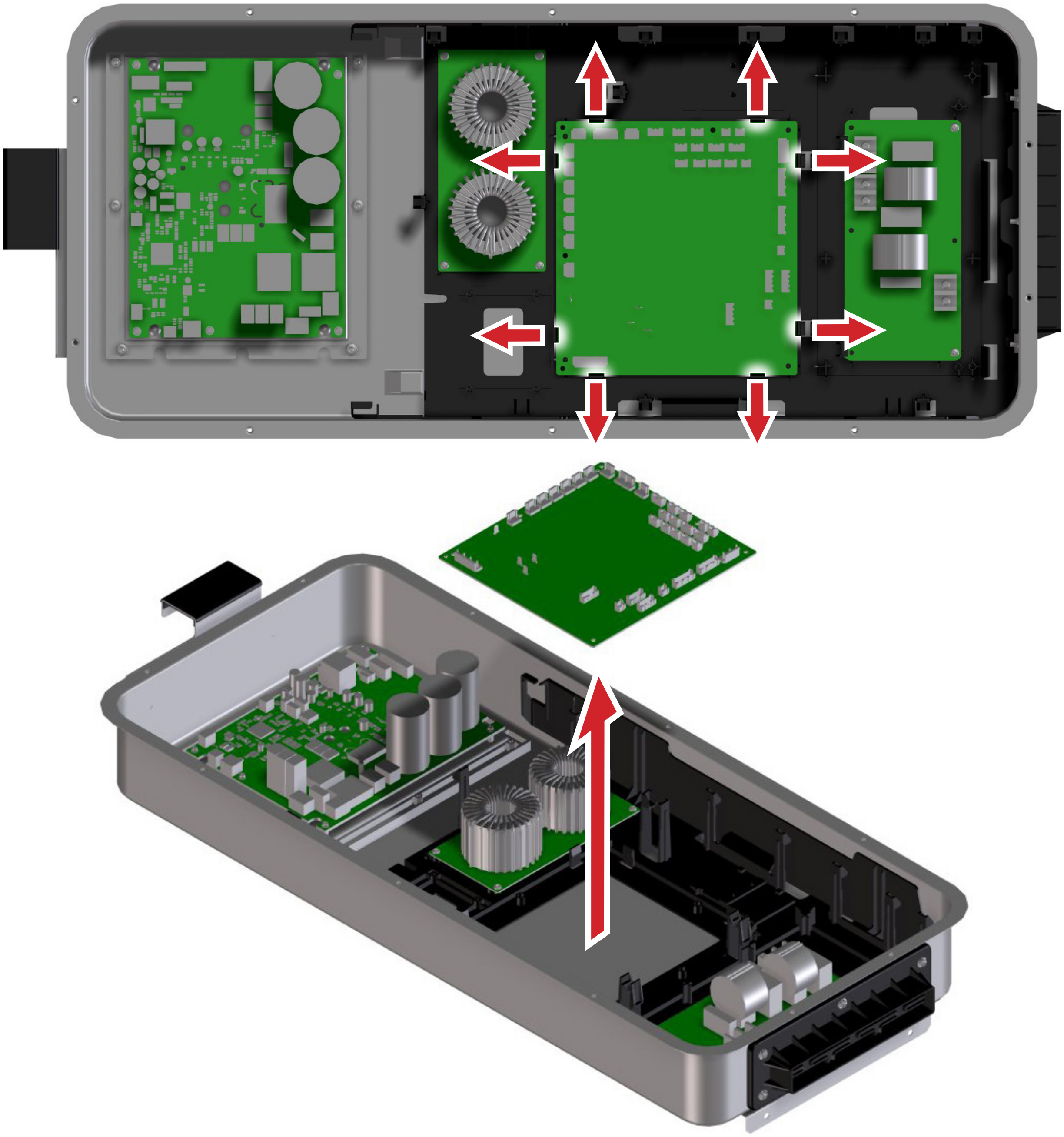


1. **Main control board (PCB1)**
2. **Inverter board (PCB2)**
3. **Fan power board (PCB3)**
4. **Fan control board (PCB4)**
5. **Reactor**
6. **Noise filter**
7. **Resin mould**

5.3.3.10 Removing the main control board

Monophase electrical box (~ 230 V 50 Hz) - PCB1

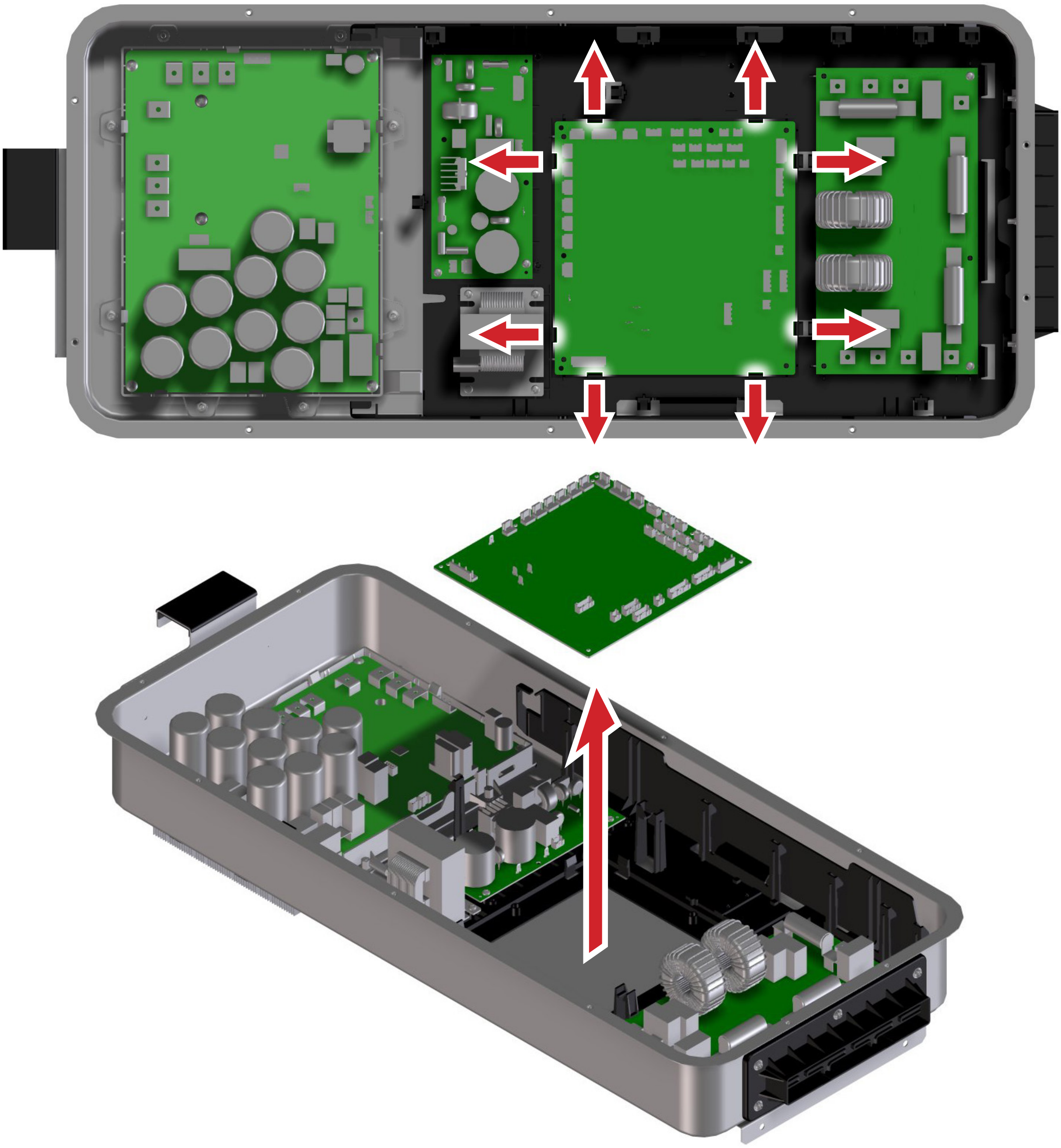
1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the main control board. Take note of their positions for reassembly.
4 Carefully detach the main control board from the 8 tabs that hold it to the electrical box.



5 Remove the main control board and replace it with a new one proceeding in reverse way than disassembling.
6 Set the DSWs of all PCBs with the setting that corresponds to the installed model as indicated in chapter *"Setting of DIP switches and rotary switches"* of the Technical Catalogue.

Three-phase electrical box (3N~ 400 V 50 Hz) - PCB1

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the main control board. Take note of their positions for reassembly.
4 Carefully detach the main control board from the 8 tabs that hold it to the electrical box.

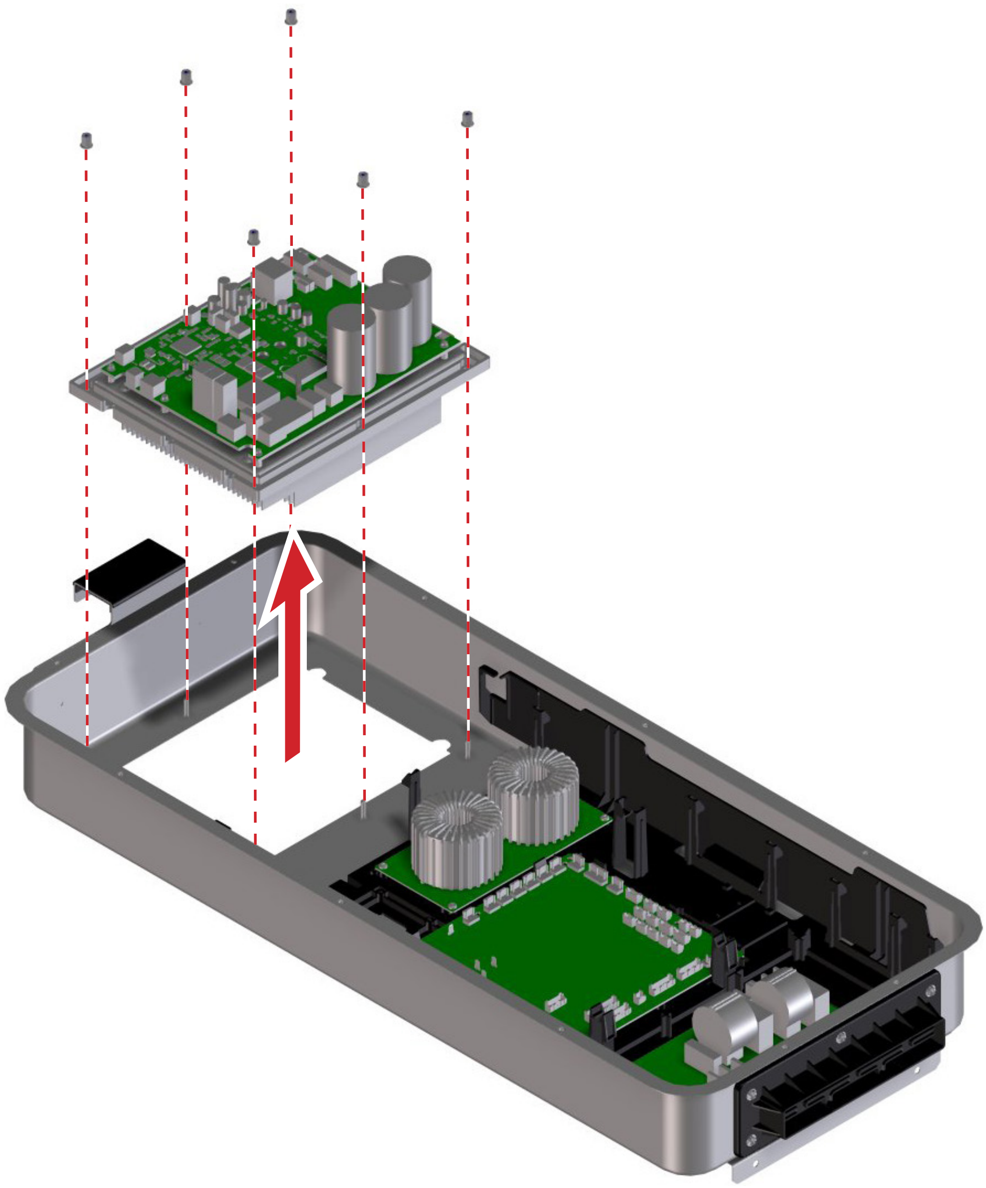


5 Remove the main control board and replace it with a new one proceeding in reverse way than disassembling.
6 Set the DSWs of all PCBs with the setting that corresponds to the installed model as indicated in chapter *"Setting of DIP switches and rotary switches"* of the Technical Catalogue.

5.3.3.11 Removing the inverter board

Monophase electrical box (~ 230 V 50 Hz) - PCB2

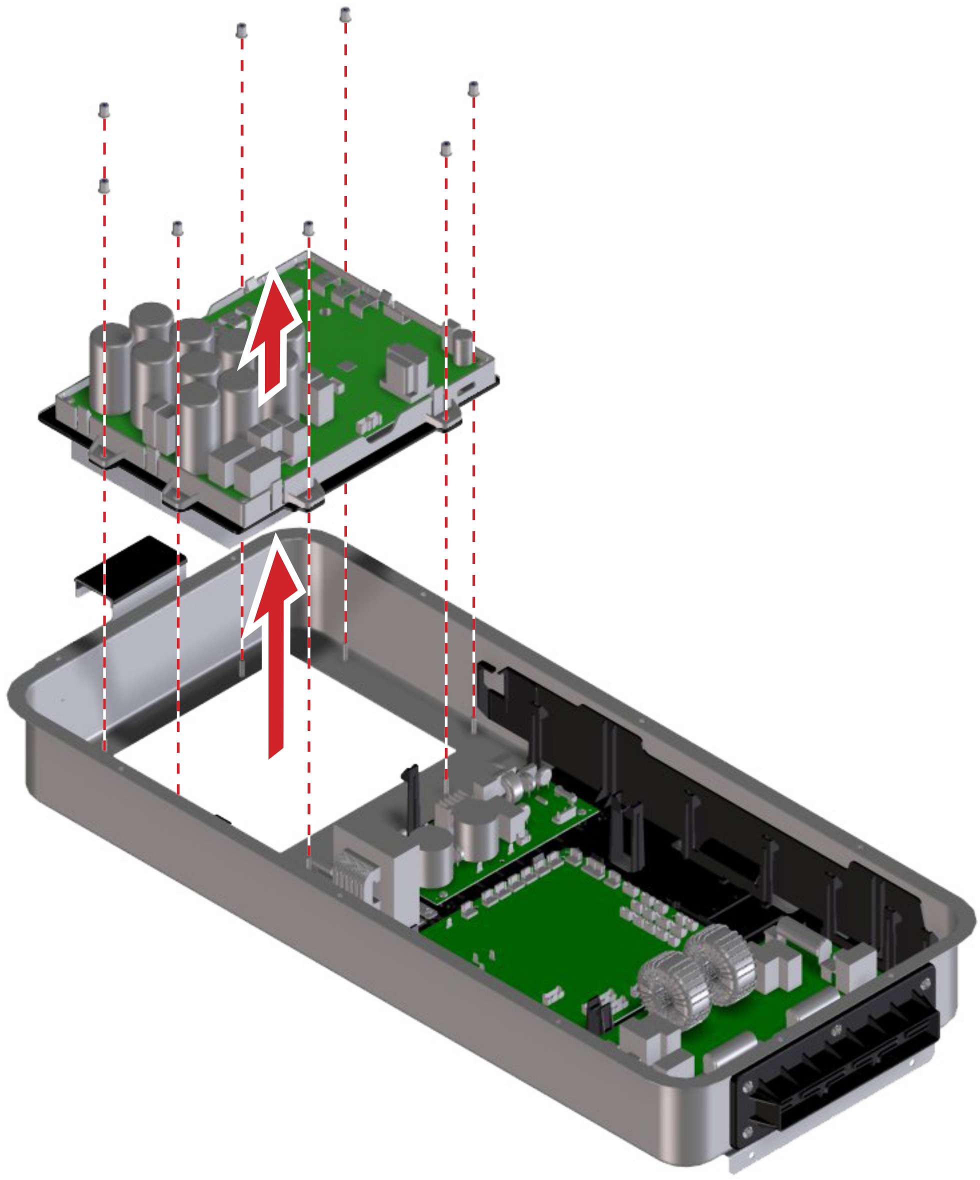
1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the inverter board. Take note of their positions for reassembly.
4 Remove the 6 nuts securing the inverter board to the electrical box.



5 Remove the inverter board and replace it with a new one proceeding in reverse way than disassembling.

Three-phase electrical box (3N~ 400 V 50 Hz) - PCB2

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the inverter board. Take note of their positions for reassembly.
4 Remove the 8 nuts securing the inverter board to the electrical box.

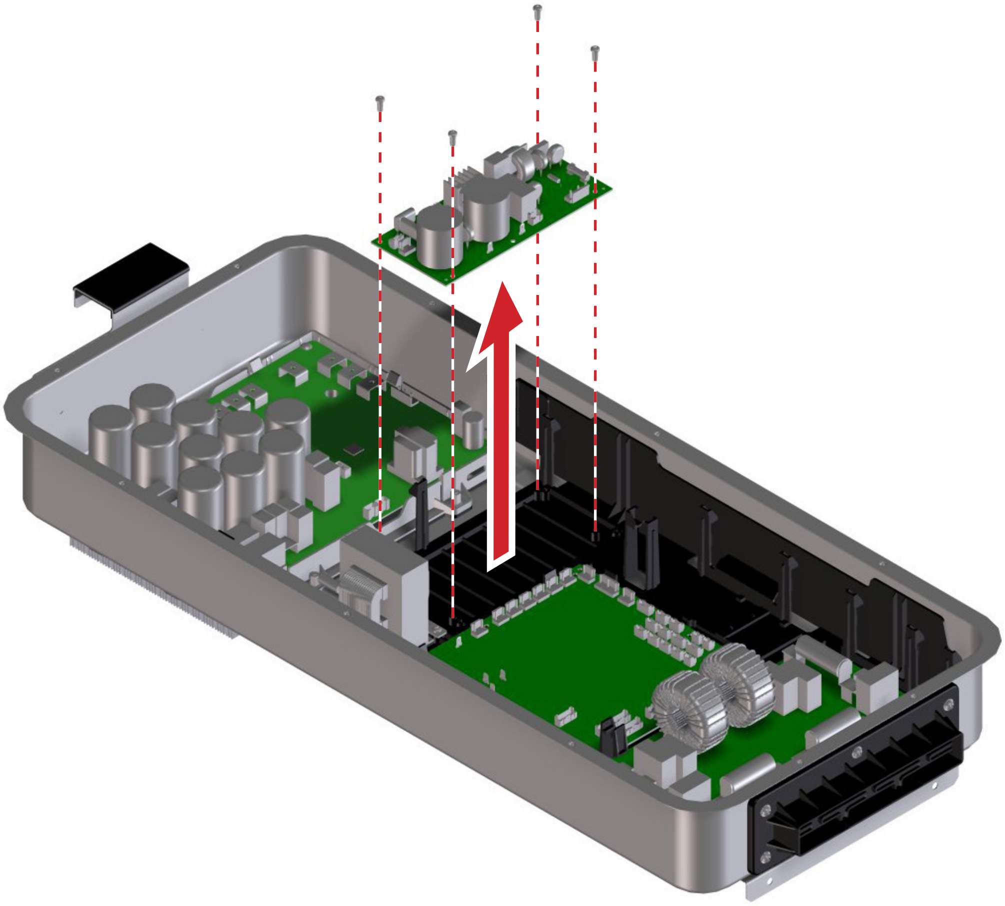


5 Remove the inverter board and replace it with a new one proceeding in reverse way than disassembling.

5.3.3.12 Removing the fan power board

Three-phase electrical box (3N~ 400 V 50 Hz) - PCB3

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the fan power board. Take note of their positions for reassembly.
4 Remove the 4 screws securing the inverter board to the electrical box.

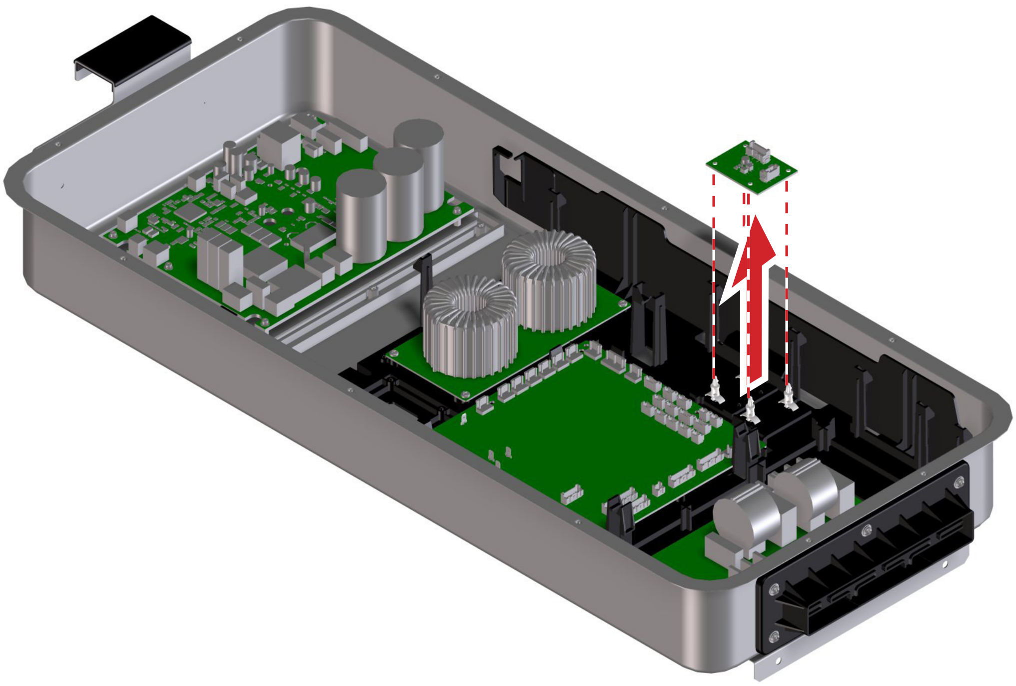


5 Remove the fan power board and replace it with a new one proceeding in reverse way than disassembling.

5.3.3.13 Removing the fan control board

Monophase electrical box (~ 230 V 50 Hz) - PCB4 (only for 4-6 HP)

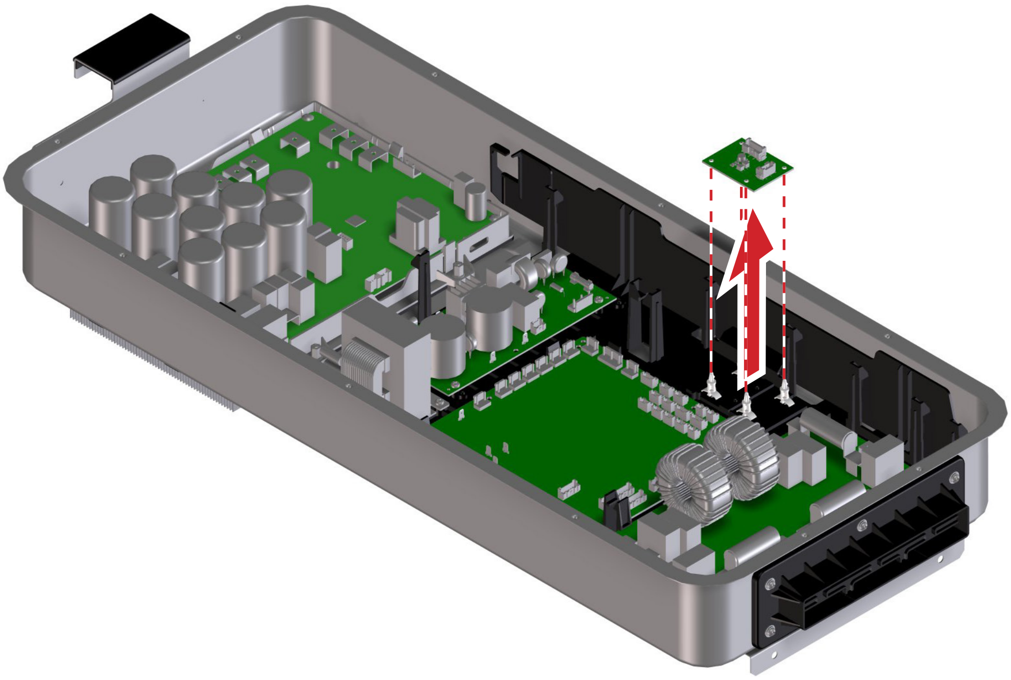
1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the fan control board. Take note of their positions for reassembly.
4 Detach the fan control board from the 4 plastic spacers securing it to the electrical box.



5 Remove the fan control board and replace it with a new one proceeding in reverse way than disassembling.

Three-phase electrical box (3N~ 400 V 50 Hz) - PCB4

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the fan control board. Take note of their positions for reassembly.
4 Detach the fan control board from the 4 plastic spacers securing it to the electrical box.

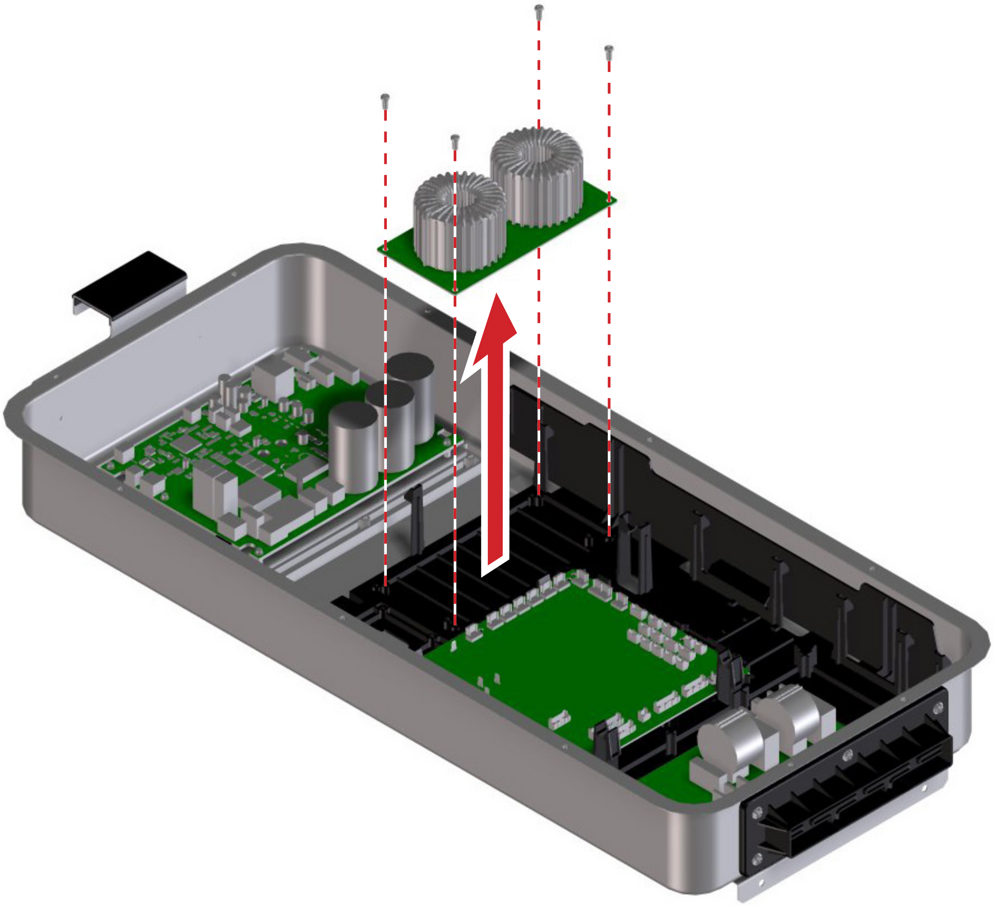


5 Remove the fan control board and replace it with a new one proceeding in reverse way than disassembling.

5.3.3.14 Removing the reactor

Monophase electrical box (~ 230 V 50 Hz)

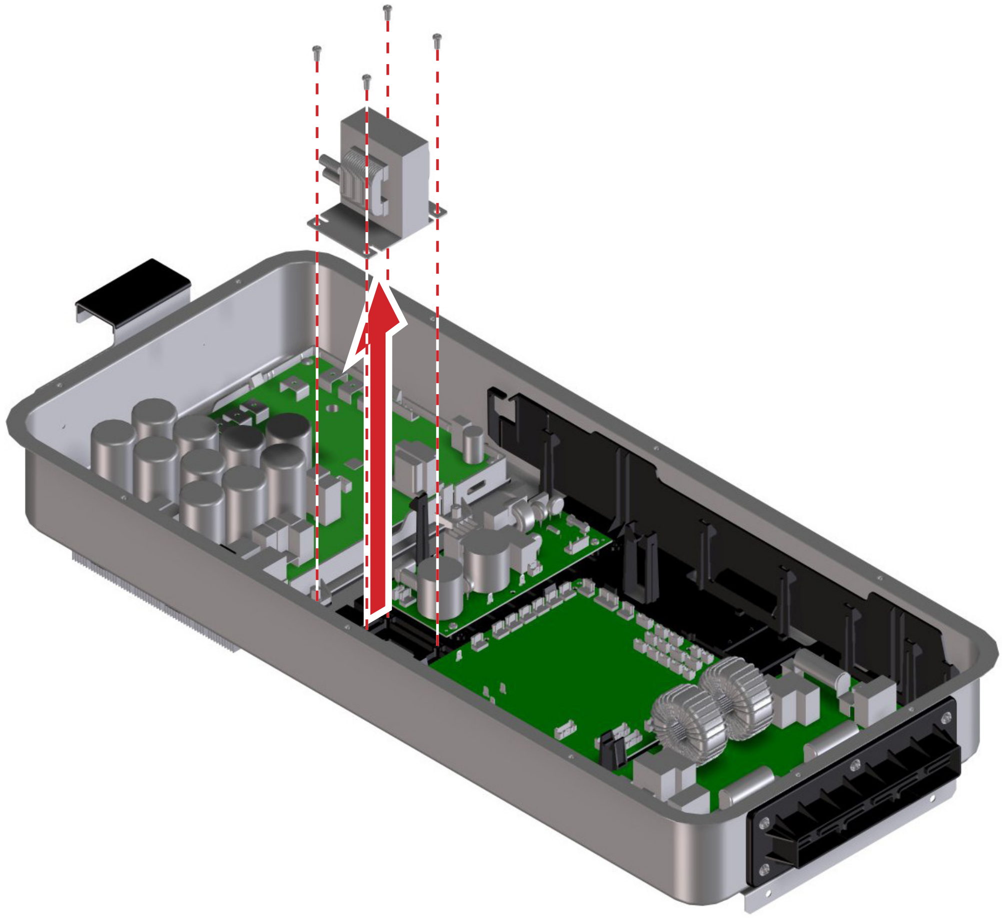
1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the reactor. Take note of their positions for reassembly.
4 Remove the 4 bolts securing the reactor to the electrical box.



5 Remove the reactor and replace it with a new one proceeding in reverse way than disassembling.

Three-phase electrical box (3N~ 400 V 50 Hz)

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the reactor. Take note of their positions for reassembly.
4 Remove the 4 bolts securing the reactor to the electrical box.

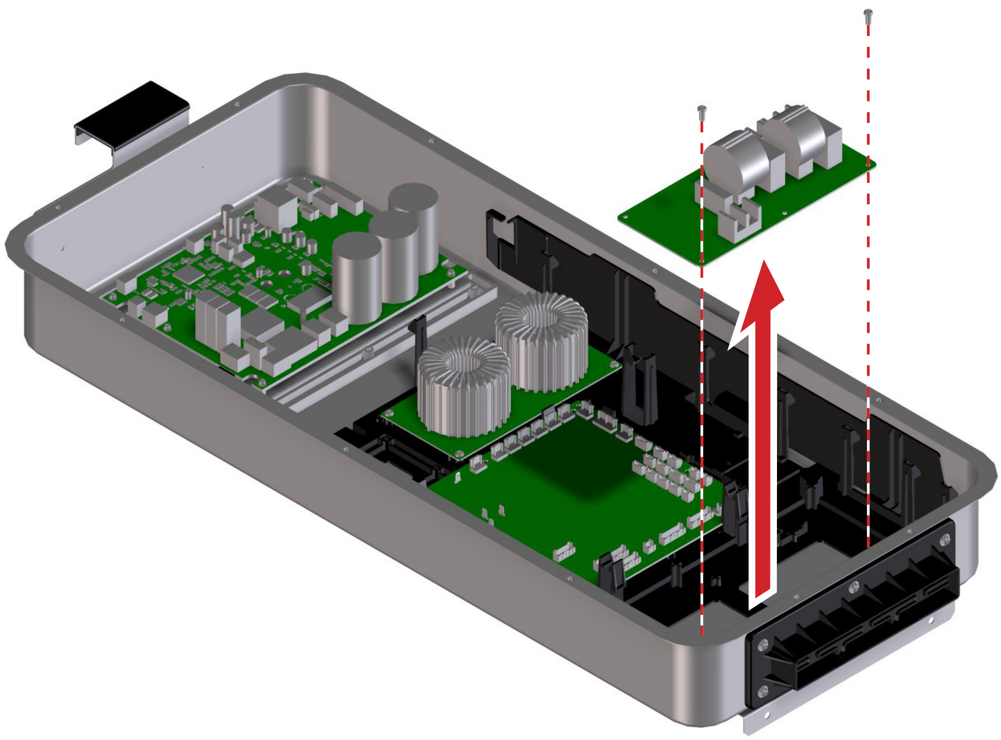


5 Remove the reactor and replace it with a new one proceeding in reverse way than disassembling.

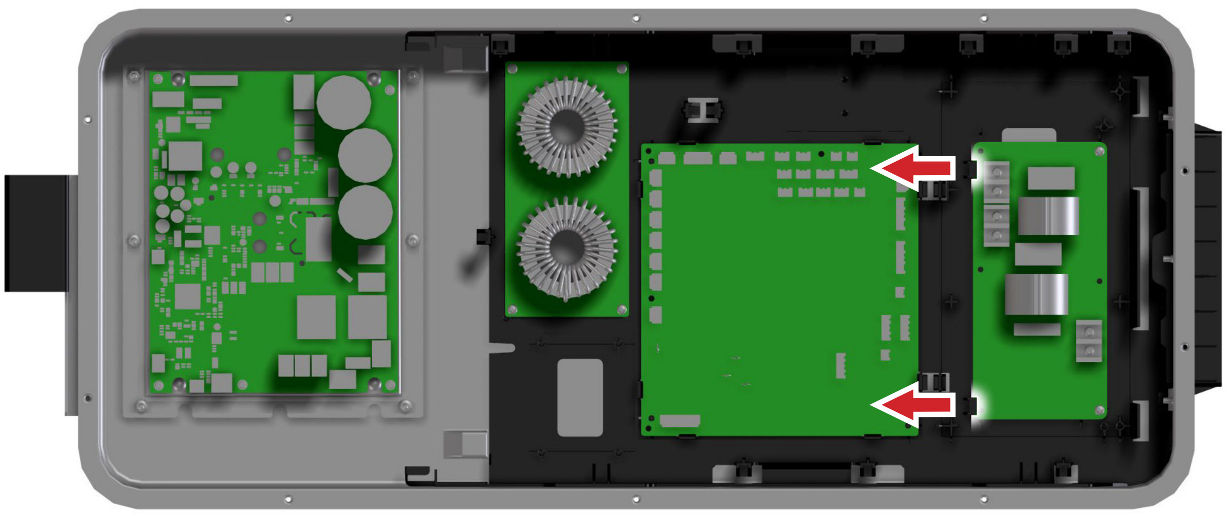
5.3.3.15 Removing the noise filter

Monophase electrical box (~ 230 V 50 Hz)

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the noise filter. Take note of their positions for reassembly.
4 Remove the 2 bolts securing the noise filter to the electrical box.



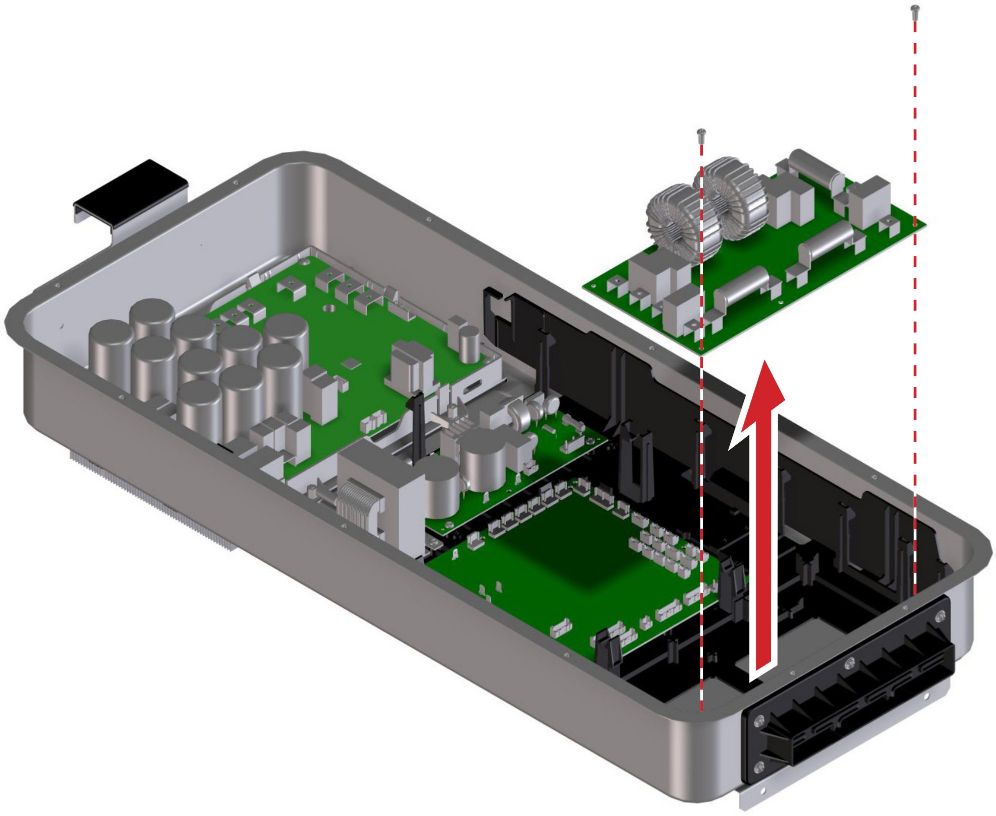
5 Carefully detach the noise filter from the 2 tabs that hold it to the electrical box.



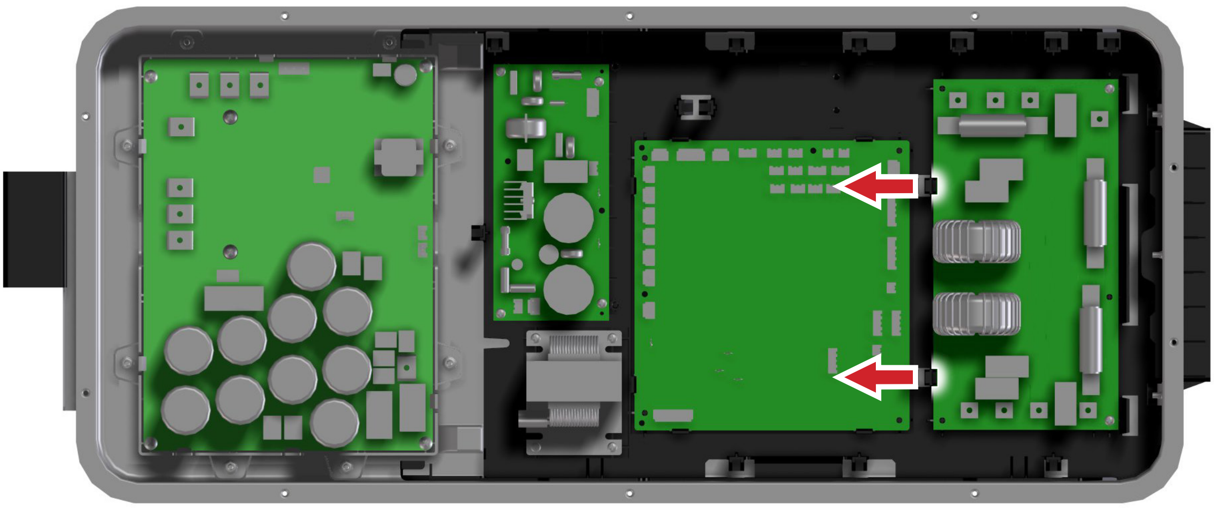
6 Remove the noise filter and replace it with a new one proceeding in reverse way than disassembling.

Three-phase electrical box (3N~ 400 V 50 Hz)

1 Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2 Open the electrical box as explained in *"5.3.3.1 Removing the fan propeller and motor"*.
3 Carefully detach all connectors connected to the noise filter. Take note of their positions for reassembly.
4 Remove the 2 bolts securing the noise filter to the electrical box.



5 Carefully detach the noise filter from the 2 tabs that hold it to the electrical box.



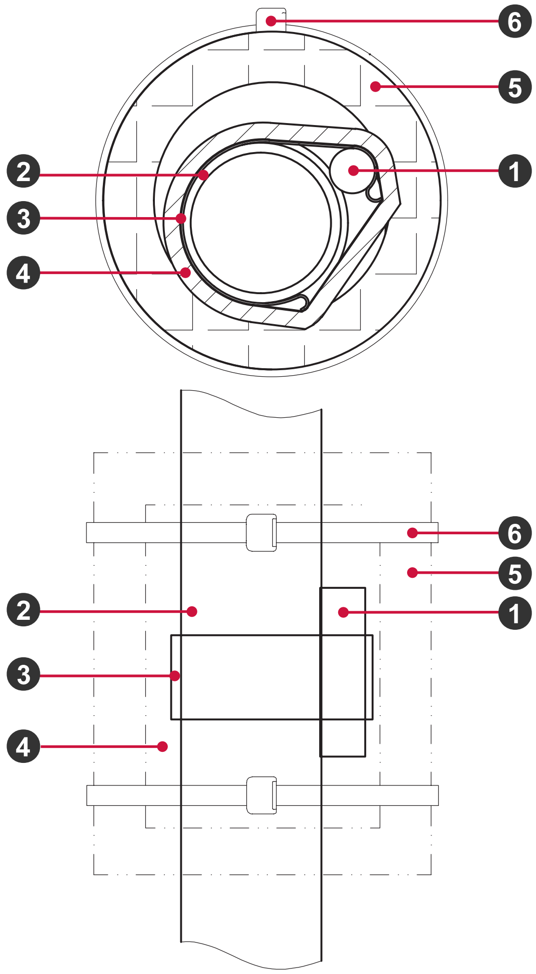
6 Remove the noise filter and replace it with a new one proceeding in reverse way than disassembling.

5.3.3.16 Replacing thermistors

1. Remove the upper cover as explained in *"5.3.1.1 Removing the upper cover"*.
2. Remove the service cover as explained in *"5.3.1.2 Removing the service cover"*.
3. Remove the rear cover as explained in *"5.3.1.4 Removing the rear cover"*.
4. Locate the thermistors position as explained in *"4.1.1.1 Thermistors for airH2O 800M - RASM-(2-6)(V)TW2E"*.
5. Disconnect these components properly from the corresponding aerial connectors:

Component		Aerial connector
Mark	Name	Mark
Ta	Thermistor for ambient temperature	CN22
Te	Thermistor for evaporation temperature	CN21
Td	Thermistor for discharge temperature	CN20
TL	Thermistor for liquid temperature	CN23
Two	Thermistor for water output temperature	CN25
Twi	Thermistor for water input temperature	

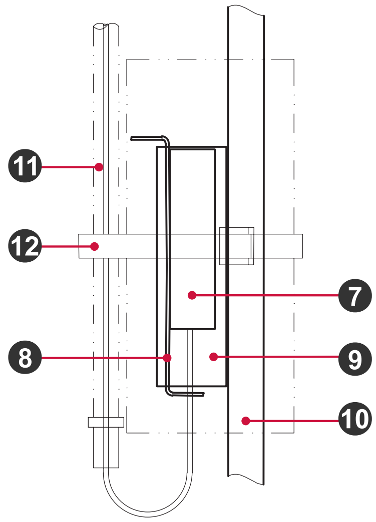
6. Remove the pipe insulation (5) of the thermistors and any fixing element they may have.
7. Remove the thermistors (1).
8. Install the new thermistors using P-springs (3) and butyl sheets (4) as shown in the following drawings:



1. **Thermistor**
2. **Water/refrigerant pipe**
3. **P-spring**
4. **Butyl sheet (aluminium foil tape)**
5. **Pipe insulation**
6. **Plastic tie**

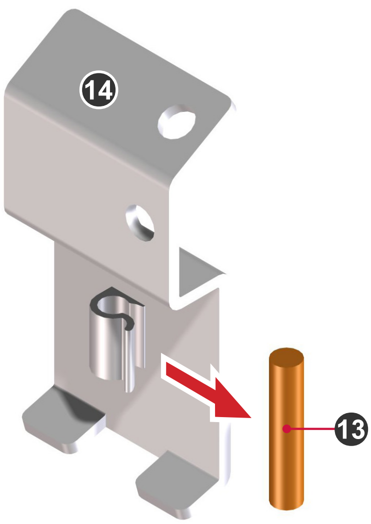
⚠ CAUTION

- *In case of a deformed P-spring, it needs to be replaced.*
- *Twi, Two and Td thermistors include aluminium foil tape between the P-spring and the butyl sheet.*
- *Thermistor for evaporation temperature (Te, 7) does not use a P-spring, but a folded metal sheet (8) and a support pipe (9, which is welded to the evaporation pipe, 10) instead:*



7 Thermistor Te	**9 Support pipe**	**11 Vinyl tube**
8 Folded metal sheet	**10 Evaporation pipe**	**12 Plastic tie**

- *The thermistor for ambient temperature (Ta , 13) is fixed by means of a specific plastic holder (14):*



13 Thermistor Ta **14 Plastic holder**

9 Install the thermistors wires proceeding in reverse way than disassembling.

5.4 Indoor units - Hydrosplit system - airH2O 800H - HWM-W2E(-B)

DANGER

- ***Disconnect the units from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Wait minimum 10 minutes or more from all power supplies have been turned OFF.***
- ***In case of replacing hydraulic parts, drain water from the unit if needed. Close shutdown valves and open the drain valves.***

CAUTION

- *When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid possible failures and damage to electrical components.*
- *In case of blocked or stacked parts, use appropriated tools and eventually lubricants to release them.*
- *In case of sharped edged parts, as covers, use security gloves to avoid getting injured.*
- *Pay attention of no falling off the service cover.*
- *Take care when removing service cover; the parts inside the unit could be hot.*

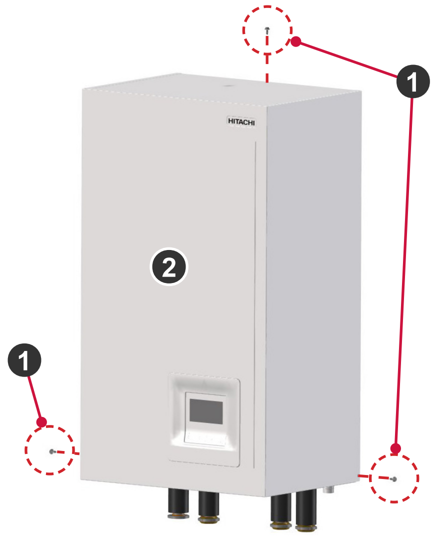
5.4.1 Structural components

5.4.1.1 Removing the service cover

NOTE

The service cover must be removed for most operations inside the indoor unit.

1 Unfasten the screws (1) securing the service cover (2):



CAUTION

- *Exercise care when handling the unit controller's LCD display during frame removal.*
- *Ensure the service cover does not accidentally fall off.*

2 Gently slide the service cover slightly upward and remove it by pulling it backward.

1 Service cover screws **2 Service cover**

5.4.1.2 Opening the electrical box cover

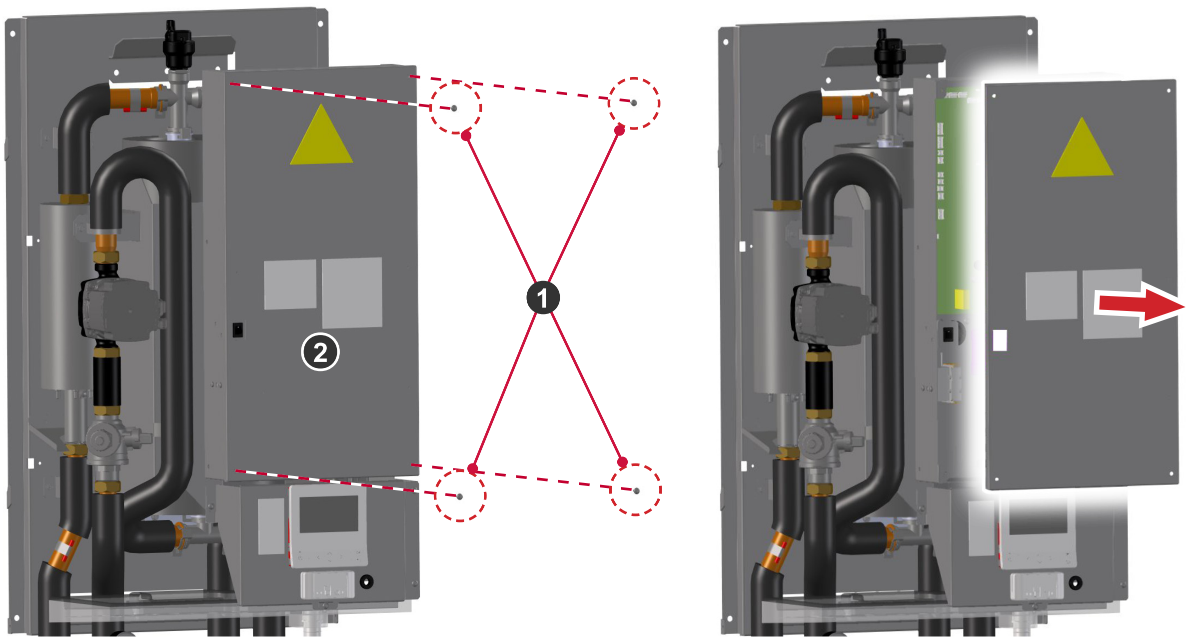
1 Remove the service cover as instructed in *"5.4.1.1 Removing the service cover"*.

2 Unfasten the 4 screws (1) securing the electrical box cover (2).

3 Remove the electrical box cover:

⚠ **CAUTION**

Pay attention to prevent the electrical box cover from accidentally falling off.



1 **Electrical box cover screws**

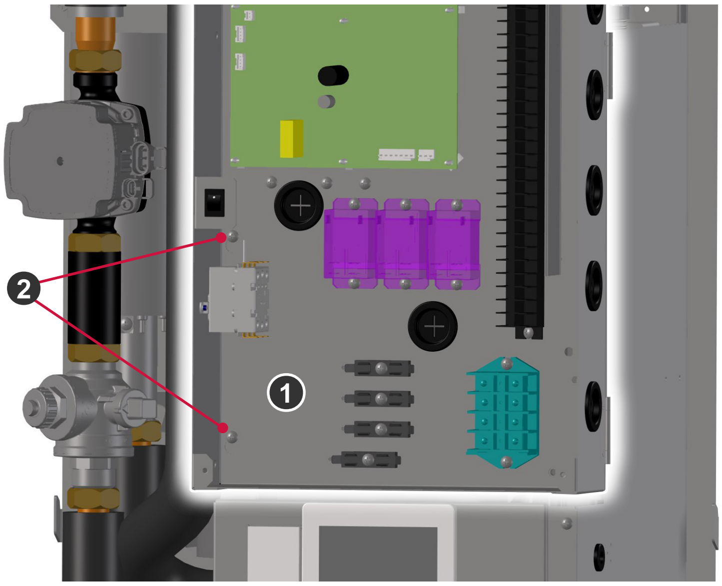
2 **Electrical box cover**

5.4.1.3 Opening the electrical box

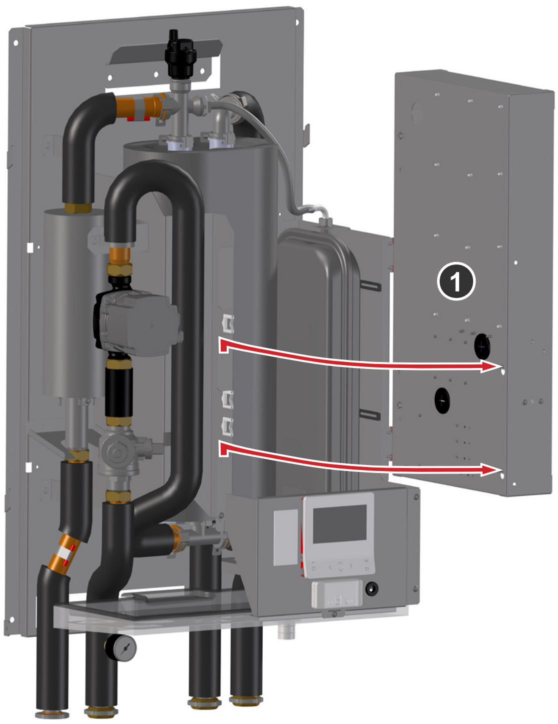
1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.

2 Open the electrical box cover following the instructions in chapter *"5.4.1.2 Opening the electrical box cover"*.

3 Loosen the 2 screws (2) fixing the electrical box (1):



4 From the left side, gently pull up and then backwards to smoothly open the electrical box:



1 **Electrical box**

2 **Electrical box screws**

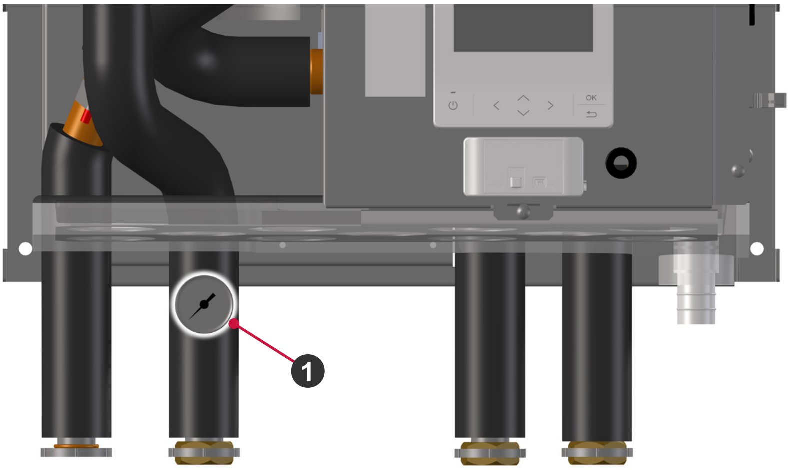
5.4.2 Water cycle components

5.4.2.1 Access to the hydraulic parts

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover".*
3 Opening of the electrical box as explained in chapter *"5.4.1.3 Opening the electrical box"*.

5.4.2.2 Removing the manometer

1 Perform the draining operation following *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.
2 Unscrew manometer capillary joint (1) from the water pipe:



1 **Manometer**

3 Install the new manometer by following the procedures described above in reverse.

NOTE

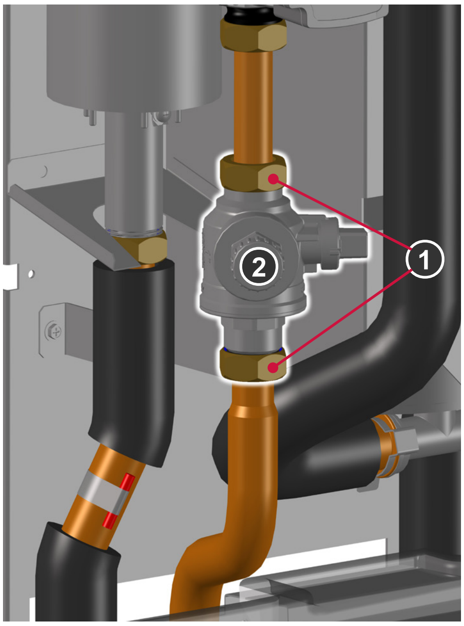
- *Ensure the correct position of the manometer.*
- *Apply teflon to the thread of the manometer port before assembling to prevent leakage.*

5.4.2.3 Removing the filter plus ball valve

1 Drain the indoor unit water following *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

2 Access to the hydraulic parts as explained in chapter *"5.4.2.1 Access to the hydraulic parts"*.

3 Loosen the 2 flare nuts (1) and remove the filter plus ball valve (2):



1 **Flare nuts**

2 **Filter plus ball valve**

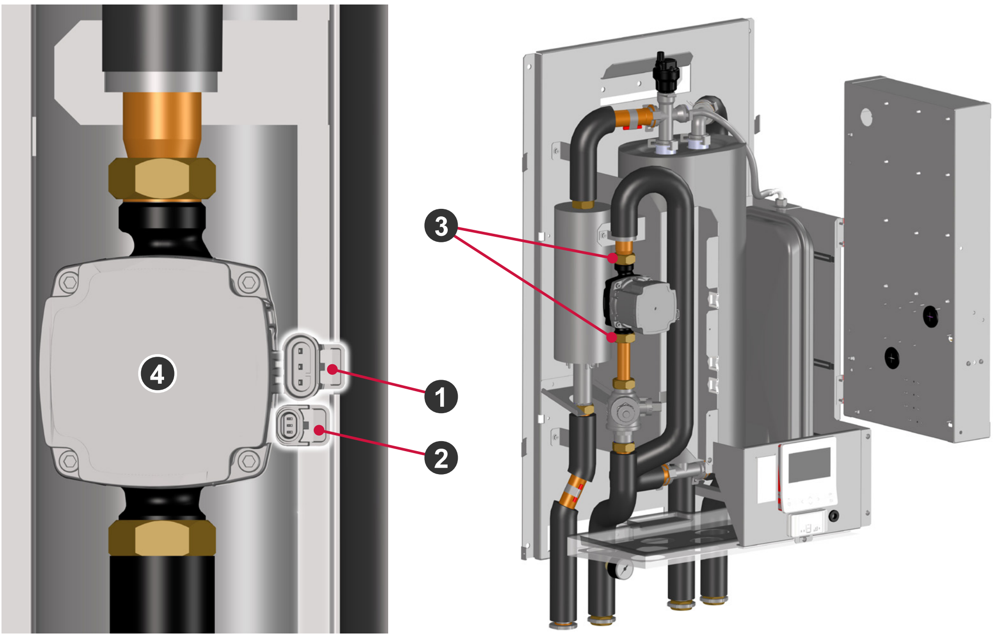
4 Install the new filter plus ball valve by following the procedures described above in reverse.

NOTE

For further information about the filter plus ball valve, refer to "7 Filter plus ball valve" of "Maintenance" chapter.

5.4.2.4 Removing the water pump

1. Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.
2. Access to the hydraulic parts as explained in chapter *"5.4.2.1 Access to the hydraulic parts"*.
3. Remove the power supply connector (1) of the water pump and the signal transmission cable (2).
4. Loosen the 2 nuts (3).
5. Remove the water pump (4).



6. Install the new water pump (4) by following the procedures described above in reverse.
7. Connect the power supply connector (1) of the water pump and the signal transmission cable (2).

1 Power supply connector	**3 Nuts**
2 Signal connector	**4 Water pump**

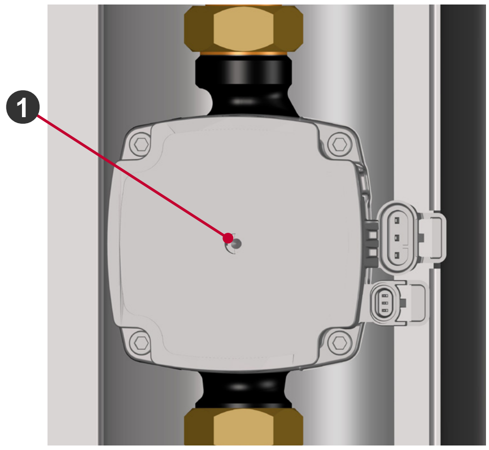
NOTE

- *Ensure the correct position of the water pump.*
- *Exercise caution to avoid losing the gaskets of the water pump.*
- *Check the gaskets; if damaged, replace them with new ones.*

◆ Deblocking device of the water pump

The deblocking device (1) consists of an axial moving plunger tightened by an O-ring and pulled back by a spring inside a stainless steel housing that is welded to the rotor can.

By pushing and turning a screw driver, Phillips number 2, the plunger pushes the shaft in axial direction into the pump,while it can be turned as well. The force is high enough to deblock pumps which are seized by lime e.g. if an appliance is stored for months after being wet tested. Before, during and after the deblocking, the device is tight and must not release any water



1 **Deblocking device**

CAUTION

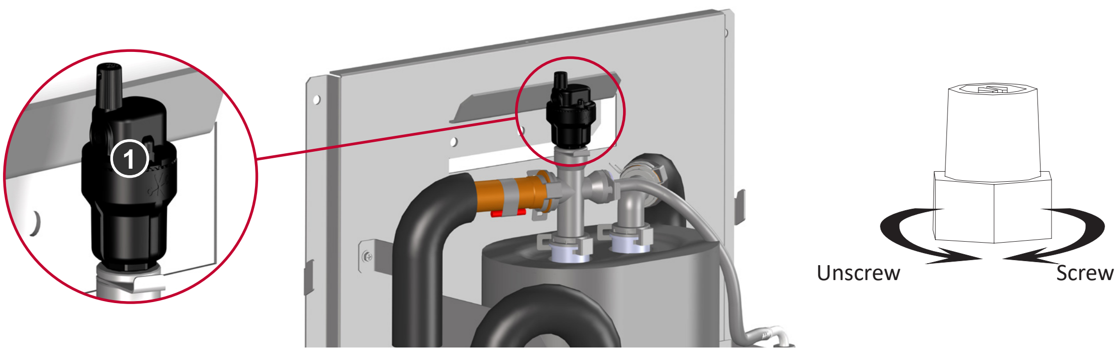
Be aware of splashing hot water.

5.4.2.5 Removing the air purger

1 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

2 Access to the hydraulic parts as explained in chapter *"5.4.2.1 Access to the hydraulic parts"*.

3 Unscrew the air purger (1) and replace it for a new one:



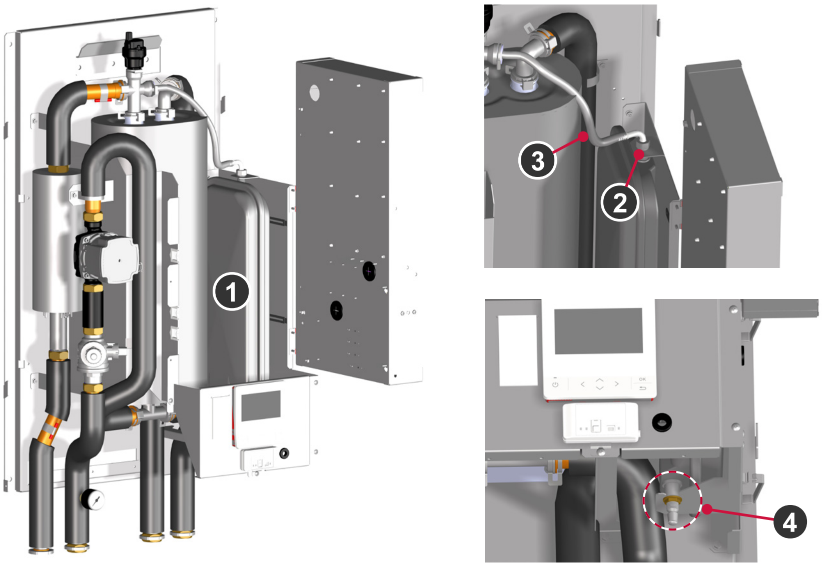
NOTE

- *Lubricate the thread of the air purger when reassembling.*

4 Install the new air purger by following the procedures described above in reverse.

5.4.2.6 Removing the expansion vessel

1. Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.
2. Access to the hydraulic parts as explained in chapter *"5.4.2.1 Access to the hydraulic parts"*.
3. Unscrew the nut (2) of the pipe (3) at the top of the expansion vessel (1).
4. Unscrew the flare nut (4) that secures the expansion vessel at its bottom and remove the expansion vessel:



1 **Expansion vessel**

2 **Nut**

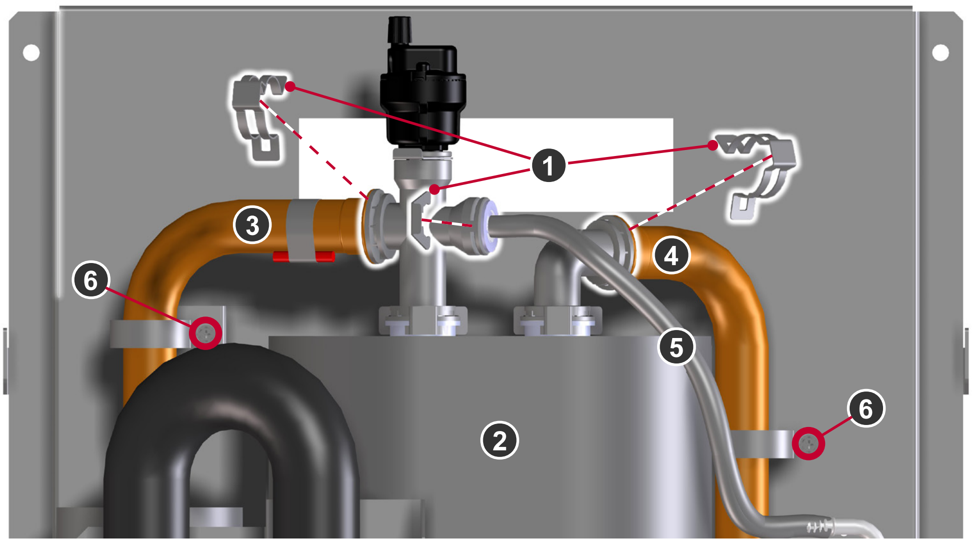
3 **Expansion vessel pipe**

4 **Flare nut**

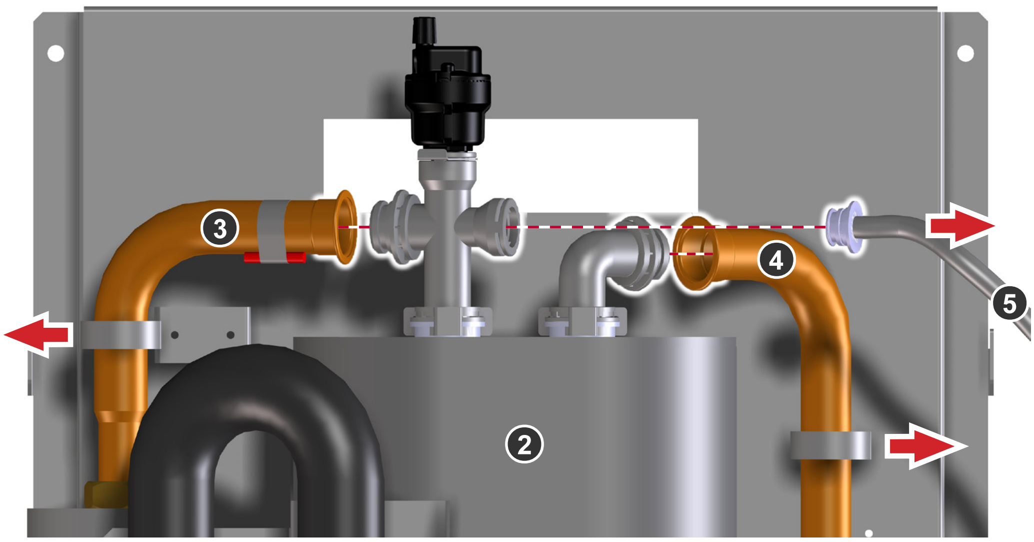
5. Install the new expansion vessel by following the procedures described above in reverse.

5.4.2.7 Removing the hydraulic separator

1 Remove the service cover as explained in *"5.4.1.1 Removing the service cover"*.
2 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.
3 Access to the hydraulic parts as explained in chapter *"5.4.2.1 Access to the hydraulic parts"*.
4 Remove the clamps (1) connecting the hydraulic separator (2) upper connections to the secondary circuit inlet pipe (3), the hydraulic separator inlet pipe (4) and the expansion vessel pipe (5):

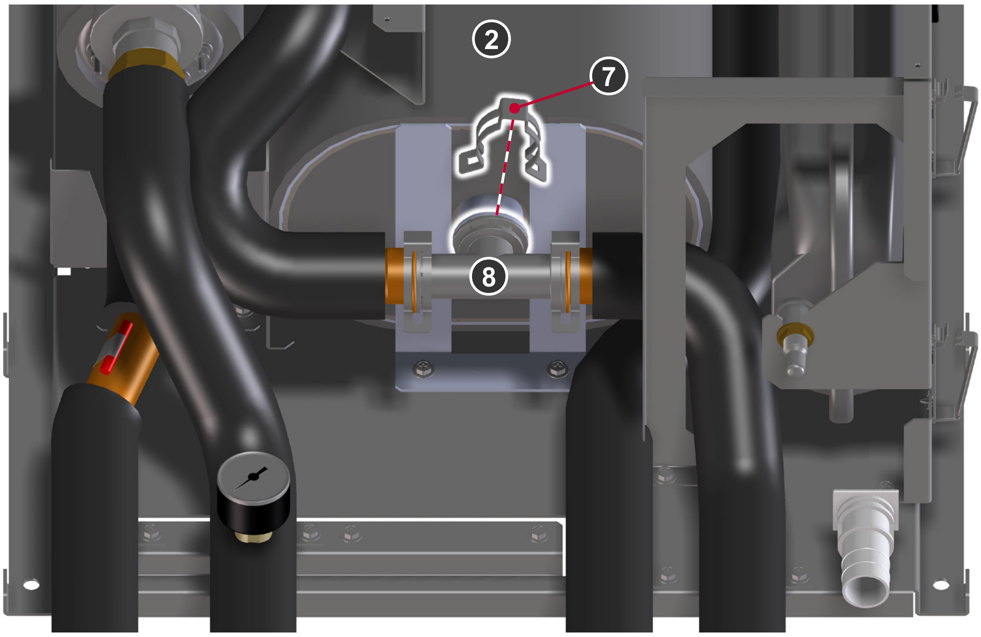


5 Separate these 3 pipes form the hydraulic separator. If needed, remove the screws (6) that fix pipes 3 and 4 to the structure:

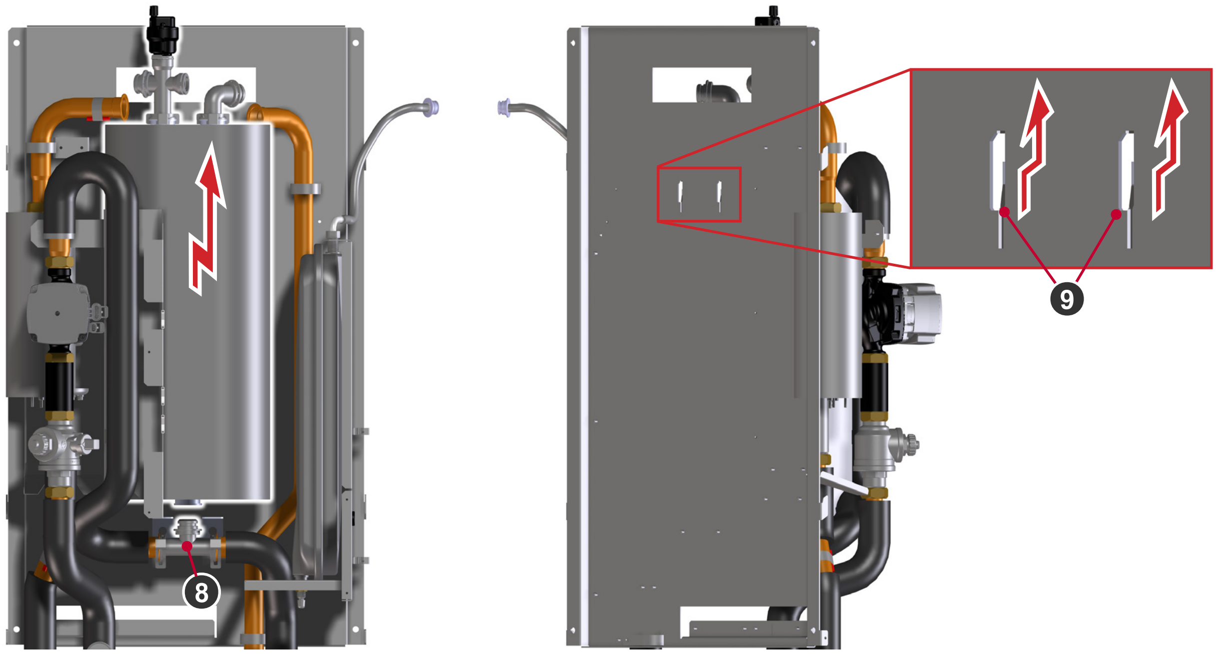


1 **Clamps**
2 **Hydraulic separator**
3 **Secondary circuit inlet pipe**
4 **Hydraulic separator inlet pipe**
5 **Expansion vessel pipe**
6 **Pipe fixing screws**

6 Remove the lower clamp (7) connecting the hydraulic separator to the T-shaped outlet pipe connection (8):



7 Remove the hydraulic separator by pulling it up, separating it from the connection (8), and detaching the 2 hooks (9) that fix the hydraulic separator to its rear support:



7 Lower clamp

8 T-shaped outlet pipe connection

9 Supporting hooks

NOTE

- *The piping insulation is hidden in some pictures for illustrative purposes.*
- *If needed, remove the pipe connections on top of the hydraulic separator at the end.*

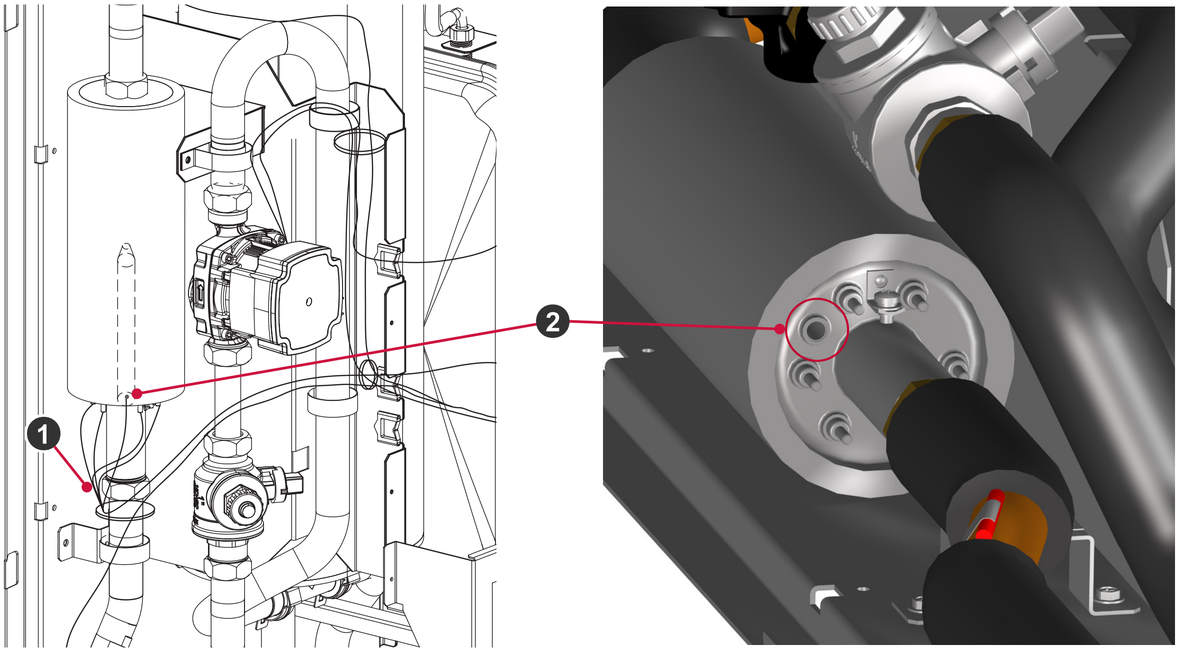
5.4.2.8 Removing the electrical heater

1 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

2 Access to the hydraulic parts as explained in chapter *"5.4.2.1 Access to the hydraulic parts"*.

3 Cut the plastic cord band (1) of the ITH1 thermostat (2), located at the head of connectors of the electrical heater.

4 Pull the thermistor backwards, carefully, and remove it from the electrical heater.



1 **Plastic cord band**

2 **ITH1 thermostat**

NOTE

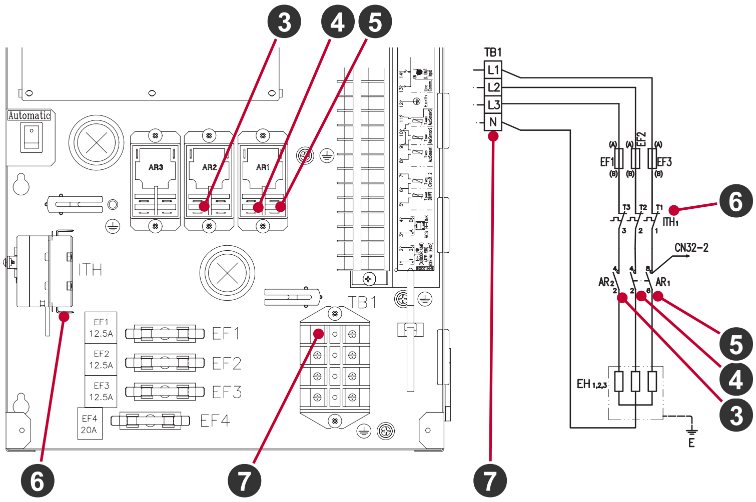
Take special care with the thermistor when handling it. Once it is removed, place it in a place where it cannot be damaged when removing the electrical heater.

CAUTION

Do not unscrew, remove or manipulate the terminals at the head of the electrical heater. When removing the electrical heater, disconnection procedure must be done on the electrical box.

5 Cut the plastic cord bands attached to the harness of the electrical heater.

6 Remove the terminals of the electrical heater cables, located inside the electrical box:



❸ **AR2: Terminal 2**

❹ **AR1: Terminal 2**

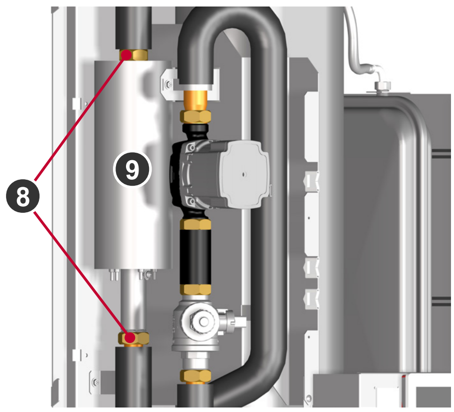
❺ **AR1: Terminal 6**

❻ **Thermistor ITH1**

❼ **Neutral**

7 Loosen the nuts (❽) connecting the pipes to the electrical heater (❾).

8 Remove the electrical heater:



❽ **Electrical heater piping nuts**

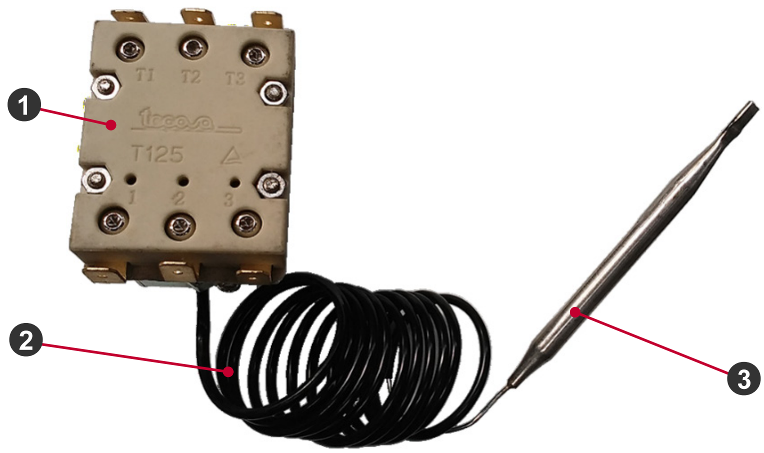
❾ **Electrical heater**

9 Install the new electrical heater by following the procedures described above in reverse.

5.4.2.9 Resetting the oil bulb thermostat

airH2O 800 back-up electric heater is protected by an oil bulb thermostat.

When water temperature becomes too high, it cuts power supply to the heater elements.

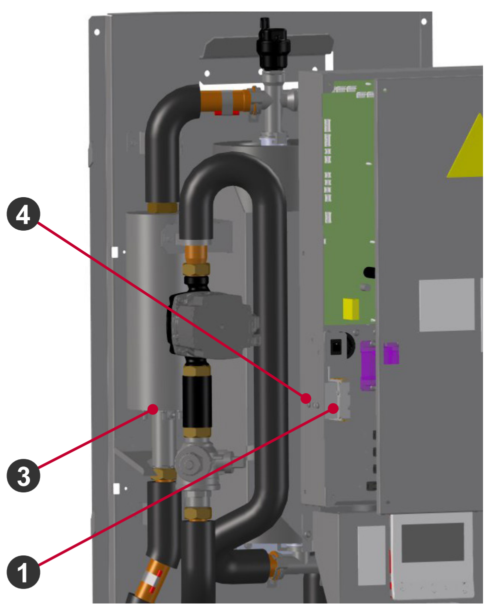


1 Thermostat

2 Capillary pipe

3 Oil bulb

◆ **Position**



4 Reset button

5.4.3 Electrical components

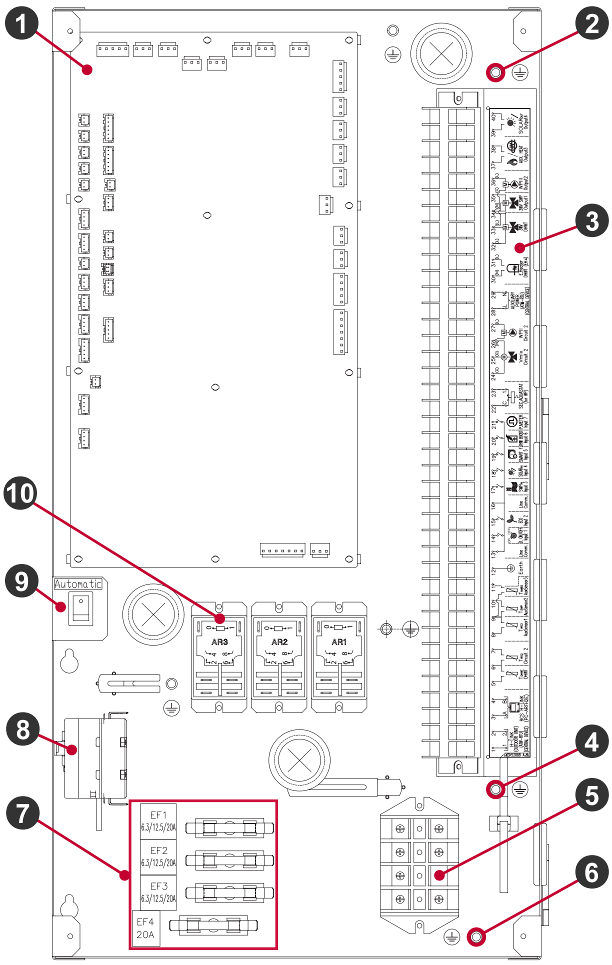
DANGER

- ***Disconnect the airH2O 800H from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***

CAUTION

- *When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid possible failures and damage to electrical components.*
- *To properly disconnect these components from the PCB, see the "8.4 Electrical Wiring Diagrams" section of "Electrical and control settings" chapter of this manual.*
- *Cover the thermistors with the cork tape or pipe insulation according to each location. Both materials are factory supplied. Replace them if damaged during the servicing.*

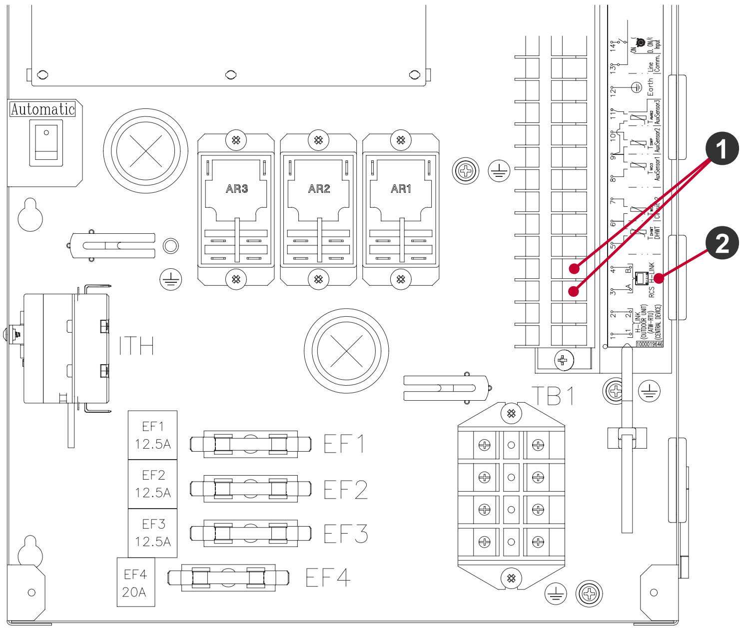
5.4.3.1 Location of components of the electrical box



1. **PCB**
2. **Earth connection**
3. **Terminal board (TB2)**
4. **Earth connection**
5. **Terminal board (TB1)**
6. **Earth connection**
7. **Fuses and Fuse holders**
8. **Thermostat (Reset button)**
9. **Rocker switch**
10. **Relays (AR1~3)**

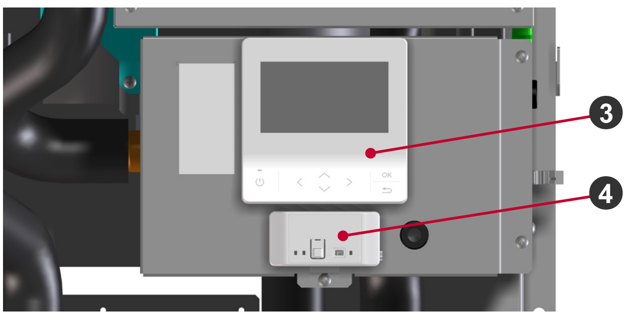
5.4.3.2 Removing the unit controller

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.
3 Disconnect the cables (1) of the unit controller connected to the terminals 3 and 4 (2) of the Terminal Board (TB2):



1 Unit controller cables **2 TB2 terminals 3 and 4**

4 Cut the plastic cord bands attaching the PC-ARFH3E (3) cables.
5 Remove the gateway ATW-IOT-02 (4) as explained in chapter *"5.4.3.3 Removing the gateway Wi-Fi - ATW-IOT-02"*.



3 PC-ARFH3E **4 ATW-IOT-02**

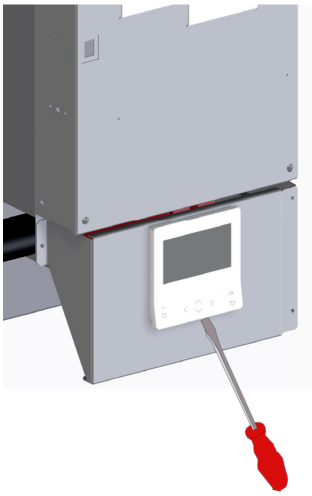
NOTE

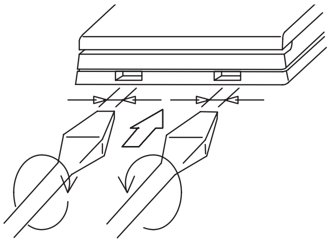
Refer to the Instructions manual of the Gateway Wi-Fi - ATW-IOT-02 for more information regarding the opening and disassembling of the device.

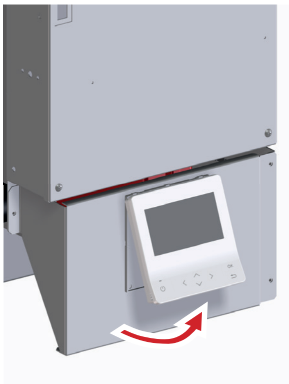
6 Open the unit controller front cover:

NOTE

Refer to the Instructions manual of the PC-ARFH3E unit controller for more information regarding the opening and disassembling of the device.







7 Gently pull the harness backwards.

8 Remove the screws fixing the unit controller base to the unit.

9 Install the new unit controller by following the procedures described above in reverse.

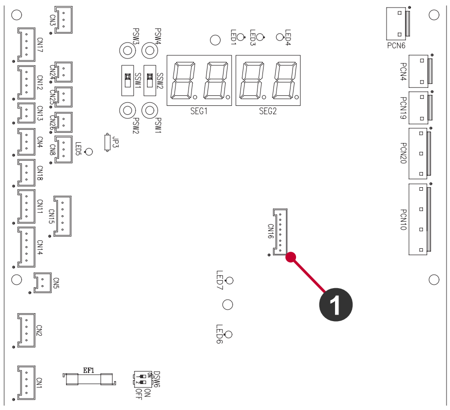
5.4.3.3 Removing the gateway Wi-Fi - ATW-IOT-02

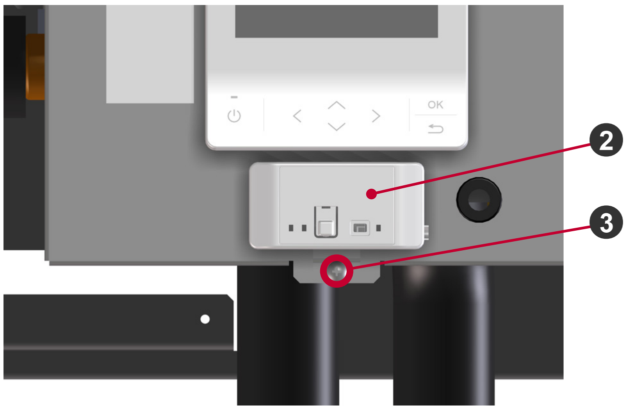
1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*

3 Disconnect the connector of the ATW-IOT-02 connected to the CN16 (1) of the PCB.

4 Remove the screw (3) fixing the ATW-IOT-02 (2) to the unit.



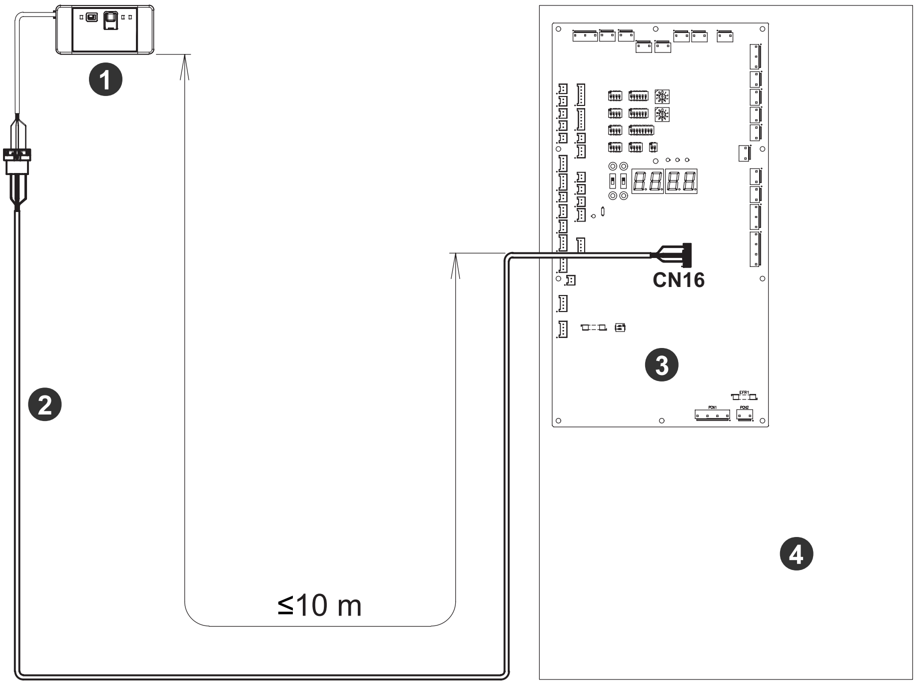


1 CN16 connector **2 ATW-IOT-02** **3 ATW-IOT-02 screw**

5 Install the new ATW-IOT-02 by following the procedures described above in reverse.

Extension cord accessory (ATW-EC-01)

The extension cord is a 10 m accessory cable that allows to install the gateway Wi-Fi (ATW-IOT-02) outside the indoor units (**airH2O 800H**, **airH2O 800H Combi** and Control Box) in case of weak Wi-Fi signal. To install it, simply connect it between the ATW-IOT-02 (1) and the indoor unit PCB (3, at the CN16 connector, where the ATW-IOT-02 was originally connected):



1 Gateway Wi-Fi (ATW-IOT-02)

2 Extension cord accessory (ATW-EC-01)

3 Indoor unit PCB

4 Indoor unit electrical box

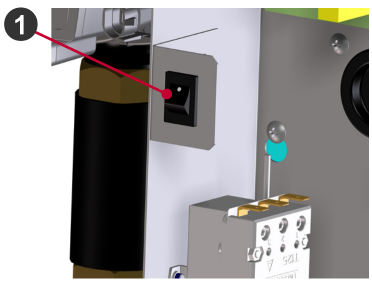
5.4.3.4 Removing the rocker switch

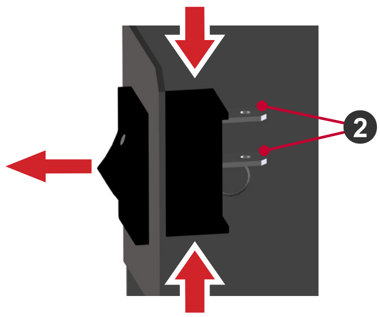
1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.

3 Disconnect the terminals (2) of the rocker switch (1) from the rear side.

4 Press backwards of the switch from the rear side and remove it:





1 Rocker switch

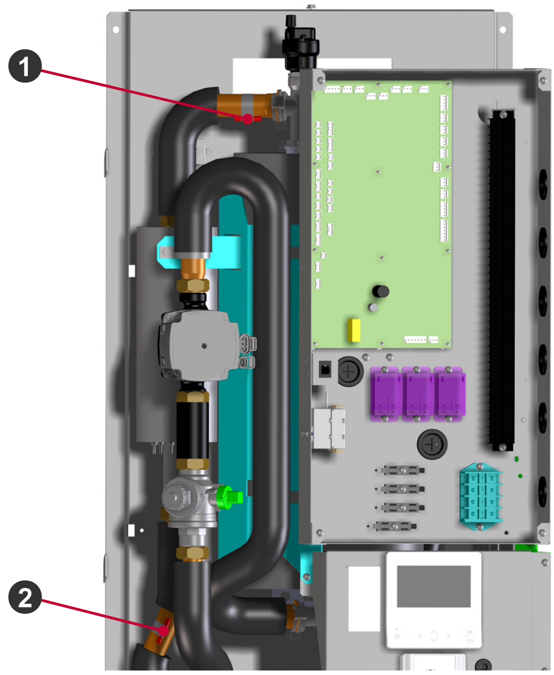
2 Rocker switch terminals

5 Install the new rocker switch by following the procedures described above in reverse.

5.4.3.5 Removing the thermistors - T_{WO}, T_{WOHP}

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.



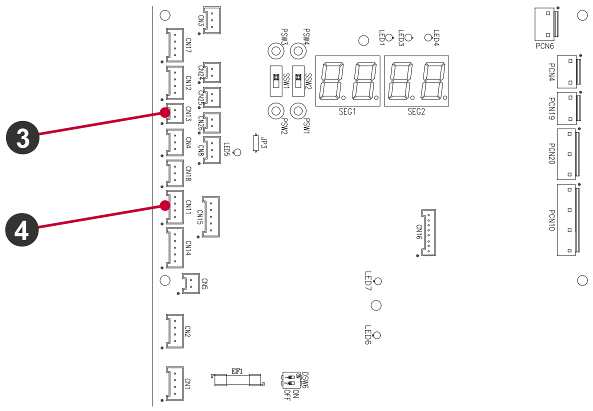
1 **T_{WOHP} (Water outlet pipe thermistor)** **2** **T_{WO} (Water outlet pipe thermistor)**

NOTE

Additional thermistors can be connected to the PCB according to the configuration of the installation. Refer to the wiring diagram to see where they should be connected.

3 Disconnect the thermistor to be replaced from the correct connector of the PCB.

4 Cut and remove the plastic cord band attached to the thermistor harness.



3 **CN13: T_{WO} connector**

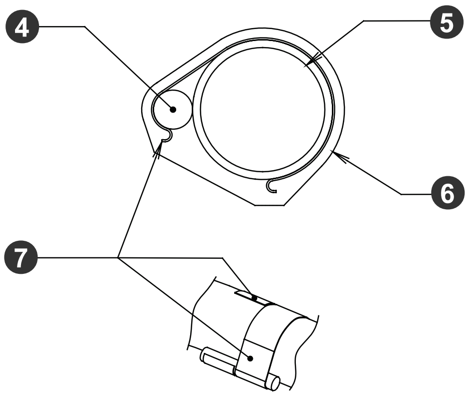
4 **CN11: T_{WOHP} connector**

⚠ **CAUTION**

In case of P-spring deforming, it needs to be replaced.

5 Remove the butyl sheet insulation (6) of the thermistor (4).

6 Remove the P-spring (7) attaching the thermistor to the copper pipe (5):



4 Thermistor	**6 Butyl sheet insulation**
5 Copper pipe	**7 P-spring**

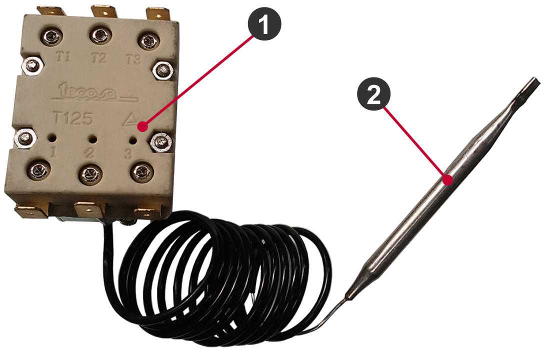
7 Install the new thermistor by following the procedures described above in reverse.

5.4.3.6 Removing the thermostat reset switch

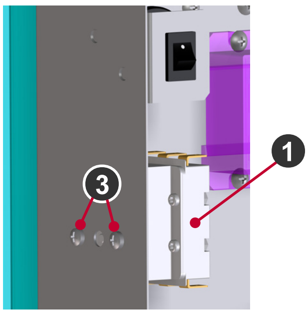
1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.
3 Disconnect all the terminals connected to the thermostat reset switch (1).
4 Remove the thermostat (2) from the electrical heater as explained in chapter *"5.4.2.8 Removing the electrical heater"*.

NOTE

The thermostat of the electrical heater is connected and sealed to the thermostat reset switch.



5 Remove the 2 screws (3) fixing the thermostat reset switch to the electrical box.



1 Thermostat reset switch

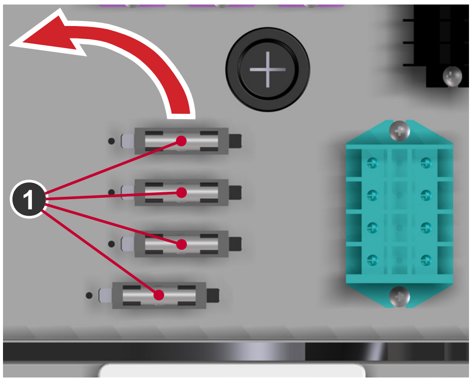
2 Thermostat

3 Thermostat reset switch screws

6 Install the new thermostat reset switch by following the procedures described above in reverse.

5.4.3.7 Removing the fuses - EF1~4

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.
3 Once the broken fuse (1) is detected, pull it from its placement:



1 **Fuses**

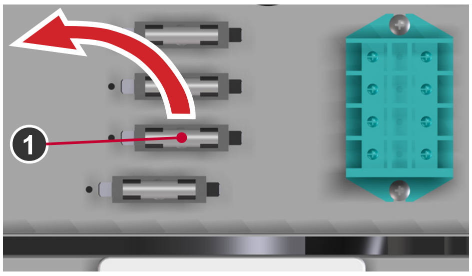
Table of fuses

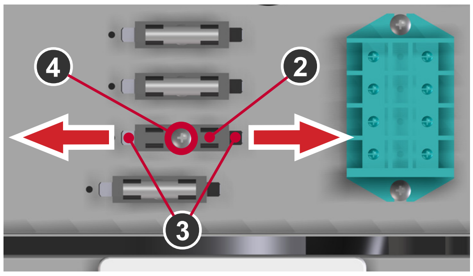
Fuse	Dimensions (Ø x L)(mm)	HWM-W2E(-B)
EF1	6.35 x 31.8	12.5 A
EF2		12.5 A
EF3		12.5 A
EF4		20 A

4 Install the new fuses by following the procedures described above in reverse.

5.4.3.8 Removing the fuse holder

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.
3 Remove the necessary fuse (1) as explained in *"5.4.3.7 Removing the fuses - EF1~4"*.
4 Disconnect the cables from the terminals (3) of the fuse holder (2).
5 Remove the screw (4) fixing the fuse holder and replace it:





1 Fuse

2 Fuse holder

3 Fuse holder terminals

4 Fuse holder screw

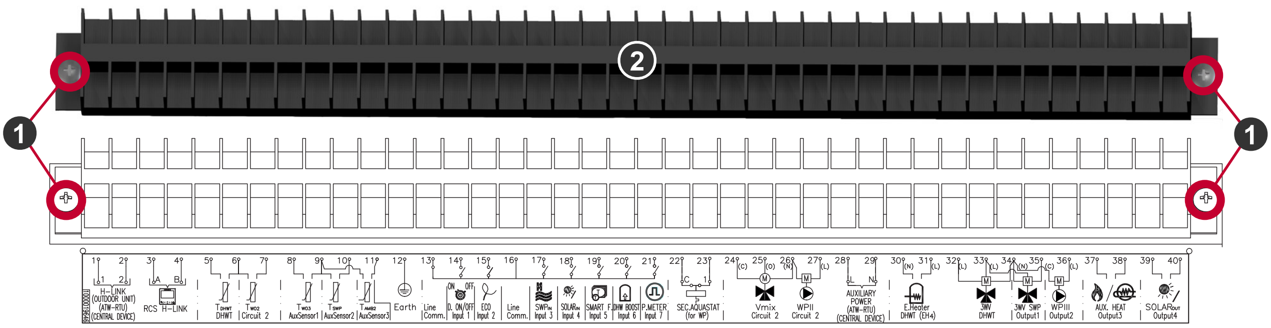
NOTE

Make sure to connect the cables to the terminals of the new fuse holder.

6 Install the new fuse holder by following the procedures described above in reverse.

5.4.3.9 Removing the terminal board - TB2

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.
3 Remove all the cables connected to the terminal board.
4 Remove the 2 screws (1) fixing the terminal board (2) to the electrical box:



1 Terminal board screws

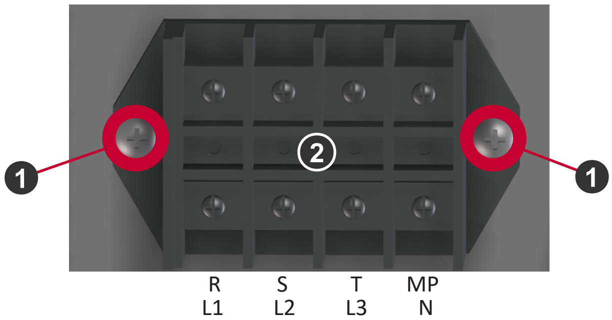
2 Terminal board (TB2)

NOTE

Take note of the connections on the PCB. In particular, special connections, bridges, etc. Check the wiring diagram for any doubt you may have. Any incorrect connection may damage the unit.

5.4.3.10 Removing the terminal board - TB1

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.
3 Remove all the cables connected to the terminal board.
4 Remove the screws (1) fixing the terminal board (2) to the electrical box:



1 Terminal board screws **2 Terminal board (TB1)**

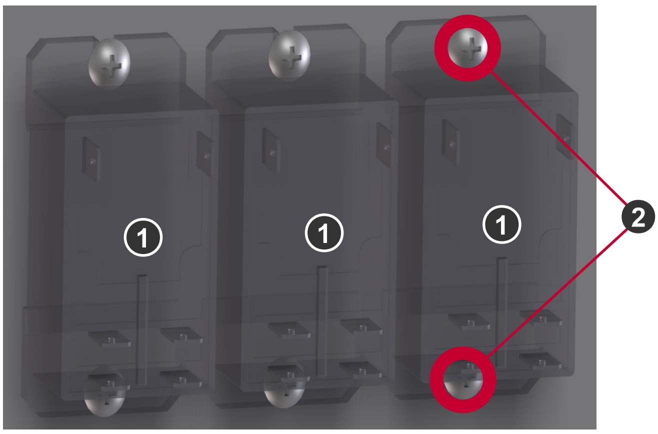
5.4.3.11 Removing the relays - AR1~3

1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.
3 Identify the abnormal relay (1) and disconnect the cables.

NOTE

Take note of the connections on the relays. Check the wiring diagram for any doubt. Any incorrect connection may damage the unit.

4 Remove the screws (2) attaching the relay to the electrical box:



1 Relays **2 Relay screws**

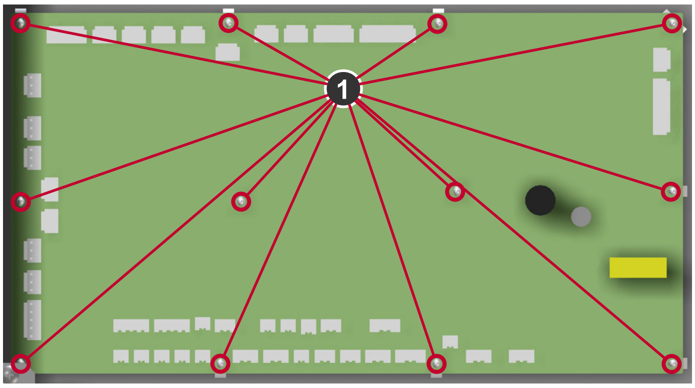
5.4.3.12 Removing the PCB

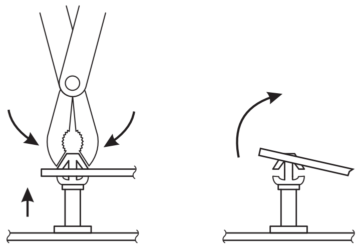
1 Remove the service cover as explained in chapter *"5.4.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in chapter *"5.4.1.2 Opening the electrical box cover"*.

3 Remove all the connectors connected to the PCB.

4 Remove the plastic holders (1) that fix the PCB to the electrical box:





1 Plastic holders

5.5 Indoor units - Hydrosplit system airH2O 800H Combi - HWD-W2E-220S(-K)

DANGER

- ***Disconnect the units from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Wait minimum 10 minutes or more from all power supplies have been turned OFF.***
- ***In case of replacing hydraulic parts, drain water from the unit if needed. Close shutdown valves and open the drain valves.***

CAUTION

- *When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid possible failures and damage to electrical components.*
- *In case of blocked or stacked parts, use appropriated tools and eventually lubricants to release them.*
- *In case of sharped edged parts, as covers, use security gloves to avoid getting injured.*
- *Pay attention of no falling off the service cover.*
- *Take care when removing service cover; the parts inside the unit could be hot.*

5.5.1 Structural components

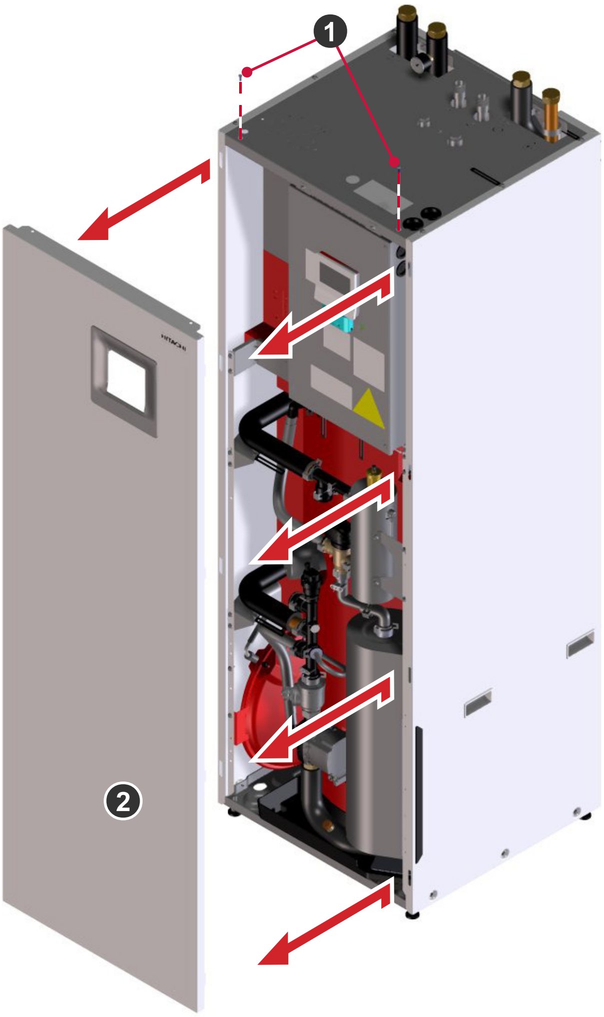
5.5.1.1 Removing the service cover

NOTE

For most operations inside the indoor unit, the removal of the cover is necessary. It's important to note that the back, left, and right covers do not need to be removed.

1 Remove the 2 screws (1) securing the service cover (2).

2 Slide the service cover slightly upwards and carefully remove it by pulling it backwards:



1 **Service cover screws** 2 **Service cover**

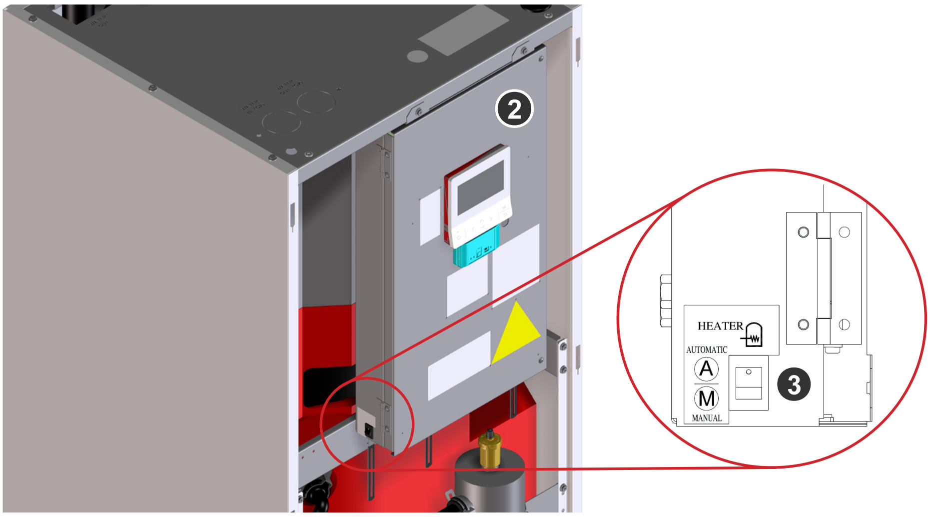
CAUTION

- *Ensure the service cover does not accidentally fall off.*
- *Exercise caution when removing the service cover as components inside the unit may be hot.*

5.5.1.2 Opening the electrical box cover

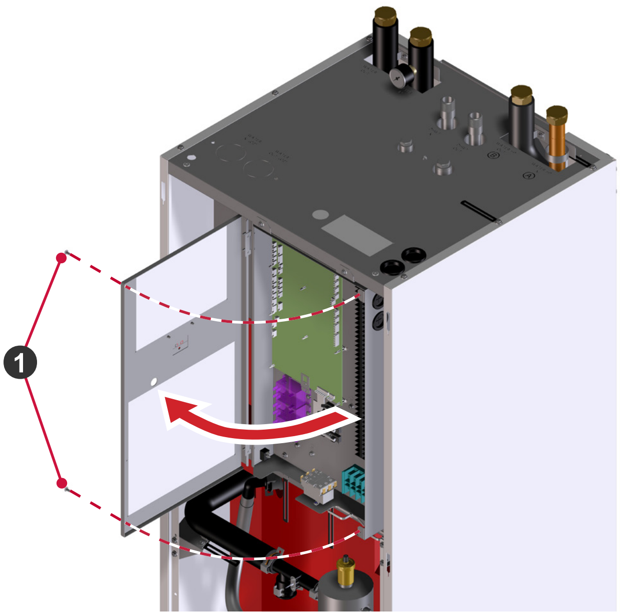
⚠ **DANGER**

- ***Disconnect the unit from the power supply before touching any of the parts in order to avoid an electrical shock.***
- ***Do not touch the switch for DHW tank heater operation (3) when handling the electrical box. Keep the switch in the factory setting position ("Automatic" operation).***



1 Remove the service cover as explained in "5.5.1.1 Removing the service cover".

2 Unscrew the 2 front screws (1) of the electrical box cover (2) and carefully remove it:



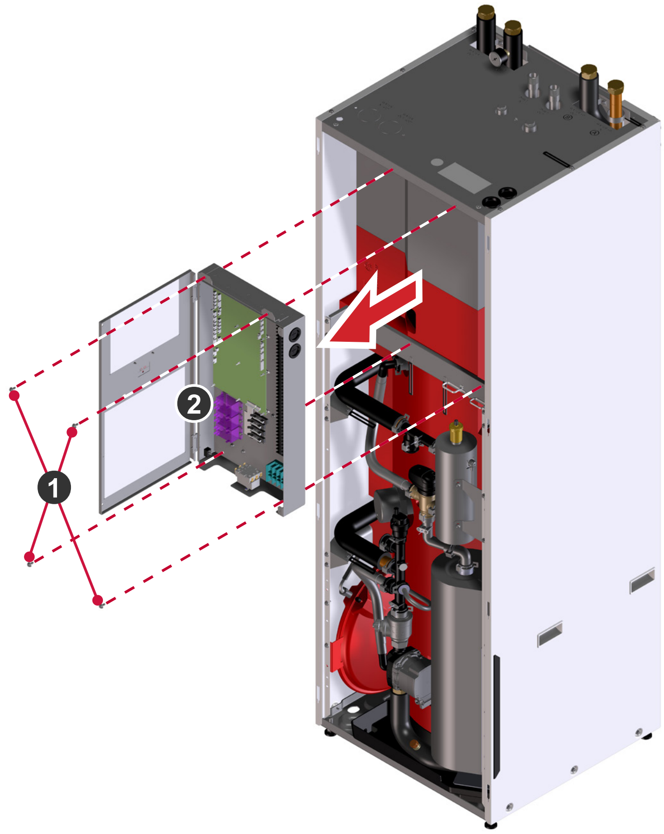
1 Electrical box cover screws

2 Electrical box cover

3 DHW tank heater operation switch

5.5.1.3 Removing the electrical box

1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.
2 Remove the electrical box cover as explained in *"5.5.1.2 Opening the electrical box cover"*.
3 Carefully loosen the 4 screws (1) that secure the electrical box (2) in place.
4 Gently pull the electrical box backwards, away from its original position. Ensure that it is free from any obstructions:



1 **Electrical box screws**

2 **Electrical box**

5.5.2 Water cycle components

5.5.2.1 Access to the hydraulic parts

1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.

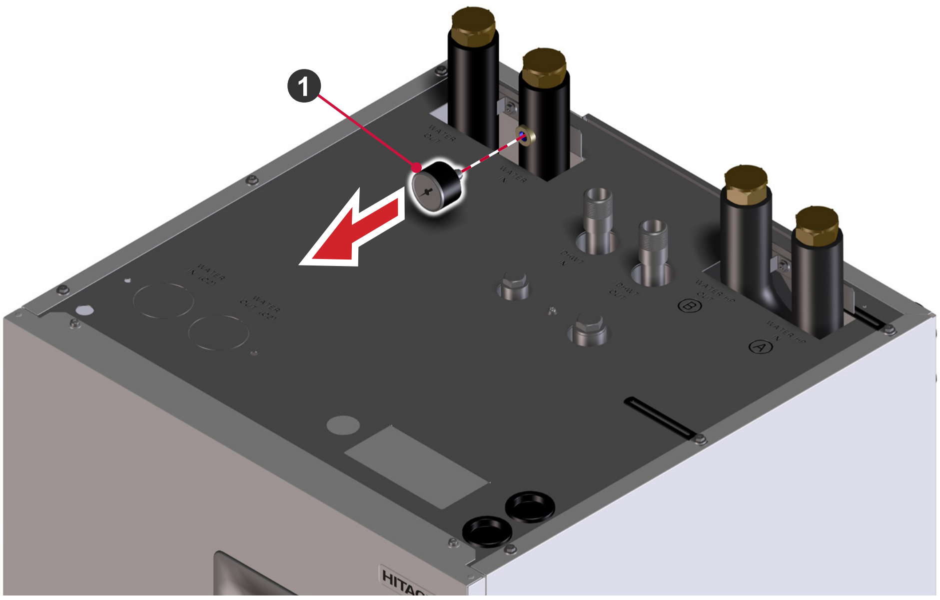
2 Opening the electrical box cover as explained in *"5.5.1.2 Opening the electrical box cover"*

3 Occasionally, remove the electrical box as explained in *"5.5.1.3 Removing the electrical box"*.

5.5.2.2 Removing the manometer

1 Begin by draining the indoor unit as detailed in the section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

2 Unscrew the manometer (1) from its pipe to detach it from its position.



1 Manometer

3 Replace the manometer with a new one.

NOTE

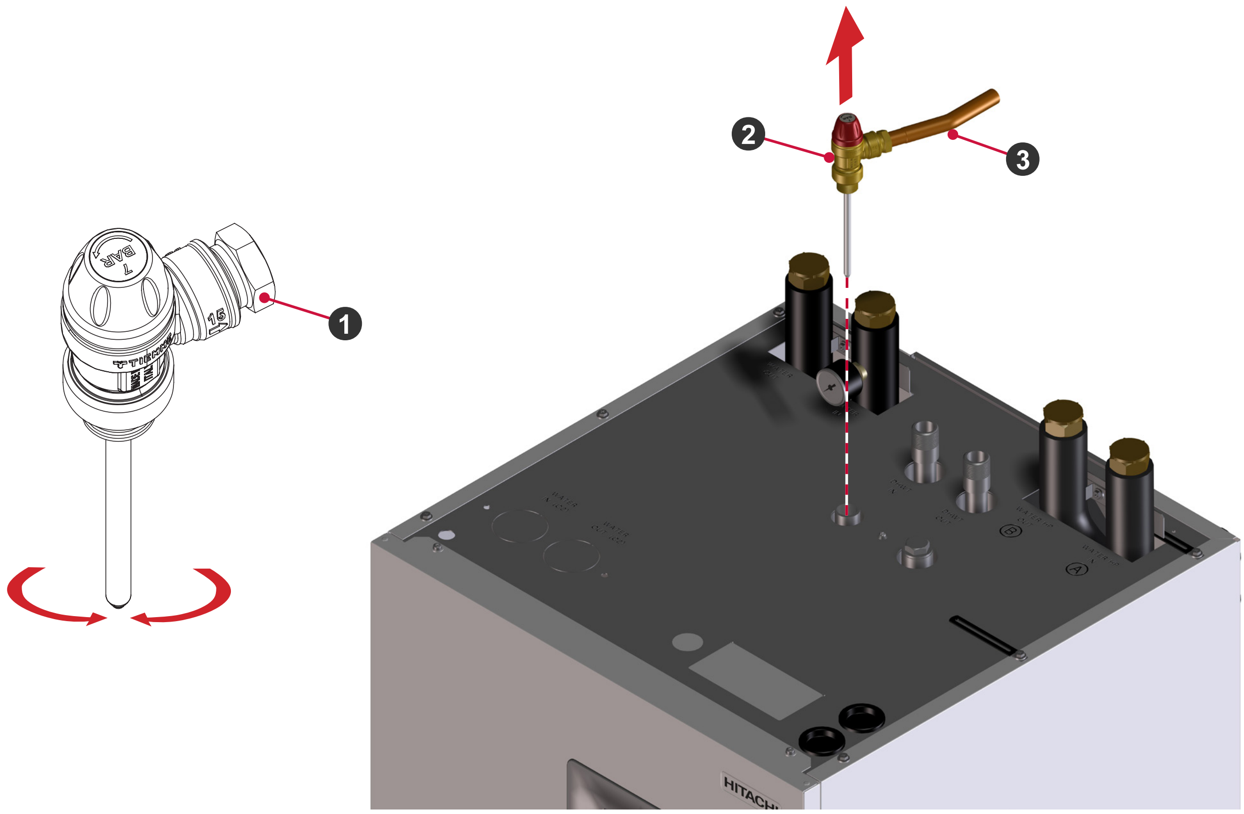
- *During reassembly, follow the reverse sequence of disassembling.*
- *Apply teflon tape on the thread before screwing the manometer back to prevent any leakage.*

5.5.2.3 Removing the pressure and temperature relief valve (only models for UK market)

1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.

2 Loosen the nut (1) of the discharge pipe (3).

3 Unscrew the pressure and temperature relief valve (2):



1 **Discharge pipe nut**

2 **Pressure and temperature relief valve**

3 **Discharge pipe**

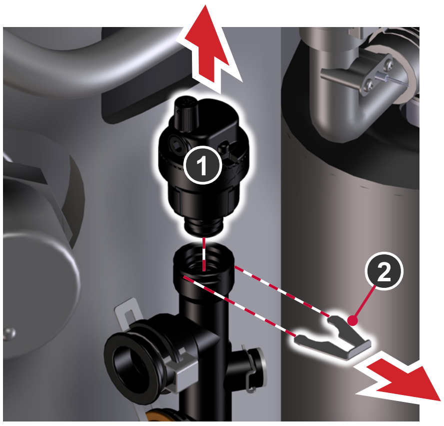
Technical features

Maximum temperature	120 °C
Minimum temperature	-5 °C
Operating temperature	96 °C
Maximum pressure	10 bar
Operating pressure	7 bar
Maximum open pressure	20 %
Minimum closing differential	20 %

5.5.2.4 Removing the air purger

1 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

2 Pull the locking clip (2) to release and remove the existing air purger (1):



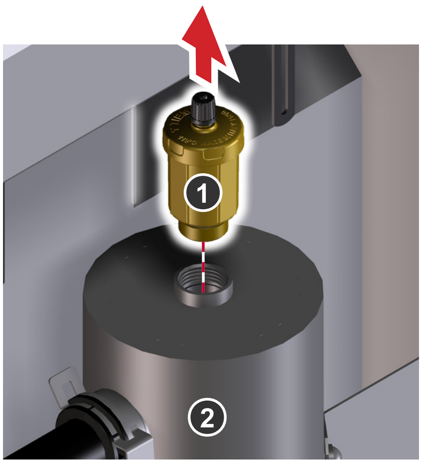
1 **Air purger** 2 **Locking clip**

3 Insert the new air purger by following the procedures described above in reverse.

5.5.2.5 Removing the air purger of the electrical heater

1 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

2 Unscrew the air purger (1) from the electrical heater (2):



1 **Air purger** 2 **Electrical heater**

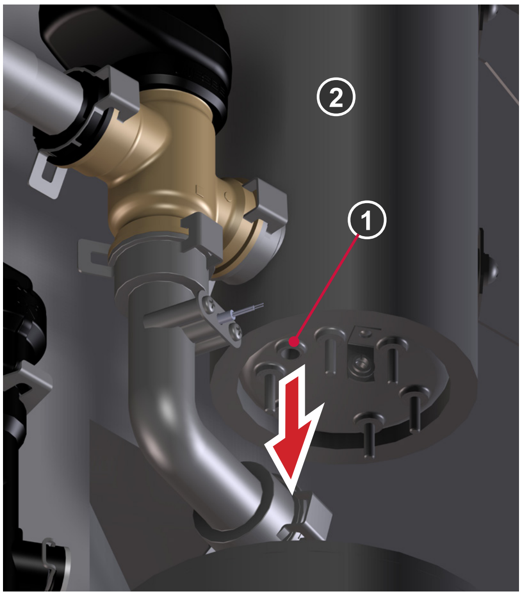
3 Insert the new air purger by following the procedures described above in reverse.

5.5.2.6 Removing the electrical heater

1 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

2 Cut the plastic cord band of the ITH1 thermostat, located at the head of connectors of the electrical heater.

3 Softly pull the thermistor (1) downwards and remove it from the electrical heater (2):



1 **ITH1 thermostat**

2 **Electrical heater**

NOTE

Handle the thermistor with special care and place it in a location where it cannot be damaged.

CAUTION

Do not unscrew, remove, or manipulate the terminals at the head of the electrical heater.
Disconnect the electrical heater following the procedure outlined in the electrical box.

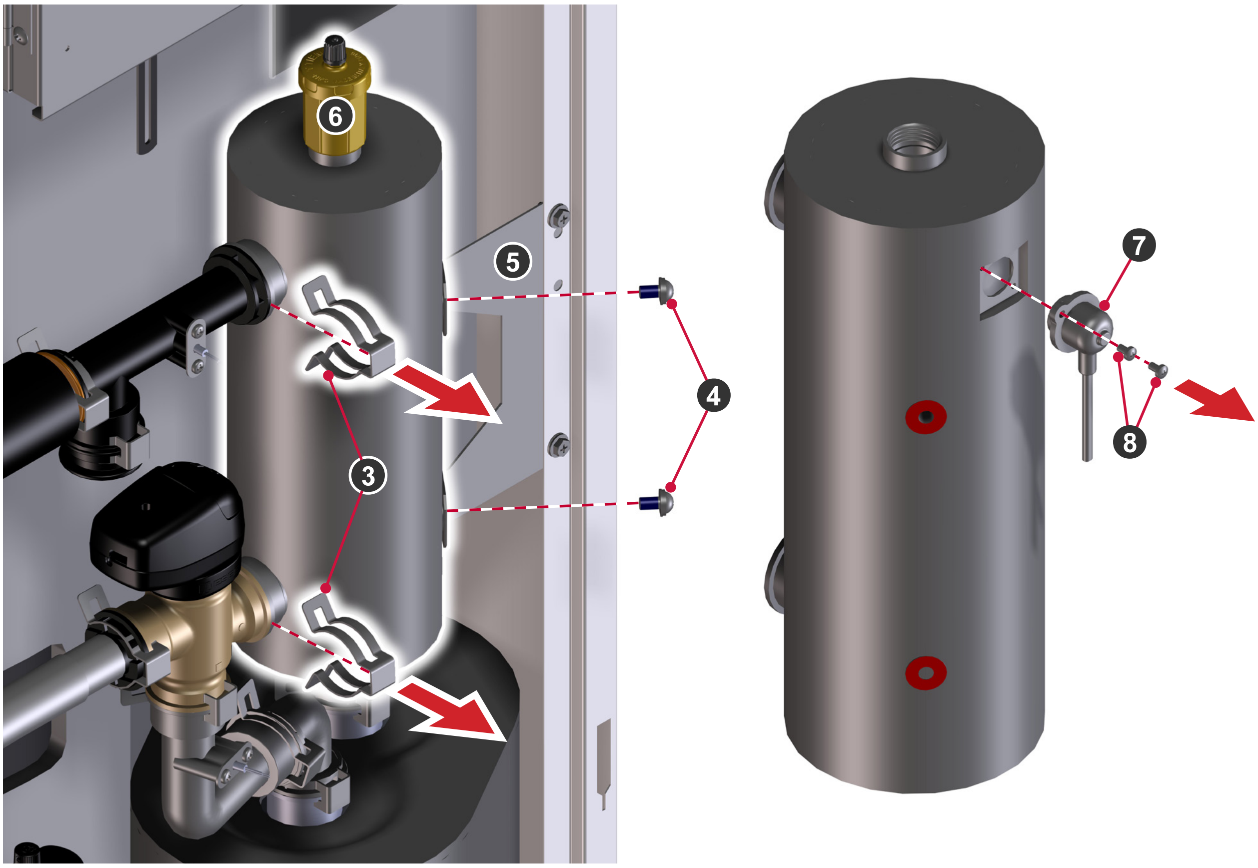
4 Cut the plastic cord bands attached to the harness of the electrical heater.

5 Remove the electrical heater cables from the CN33 connector and the earth cable, located inside the electrical box

6 Pull the harness, following its way to the electrical heater.

7 Remove the water outlet thermistor (THM_{WO}) as explained in *"5.5.3.5 Removing the thermistors - TWO, TWI, TWOHP, TDHW1, TDHW2"*.

8 Remove the 2 clamps (3), at the outlet port of the electrical heater and at the 3 way valve connection:



3 Clamps

4 Support screws

5 Fixing support

6 Electrical heater air purger

7 Klixon screws

8 Klixon

9 Remove the air purger (6) as explained in *"5.5.2.5 Removing the air purger of the electrical heater"*.

10 Loose the 2 screws (4) of the fixing support (5) of the electrical heater to take it out.

11 Remove the electrical heater.

12 Unscrew the 2 screws (7) to remove the klixon (8) from the electrical heater.

⚠ **CAUTION**

Take special care when manipulating the electrical heater as it can be extremely hot.

5.5.2.7 Resetting the electrical heater klixon and oil bulb thermostat

airH2O 800 back-up electric heater is protected by 2 different devices with different purposes:

- Oil bulb thermostat: When water temperature becomes too high cuts power supply to the heater elements.
- Surface klixon: If the heater is operated without water the shell may be heated too fast. The klixon will open contact to the alarm detection.

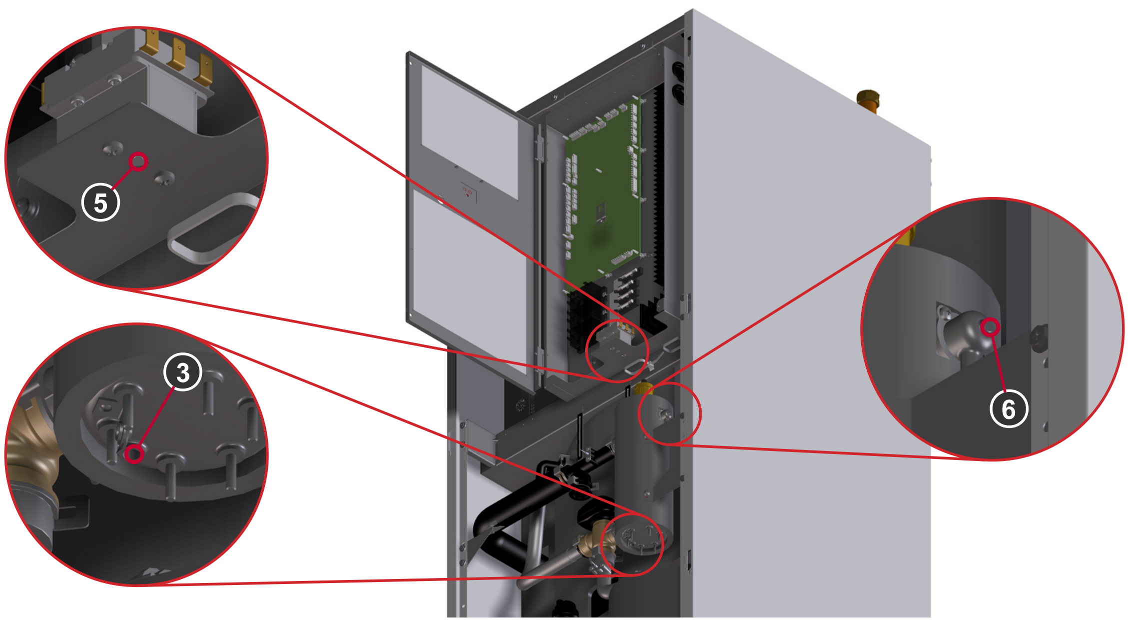
❶ **Thermostat**

❷ **Capillary pipe**

❸ **Oil bulb**

❹ **Surface klixon**

◆ **Position**

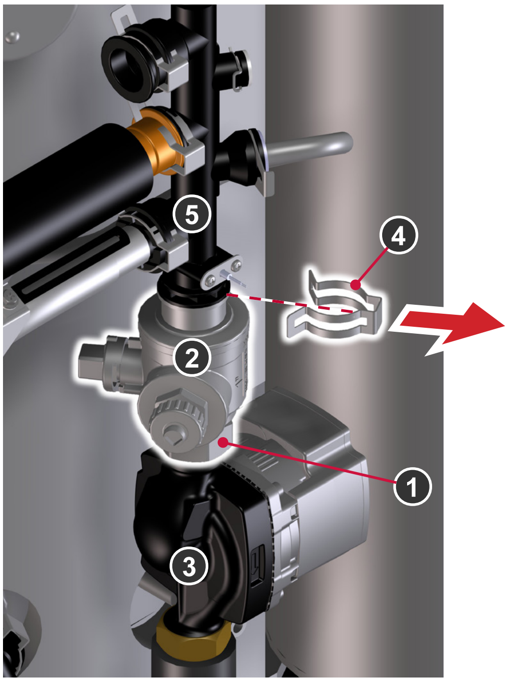


❺ **Thermostat reset button**

❻ **Klixon reset button**

5.5.2.8 Removing the filter plus ball valve

1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.
2 Drain the indoor unit as explained in *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.
3 Loosen the nut (1) connecting the filter plus ball valve (2) with the water pump (3).
4 Remove the clamp (4) connecting the filter plus ball valve with the upper piping (5):



1 **Nut**

2 **Filter plus ball valve**

3 **Water pump**

4 **Clamp**

5 **Upper piping**

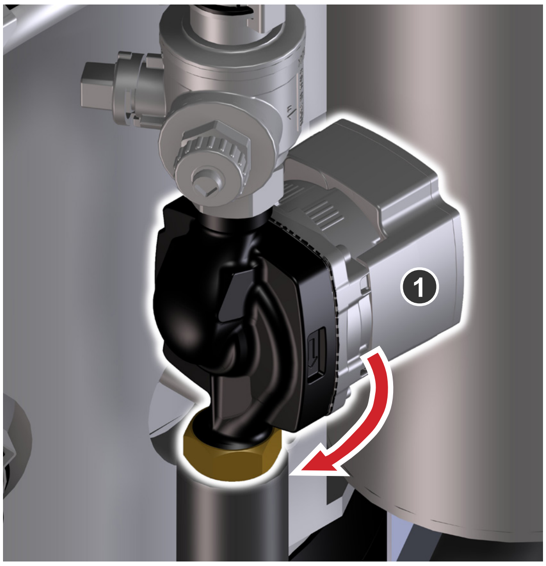
5 Remove the filter plus ball valve.

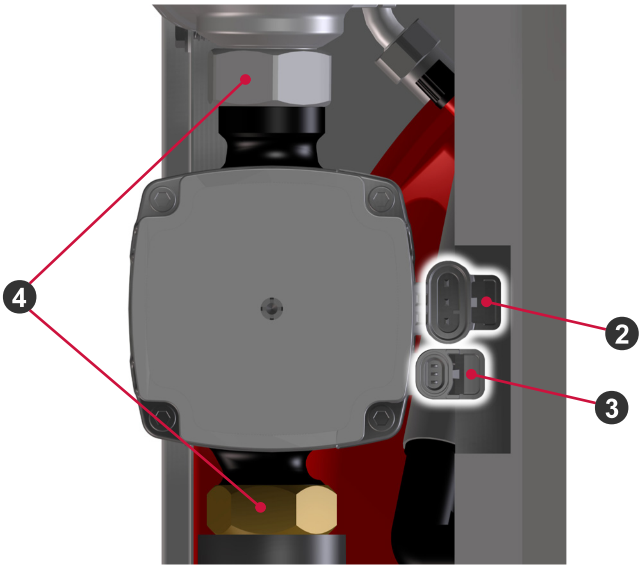
NOTE

For further information about the filter plus ball valve, refer to "7 Filter plus ball valve" of "Maintenance" chapter.

5.5.2.9 Removing the water pump

1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.
2 Drain the indoor unit as explained in the section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.
3 Turn the water pump (1) to the left to achieve better access to the cables. If necessary, loosen the nuts first:





1 Water pump

2 Power supply connector

3 Signal connector

4 Nuts

4 Remove the power supply connector (2) of the water pump and the signal transmission cable (3):
5 Loosen the 2 nuts (4) securing the water pump:
6 Remove the water pump.

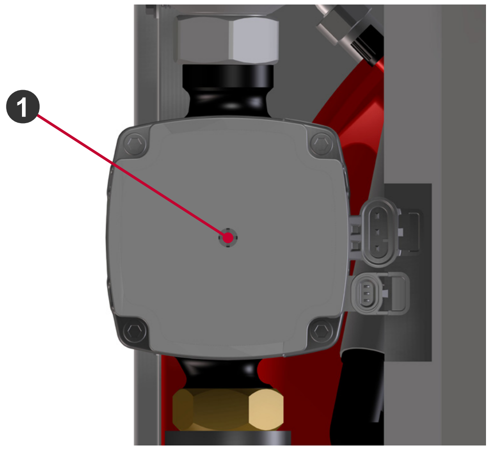
NOTE

- *During reassembly, ensure the correct position of the water pump.*
- *Be cautious not to lose the gaskets of the water pump.*
- *Check the gaskets; if damaged, replace them with new ones.*

◆ Deblocking device of the water pump

The deblocking device (1) consists of an axial moving plunger tightened by an O-ring and pulled back by a spring inside a stainless steel housing that is welded to the rotor can.

By pushing and turning a screw driver, Phillips number 2, the plunger pushes the shaft in axial direction into the pump,while it can be turned as well. The force is high enough to deblock pumps which are seized by lime e.g. if an appliance is stored for months after being wet tested. Before, during and after the deblocking, the device is tight and must not release any water



1 **Deblocking device**

⚠ **CAUTION**

Be aware of splashing hot water.

5.5.2.10 Removing the 3 way valve

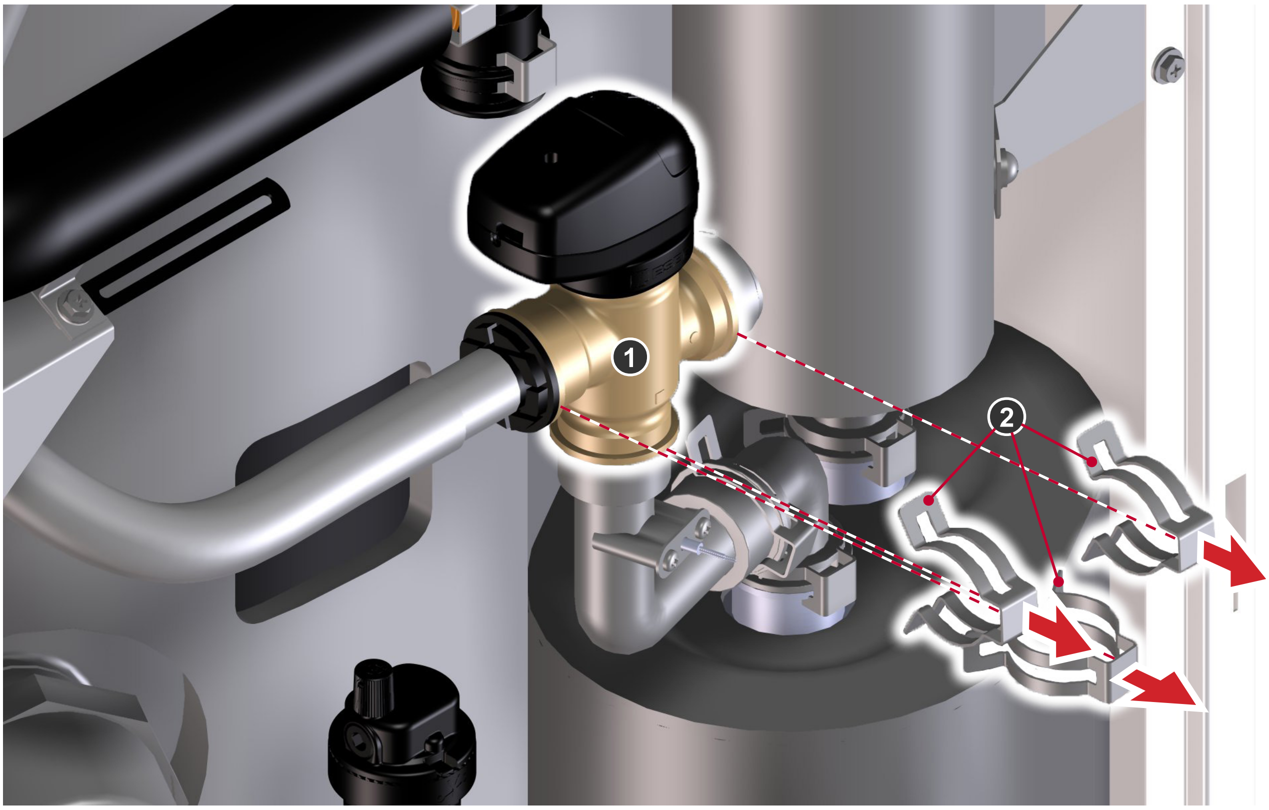
1 Remove the service cover an explained in *"5.5.1.1 Removing the service cover"*.

2 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

3 Disconnect the cables of the 3 way valve (1) from the electrical box.

4 Remove the clamps (2) connecting the 3 way valve to the pipes.

5 Once the cables and clamps are removed, take out the 3 way valve:



1 3 way valve **2 Clamps**

NOTE

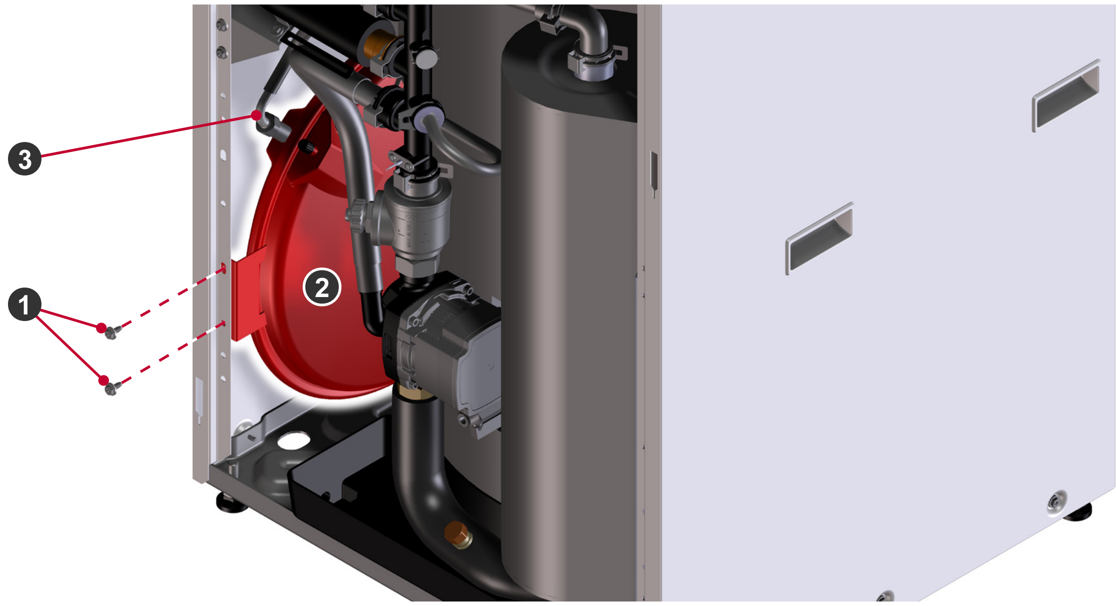
- *During reassembly, ensure the correct position of the 3 way valve.*
- *Be cautious not to lose the gaskets of the 3 way valve.*
- *Check the gaskets; if damaged, replace them with new ones.*

5.5.2.11 Removing the expansion vessel

1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.

2 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

3 Unscrew and remove the 2 screws (1) that fix the expansion vessel (2) to the unit.



1 Screws **2 Expansion vessel** **3 Flexible pipe**

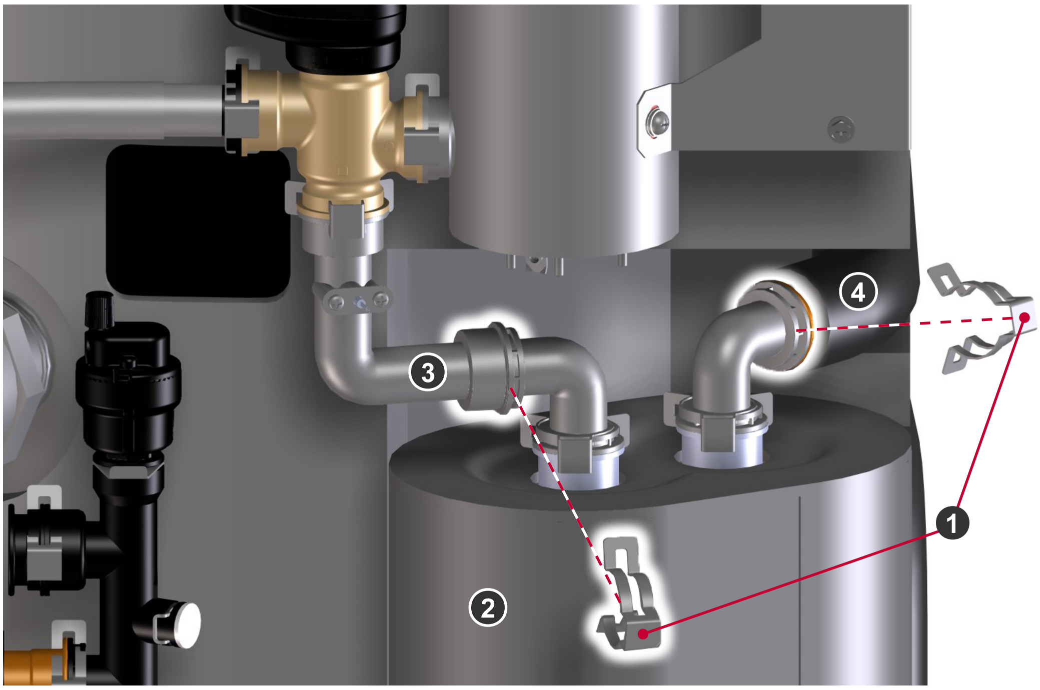
4 Once the expansion vessel is disassembled from its position, proceed to removing the flexible pipe (3).

5.5.2.12 Removing the hydraulic separator

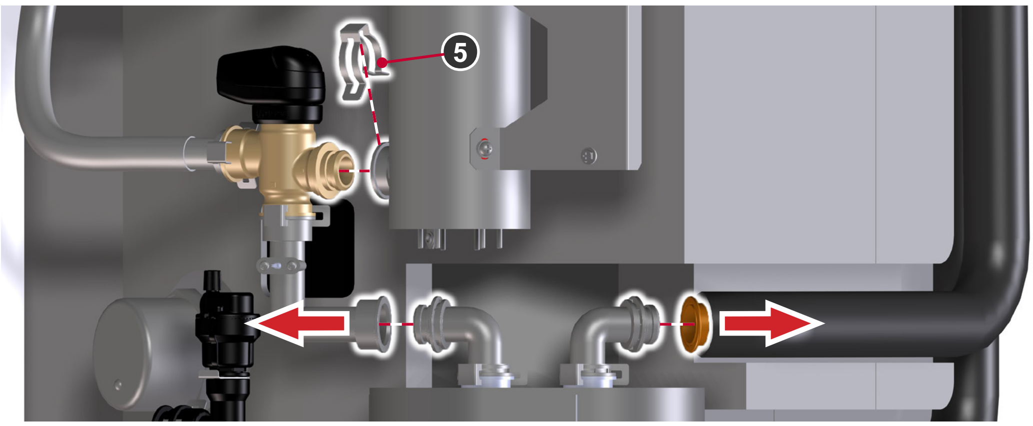
1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.

2 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.

3 Remove the clamps (1) connecting the hydraulic separator (2) upper connections to the 3 way valve pipe (3) and the water inlet pipe (4):



4 Separate these 2 pipes form the hydraulic separator. If needed, remove the clamp (5) that fixes the 3 way valve to the electrical heater :



1 Clamps

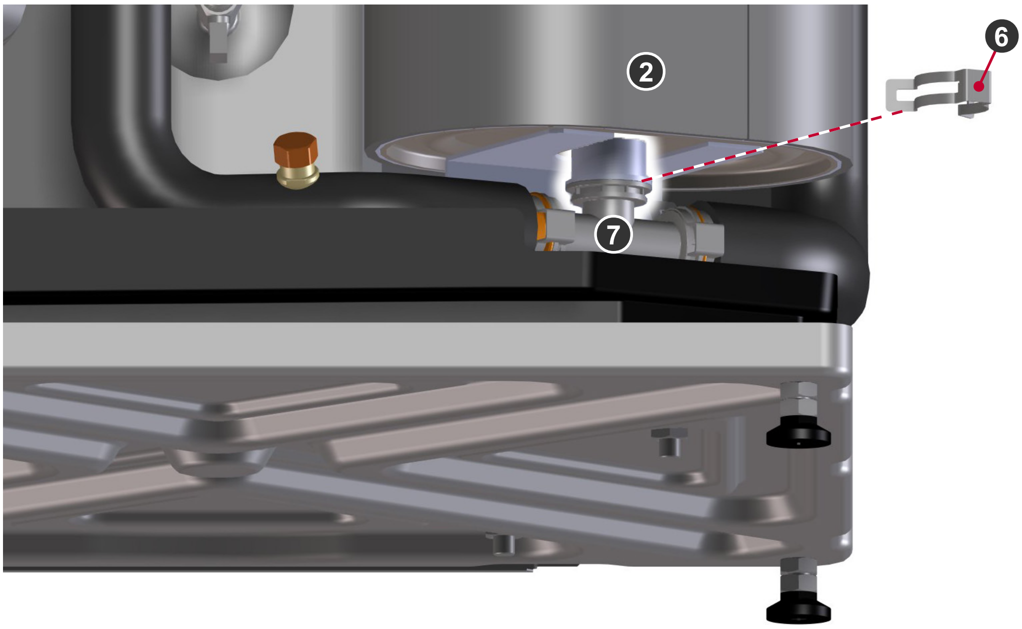
2 Hydraulic separator

3 3 way valve pipe

4 Water inlet pipe

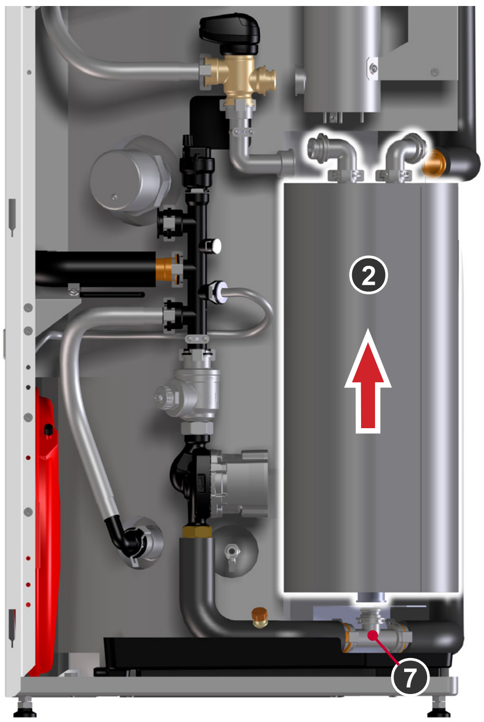
5 3 way valve-heater clamp

5 Remove the lower clamp (6) connecting the hydraulic separator to the T-shaped outlet pipe connection (7):



6 **Lower clamp** 7 **T-shaped outlet pipe connection**

6 Remove the hydraulic separator by pulling it up, separating it from the connection (7):



NOTE

- *The right side cover is hidden in the pictures for illustrative purposes.*
- *If needed, remove the L-shaped pipe connections on top of the hydraulic separator.*

5.5.3 Electrical components

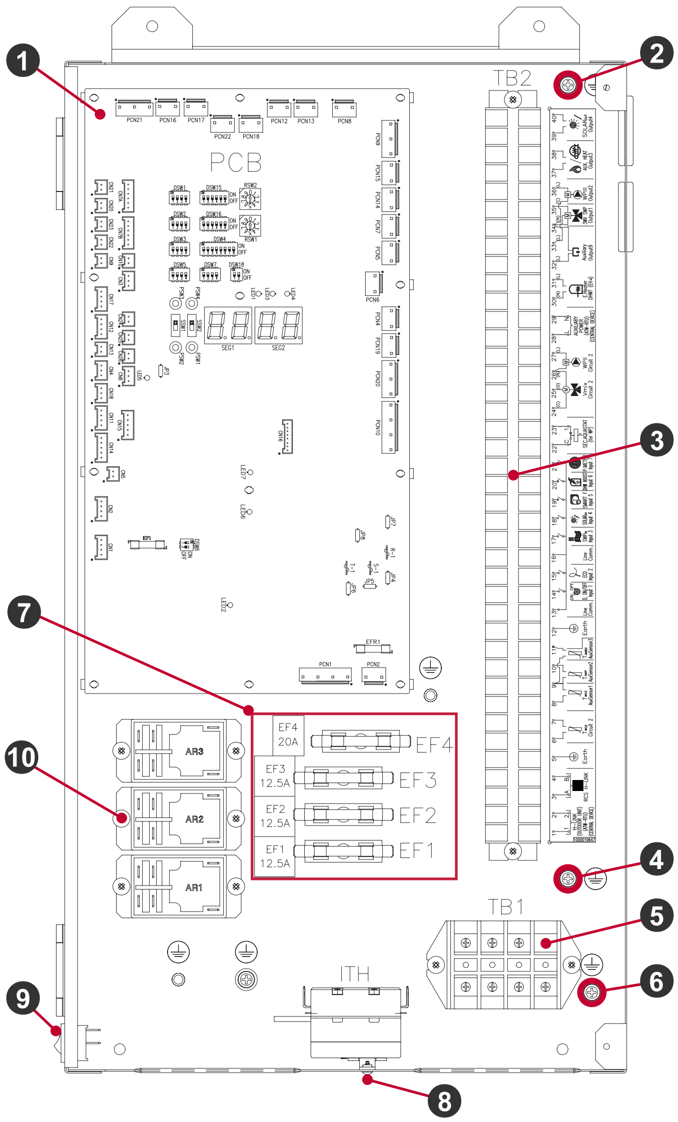
⚠ **DANGER**

- ***Disconnect the airH2O 800 from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***

⚠ **CAUTION**

- *When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid possible failures and damage to electrical components.*
- *To properly disconnect these components from the PCB, see the "8.4 Electrical Wiring Diagrams" in "Electrical and control settings" chapter of this manual.*
- *Cover the thermistors with the cork tape or pipe insulation according to each location. Both materials are factory supplied. Replace them if damaged during the servicing.*

5.5.3.1 Location of components of the electrical box



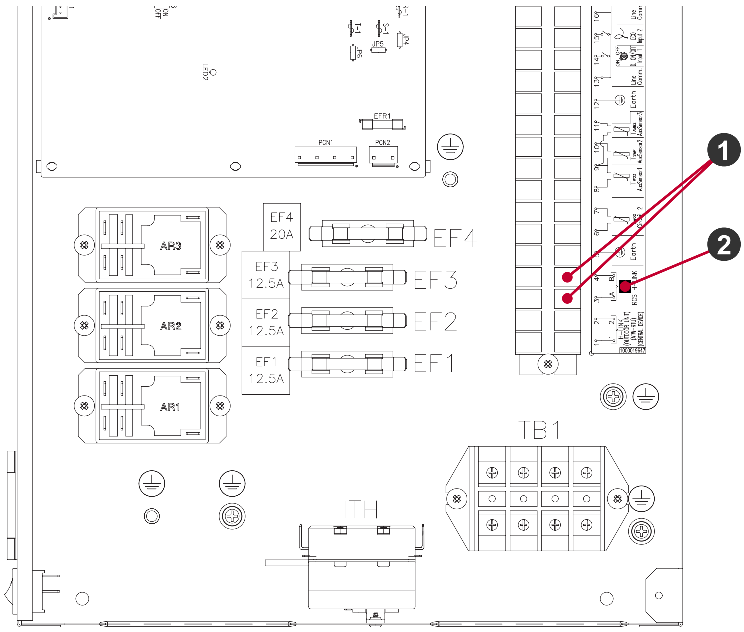
1. PCB
2. Earth connection
3. Terminal board (TB2)
4. Earth connection
5. Terminal board (TB1)
6. Earth connection
7. Fuses and Fuse holders
8. Thermostat (Reset button)
9. Rocker switch
10. Relays (AR1~3)

5.5.3.2 Removing the unit controller

1 Remove the service cover following the instructions in *"5.5.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in *"5.5.1.2 Opening the electrical box cover"*.

3 Disconnect the cables (1) of the unit controller connected to the terminals 3 and 4 (2) of the Terminal Board (TB2):

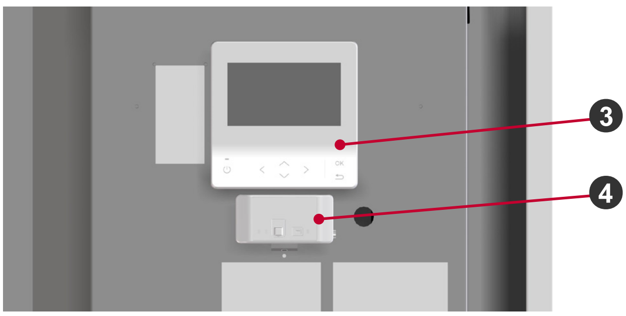


1 Unit controller cables

2 TB2 terminals 3 and 4

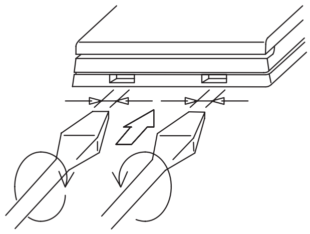
4 Cut the plastic cord bands attaching the PC-ARFH3E (3) cables.

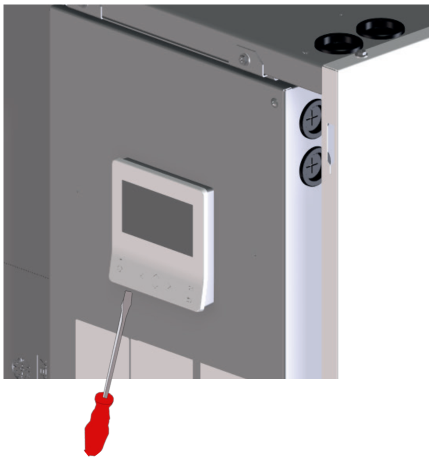
5 Remove the gateway ATW-IOT-02 (4) as explained in chapter *"5.5.3.3 Removing the gateway Wi-Fi - ATW-IOT-02"*.



3 PC-ARFH3E

4 ATW-IOT-02

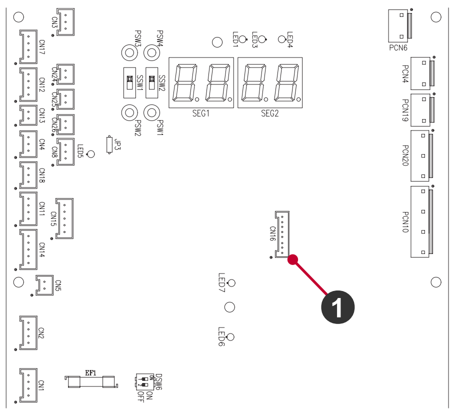


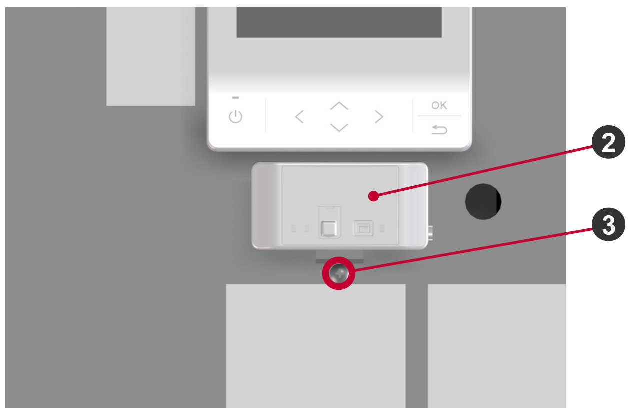


6 Gently pull the harness backwards.
7 Remove the screws fixing the unit controller base to the unit.
8 Install the new unit controller by following the procedures described above in reverse.

5.5.3.3 Removing the gateway Wi-Fi - ATW-IOT-02

1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*
3 Disconnect the connector of the ATW-IOT-02 connected to the CN16 (1) of the PCB.
4 Remove the screw (3) fixing the ATW-IOT-02 (2) to the unit.



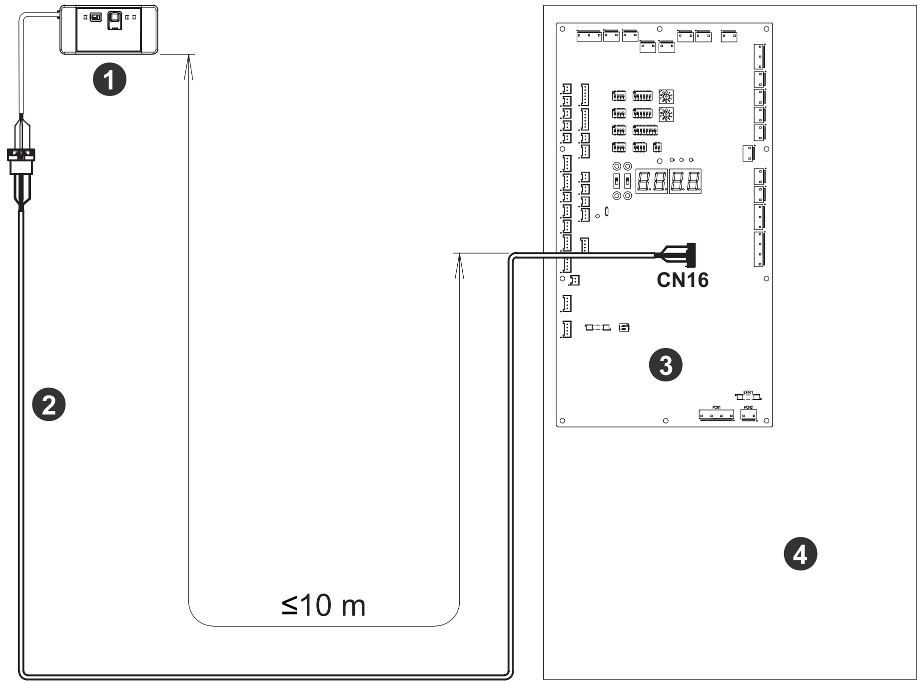


1 CN16 connector **2 ATW-IOT-02** **3 ATW-IOT-02 screw**

5 Install the new ATW-IOT-02 by following the procedures described above in reverse.

Extension cord accessory (ATW-EC-01)

The extension cord is a 10 m accessory cable that allows to install the gateway Wi-Fi (ATW-IOT-02) outside the indoor units (**airH2O 800H**, **airH2O 800H Combi** and Control Box) in case of weak Wi-Fi signal. To install it, simply connect it between the ATW-IOT-02 (1) and the indoor unit PCB (3, at the CN16 connector, where the ATW-IOT-02 was originally connected):



1 **Gateway Wi-Fi (ATW-IOT-02)**

2 **Extension cord accessory (ATW-EC-01)**

3 **Indoor unit PCB**

4 **Indoor unit electrical box**

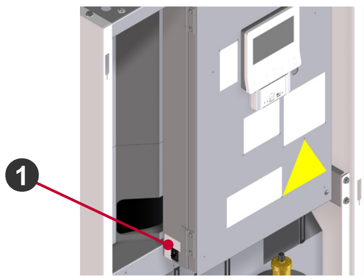
5.5.3.4 Removing the rocker switch

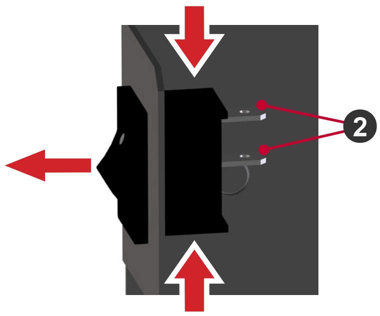
1 Remove the service cover following the instructions in *"5.5.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in *"5.5.1.2 Opening the electrical box cover"*.

3 Disconnect the terminals (2) of the rocker switch (1) from the rear side.

4 Press backwards of the switch from the rear side and remove it:





1 **Rocker switch**

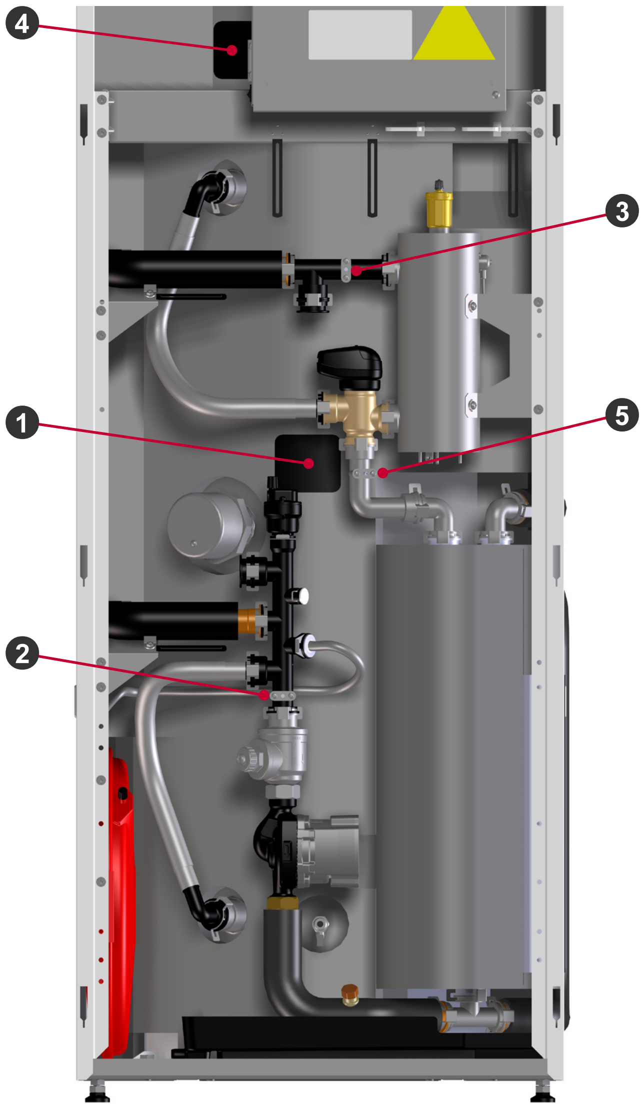
2 **Rocker switch terminals**

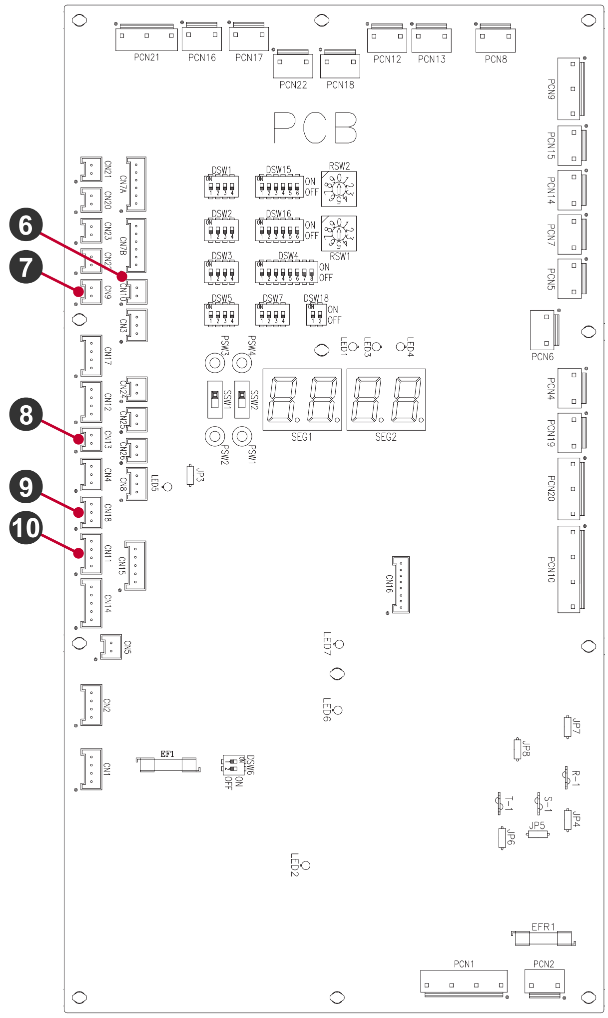
5 Install the new rocker switch by following the procedures described above in reverse.

5.5.3.5 Removing the thermistors - T_{WO}, T_{WI}, T_{WOHP}, T_{DHW1}, T_{DHW2}

1 Remove the service cover as explained in *"5.5.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in *"5.5.1.2 Opening the electrical box cover"*.





1. T_{DHW1} **(DHW tank thermistor)**
2. T_{WI} **(Water Inlet pipe thermistor)**
3. T_{WO} **(Water Outlet pipe thermistor)**
4. T_{DHW2} **(DHW tank thermistor)**
5. T_{WOHP} **(Water Outlet HP pipe thermistor)**
6. **CN10:** T_{DHW1} **connector**
7. **CN09:** T_{WI} **connector**
8. **CN13:** T_{WO} **connector**
9. **CN18:** T_{DHW2} **connector**
10. **CN11:** T_{WOHP} **connector**

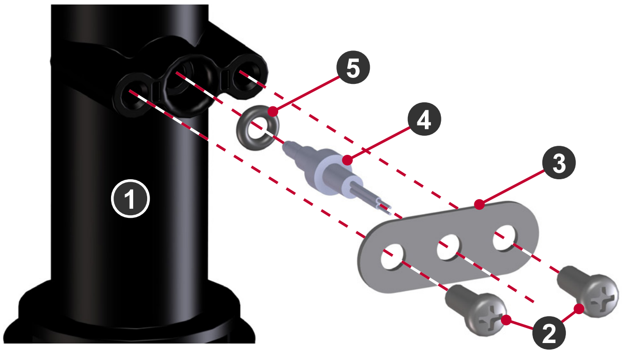
NOTE

Additional thermistors can be connected to the PCB according to the configuration of the installation. Refer to the wiring diagram to see where they should be connected.

3 Disconnect the thermistor to be replaced from the correct connector of the PCB.
4 Cut and remove the plastic cord band attached to the thermistor harness.

Detailed figure of the T_{WI}, T_{WO} and T_{WOHP} thermistors

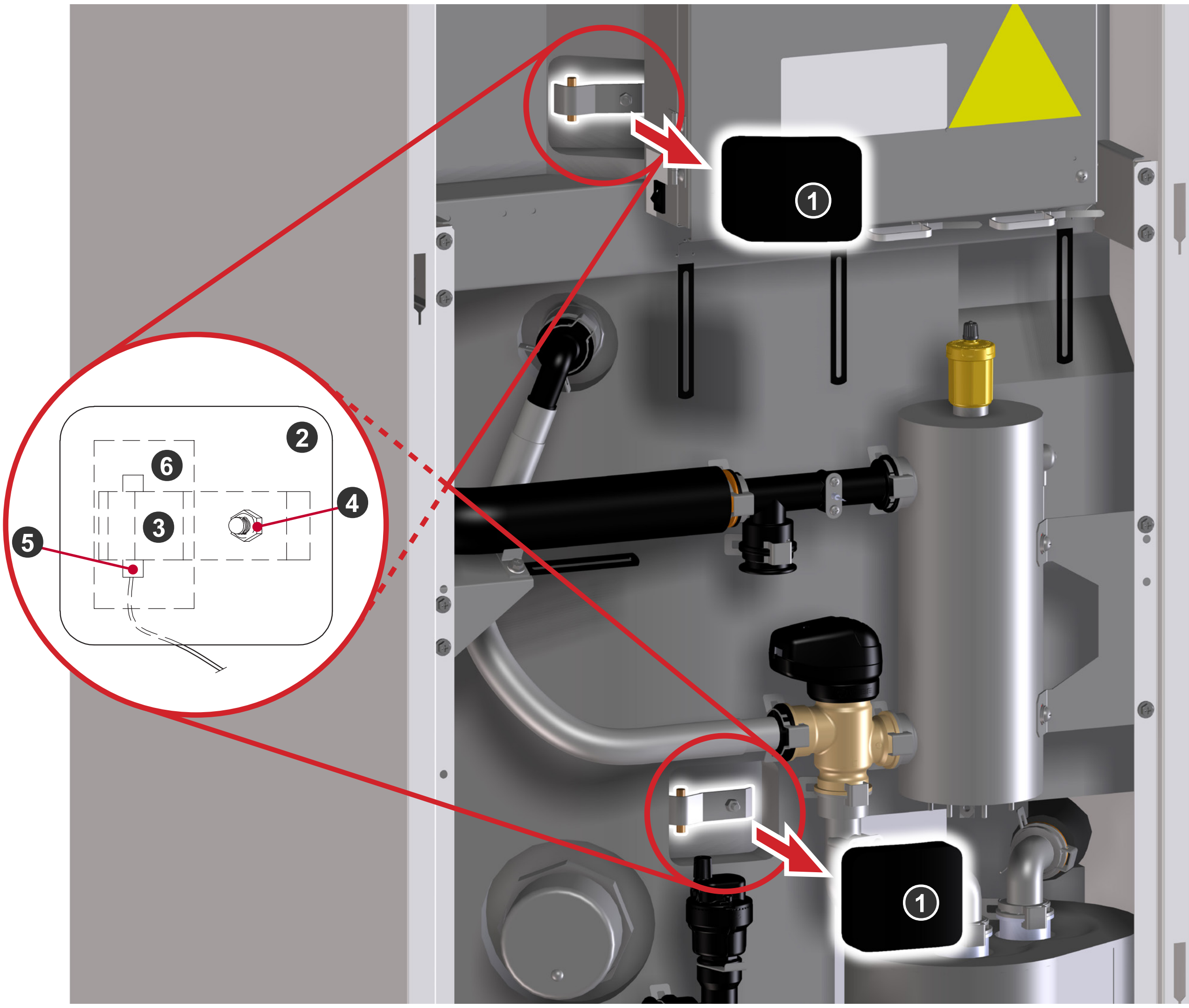
1 Drain the indoor unit as explained in section *"Draining operation for airH2O 800M"* in chapter *"Maintenance"*.
2 Remove the 2 screws fixing the thermistor.
3 Take the thermistor out of the pipe.



1 Composite pipe
2 Screws
3 Plate
4 Water thermistor (T_{WI}/T_{WO}/T_{WOHP})
5 O-ring

Detailed figure of the DHW thermistors (T_{DHWT1} and T_{DHWT2})

1 Remove the insulations (1) of the tank (2):



2 Remove the nut (4) and the P-spring (3) that fasten the sensor (5).

3 Install new thermistor using P-Spring and aluminium foil tape (6) as shown in the drawing.

1 Insulations	**4 Nut**
2 Water tank	**5 Thermistor (T_{DHWT1}/T_{DHWT2})**
3 P-spring	**6 Aluminium foil tape**

NOTE

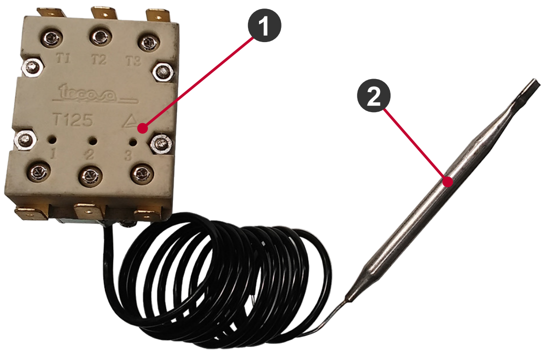
In case of P-spring deforming, it needs to be replaced.

5.5.3.6 Removing the thermostat reset switch

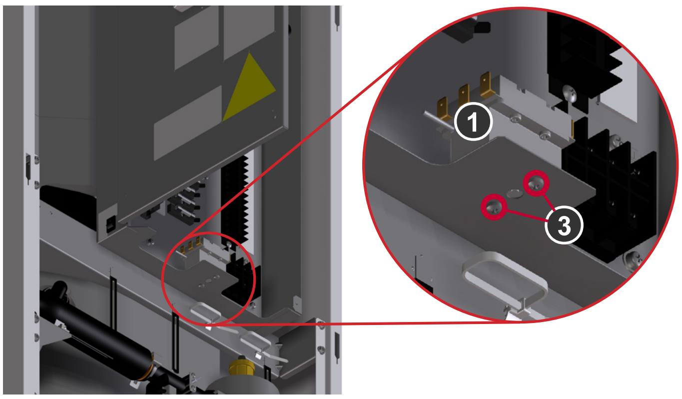
1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*.
3 Disconnect all the terminals connected to the thermostat reset switch (1).
4 Remove the thermostat (2) from the electrical heater as explained in chapter *"5.5.2.6 Removing the electrical heater"*.

NOTE

The thermostat of the electrical heater is connected and sealed to the thermostat reset switch.



5 Remove the 2 screws (3) fixing the thermostat reset switch to the electrical box.



1 **Thermostat reset switch**

2 **Thermostat**

3 **Thermostat reset switch screws**

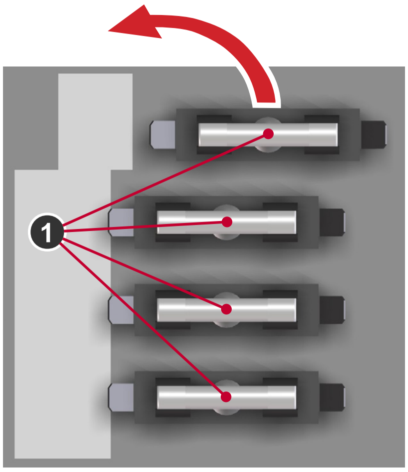
6 Install the new thermostat reset switch by following the procedures described above in reverse.

5.5.3.7 Removing the fuses - EF1~4

1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*.

3 Once the broken fuse (1) is detected, pull it from its placement.



1 **Fuses**

Table of fuses

Fuse	Dimensions (Ø x L) (mm)	HWD-W2E-220S(-K)
EF1	6.35 x 31.8	12.5 A
EF2		12.5 A
EF3		12.5 A
EF4		20 A

4 Install the new fuses by following the procedures described above in reverse.

5.5.3.8 Removing the fuse holder

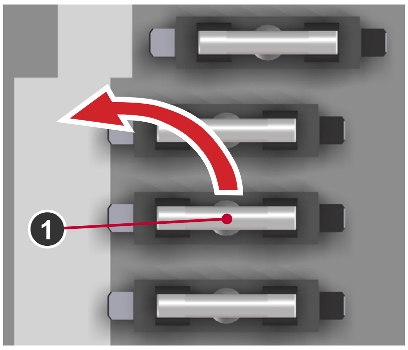
1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.

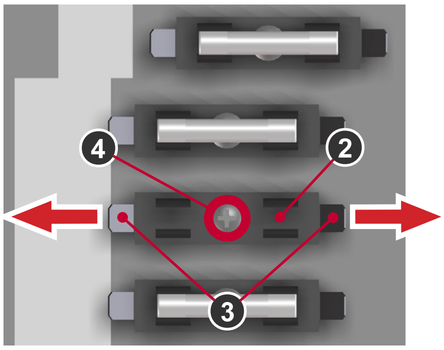
2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*.

3 Remove the necessary fuse (1) as explained in *"5.5.3.7 Removing the fuses - EF1~4"*.

4 Disconnect the cables from the terminals (3) of the fuse holder (2).

5 Remove the screw (4) fixing the fuse holder and replace it:





1 **Fuse**

2 **Fuse holder**

3 **Fuse holder terminals**

4 **Fuse holder screw**

NOTE

Make sure to connect the cables to the terminals of the new fuse holder.

6 Install the new fuse holder by following the procedures described above in reverse.

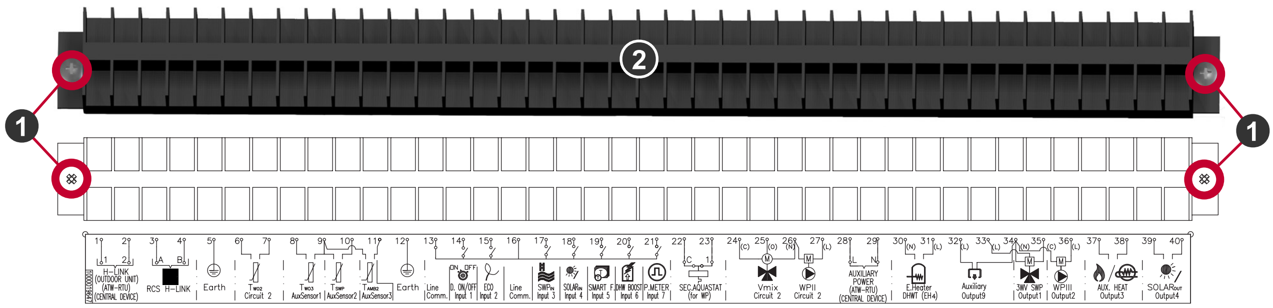
5.5.3.9 Removing the terminal board - TB2

1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*.

3 Remove all the cables connected to the terminal board.

4 Remove the 2 screws (1) fixing the terminal board (2) to the electrical box:



1 **Terminal board screws**

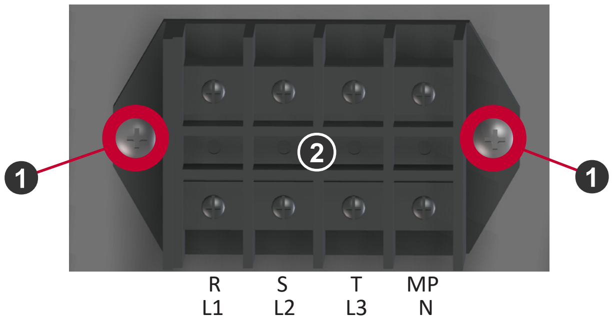
2 **Terminal board (TB2)**

NOTE

Take note of the connections on the PCB. In particular, special connections, bridges, etc. Check the wiring diagram for any doubt you may have. Any incorrect connection may damage the unit.

5.5.3.10 Removing the terminal board - TB1

1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*.
3 Remove all the cables connected to the terminal board.
4 Remove the screws (1) fixing the terminal board (2) to the electrical box:



1 Terminal board screws **2 Terminal board (TB1)**

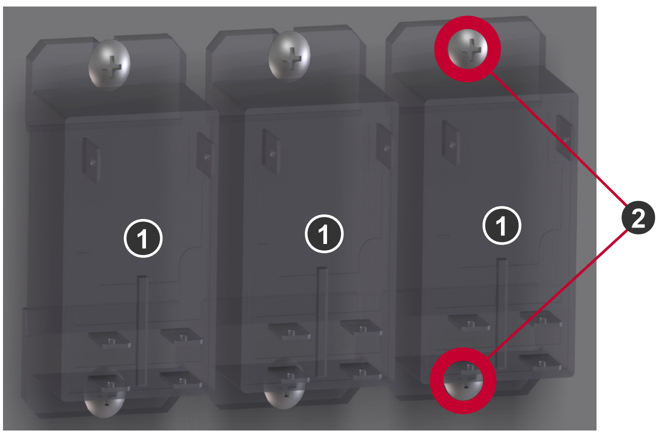
5.5.3.11 Removing the relays - AR1~3

1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.
2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*.
3 Identify the abnormal relay (1) and disconnect the cables.

NOTE

Take note of the connections on the relays. Check the wiring diagram for any doubt. Any incorrect connection may damage the unit.

4 Remove the screws (2) attaching the relay to the electrical box:



1 Relays **2 Relay screws**

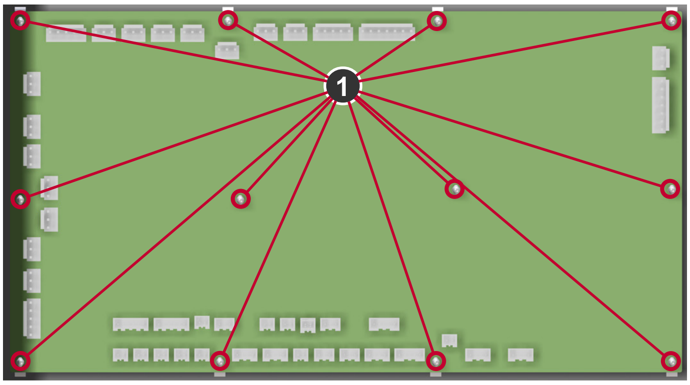
5.5.3.12 Removing the PCB

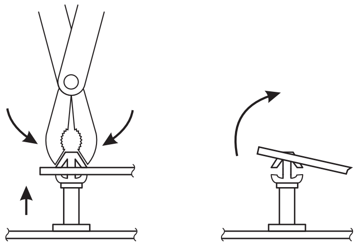
1 Remove the service cover as explained in chapter *"5.5.1.1 Removing the service cover"*.

2 Open the electrical box cover as explained in chapter *"5.5.1.2 Opening the electrical box cover"*.

3 Remove all the connectors connected to the PCB.

4 Remove the plastic holders (1) that fix the PCB to the electrical box:





1 **Plastic holders**

Troubleshooting

6.1 Initial troubleshooting for power supply failure

The heating system consists of an outdoor unit and an indoor unit. A power failure can affect the entire system or each unit separately. To determine a power failure on the outdoor unit it is required that indoor unit is fully operative, so at first, focus on solving the issue on the indoor unit.

The following table will help identify the source of the failure and determine its causes:

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Indoor unit LCD does not light up.	Indoor unit LCD does not receive power.	Open the indoor unit electrical box and verify the LED on the main PCB. In case blinking is observed and the 7-segments is displaying information, the issue is on the LCD.	Check the wire and the connection on the terminal board inputs 3 and 4 or the connection to the LCD. In case the connection is properly done and the LCD does not operate, replace the LCD.
	Indoor unit does not receive power.	Open the indoor unit electrical box and verify the LED on the main PCB. PCB shows no blinking, and the 7-segment display is not displaying any information.	Continue at: (*).
Alarm 03 is displayed on the indoor unit.	H-LINK communication wire is damaged.	Verify the outdoor unit parameters by means of the indoor unit LCD and verify they are frozen (do not update)	Replace or repair the H-LINK connection between the indoor and the outdoor units.
	Outdoor unit does not receive power.		Continue at: (*).
(*) Power failure or power is not ON		Measure the voltage by means of the voltmeter	Supply the power
Blown out fuse or activation of the breaker at the power source	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the wires to earth	Measure the insulation resistance	
Blown out fuse at the control circuit	Short circuit supplied between the wires	Check for any uncovered part of the wires	
	Short circuit of the control circuit to earth	Measure the insulation resistance	
Failure of PCB	Unconnected wires to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB	Check PCB by means of the self-check mode	Replace PCB if it failed
Incorrect wiring connection		Take action according to the procedure explained in *"3.1.2 Unit test run"* chapter	

6.2 Abnormal operation of the devices

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
No defrost operation mode is available during the heating process or the defrost operation continues	During heating operation Te is not lower than Ta		Wrong position of the Te thermistor	Verify its position and correct it
	Failure of the 4-way valve		Disconnected 4-way valve coil	Check the connector and re-connect it
			Measure the resistance of the coil	In case coil resistance is not ok, replace it
Insufficient cooling process	Indoor cool load is higher than the cooling capacity		Calculate the cool load	Use a bigger unit
	Excessively low suction pressure	Gas leakage or shortage of refrigerant	Measure superheat	Correctly charge the refrigerant after repairing the gas leakage
		Excessively small diameter tube or long piping	Measure and check the field-supplied pipes	Use the correct pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogged strainer in the indoor unit; clogging at the low pressure piping	Check the temperature difference at the inlet and the outlet of the strainer	Replace the strainer in the indoor unit
		Clogging at the low pressure piping	Check the temperature difference	Remove the clogging

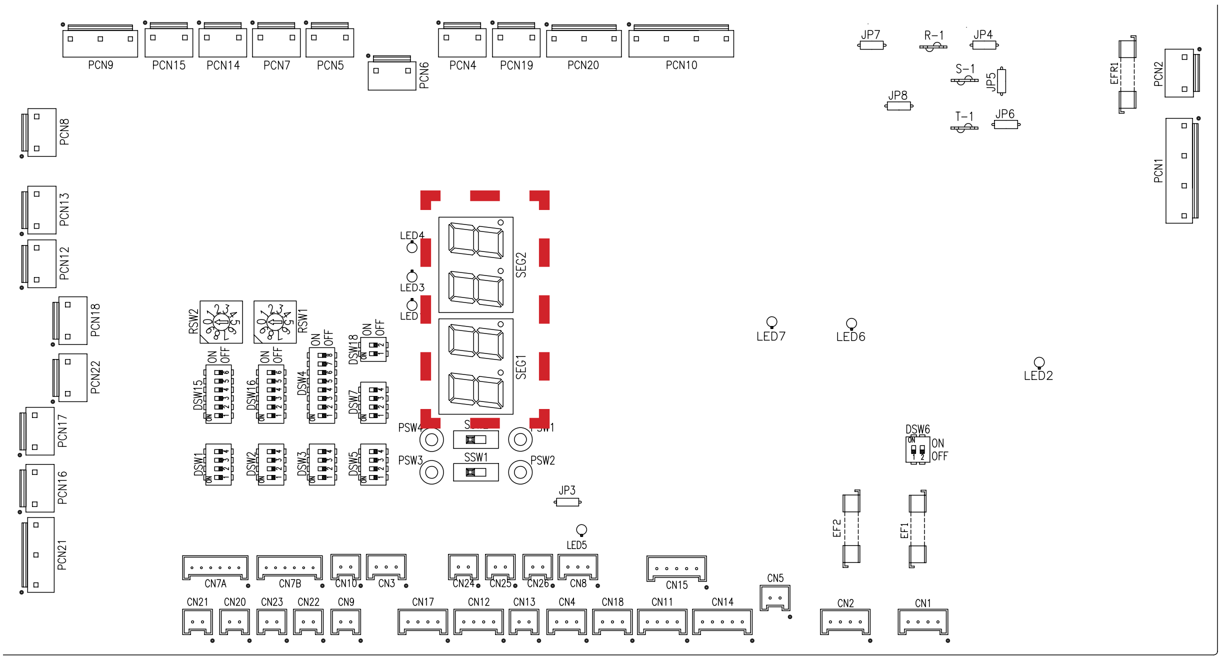
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient cooling process	Excessively high discharge pressure	Insufficient air flow at the outdoor unit heat exchanger	Clogging of the outdoor unit heat exchanger?	Remove the clogging
			Obstacles at the inlet or the outlet of the outdoor unit heat exchanger	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure the service area
			Correct fan speed?	Replace the fan motor
		Excessively high air temperature to the outdoor unit heat exchanger	Short-circuited air to the outdoor unit?	Remove the cause of the short-circuited air
			Any other heat load near the outdoor unit?	Remove the heat source
		Excessively charged refrigerant	Expansion valve opening	Correctly charge the refrigerant
		Non-condensated gas in cycle	Check each temperature and each pressure	Charge the refrigerant after the vacuum pumping
		Clogging of the discharge piping	Check for clogging	Remove the clogging
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on the compressor?	Correctly install the thermistor
	Malfunction or internal leakage of the 4-way valve		Check the temperature difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Excessively low suction pressure	Malfunction or internal leakage of the 4-way valve	Check the temperature difference between the inlet and the outlet of 4-way valve	Replace the 4-way valve
		Failure of solenoid valve for bypass	Check refrigerant leakage of solenoid valve	Replace solenoid valve
	Discharge temperature of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	Correctly charge the refrigerant after the gas leakage check and repairing
		Excessively small diameter or long piping	Measure the field supplied piping	Use the specified pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogging of indoor / outdoor strainer	Check the temperature difference between the inlet and the outlet of strainer	Replace the strainer for the outdoor unit or the indoor unit
		Clogging of suction piping	Check the temperature difference of each part	Remove the clogging
		Insufficient air flow through the outdoor unit heat exchanger	Is the outdoor unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of outdoor unit?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure a sufficient service area
			Check the speed of the outdoor unit fan	Replace the fan motor
		Excessively low air temperature through the OU heat exchanger	Check for any short-circuited air to the OU	Remove the cause of the short-circuited air
		Defrosting is insufficiently completed	Check the thermistor for the defrost operation	Correct the position of the thermistor in case it has been moved
	Excessively high discharge pressure	Excessively charged refrigerant	Check the refrigerant quantity	Correctly charge the refrigerant
		Non-condensate gas in refrigerant cycle	Check the refrigerant quantity	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge pressure piping	Check for clogging	Remove the clogging
	Malfunction or internal leakage of the 4-way valve		Check the temp difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Malfunction of the check valve of the outdoor unit		Check the temperature difference at the inlet and the outlet of the check valve	Replace the check valve
	Excessively high suction pressure	Malfunction or internal leakage of 4-way valve	Check the temp difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Discharge temperature of the indoor unit is unstable		Check the expansion valve of the IU in the same system	Replace the failed expansion valve of the indoor unit
Cooling or heating process with an abnormal sound	Foreign particles inside of the fan casing		Visually inspect it	Remove the foreign particles
	Outdoor unit propeller fan is hitting the shroud		Visually inspect it	Adjust the position of the propeller fan
	Abnormal sound from the compressor	Faulty Installation	Check that each part is tightly fixed	Tightly fix each part
		Liquid refrigerant compression	Adjust the suction gas temperature and pressure	Ensure superheat
		Wear or breakage of the internal compressor parts	Abnormal sound from the inside of the compressor	Replace the compressor
		No heating by the oil heater	Check the resistance (oil heater, fuse)	Replace the oil heater or the fuse
	Humming sound from the magnetic conductor		Check the surface of the contacts	Replace the magnetic switch
	Abnormal vibration of the cabinets		Check each fixing screw	Tightly fix each screw
Outdoor fan does not operate when the compressor operates	Obstacle at the outdoor fan		Check the obstacles	Remove the obstacles
	Watching condition for the heating process		Wait for the switching of the 4-way valve (1 ~ 3 minutes)	If the 4-way valve does not switch, check for insufficient refrigerant

6.3 Normal operation

6.3.1 7-segment display indication

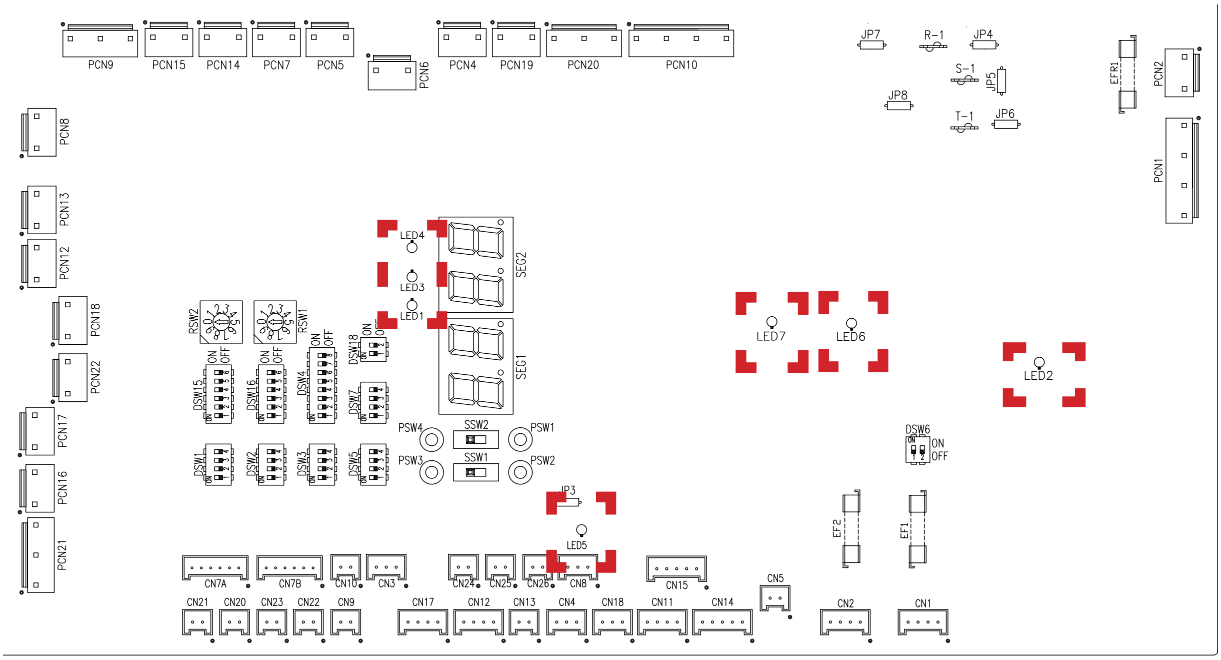


	Segment Display	
	SEG 1	SEG 2
Proceeding initialization (Product software XXX)	H-	CodE
Unit OFF - Normal	oF	
Unit OFF - Air Purge		Pu
Cooling – Demand OFF	Co	St
Cooling – Thermo-OFF		oF
Cooling – Thermo-ON		on
Heating – Demand OFF	hE	St
Heating – Thermo-OFF		oF
Heating – Thermo-ON		on
Heating – Boiler ON (Demand OFF, Thermo-OFF, Thermo-ON)		bo
Hot Sanitary Water – Demand OFF	hS	St
Hot Sanitary Water – Thermo-OFF		oF
Hot Sanitary Water – Thermo-ON		on
Hot Sanitary Water – Boiler Operation (Demand OFF, Thermo-OFF, Thermo-ON)		bo
Swimming Pool – Demand OFF	SP	St
Swimming Pool – Thermo-OFF		oF
Swimming Pool – Thermo-ON		on
Alarm	A※	CodE
Test Run Heating	th	---
Test Run Cooling	tC	---
Tariff function enabled		ta

NOTE

Applicable units: **airH2O 800H**, **airH2O 800H Combi** *and Control Box.*

6.3.2 LED indication



Name	Colour	Indication
LED 1	Green	Power indication
LED 2	Red	Power indication
LED 3	Red	Heat pump operation (Thermo-ON/OFF)
LED 4	Yellow	Alarm (flickering with 1 s interval)
LED 5	Green	-
LED 6	Yellow	H-LINK transmission
LED 7	Yellow	H-LINK RCS transmission

6.3.3 Unit controller indication

The unit controller serves as an interactive interface providing real-time information on the operational status. During normal operation, the unit controller screen displays comprehensive details related to the settings and conditions of both the outdoor and indoor units. This user-friendly interface offers a quick overview of the system's performance, allowing users to monitor and adjust settings as needed. It acts as a central hub for accessing vital information, contributing to a seamless and efficient operation of the entire unit.

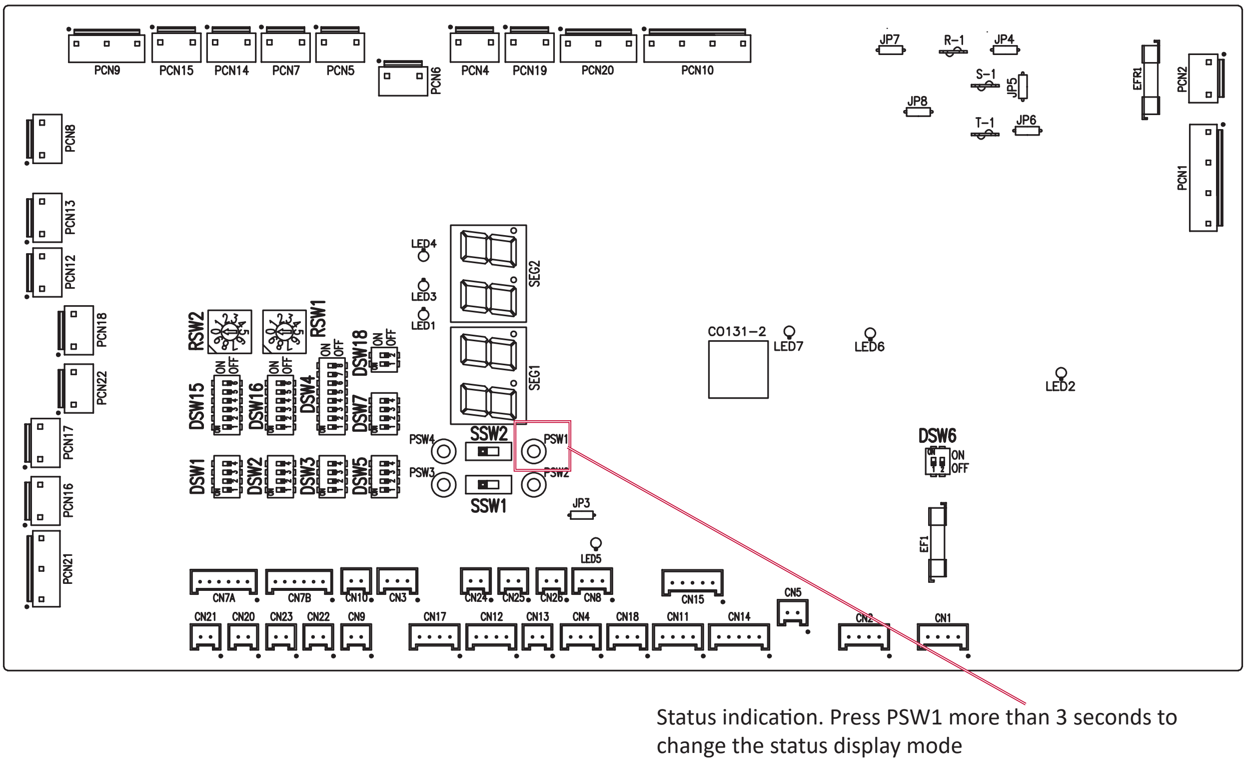
6.4 Troubleshooting in check mode

6.4.1 Troubleshooting using the 7-segment display (indoor unit)

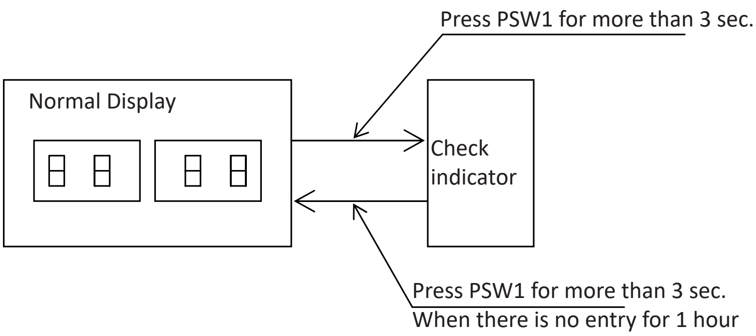
Operating conditions may be checked by 7-segment and push switches (PSW) on the PCB in the indoor unit.

CAUTION

During checking data, do not touch the electric parts except for the indicated switches because 220-240 V is applied to them. Pay attention not to contact the tools with electrical parts. If contacted, electrical parts will be damaged.

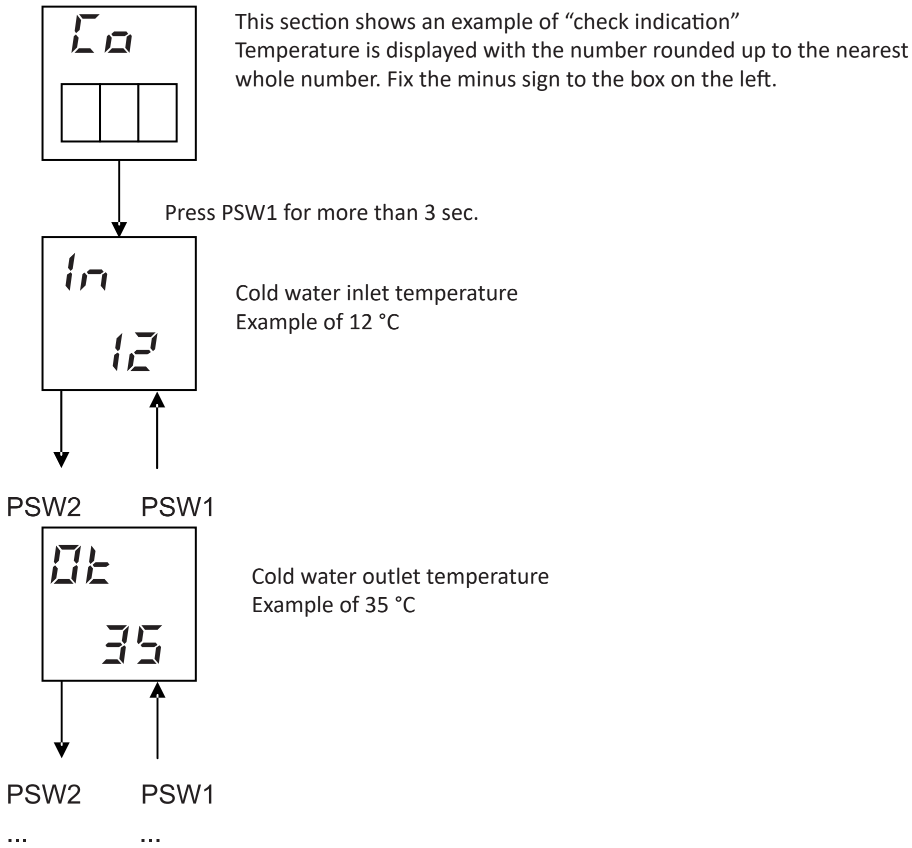


Change to check indicator mode to display different items.



This is the procedure to follow to check with the combination of checking switches (▲: PSW2 ▼: PSW1):

- To start checking, press PSW1 switch for more than three seconds.
- To proceed checking, press the PSW1 switch.
- To back to the previous item, press the PSW2 switch.
- To cancel this checking, press the PSW1 switch for more than 3 seconds.



◆ Check mode items PCB1

Code Display	Data display	Description
oP	8888	Normal operation
th	88.8	Heat water temperature setting (°C)
tc	88.8	Cold water temperature setting (°C)
in	88.8	Water inlet temperature at the outdoor unit plate exchanger (THM_{WI}) (°C)
ot	88.8	Water outlet temperature at the outdoor unit plate exchanger (THM_{WO}) (°C)
in.	88.8	Water inlet temperature from the installation (°C) (available only for **airH2O 800H Combi**)
ot.	88.8	Water outlet temperature at the **airH2O 800H/H Combi** module (°C)
o1	88.8	Water outlet temperature heat pump (THM_{WOHP}) (°C) (available only for **airH2O 800H/H Combi**)
o2	88.8	Water outlet temperature circuit 2 (THM_{WO2}) (°C)
A1	88.8	Auxiliary temperature 1 (THMaux1) (°C)
oh.	88.8	Temperature of the upper sensor of the DHW (°C) (available only for **airH2O 800H Combi**)
oh	88.8	Temperature of the lower sensor of the DHW tank in case of **airH2O 800H Combi**. Otherwise it is tank temperature (THM_{DHW}) (°C)
A2	88.8	Auxiliary temperature 2 (THMaux2) (°C)
tA	88.8	Outdoor unit ambient temperature (THM7) (°C)
A3	88.8	Auxiliary temperature 3 (THMaux3) (°C)
t1	88.8	Outdoor unit average ambient temperature (°C)
t1.	88.8	Second outdoor unit average ambient temperature (°C)
tL	88.8	Indoor unit refrigerant liquid temperature (THM_L) (°C)
Pr	88.8	Water pressure (bar)
td	88.8	Discharge gas temperature (°C)
tS	888	Evaporation gas temperature (°C)
dF	888	Defrosting
d1	888	Cause of stoppage
h1	888	Inverter operation frequency (Hz)
Eo	888	Outdoor expansion valve opening (%)
PP	888	Water pump (0-100) (not available for Control Box)
FF	888	Water pump feedback frequency (0-100) (not available for Control Box)
FP	8.88	Secondary water flow (m^3/h) (not available for Control Box)

Code Display	Data display	Description
FP.	8.88	Primary water flow (m^3/h)
P 1	888	Compressor running current (A)
d i	888	Digital inputs
do	888	Digital outputs
ou	888	Refrigerant cycle address
iu	888	Indoor unit address
no	888	ROM N°
Cd	888	Capacity code
Co	888	Outdoor capacity code
CP	888	Unit type (see table below)

◆ Unit capacity code

Capacity	Code
2 HP	14
3 HP	22
3.5 HP	28
4 HP	32
5 HP	40
6 HP	48

6.4.2 Protection control code check by means of the Service Tools

1 Protection control code is displayed on the Service Tools.
2 Protection control code is displayed while function is working, and goes out when released.
3 When several protection controls are activated, the code number with higher priority will be indicated:

Priority	Protection control	Code
1	Pressure ratio control	P1
2	High-pressure rise protection	P2
3	Current protection	P3
4	Inverter fin temperature rise prevention	P4
5	Discharge gas temperature rise protection	P5
6	Control for prevention of Ps fall	P6
7	High pressure decrease protection	P9
8	Ps rise prevention control	Pd
9	Capacity rise prevention control	PF

◆ Activating condition of protection control code

To monitor the conditions such as the temperature change and others, the control of the frequency and other controls are performed by the protection control in order to prevent abnormal operations. The activating conditions of protection control are shown in the table below:

Code	Protection control	Activating condition
P1	Pressure ratio control	Control to ensure compressor operation is working constantly inside the compressor working range; it allows frequency increase and decrease
P2	High-pressure increase protection	High pressure switch for control is activated => frequency decrease
P3	Inverter current protection	Frequency is forced to decrease in case inverter PCB secondary current exceeds a safety threshold
P4	Inverter fin temperature increase prevention	Frequency is forced to decrease in case fin inverter temperature exceeds a safety threshold
P5	Discharge gas temperature increase protection	Temperature at the top of compressor is high => frequency decrease (maximum temperature is different depending on the frequency)
P6	Control for prevention of Ps fall	If Ps is lower than a threshold value => frequency decrease
P9	High-pressure decrease protection	Discharge pressure of compressor decrease under 0.65 MPa => frequency increase
Pd	Ps rise prevention control	When Ps is above threshold value => frequency increase

Ps: Suction pressure of compressor (MPa)
Pd: Discharge pressure of compressor (MPa)

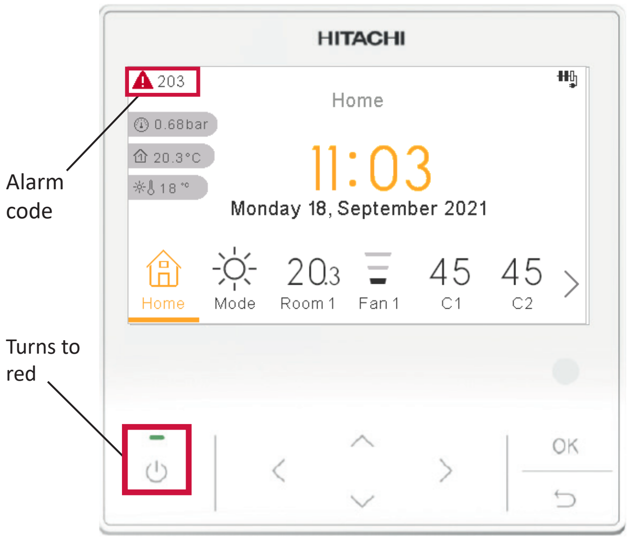
NOTE

- *During protection control (except during alarm stoppage), the protection control code is indicated.*
- *The protection control code is indicated during protection control and turns off when cancelling the protection control.*

6.5 Alarm code indication in unit controller

When an alarm is activated, it will be displayed in the screen of the unit controller. A danger symbol ⚠ and the alarm code will be displayed at the top left of the screen.

The unit screen shows the alarms coming from the outdoor unit, from the indoor unit and also from the unit controller itself (a problem with the communication between indoor unit and outdoor unit may happen). If that was the case, the unit controller will show an alarm code related to a communication failure between indoor and outdoor unit:



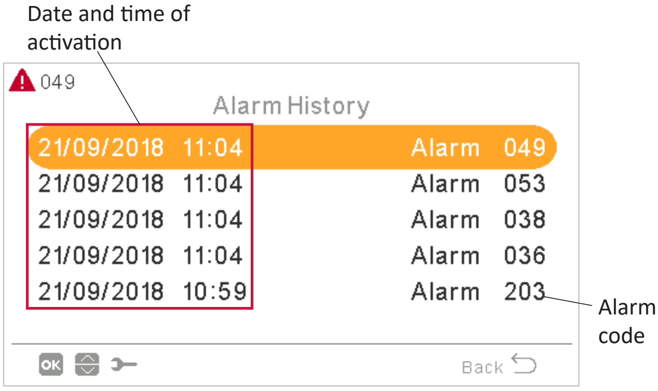
Unit controller PC-ARFH3E

- **Malfunction**
  The ON/OFF button turns red. The alarm indicator appears on the liquid crystal display: Contact your Hitachi service supplier.
- **Power supply failure**
  All contents disappear. If the unit stops due to a power shortage, it will not start again, even though the power comes back on. Carry out the start-up operations again. If the power failure lasts less than 2 seconds, the unit will start again automatically.
- **Electrical noise**
  The contents may disappear from the screen and the unit may stop. This is because the microcomputer has been activated to protect the unit from electrical noise.

◆ Alarm history

The system keeps the last 20 alarms stored. Each alarm entry has the following data:

- Date and time of activation (in dd/mm/yyyy hh:mm format).
- Alarm code (in xxx format).



Alarm history for PC-ARFH3E

NOTE

- *An alarm is registered when activated, not during all the time that is shown on the unit controller screen.*
- *Alarms are registered each time appear. Even if that alarm is deactivated, if it appears again, it will be registered again.*
- *When an alarm is registered and switches to another alarm, the second one will be registered too.*
- *If a new alarm appears when the list of 20 registered alarms is full, the oldest one will be removed from the list to allow the new one to be in the list.*

In case of being in installer mode, a menu related only to the alarm history window will be displayed by selecting an alarm and pressing the OK button:

- **Alarm description:** shows basic information of the alarm when it is selected.
- **Unit previous status:** displays the main variables recorded at the time the alarm occurred.
- **Remove the selected alarm:** it will delete the selected alarm only.
- **Clear alarms:** remove all the registered alarms.

6.6 Alarms from water cycle PCB

Code	Description	P-Code	Remarks	HWM-W2E(-B)	HWD-W2E-220S(-K)	ATW-CBX-01	ATW-YCC-04	Pumps allowed	Heaters allowed	Compressor allowed	Origin	Text
3	Transmission	-	-	O	O	O	O	YES	YES	NO	Transmission	Outdoor unit not detected
10	Domestic Hot Water Temperature (TDHW2) Top Thermistor Abnormality	-	-	-	O	-	-	NO	NO	NO	Indoor	2n DHW thermistor anomaly
15	Water outlet 2 (mix circ.) Temperature (Two2) Thermistor Abnormality	-	-	(o)	(o)	(o)	(o)	NO	NO	NO	Indoor	Water Circuit 2 thermistor anomaly
16	Domestic Hot Water Temperature (TDHW) Thermistor Abnormality	-	-	(o)	O	(o)	(o)	NO	NO	NO	Indoor	Water DHW thermistor anomaly
17	Auxiliary temperature sensor 2 (THMAUX2) Thermistor Abnormality	-	-	(o)	(o)	(o)	(o)	NO	NO	NO	Indoor	Auxiliary sensor 2 anomaly (THMaux2)
18	Auxiliary temperature sensor 1 (THMAUX1) Thermistor Abnormality	-	-	(o)	(o)	(o)	(o)	NO	NO	NO	Indoor	Auxiliary sensor 1 thermistor anomaly
19	Water outlet HP Thermistor Abnormality	-	-	O	O	-	-	NO	NO	NO	Indoor	Water Plate HEX pipe thermistor anomaly
25	Auxiliary 3 Temperature sensor (THMAUX3) Thermistor Abnormality	-	-	(o)	(o)	(o)	(o)	NO	NO	NO	Indoor	Auxiliary sensor 3 thermistor anomaly
33	Twi sensor alarm at **airH2O 800H Combi** module	-	-	-	O	-	-	NO	NO	NO	Mirror Module	Water inlet thermistor anomaly (THMwi)
34	Two sensor alarm at **airH2O 800H/H Combi** module	-	-	O	O	-	-	NO	NO	NO	Mirror Module	Water outlet thermistor anomaly (THMwo)
40	Incorrect LCD Setting	-	-	O	O	O	O	NO	NO	NO	Indoor	Incorrect Unit controller setting
60	Slave units in alarm	-	-	-	-	-	O	NO	NO	NO	Comunication	Alarm on all the modules
61	No Cascade messages	-	-	(o)	(o)	(o)	-	NO	NO	NO	Comunication	Cascade stopped communicating
70	Hydraulic Alarm: Low flow & Water Pump malfunction	P-70	-	O	O	-	-	NO	NO	NO	Indoor	Flow & Water Pump malfunction
72	Thermostat Heater Alarm	-	-	O	O	-	-	YES	NO	NO	Indoor	Thermostat Heater Alarm
73	Mixing over-temperature Limit Protection for mixed circuit (only if Circuit 2 has enabled)	-	-	(o)	(o)	(o)	(o)	YES	NO	NO	Indoor	Mixing over-temperature limit
74	Over-temperature Limit Protection	P-74	-	O	O	O	O	NO	NO	NO	Indoor	Unit over-temperature limit protection
77	Intelligent wireless receiver communication failure (only with intelligent thermostat accessory)	-	-	(o)	(o)	(o)	(o)	YES	YES	YES	Indoor unit controller	Communication error with wireless receiver
78	RF communication failure (only with intelligent thermostat accessory)	-	-	(o)	(o)	(o)	(o)	YES	YES	YES	Indoor unit controller	RF Communication failure
79	Unit capacity setting error	-	-	O	O	O	-	NO	NO	NO	Indoor	Unit capacity setting error
80	RCS H-Link communication failure between IDU and LCD	-	-	O	O	O	O	NO	NO	NO	Indoor unit controller	H-LINK - RCS transmission error
81	Momentary Power interruption or Low voltage detected	P-81	-	O	O	O	O	NO	NO	NO	Indoor	Momentary Power interruption
85	Float switch Alarm	-	-	(o)	(o)	(o)	(o)	NO	NO	NO	Indoor	Drain pump error
202	Wrong settings of the controller	-	-	O	O	O	O	-	-	-	-	-
203	Sub room controller stops answering	-	-	(o)	(o)	(o)	(o)	-	-	-	-	-
204	Indoor unit stops answering to controller	-	-	O	O	O	O	-	-	-	-	-
208	Module with repeated H-LINK address	-	-	-	-	-	O	-	-	-	-	-
209	Sub DHW configured on unexisting module	-	-	-	-	-	O	-	-	-	-	-
211	Alarm on the module 1	-	-	-	-	-	O	-	-	-	-	-
212	Alarm on the module 2	-	-	-	-	-	O	-	-	-	-	-
213	Alarm on the module 3	-	-	-	-	-	O	-	-	-	-	-
214	Alarm on the module 4	-	-	-	-	-	O	-	-	-	-	-
215	Alarm on the module 5	-	-	-	-	-	O	-	-	-	-	-
216	Alarm on the module 6	-	-	-	-	-	O	-	-	-	-	-
217	Alarm on the module 7	-	-	-	-	-	O	-	-	-	-	-
218	Alarm on the module 8	-	-	-	-	-	O	-	-	-	-	-

O: Default. This alarm will be displayed in the Unit controller.
(o): Optional. This alarm will be displayed in the Unit controller.
–: Not applicable.

6.7 Alarms generated by refrigerant cycle PCB

Code	Description	Retry Code	Comments	Origin	Text
2	Triggering protection of High pressure cut	-	-	Outdoor Unit	Triggering protection of High pressure cut
3	Control for abnormality in transmission between indoor units	5	-	Transmission	-
4	Control for abnormality in transmission between inverter and PCB	5	-	Transmission	Issue between inverter and outdoor unit PCB
5	Wrong operation code of power source phase	-	This alarm is also used to identify a wrong compressor connection	Power supply	Wrong operation code of power source phase
6	Wrong voltage for the inverter	18	-	Voltage	Wrong voltage for the inverter
7	Decrease in discharge gas superheat	16	-	Cycle	Decrease in discharge gas superheat
8	High discharge gas temp. on compressor top	15	-	Cycle	High discharge gas temp. on compressor top
11	Water inlet Temperature (Twi) Thermistor Abnormality	-	-	Indoor	Water inlet thermistor anomaly (THMwi)
12	Water outlet Temperature (Two) Thermistor Abnormality	-	-	Indoor	Water outlet thermistor anomaly (THMwo)
13	Indoor liquid pipe Temperature (Tl) Thermistor Abnormality	-	-	Indoor	Indoor Liquid Pipe Thermistor anomaly
20	Thermistor for discharge gas temperature	-	-	OU sensor	Thermistor for discharge gas temperature
21	High pressure sensor	-	-	1st cycle	High pressure sensor
22	Thermistor for outdoor ambient temperature	-	-	OU sensor	Thermistor for outdoor ambient temperature
24	Thermistor for evaporation temperature	-	-	OU sensor	Thermistor for evaporation temperature
26	Water pressure sensor (WPS) abnormality	-	-	Indoor	Water pressure sensor (WPS) abnormality
29	Low pressure sensor	-	-	1st cycle	Low pressure sensor
35	Incorrect indoor unit address setting	-	-	System	Incorrect indoor unit address setting
36	Incorrect indoor unit combination	-	-	System	Incorrect indoor unit combination
38	Abnormality picking up circuit for protec.	-	-	System	Abnormality picking up circuit for protection
42	Pressure ratio decrease	-	-	Outdoor	Pressure ratio decrease
43	Pressure ratio increase	-	-	Outdoor	Pressure ratio increase
44	Low pressure increase abnormality	-	-	Outdoor	Low pressure increase abnormality
45	Very high discharge pressure protection	13	-	Outdoor	Very high discharge pressure protection
46	High pressure fall abnormality	-	-	Outdoor	Refrigerant Cycle: High pressure fall
47	Excessively low suction pressure	15	-	Multiple Origins	Excessively low suction pressure
48	Activation of overcurrent protection	17	-	Multiple Origins	Activation of overcurrent protection
49	Leak alarm or leak sensor malfunction	-	-	Outdoor	-
51	Abnormal operation of the current sensor	17	-	Inverter	Abnormal operation of the current sensor
53	Protection of the Inverter PCB (Outdoor)	17	-	Inverter	Protection of the Inverter PCB (Outdoor)
54	Excessive temperature of the Inverter PCB	17	-	Inverter	Excessive temperature of the Inverter PCB
55	Abnormal operation of Inverter PCB (OU)	18	-	Inverter	Abnormal operation of Inverter PCB (OU)
57	Activating the protection of the fan motor	-	-	Outdoor	Activating the protection of the fan motor
71	Low primary water flow or primary water pump malfunction	-	-	Outdoor	Low flow at water cycle or water pump abnormality
75	Freeze Protection by Cold water inlet, temperature detection	-	-	Indoor	Freeze Protection by Cold water inlet
76	Freeze Protection Stop by indoor liquid or gas temperature thermistor	-	-	Indoor	Freeze Protection Stop by indoor liquid
83	Hydraulic Alarm: Low pressure	P-83	-	Indoor	Hydraulic alarm pressure
84	High Water pressure	-	-	Indoor	High Water pressure alarm
EE	Compressor protection	-	-	Compressor	Compressor protection

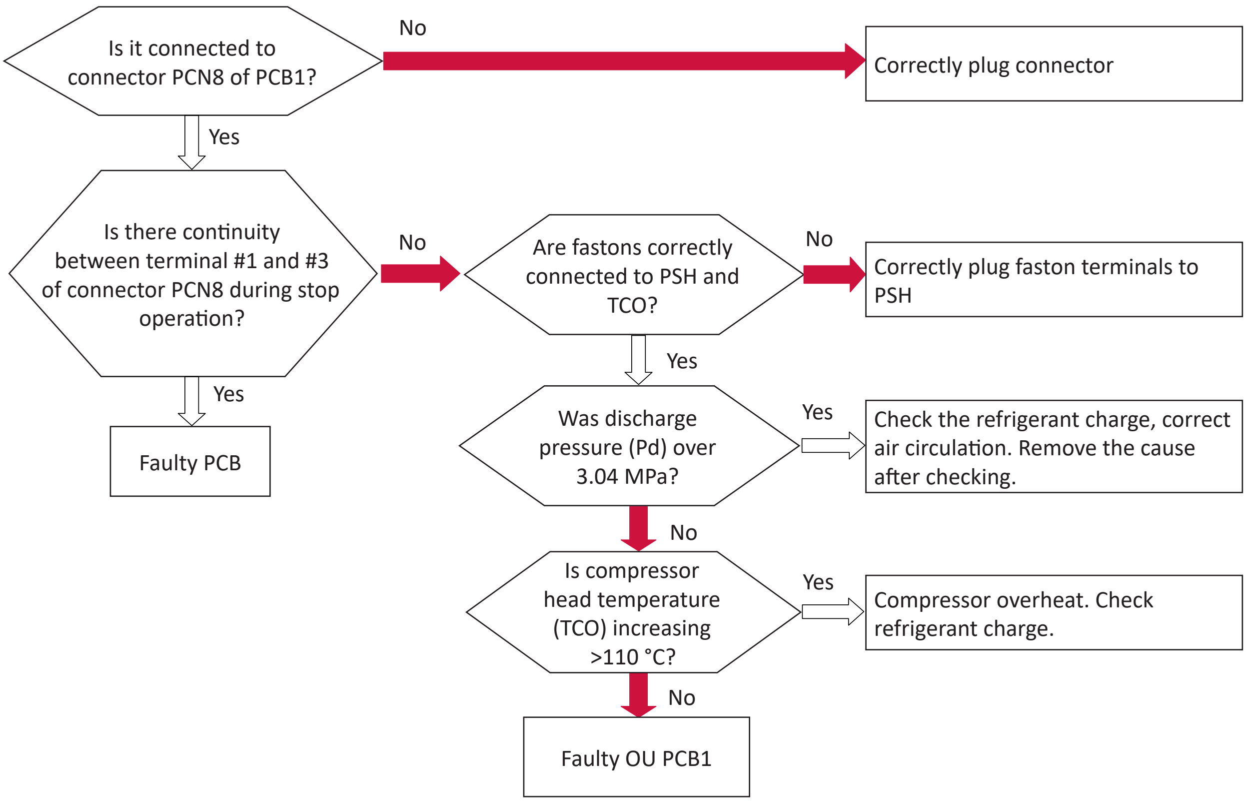
NOTE

These alarms apply to all outdoor units (RASM-(2-6)(V)TW2E).

6.8 Troubleshooting by alarm code

Alarm code 02 Activation of the high pressure switch or klixon protection of the compressor.

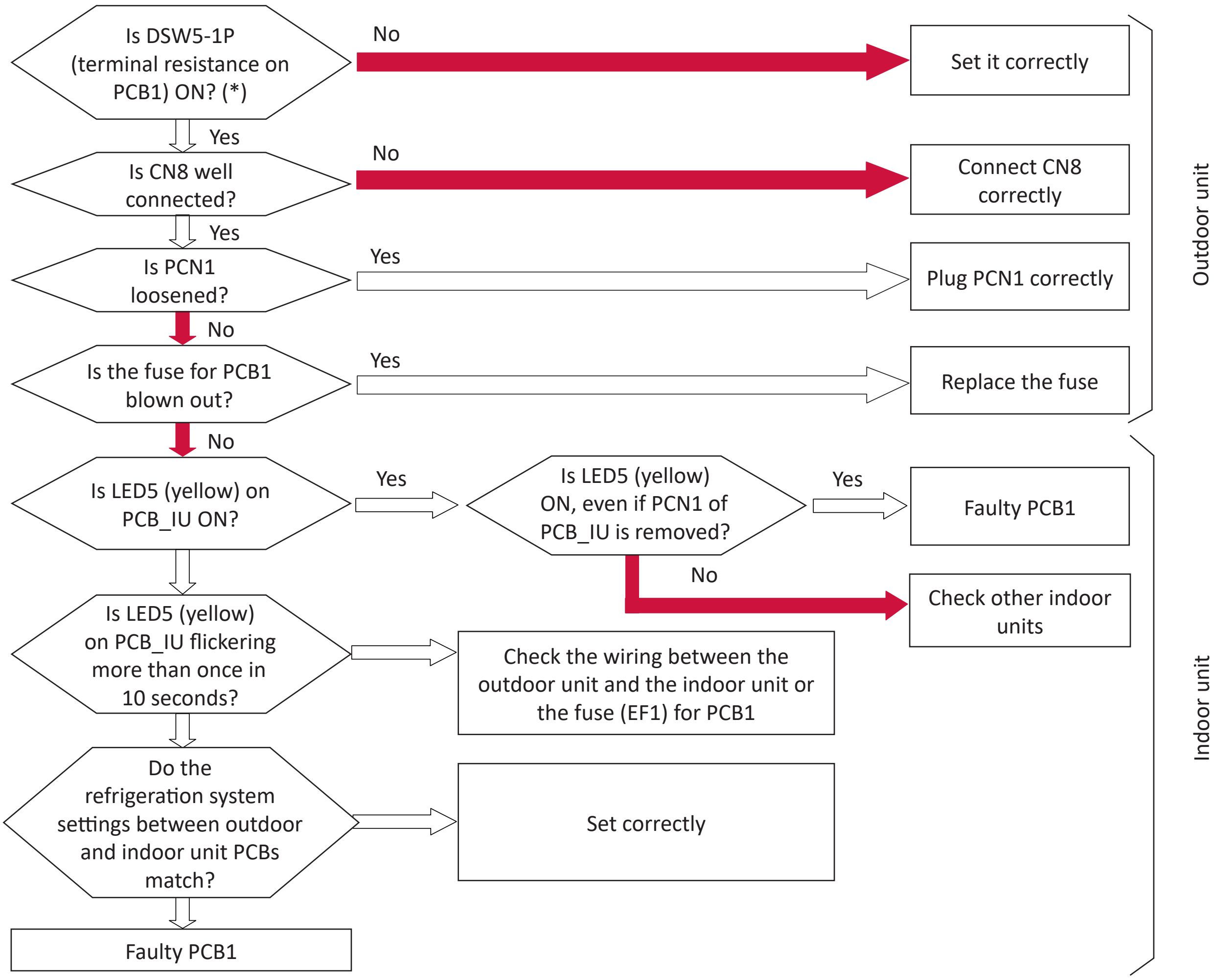
This alarm is indicated when one of the safety devices is activated during compressor running.



Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the high-pressure switch due to the excessively high discharge pressure (PSH)	Outdoor unit: insufficient air flow to the heat exchanger (outdoor heat exchanger during the cooling process)		Check the heat exchanger for dust or for clogging	Remove the dust or the clogging
			Check the air filter for dust	Remove the dust
			Check for any obstacles at the inlet or the outlet of the heat exchanger	Remove the obstacles
			Check the service area	Secure service area
			Check the speed (outdoor fan: cooling)	Replace the fan motor if faulty
			Check the speed of the water pump	Replace the water pump if faulty
	Expansion valve malfunction or anomaly		Disconnected	Fix the looseness or reconnect the connector
			Fully closed and locked	Replace the expansion valve
			Check the operation sound of the coil	Replace the coil
			Check the discharge gas thermistor	Replace the thermistor
			Check the fastening of the thermistor	Re-fasten the thermistor
	Excessively high water temperature in the indoor unit		Calculate the heat load	Reduce the heat load or use a bigger unit
			Check minimum water flow	Provide good circulation
			Check for collapse in water circuit	Remove the short-circuited
			Check for other heat source	Stop the heat source
	Faulty high-pressure switch	Faulty pressure switch	Measure the discharge pressure. Check the continuity after the decrease of the pressure	Replace the pressure switch if faulty
		Insufficient contacting	Measure the resistance by means of a tester	Fix the looseness. Replace the connector
		Incorrect connection	Check the connections	Repair the connections
	Overcharged refrigerant		Check the cycle operation temp.	Charge the refrigerant correctly
	Mixture of the non-condensate gas in the refrigerant cycle		Check the air temperature and the pressure	Recharge the refrigerant after the vacuum pumping
	Clogging of the discharge piping		Check for clogging	Remove the clogging
	Liquid line stop valve or gas line stop valve is not in operation		Check the stop valves	Fully open the stop valves
Activation of the compressor klixon (TCO) due to overheat	Overheat at the compressor (Compressor heat temperature (TCO) >110 °C)		Check the refrigerant charge	The unit is currently operating without the necessary refrigerant charge. It is essential to investigate potential leaks, perform any necessary repairs, and then recharge the refrigerant to ensure proper functionality.

Alarm code	03	Abnormal transmission between the indoor unit and the outdoor unit

- This alarm is displayed when an abnormal operation is maintained for 3 minutes after the normal transmission between the indoor units and the outdoor unit. Also, an abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset. The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.



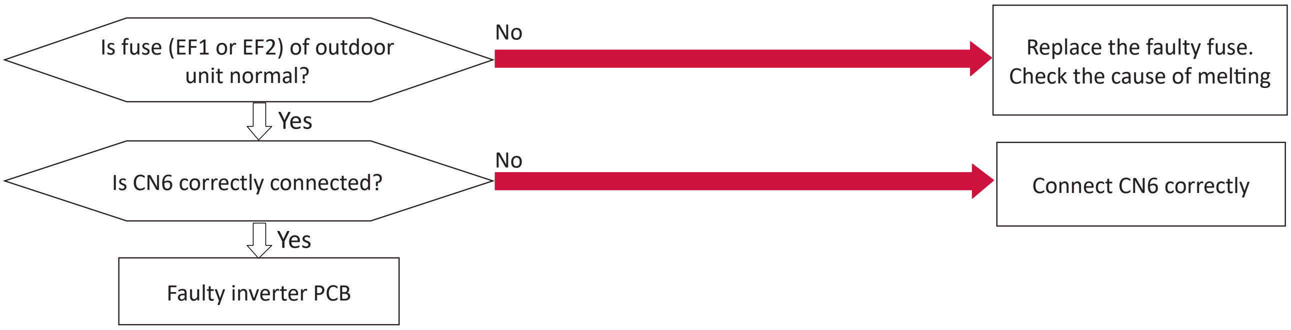
NOTE

(*) In case that terminal resistance (DSW5-1P) is OFF when H-LINK connection is performed.

- *Set the terminal resistance to ON when CN8 is removed.*
- *Set the terminal resistance to OFF when CN8 is reconnected.*

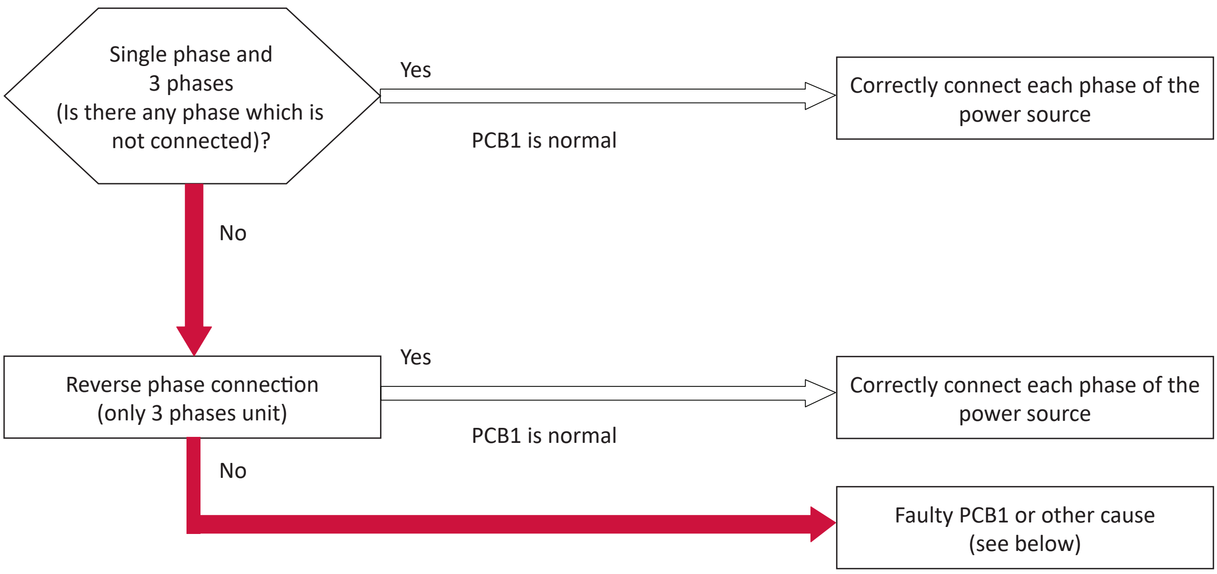
Alarm 03 can be generated when the outdoor or the indoor units are not powered ON or power is not being supplied to the main PCB. In this case verify the possible power supply issues as explained in "6.1 Initial troubleshooting for power supply failure".

Alarm code 04 Abnormal transmission between inverter and PCB



Alarm code	05	Reception of abnormal operation code for detection of power source phase

This alarm is displayed when the main power source phase is reversely connected or one phase is not connected.



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of reverse phase sensor in the outdoor unit	Reverse or single phase	Check it according to the electrical wiring	Replacing wires, repair, tightening screws or correct wiring
	Faulty outdoor unit PCB	-	Replace PCB if faulty

NOTE

In case phases are correctly connected but alarm 05 keeps appearing, check correct placement of Ts sensor. In case it is correctly placed, check compressor connection by opening the compressor terminal cover and verify that the labels on the wires match with the indications on the compressor (U-U, V-V and W-W).

Alarm code	06	Excessively low voltage or excessively high voltage for the inverter

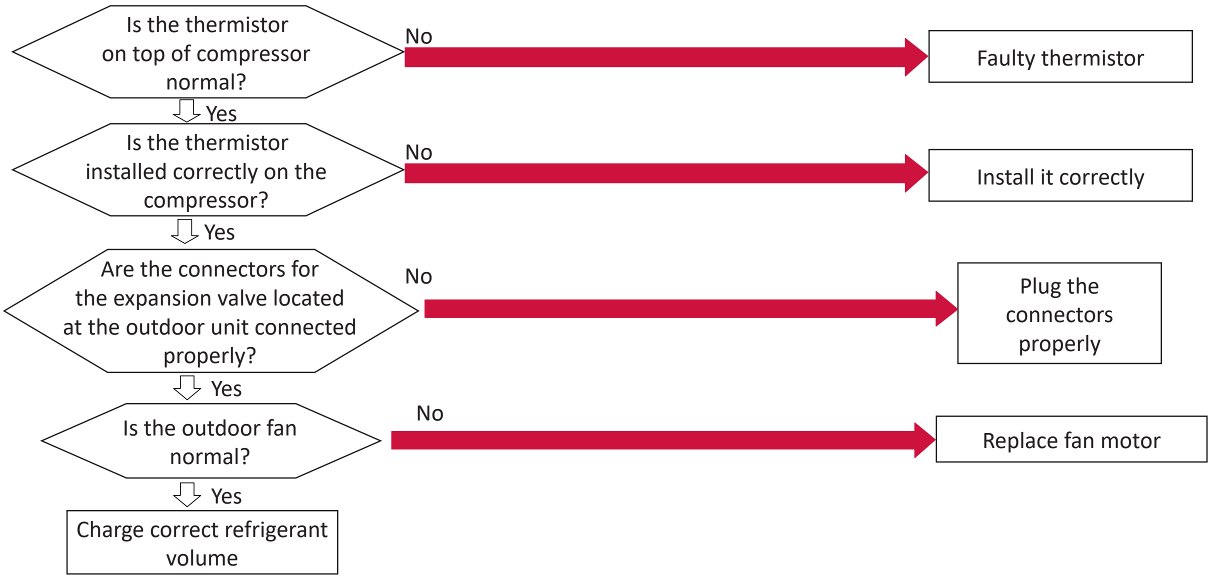
1 Verify that the unit power supply is within the standard ranges:
- For 3-phase units: 400 V +/-10% when stopped (it may decrease to 323 V when in operation).
- For single-phase units: 200 V +/-10% when stopped (it may decrease to 187 V when in operation).

2 Check under which conditions the alarm is triggered: in case it is triggered constantly for any compressor frequency, change the inverter.

Alarm code 07 — Decrease of discharge gas superheat

This alarm code is indicated as follows:

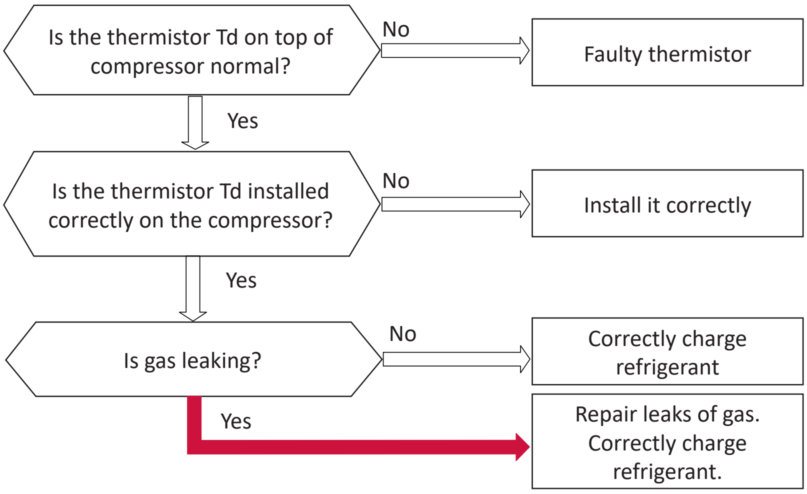
- The temperature on the top of the compressor is less than the target.
- The compressor is stopped and then the retry operation is performed after 30 minutes.

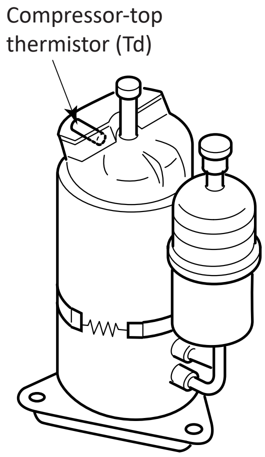


Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Decrease of discharge gas superheat	Overcharged refrigerant		Measure pressure	Correctly charge refrigerant
	Faulty Expansion Valve		Check expansion valve. Refer to *"6.9.2 Checking procedure for the electronic expansion valve for outdoor unit"*	Replace expansion valve if faulty.
	Faulty PCB	Fault	Replace PCB and check operation	Replace PCB if faulty
		Disconnected wires for expansion valve control	Check connections	Repair wiring connections
	Faulty discharge gas thermistor	Fault	When the outdoor unit has been stopped for a long time, verify Td thermistor measures almost the same temperature as the rest of the outdoor unit thermistors	Replace thermistor if faulty
		Incorrect mounting	Check mounting state	Correctly mount thermistor
		Incorrect connection	Check connections	Remove looseness, replace connector or repair connections.

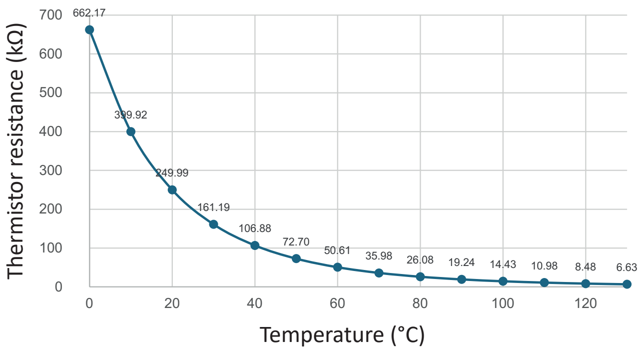
Alarm code 08 Excessively high discharge gas temperature at the top of compressor

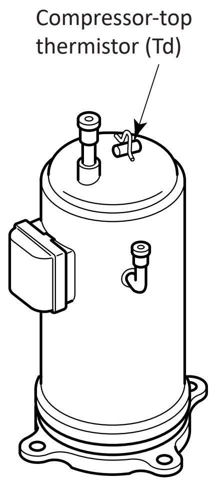
- The alarm appears when the compressor-top thermistor temperature remains at 110 °C or above for 10 minutes, or at 112 °C or above for 5 seconds.





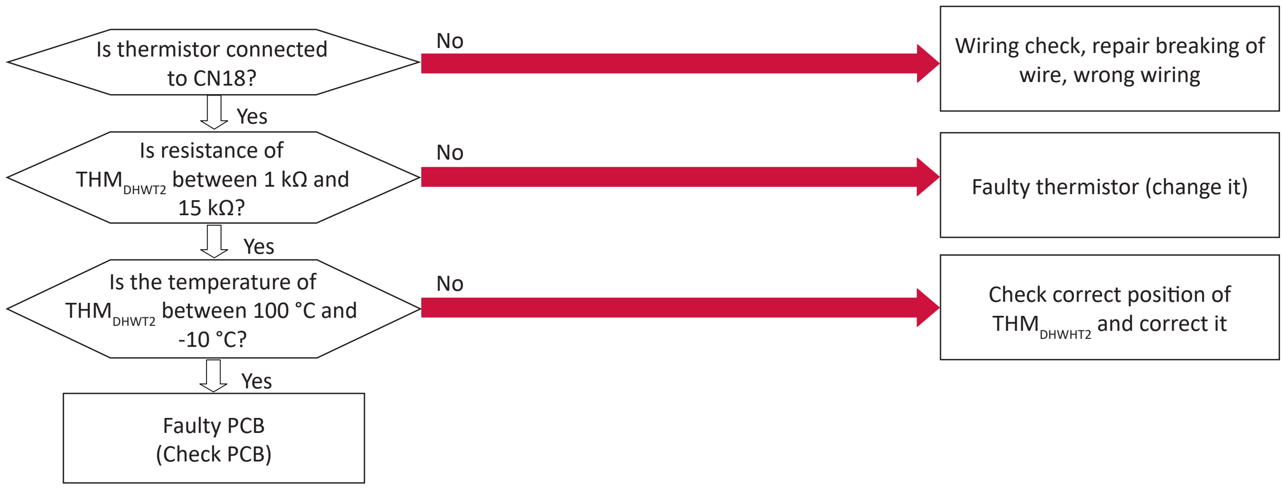
Thermistor resistance characteristics





Alarm code	10	Domestic hot water temperature top thermistor (THM_{DHWT2}) anomaly

- This alarm code is displayed when the thermistor is short-circuited (greater than 100 °C) or cut (less than -10 °C) when DHW is enabled.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

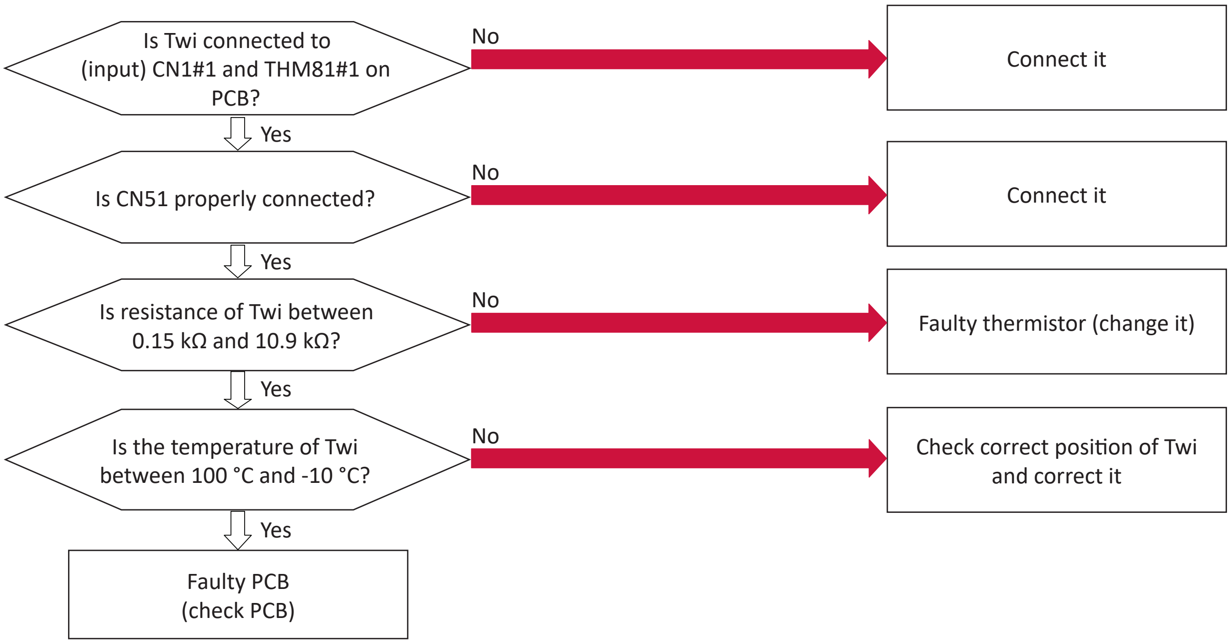


NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code	11	Water inlet temperature thermistor (Twi) anomaly

- This alarm code is displayed when the thermistor is short-circuited (≥ 100 °C) or cut (≤ -10 °C) during the cooling process or the heating process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

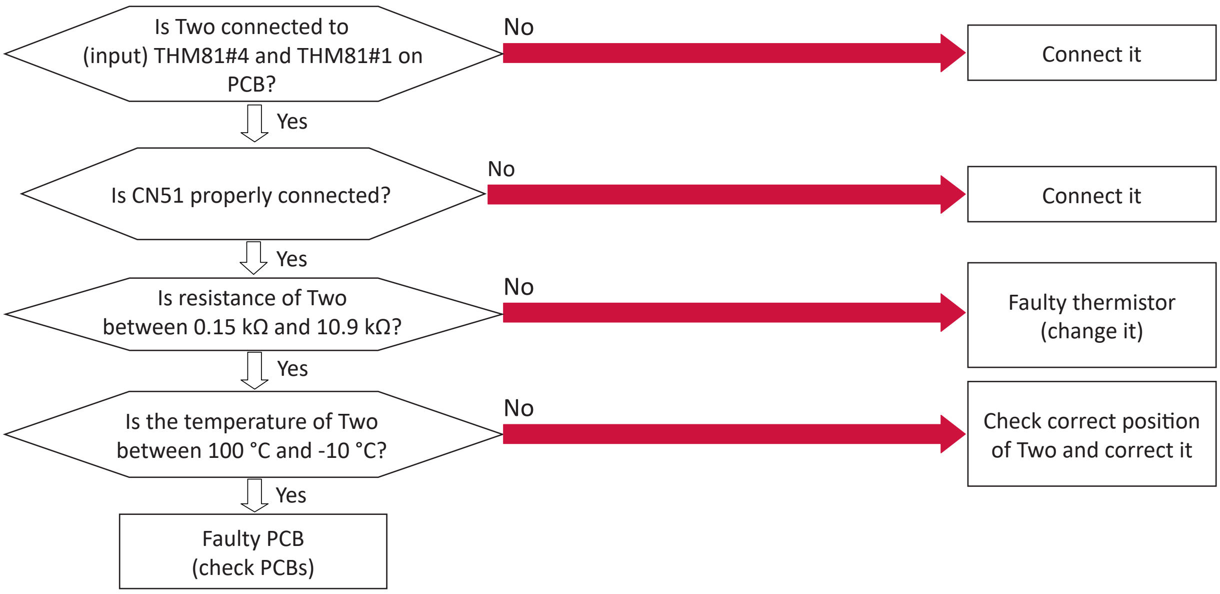


NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code	12	Water outlet temperature thermistor (Two) anomaly

- This alarm code is displayed when the thermistor is short-circuited (≥ 100 °C) or cut (≤ -10 °C) during operation process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

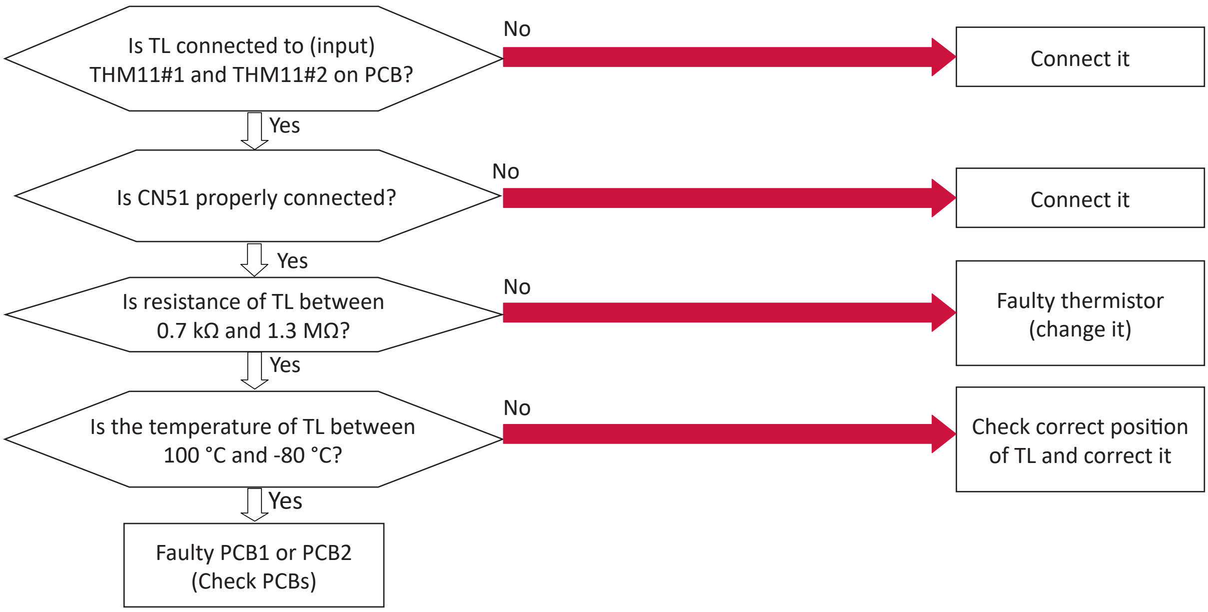


NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code 13 Indoor liquid pipe refrigerant temperature (TL) thermistor anomaly

- This alarm code is displayed when the thermistor is short-circuited (≥ 100 °C) or cut (≤ -80 °C) during operation process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

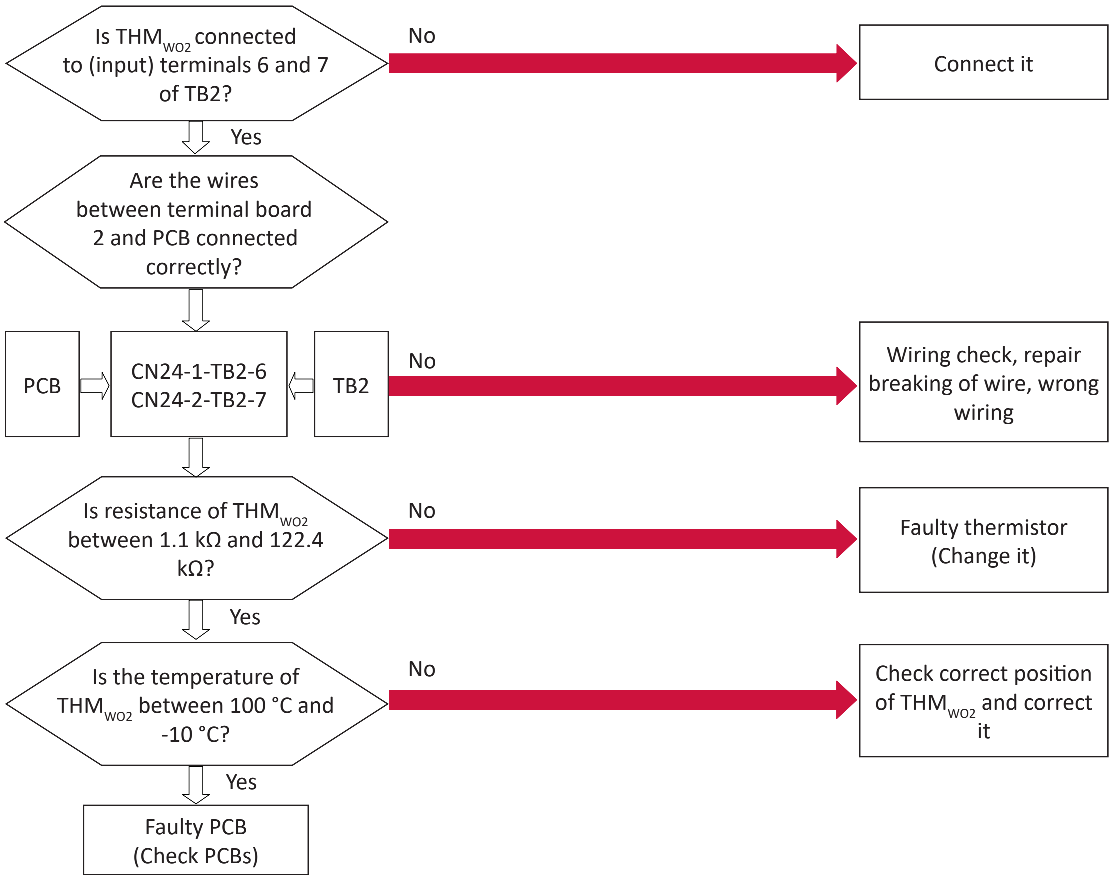


NOTE

For more information refer to *"Electrical checks of the main parts".*

Alarm code	15	Water outlet circuit 2 (mixing circuit) temperature thermistor (THM_{WO2}) anomaly

- This alarm code is displayed when the thermistor is short-circuited (≥ 100 °C) or cut (≤ -10 °C) during operation process.
- This alarm forces tall operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



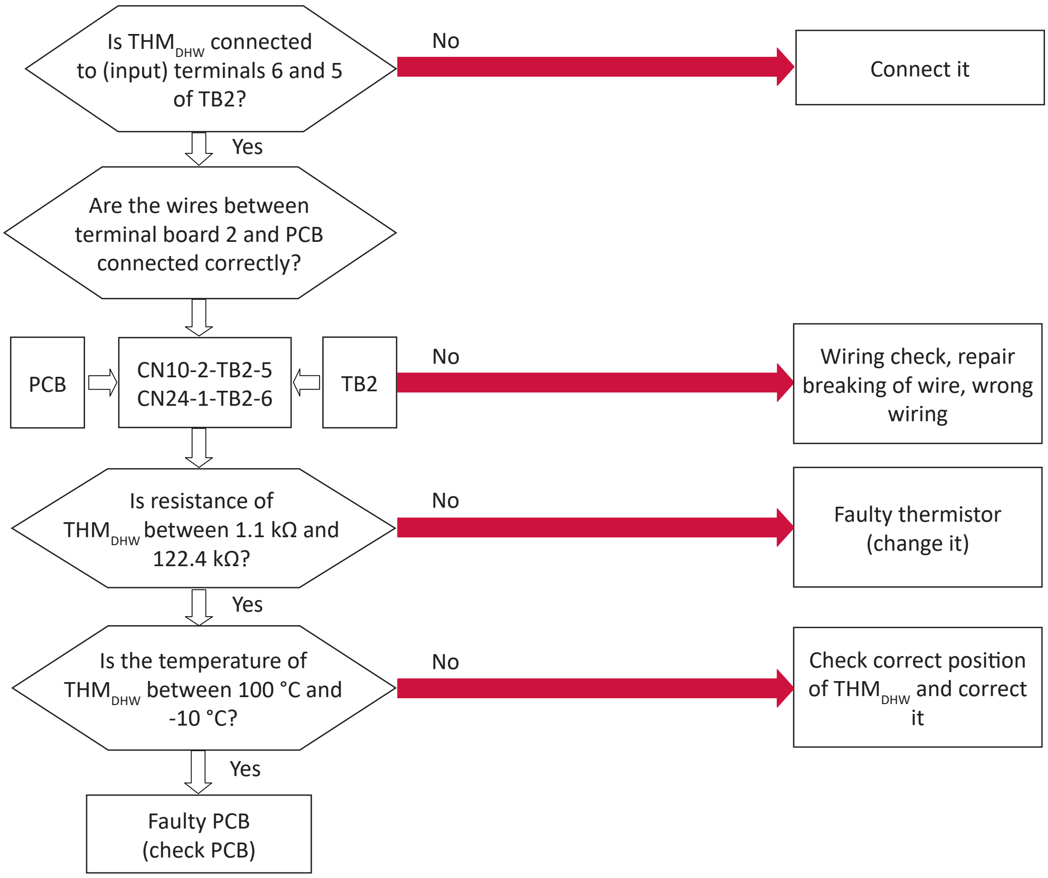
NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code	16	Domestic hot water temperature thermistor (THM_{DHW}) anomaly

HWM-W2E(-B) and ATW-CBX-01

- This alarm code is displayed when the thermistor is short-circuited (greater than 100 °C) or cut (less than -10 °C) when DHW is enabled.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



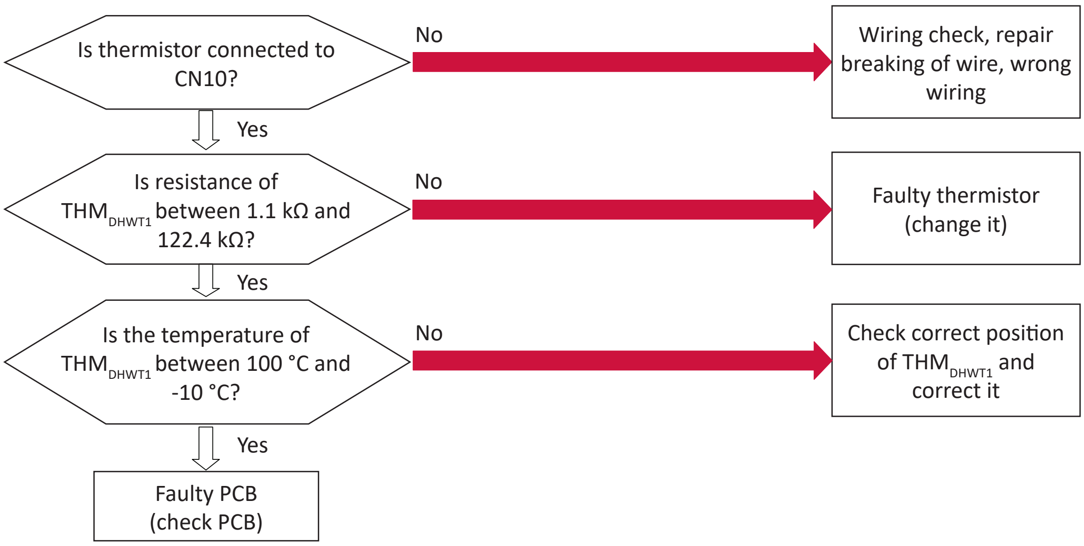
NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code	16	Domestic hot water temperature thermistor (THM_{DHWT1}) anomaly

HWD-W2E-220S(-K)

- This alarm code is displayed when the thermistor is short-circuited (greater than 100 °C) or cut (less than -10 °C) when DHW is enabled.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

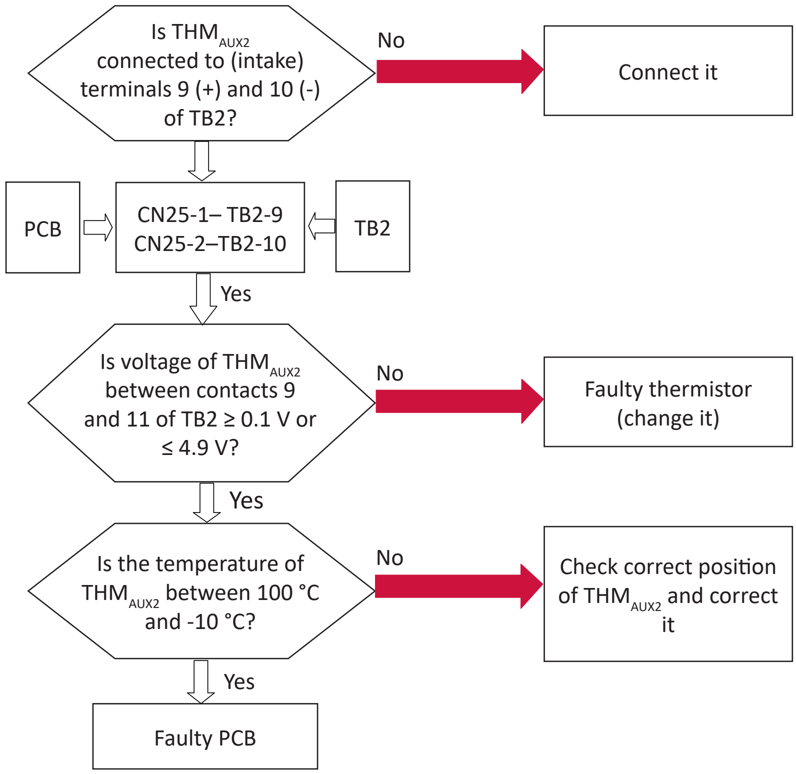


NOTE

For more information refer to "Electrical checks of the main parts".

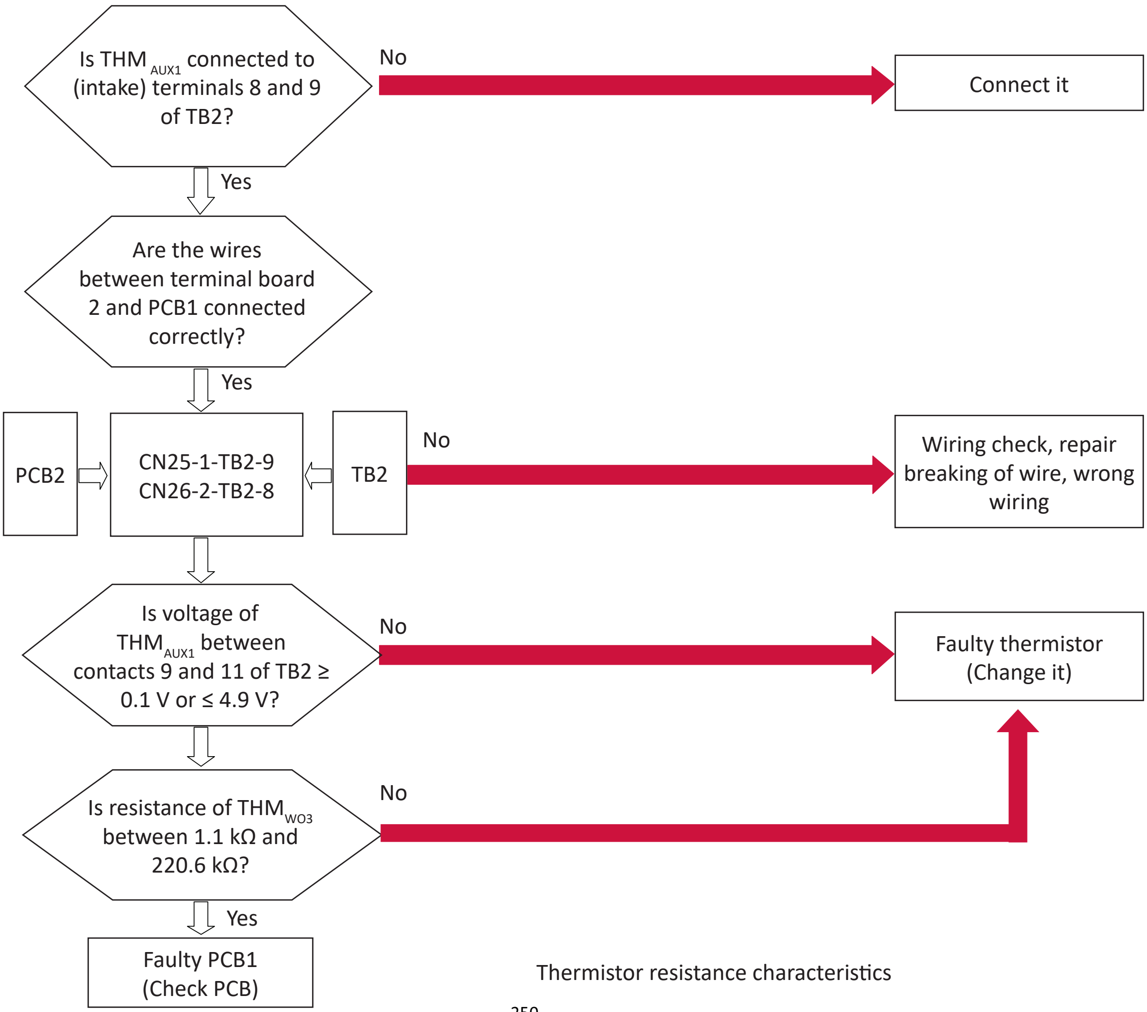
Alarm code	17	Auxiliary temperature sensor 2 (THM_{AUX2}) anomaly

- This alarm code is displayed when a sensor anomaly is detected. The detection of anomaly is activated when the read voltage is lower than 0.1 V or higher than 4.9 V during operation process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

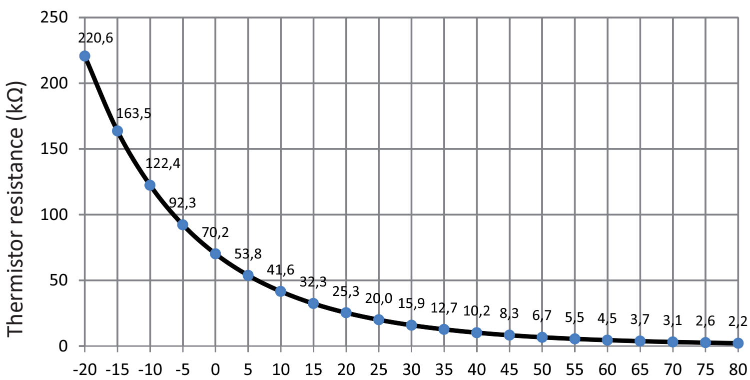


Alarm code 18 Auxiliary temperature sensor 1 (THM_{AUX1}) thermistor anomaly

- This alarm code is displayed when a sensor anomaly is detected. The detection of anomaly is activated when the read voltage is lower than 0.1 V or higher than 4.9 V during operation process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

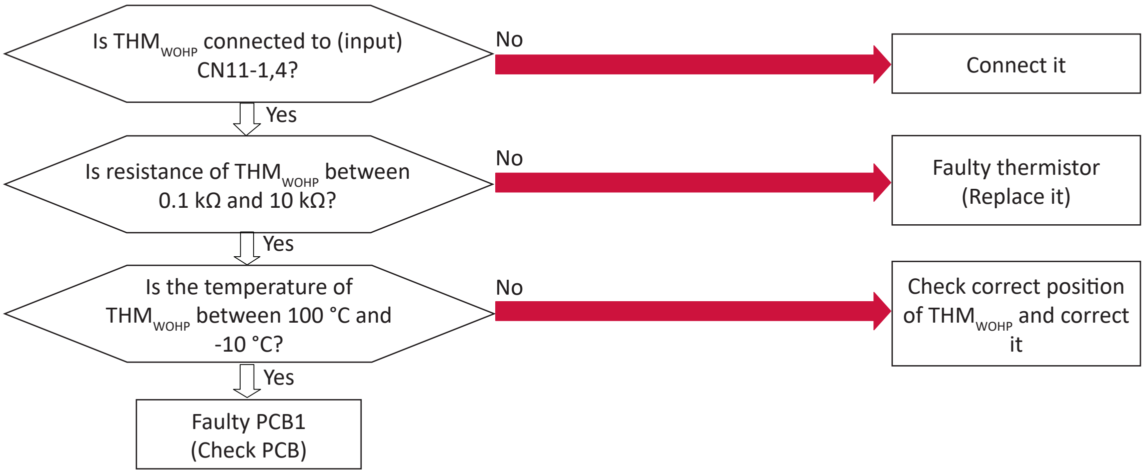


Thermistor resistance characteristics



Alarm code	14	Water Plate HEX pipe (THM_{WOHP}) thermistor anomaly

- This alarm code is displayed when the thermistor is short-circuited (≥ 100 °C) or cut (≤ -10 °C) during the cooling process or the heating process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code	20	Thermistor for discharge gas temperature (Td) (compressor thermistor) anomaly

- This alarm code is indicated when the thermistor is short-circuited (less than 1 kΩ) or cut (higher than 640 kΩ) during the cooling or the heating process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

Is the thermistor connected to Td of PCB? — No → Connect it

↓ Yes

Is CN51 properly connected? — No → Connect it

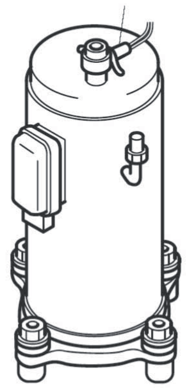
↓ Yes

Is the resistance of Td between 1 kΩ and 6 kΩ? — No → Faulty thermistor

↓ Yes

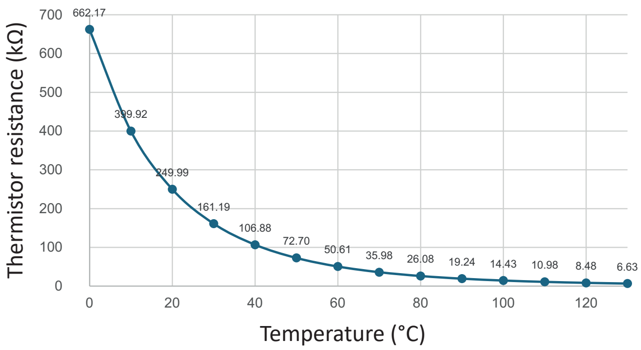
Faulty PCB

Thermistor on top of compressor



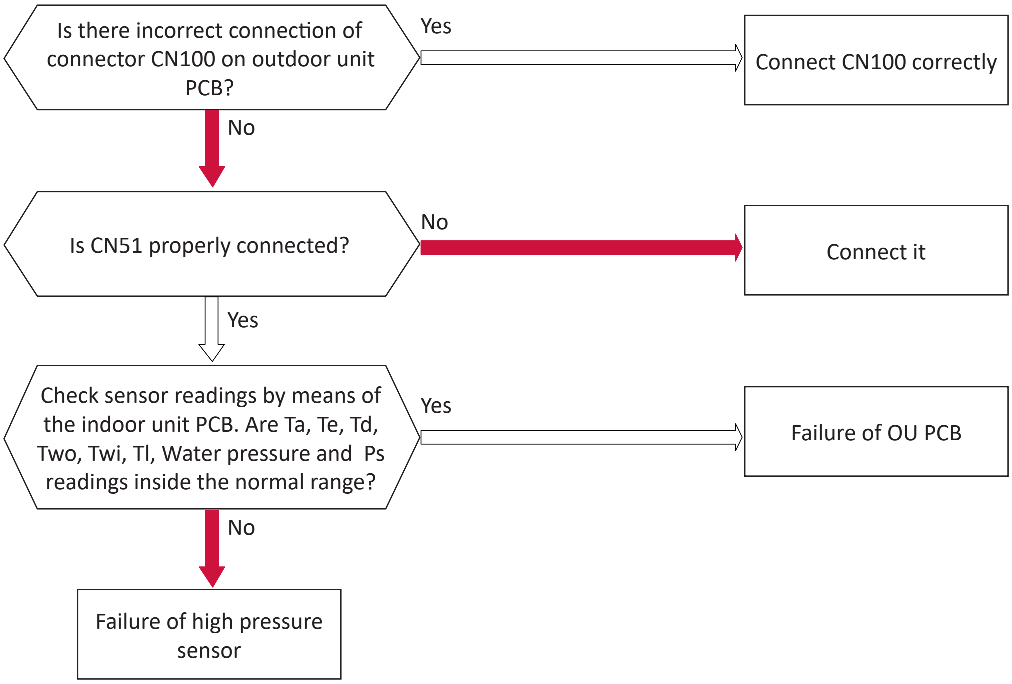
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty top of compressor thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB1 if faulty

Thermistor resistance characteristics



Alarm code 21 Abnormality of High Pressure Sensor (Pd)

- This alarm code is displayed when output voltage of the high pressure sensor decreases to 0.1 V or less, or increases to 4.9 V or more during operation.
- The alarm code is displayed on the wired controller of the indoor unit.
- The unit should be stopped to release the alarm.



Alarm code	22	Abnormal operation of the thermistor for the outdoor temperature (Ta) (outdoor unit ambient thermistor)

- This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

Is the thermistor Ta connected to PCB1? — No → Connect it

Yes ↓

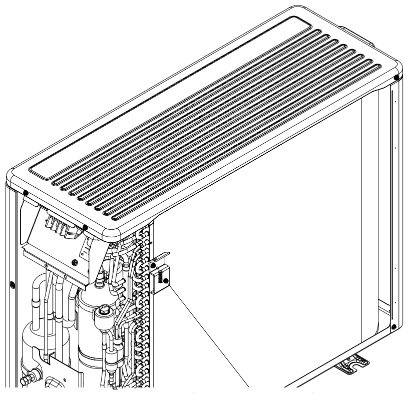
Is CN50 properly connected? — No → Connect it

Yes ↓

Is the resistance of Ta between 0.24 kΩ and 500 kΩ? — No → Faulty thermistor

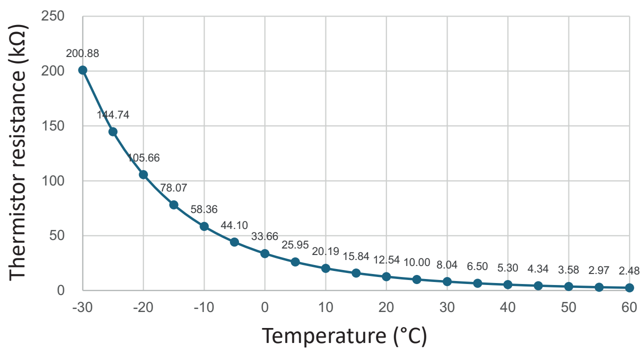
Yes ↓

Faulty PCB1



Outdoor unit ambient thermistor (Ta)

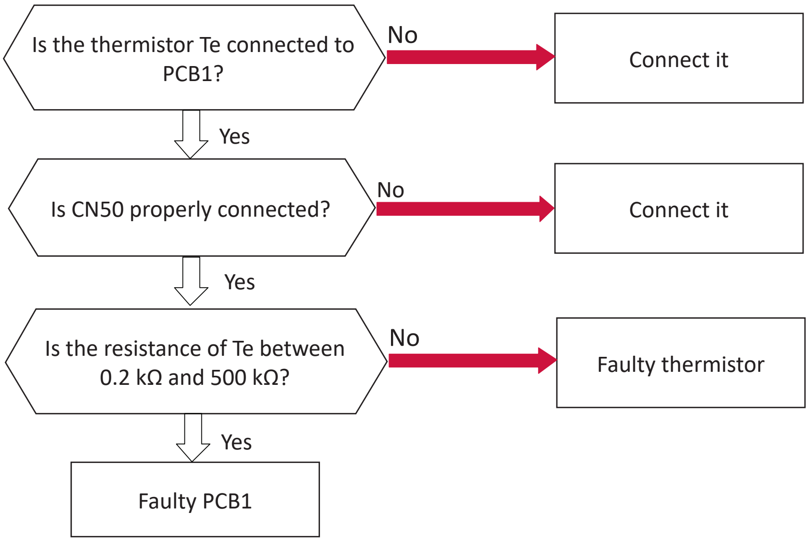
Thermistor resistance characteristics



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty thermistor for the outdoor unit ambient	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Repair wiring and connections
Faulty PCB		Replace PCB and check operation	Replace PCB if faulty

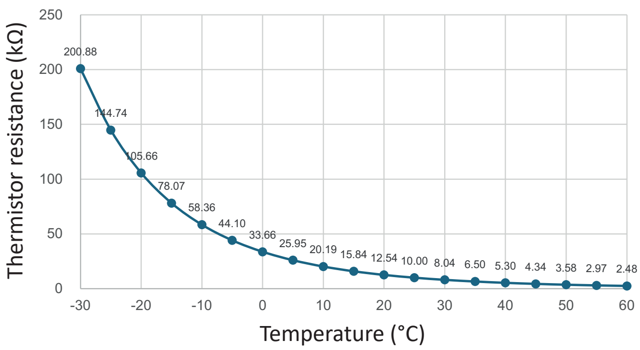
Alarm code	24	Abnormal operation of the thermistor for the evaporating temperature in heating mode / condensing temperature in cooling mode (Te)

- The evaporating / condensing thermistor during the heating process is attached to the heat exchanger as shown in the figure below. If this thermistor is faulty, such as short-circuit (less than 0.2 kΩ) or cut (more than 500 kΩ) during eight minutes continuously, this alarm is displayed. The position is indicated below.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



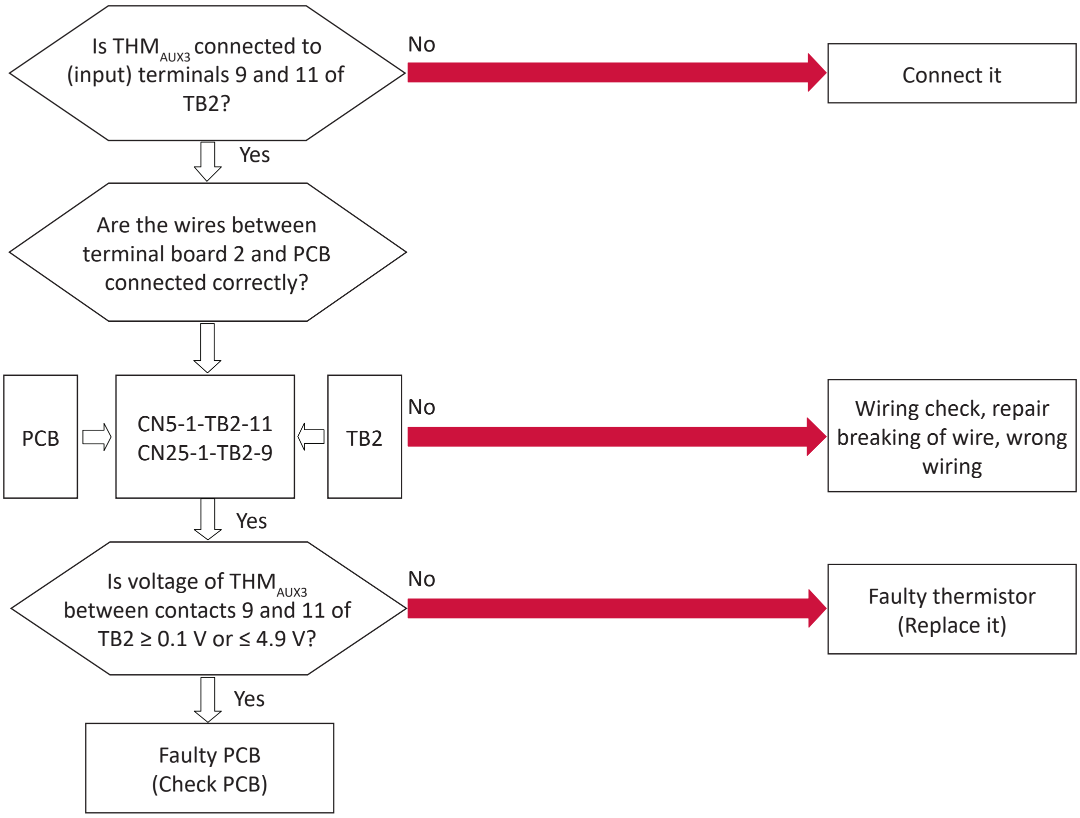
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty thermistor for the evaporating / condensing temperature during heating	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect Connection	Check the wiring to PCB	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Te (Evaporating thermistor)



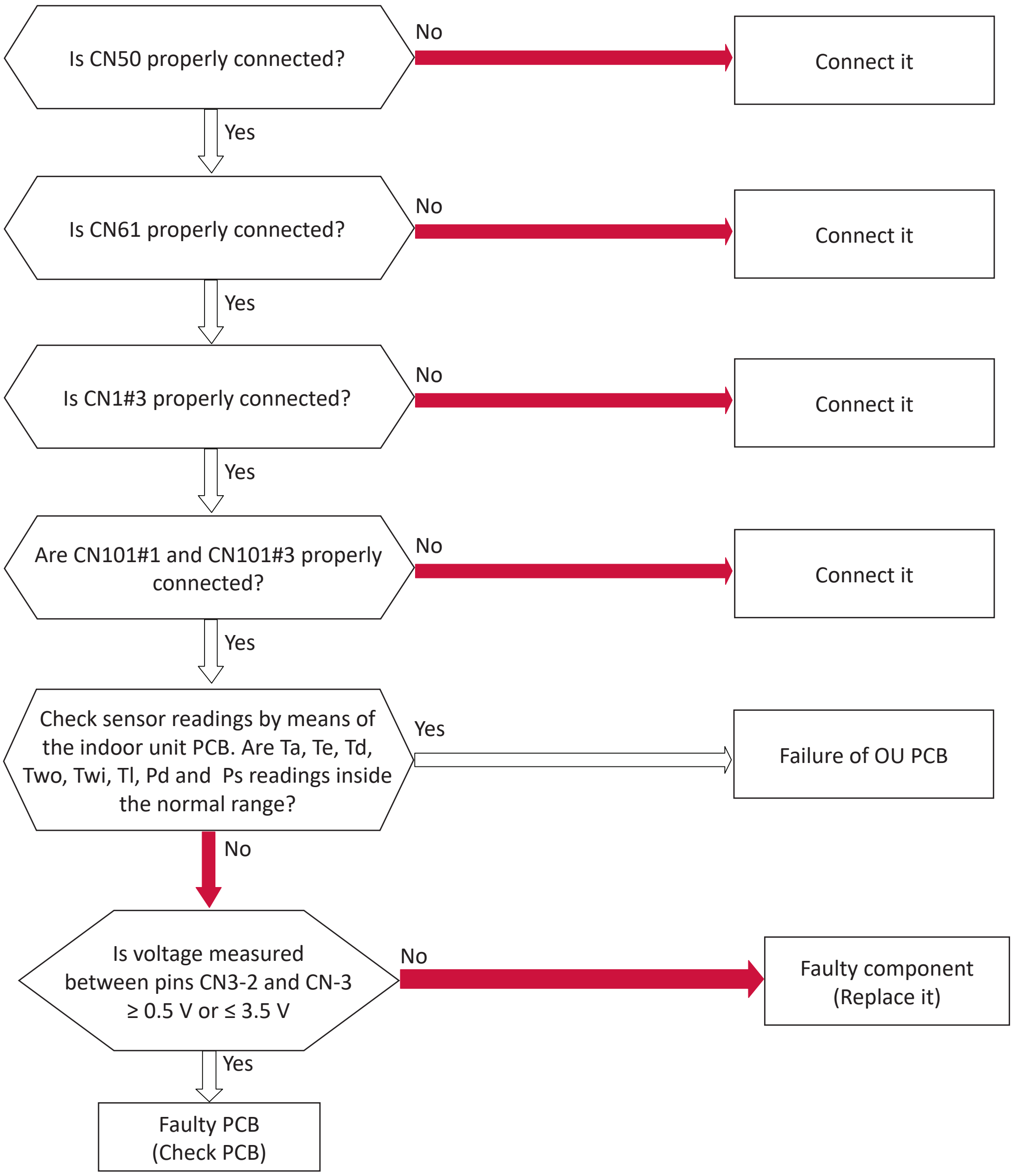
Alarm code 25 | Auxiliary sensor 3 thermistor (THM_{AUX3}) anomaly

- This alarm code is displayed when a thermistor anomaly is detected. The detection of anomaly is activated when the read voltage is lower than 0.1 V or higher than 4.9 V during operation process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



Alarm code	26	Water pressure sensor (Psw) anomaly

- This alarm code is displayed when a anomaly is detected on the pressure sensor. The detection of anomaly is activated when the read voltage is lower than 0.5 V or higher than 3.5 V during operation process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



Alarm code 24 Low pressure sensor

- This alarm code is displayed immediately after detection of the abnormality:
  - ✓ In case that the state in which the pressure conversion value of the low pressure sensor is higher than 1.3 MPa continues for 1 second.
  - ✓ In case that the state in which the pressure conversion value of high pressure sensor is lower than -0.1 MPa continues for 1 second.
- After detection of abnormality and before occurrence of alarm, operation continues retaining the data from before abnormality detection.
- The alarm is shown immediately in case of abnormality when 20 seconds have passed after the end of automatic addressing.

Process at alarm:

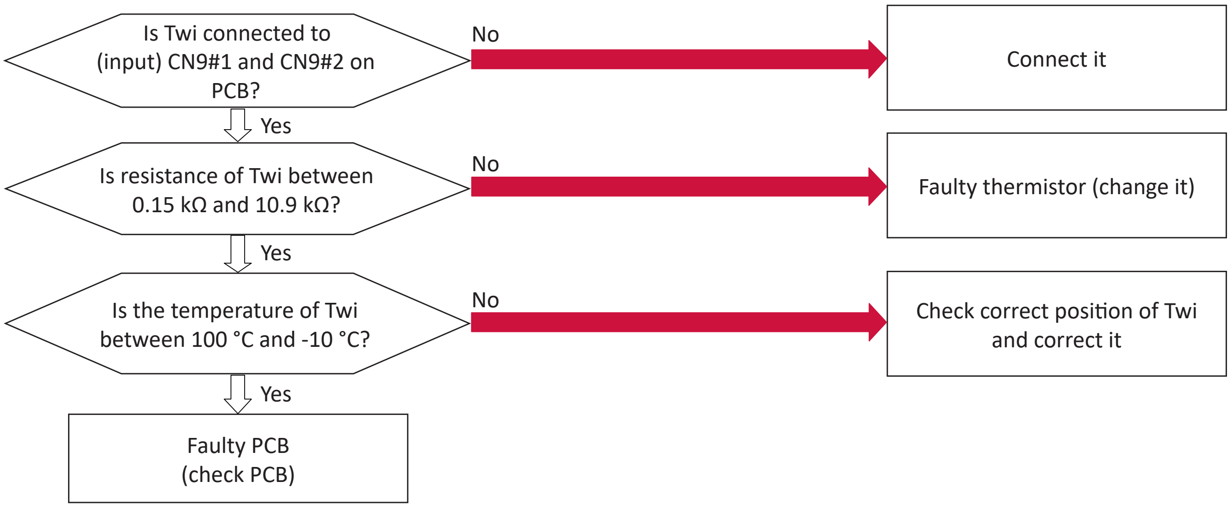
a. Shift to switch OFF stop state.
b. Zero reset process of the expansion valve is performed.
c. The alarm code is sent to all the indoor units

Alarm release conditions:

a. In case that the pressure conversion value of the low pressure sensor returns to the normal range.
b. In case that release condition Ta ≥ 30 °C is satisfied while an abnormality has been detected with the outdoor unit being stopped.

Alarm code	33	Twi sensor alarm at **airH2O 800H Combi** module

- This alarm code is displayed when the thermistor is short-circuited (≥ 100 °C) or cut (≤ -10 °C) during the cooling process or the heating process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

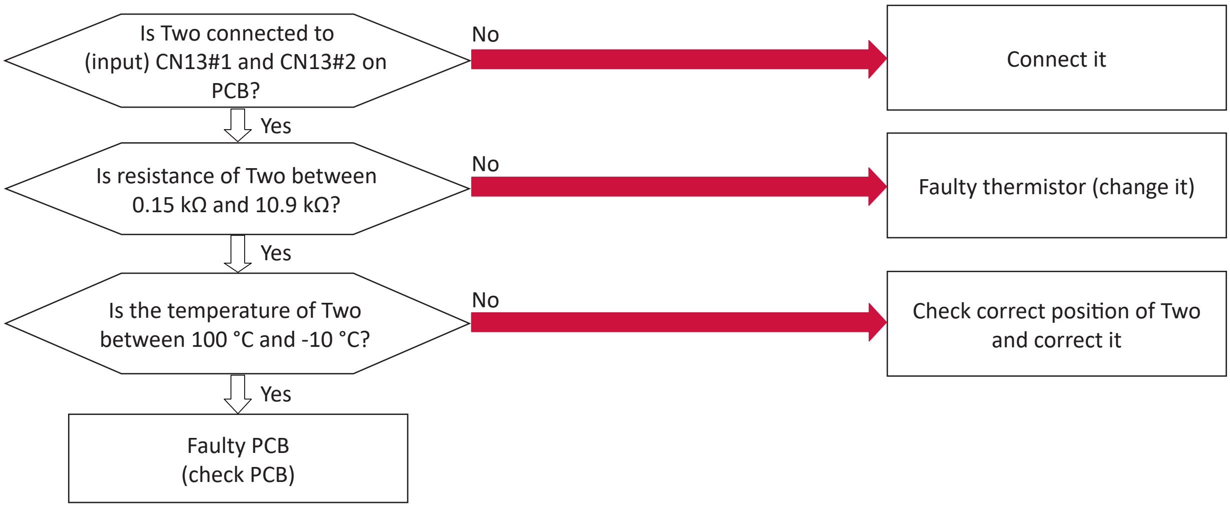


NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code **34** — Two sensor alarm at **airH2O 800H/H Combi** module

- This alarm code is displayed when the thermistor is short-circuited (≥ 100 °C) or cut (≤ -10 °C) during the cooling process or the heating process.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



NOTE

For more information refer to "Electrical checks of the main parts".

Alarm code	35	Incorrect indoor unit number setting

- The alarm code appears from 3 to 5 minutes after the outdoor unit power activation if any inconsistency according to capacity is detected between indoor unit and outdoor unit. This applies when indoor unit capacity has no coincidence with outdoor unit capacity.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

Alarm code	36	Indoor unit combination error

- This alarm code is indicated in case an incorrect indoor unit is connected.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

Alarm code	38	Anomaly at picking up circuit for protection (outdoor unit)

The purpose of this alarm is to detect any anomaly in the fault detection circuit. This circuit consists of the Klixon thermal protector (TCO) located at the top of the compressor and the high-pressure switch (PSH).

If either of these two components is active at the moment the compressor attempts to start, the system will keep the compressor stopped and display alarm 38.

Procedure in case of alarm 38

- If the compressor temperature has risen excessively, wait until it returns to ambient temperature.
- If the system pressure has been too high, wait until it stabilizes to values consistent with the ambient temperature.

NOTE

Both the compressor discharge temperature and discharge pressure can be checked via the PC-ARFH3E.

- If none of the above conditions are present and the alarm persists after performing a Power OFF / Power ON cycle, this indicates a lack of continuity somewhere in the circuit. Therefore, it is recommended to disconnect connector CN17 and measure the continuity of the circuit.
- If there is no continuity, repeat the measurement at both the thermal protector (TCO) and the high-pressure switch (PSH).

Alarm code	40	Incorrect unit controller setting

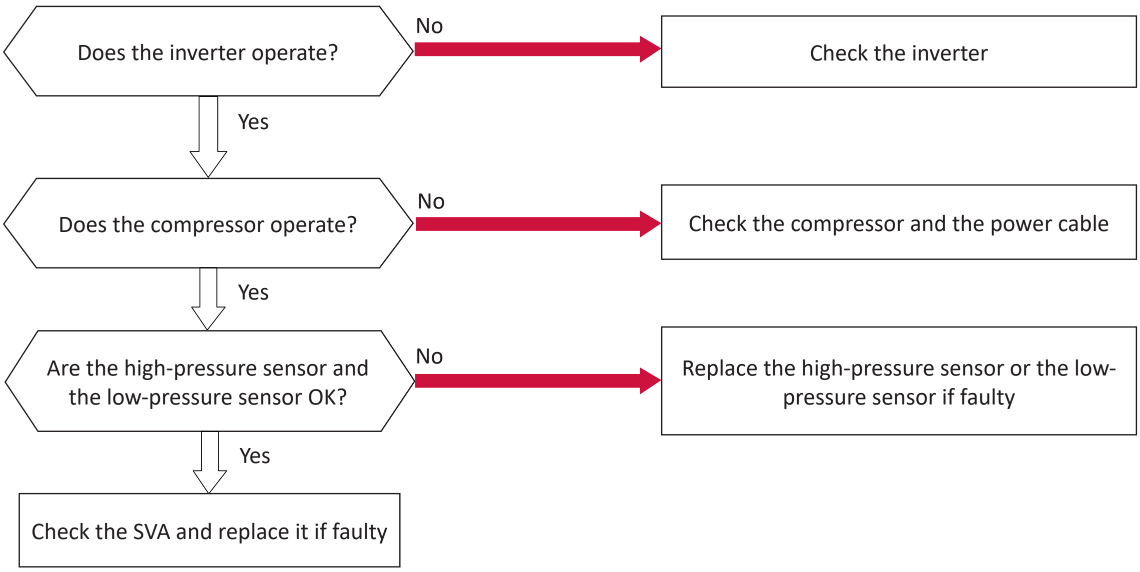
- This alarm is displayed when an abnormal setting of the unit controller is detected after 30 seconds.
- This alarm forces all operations to stop (outdoor and indoor units).
- To release the alarm the unit should be stopped or no incorrect setting should be detected.

The incorrect settings detected for this alarm to be displayed are explained below:

- T_{WO3} needs to be used and it is not configured. T_{WO3} needs to be used in following conditions:
  - ✓ Boiler operation (serial or parallel) is configured.
  - ✓ DSW5-4 is ON.

Alarm code	42	Pressure ratio increase

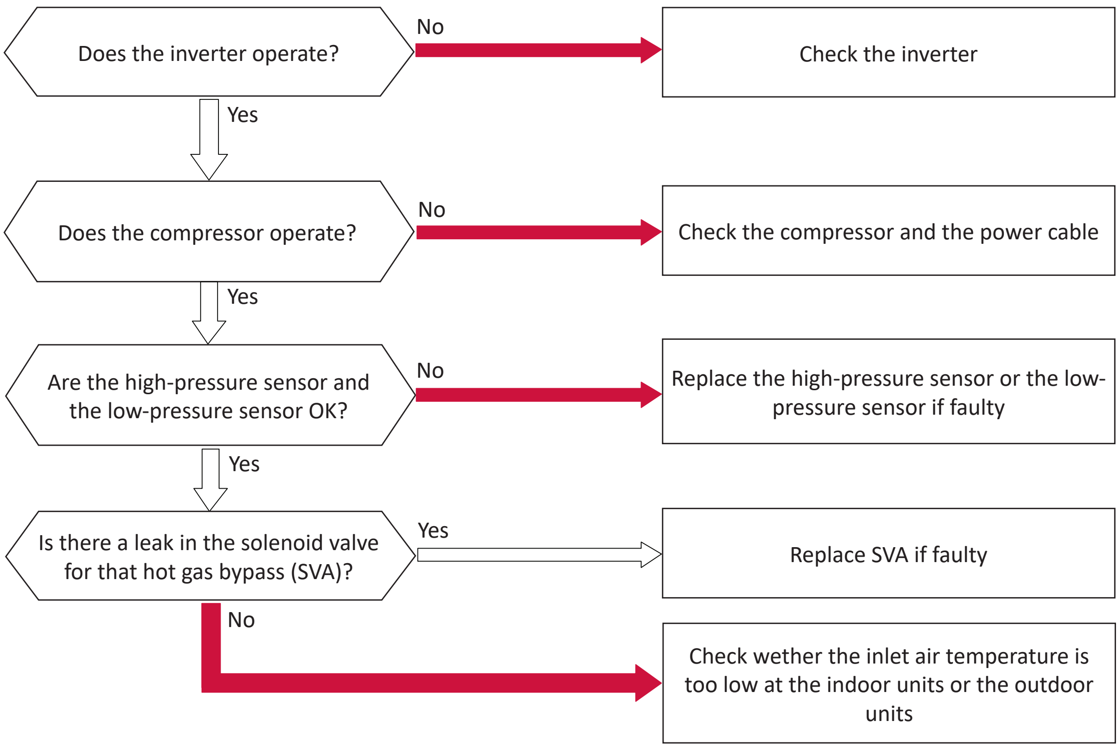
- This alarm is displayed when the compression ratio, calculated from the discharge pressure (Pd, MPa) and the suction pressure (Ps, MPa), becomes critically high for more than 3 times in 30 minutes.



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Excessively high compression ratio	Valve stoppage at medium position of 4-way valve	Measure the suction pipe temp. of the 4-way valve	Replace the 4-way valve if faulty
	Abnormal operation of the high-pressure sensor or the low-pressure sensor	Check the connector for PCB1, the power source and the pressure indication	Replace the sensor if faulty
	Excessively low water inlet temperature of the indoor unit	Check the indoor unit and the outdoor unit air temp. thermistor	Replace the thermistor if faulty
	Leakage of the solenoid valve (outdoor unit)	Check the solenoid valve	Replace SVA if leaking

Alarm code 43 — Pressure ratio decrease

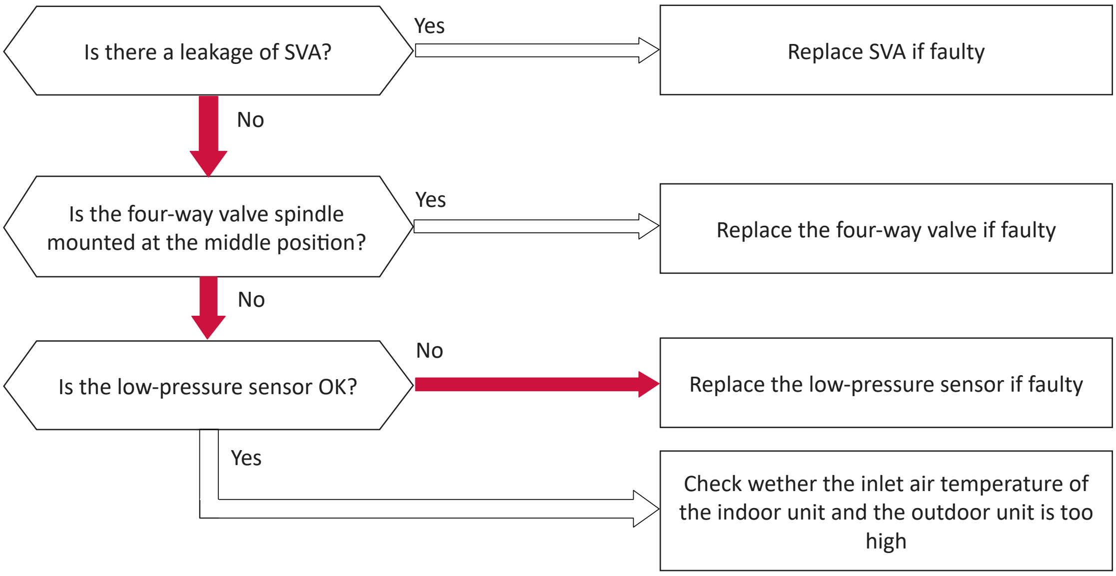
- This alarm is displayed when the compression ratio, calculated from the discharge pressure (Pd MPa) and the suction pressure (Ps MPa), becomes critically low for more than 3 times in 30 minutes.



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Excessively low compression ratio	Valve stoppage at medium position of 4-way valve	Measure the suction pipe temp. of the 4-way valve	Replace the 4-way valve if faulty
	Abnormal operation of the high-pressure sensor or the low-pressure sensor	Check the connector for PCB1, the power source and the pressure indication	Replace the sensor if faulty
	Excessively low water outlet temperature of the indoor unit	Check the indoor unit and the outdoor unit air temperature thermistor	Replace the thermistor if faulty
	Leakage of the solenoid valve (outdoor unit)	Check the solenoid valve	Replace SVA if leaking

Alarm code	44	Low pressure increase abnormality

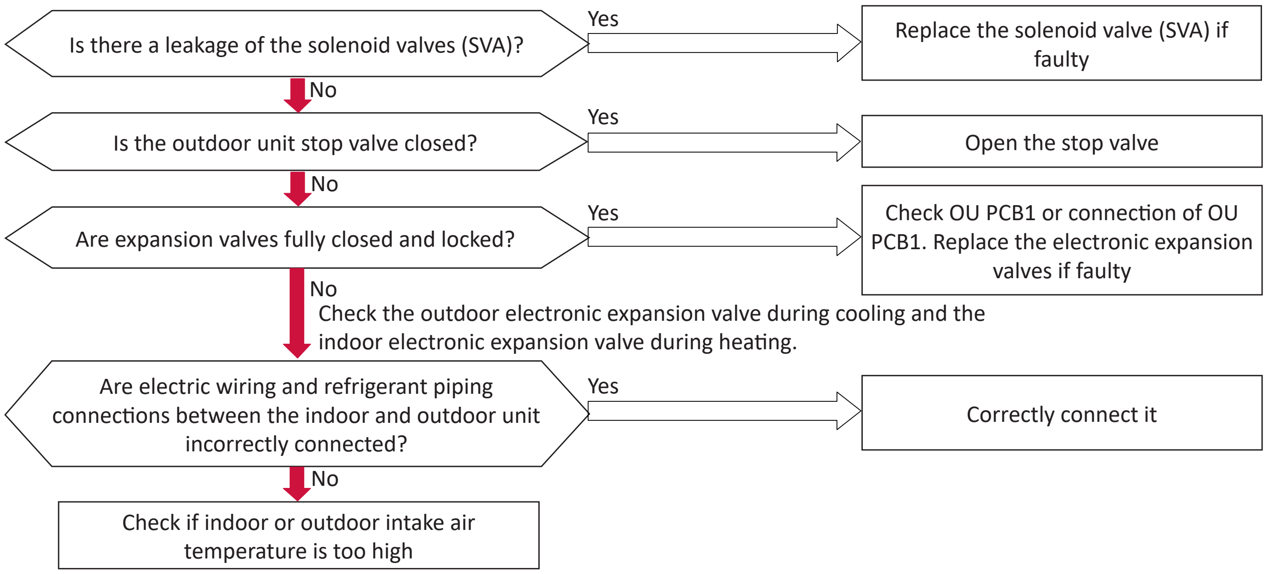
- This alarm is displayed when the compressor operates for 1 minute with a suction pressure (Ps) higher than 1.0 MPa. All compressors are stopped and retry operation is started after 3 minutes.
- This alarm is displayed when same phenomenon is occurred at two times within the next 30 minutes.



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Excessively high suction pressure	Leakage of solenoid valve (SVA)	Check the outlet pipe temp of (SVA)	Check the connect wires. Replace (SVA) if faulty
	Valve stoppage at the medium position of the 4-way valve	Measure the suction gas temp. of 4-way valve	Replace the 4-way valve if faulty
	Abnormal suction pressure sensor	Check the connectors of PCB1 and the power source	Replace the sensor if faulty
	Excessively high water temperature and high outdoor unit Ta temperature	Check the indoor unit and the outdoor unit suction air temperature thermistor	Replace the thermistor if faulty

Alarm code 45 Activation of the safety device from excessively high discharge pressure

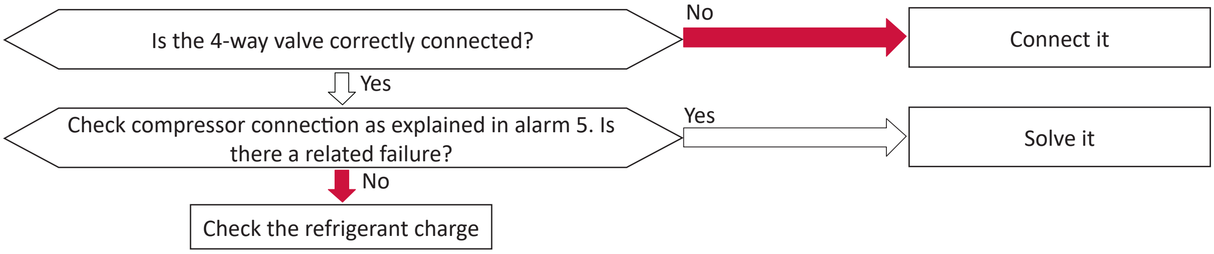
- When the compressor is operated with the discharge pressure (Pd) higher than 3.0 MPa for 1 minute, the retry operation is performed 3 minutes after all compressors are stopped. Thereafter, this alarm code is indicated when above anomaly is detected twice in 30 minutes.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Excessively high discharge pressure	Leakage of solenoid valve (SVA)	Check the outlet temperature of solenoid valve (SVA)	Check connection. Replace solenoid valve (SVA) if faulty
	Closed stop valve	Check stop valve	Open stop valve
	Abnormal high pressure sensor	Check connecting condition and output voltage “CN100” (on outdoor unit PCB1) for high pressure sensor	Replace high pressure sensor if faulty
	Excessively high temperature of inlet air for outdoor unit or indoor unit	Check thermistor for indoor unit and outdoor unit inlet air temperature	Replace the inlet air thermistor if faulty
	Incorrect connection between indoor unit and outdoor unit	Check electrical system and refrigerant cycle system	Correctly connect
	Locked expansion valve with fully closed	Check condition of connector “CN100” on OU PCB1	Repair connector for OU PCB1 or expansion valve. Replace if faulty

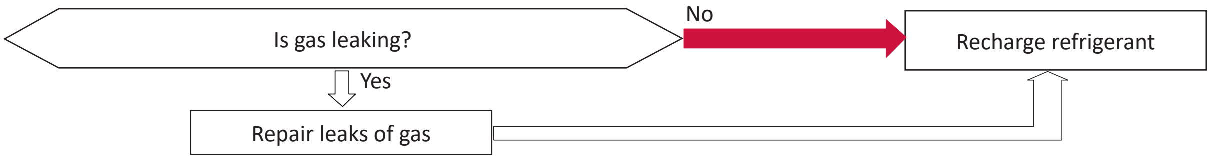
Alarm code 46 High pressure fall abnormality

- When the compressor is operated with the discharge pressure (Pd) lower than 0.45 MPa for 4 minutes. The alarm is confirmed in case the abnormality si confirmed 2 more times within 30 minutes.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



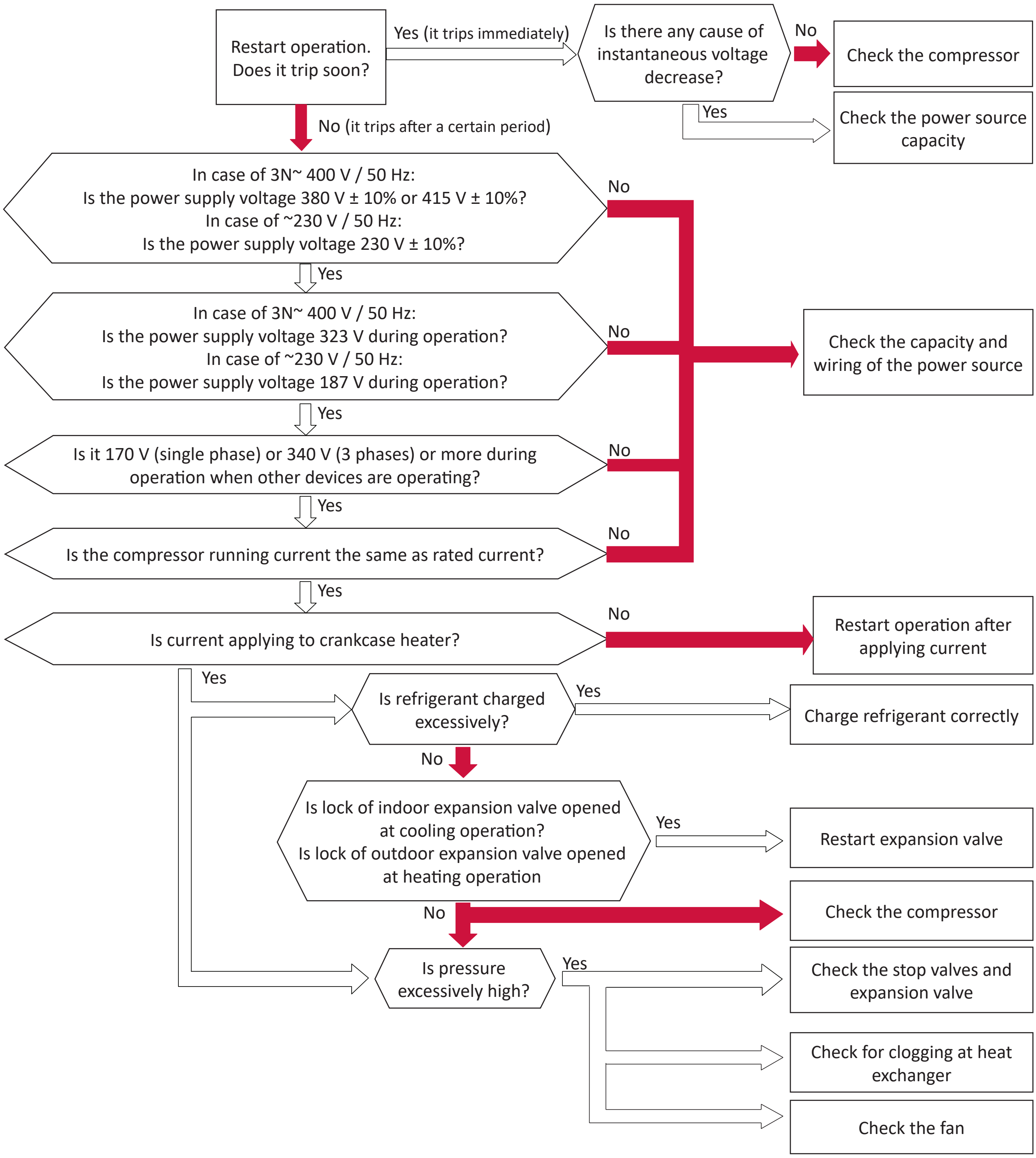
Alarm code	47	Activation of the safety device from excessively low suction pressure (protection from vacuum operation)

- When the compressor is operated with the suction pressure (Ps) lower than 0.08 MPa during 240 seconds. The alarm is confirmed in case the abnormality appears 2 more times within 1 hour
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty indoor unit liquid refrigerant temperature thermistor	Fault	Check resistance.	Replace thermistor if faulty.
Faulty outdoor unit evaporating temperature thermistor	Incorrect Connection	Check wiring to PCB.	Repair wiring and connections.
Faulty PCB (outdoor unit, indoor unit)		Replace PCB and check the operation.	Replace PCB if faulty.
Excessively low suction pressure (in vacuum)	Liquid line stop valve is not open before operation	Check stop valve.	Fully open stop valve.
	Faulty or malfunction of expansion valve	Check for clogging.	Remove clogging.
		Check connecting wiring and connectors.	Replace connector.
		Check operating sound from coil.	Replace coil.
		Check discharge gas thermistor.	Replace thermistor.
		Check attaching state of discharge gas thermistor.	Reattach thermistor.
	Refrigerant Leakage	Check each temperature and pressure.	Charge refrigerant after vacuum pumping.
		Check gas leakage part.	Correctly charge refrigerant after repairing gas leakage.
Faulty outdoor fan at heating operation	Faulty outdoor fan motor	Measure coil resistance and insulating resistance.	Replace outdoor fan motor if faulty.

Alarm code 48 Activation of overcurrent protection



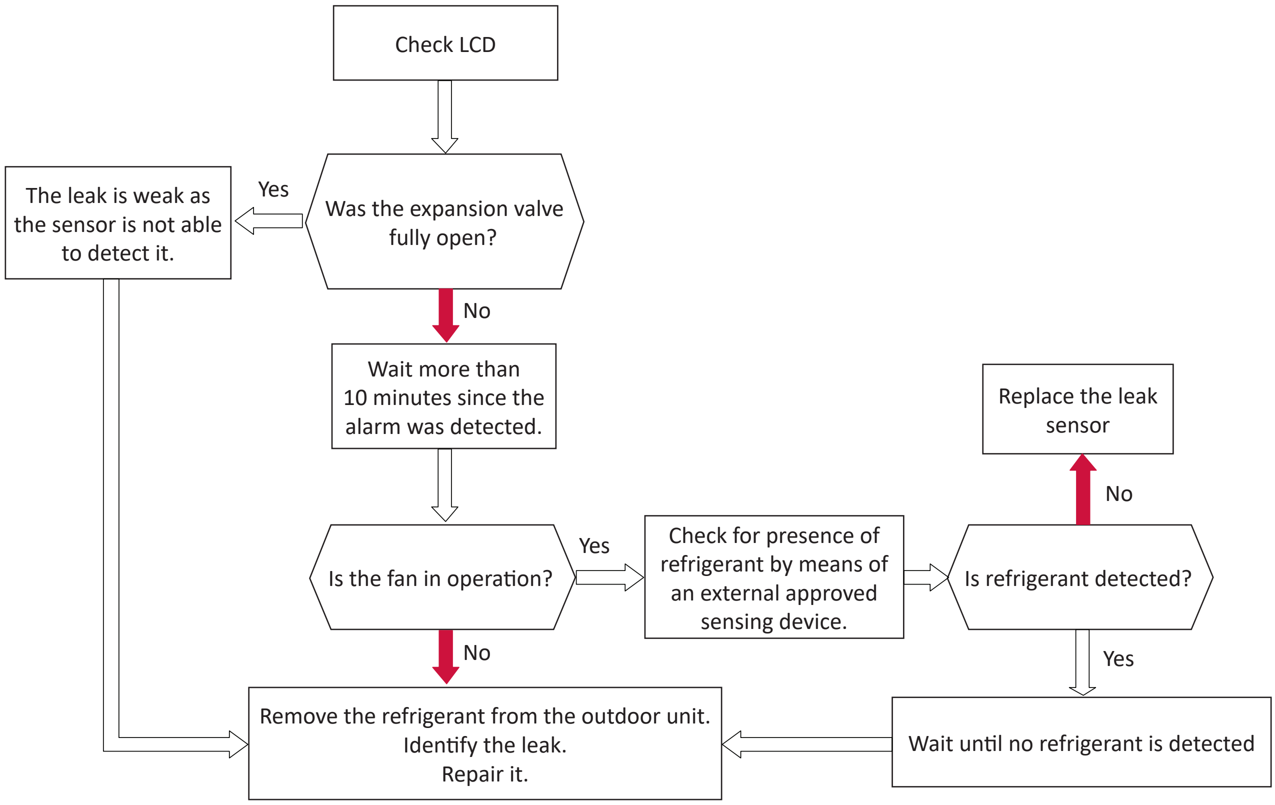
NOTE

The electrical measurements shall be done out of the unit itself, i. e. at the electrical panel.

Alarm code 49 Leak alarm or leak sensor malfunction

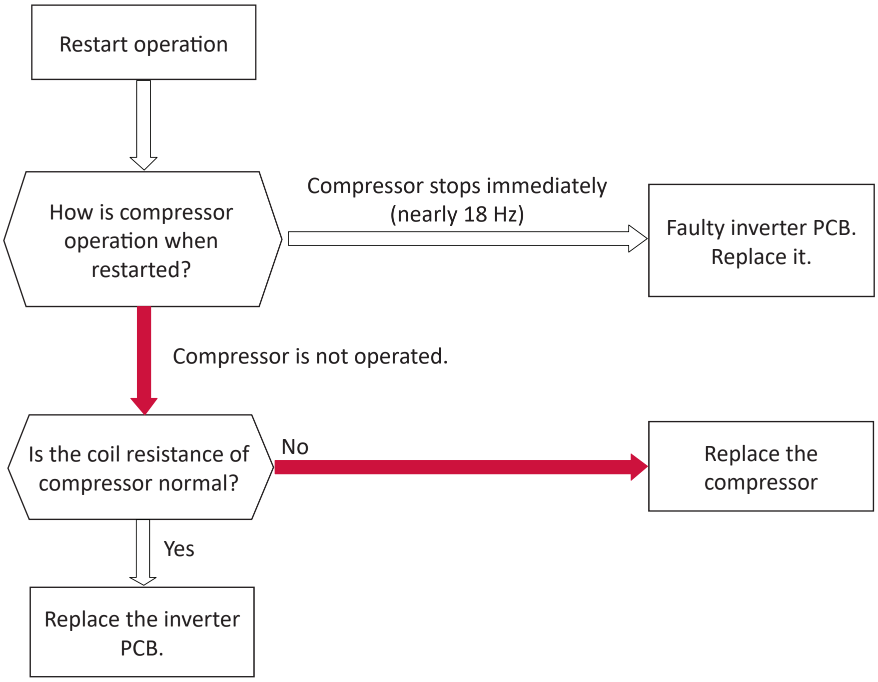
- This alarm is triggered in case:
  - ✓ A refrigerant leak is detected by means of the R290 leak sensor or indirect measurements.
  - ✓ The leak sensor is malfunctioning.

In case the unit shows alarm 49, the next steps are to be followed to detect its cause:



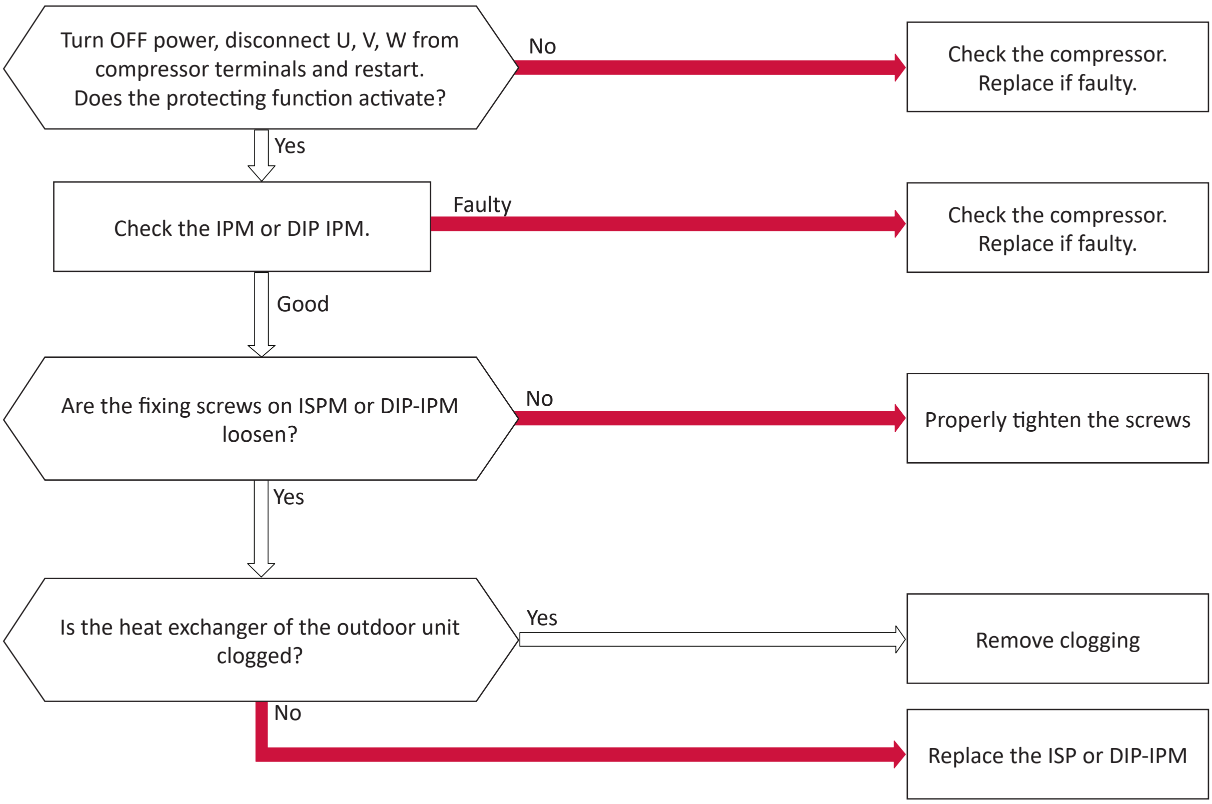
Alarm code 51 Abnormal operation of the current sensor

- This alarm code is displayed when the current transformer is abnormal (0 A detection or 5 A alarm condition) and the alarm has more than three occurrences in 30 minutes.
- Condition of activation:
  - ✓ When the frequency of the compressor is maintained at 15~18 Hz after the compressor is started, one of the absolute values of the running current at each phase U+, U-, V+ and V- is less than 1.5 A (including 1.5 A).
  - ✓ Before the compressor is operated (at the end of position control), the current wave value is less than 5.0 A.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



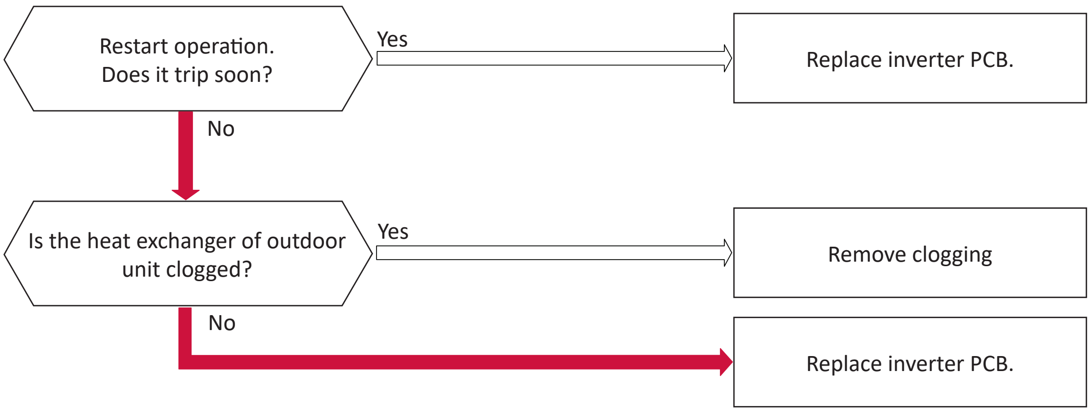
Alarm code 53 Protection of the inverter PCB

- IPM or DIP-IPM and PCB2 have detecting function of anomaly. This alarm is indicated when the transistor module detects the anomaly 7 times in 30 minutes. Retry operation is performed up to the occurrence of 6 times.
- Condition of activation:
  - ✓ Abnormal current such as short circuit, ground or the overcurrent occurs at the transistor module.
  - ✓ The temperature at transistor module increases abnormally.
  - ✓ The control voltage decreases.
  - ✓ The angle difference between the shaft in compressor and the shaft in the control program exceeds + 60 degrees.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



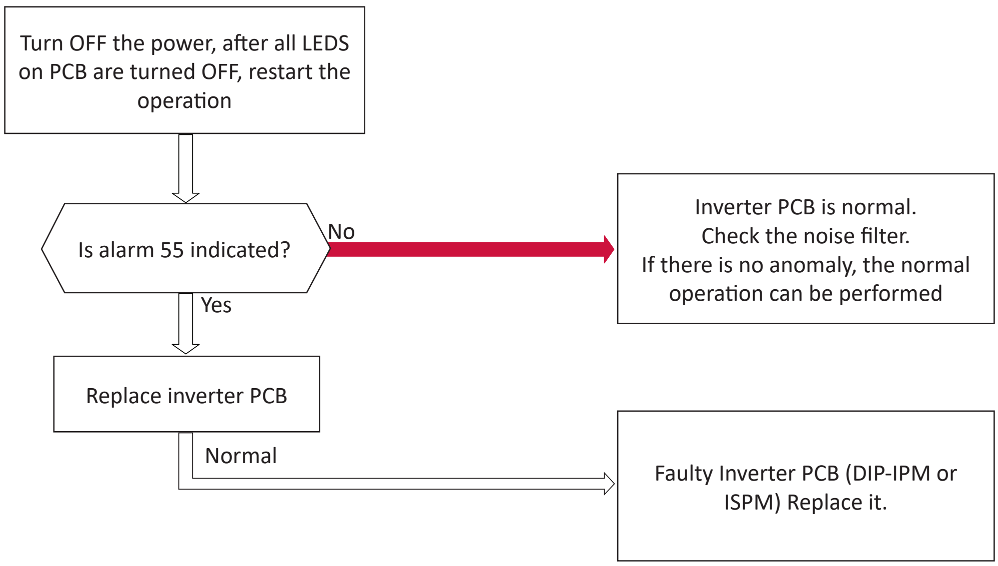
Alarm code 54 Anomaly of the inverter fin temperature

- This alarm code is indicated after the operation is stopped when the following conditions occur three times within 30 minutes. The retry operation is performed twice.
- Conditions of activation:
  - ✓ When the temperature inside the transistor module exceeds 100 °C.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.



Alarm code	55	Anomaly of inverter module

- Actual frequency from Inverter PCB is less than 10 Hz (after inverter frequency output form PCB1 to Inverter PCB).
- This alarm is displayed when it occurs 3 times in 30 minutes. Retry operation is performed up to the occurrence of 2 times.
- Condition of Activation:
  - ✓ This alarm is indicated when Inverter PCB is not performed normally.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

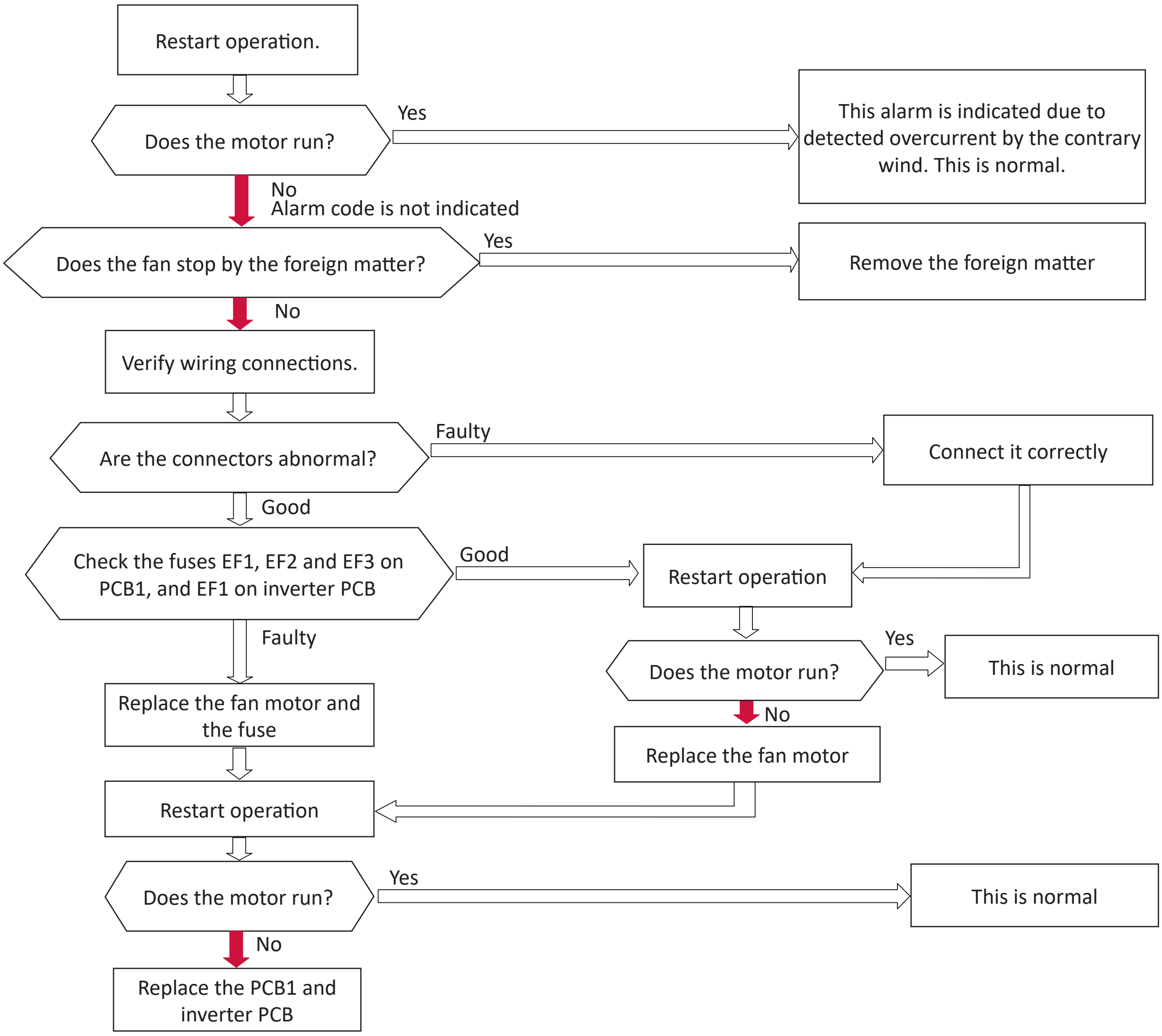


NOTE

When the excessive surge current is applied to the unit due to lighting or other causes, this alarm code is displayed on the LCD and the Itc=11 can be checked by means of the Service Tools software. In this case, check to ensure the surge absorber (SA) on the noise filter (NF1). The surge absorber may be damaged if the inner surface of the surge absorber is changed to black. If the surge absorber is damaged, replace the noise filter. If the surge absorber does not have anomaly, turn OFF the power source once and wait until turning OFF all LEDS on inverter PCB for approx. 5 min. Then, turn ON again.

Alarm code	57	Anomaly of fan motor protection (DC fan motor)

- This alarm is indicated when the revolution pulse output from the fan motor is 10 rpm or less. The fan motor is stopped once, and restarted after 10 seconds.
- If it occurs more than 10 times in 5 minutes after the first anomaly occurs, this alarm is indicated. The anomaly occurs when the fan motor is stopped.



NOTE

Check to ensure that DC Fan Motor is checked according to the item "6.9.1 Checking procedure for the DC fan motor".

Alarm code	60	Slave units in alarm

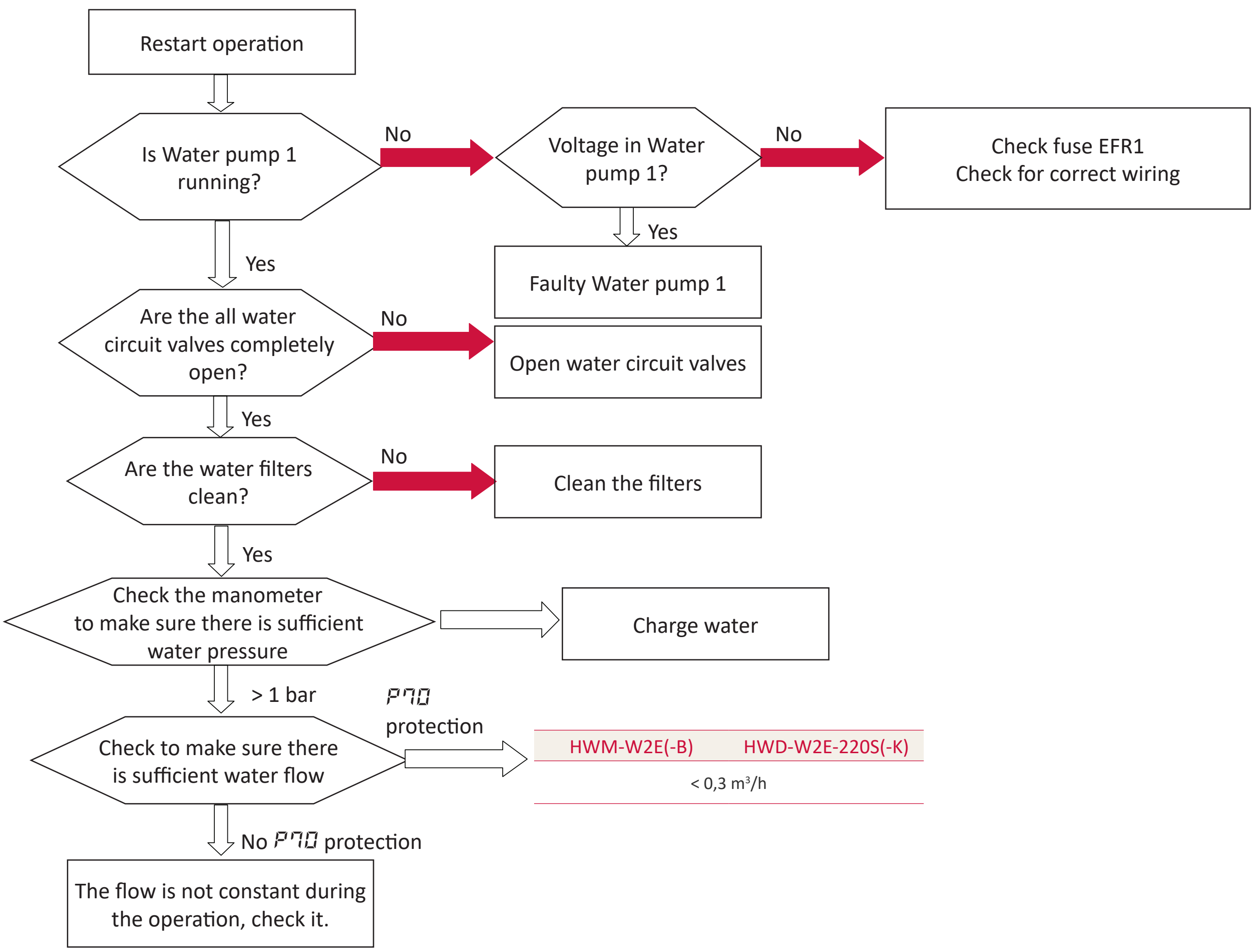
- This alarm is displayed when all the slave units connected to a Cascade Controller have an alarm at the same time.

Alarm code	61	No Cascade messages

- This alarm is displayed when the slave units do not receive information from the Cascade Controller.
- Alarm recovery: When the communication is established again or the address configuration is properly set, the alarm is recovered.

Alarm code 70 Hydraulic low flow alarm and Water pump malfunction

- This alarm is displayed when there is a low flow anomaly in the hydraulic system for 60 seconds.
- The anomaly is detected when there is a pump operation requested.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

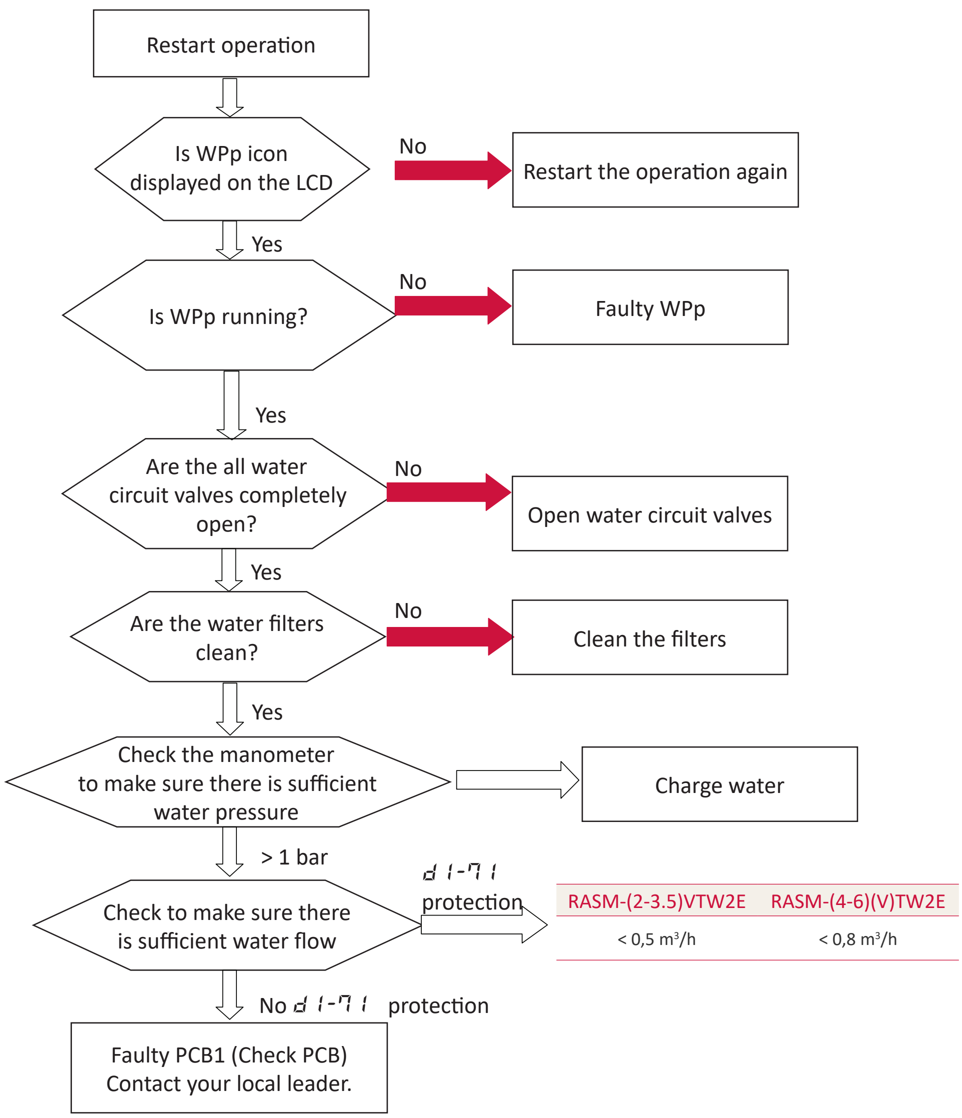


Alarm control procedure:

Protection showing on P70 on 7-segment is performed during 1 minute. Outdoor unit and heater stops during this time. When the condition remains continuously during 1 minute then alarm 70 is displayed.

Alarm code	71	Low primary water flow or primary water pump malfunction

- This alarm is displayed when there is a low flow anomaly in the hydraulic system for 60 seconds.
- The anomaly is detected when there is a pump operation requested.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

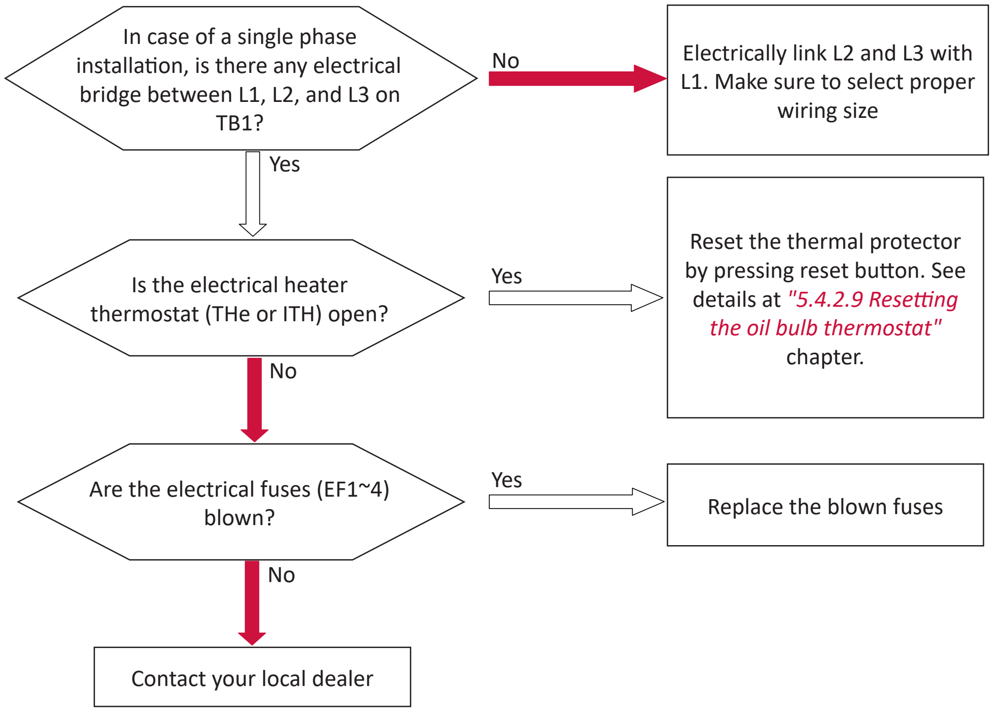


NOTE

Check the d1-71 protection via the Service tools.

Alarm code 72 Thermostat heater alarm (ITH oil bulb thermostat / THe klixon)

- This alarm is displayed when the temperature inside the heater exceeds the safety temperature.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

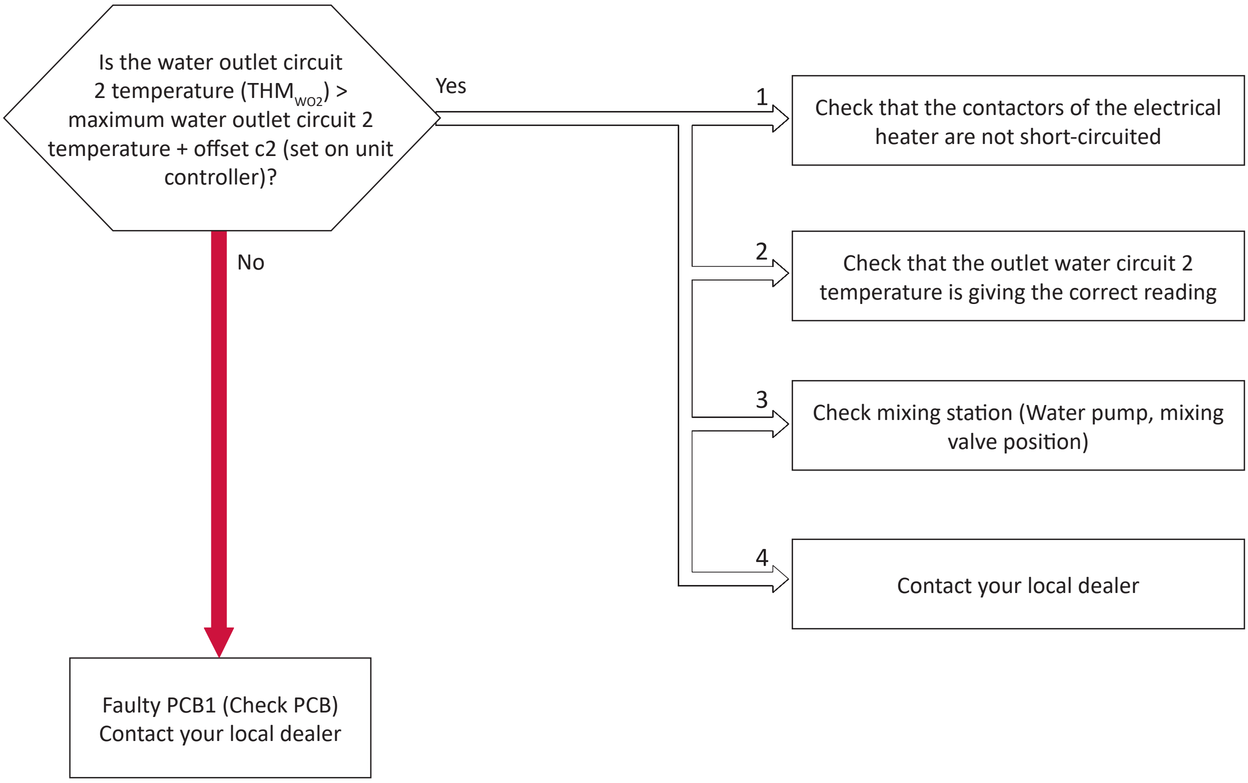


Alarm control procedure:

- Switch OFF outdoor and indoor units.
- Electrical Heater Disabled.
- Water pumps continues running up to water < 55 °C.

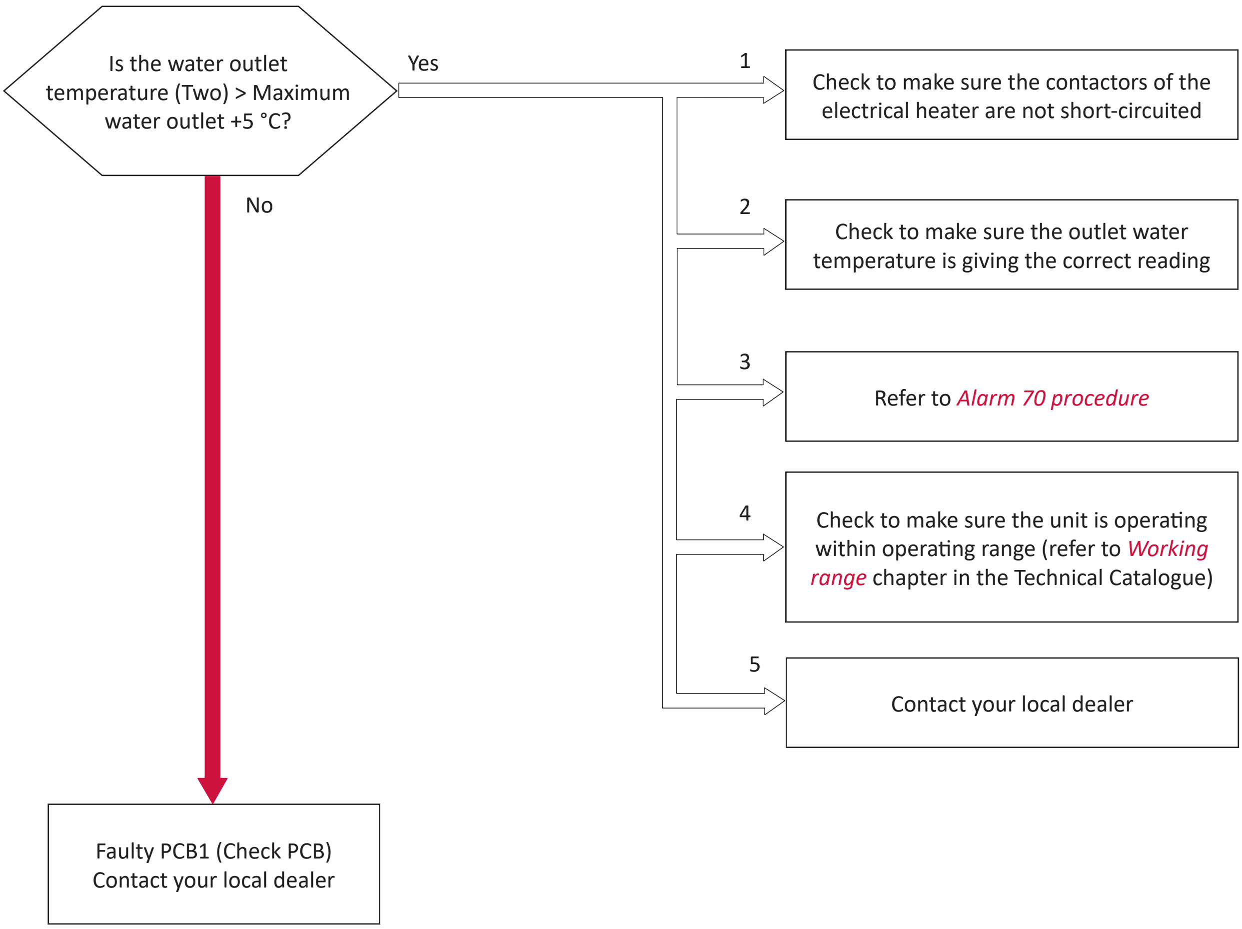
Alarm code 73 Mixing overheating limit protection for mixed circuit (only if circuit 2 is enabled)

- This alarm code is displayed when temperature of circuit 2 is higher than a determined offset from the maximum water temperature value set for circuit 2 by installer configuration, for 20 seconds.
- This alarm forces all operations to stop, except water pump (water pump 2 will also be stopped).
- The unit should be stopped to release the alarm.



Alarm code 74 Unit overheating limit protection

- This alarm code is displayed when water supply temperature (Two) is 5 °C more than maximum water circuit temperature for 20 seconds.
- This alarm forces all operations to stop (outdoor and indoor units), except Water pump.
- The unit should be stopped to release the alarm.

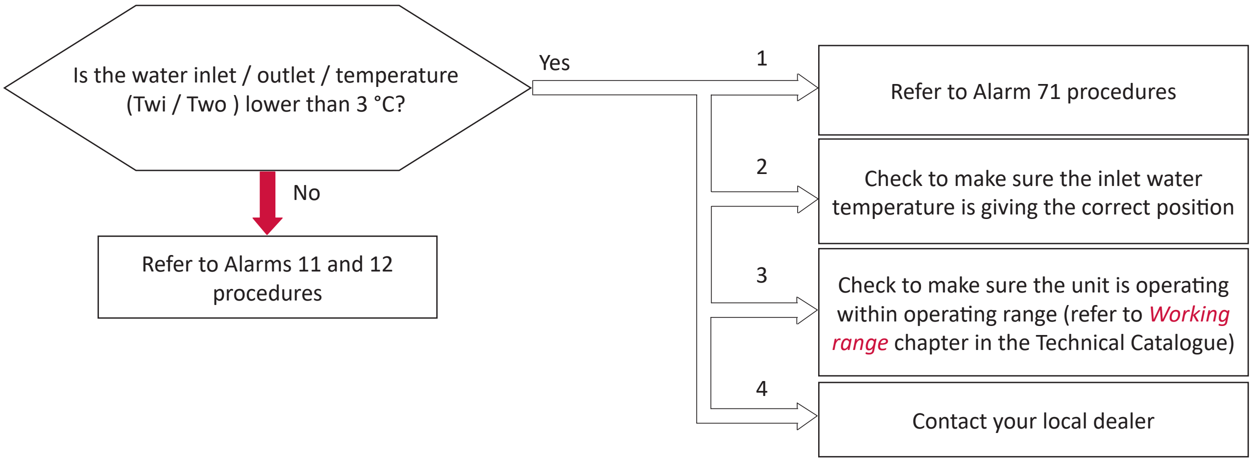


Alarm control procedure:

- Perform retry operation for 6 minutes the first time (7-segment shows P74) and keep Outdoor and indoor unit running (except Electrical Heater). After 6 minutes have passed (P74), switch stop status OFF for outdoor and indoor Units.
  - ✓ Switch water pump 1 to OFF (if water outlet < 55 °C).
  - ✓ Mixing valve closed.

Alarm code	75	Freeze Protection by cold water inlet / outlet temperature detection

- The alarm code is displayed on the unit controller.
- This alarm code is displayed when the water inlet temperature is ≤ 3 °C during 30 seconds.
- This alarm forces all operations to stop, except water pump.
- The unit should be stopped to release the alarm.



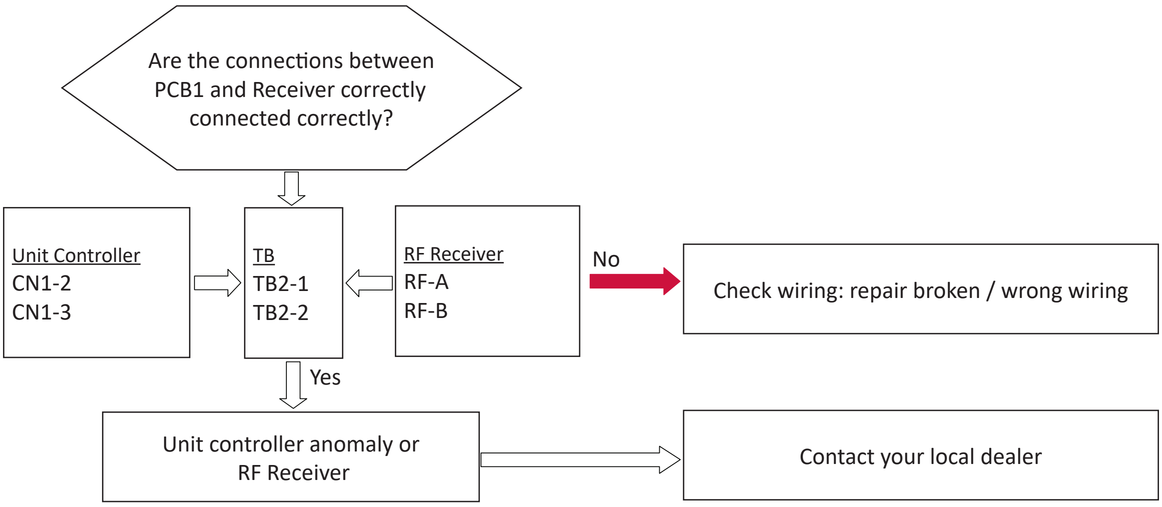
Alarm code **76** Freeze protection stop by indoor liquid temperature thermistor

- The alarm code is displayed on the unit controller.
- This alarm code is displayed when the relation between liquid temperature and water temperature may create frost formation inside the plate exchanger
- This alarm forces all operations to stop, except water pump.
- The unit should be stopped to release the alarm.

1. Refer to Alarm 71 procedures
2. Check that the refrigerant thermistor TL is positioned correctly
3. Check to make sure the unit is operating within operating range (refer to Working range chapter in the Technical Catalogue)
4. Check for shortage of refrigerant gas leakage
5. Clogging of plate heat exchanger
6. Clogging of expansion valve and strainer
7. Check valve malfunction
8. Expansion valve malfunction
9. Make sure that the water volume of the installation is above minimum required for the unit
10. Contact your local dealer

Alarm code	77	Intelligent wireless receiver communication failure (only with intelligent thermostat accessory)

- This alarm code is displayed when an Intelligent thermostat is installed (and selected as wireless on the unit controller menu) and there is no communication for a continuous period of 10 minutes.
- This alarm forces all operations to stop, except water pump.
- The alarm is released when the communication is restored.



Alarm control procedure:

The control will continue in normal operation with the following fixed Opentherm values:

- Circuit 1: uses the last received room set point. The room temperature is assumed to be equal to the room set point.
- Circuit 2: uses the last received room set point. The room temperature is assumed to be equal to the room set point.
- Indicates alarm to unit controller.

Alarm code	78	RF communication failure (only with intelligent thermostat accessory)

- This alarm code is displayed when an intelligent thermostat is installed (and selected as wireless on the unit controller menu) and there is no communication for 1 hour or two room thermostat devices that are bound to the RF-bridge.
- This alarm forces all operations to stop, except Water pump.
- The unit should be stopped to release the alarm.

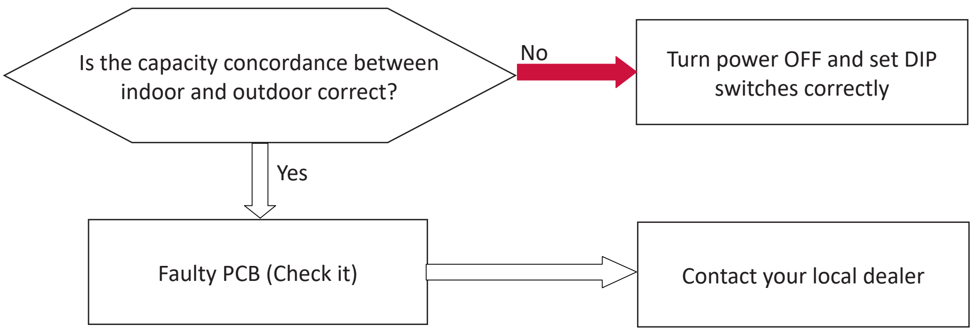
Alarm control procedure:

The control will continue in normal operation with the following fixed Opentherm values:

- Circuit 1: uses the last received room set point. The room temperature is assumed to be equal to the room set point.
- Circuit 2: uses the last received room set point. The room temperature is assumed to be equal to the room set point.
- Control will not obey the thermostat time programme and off function.

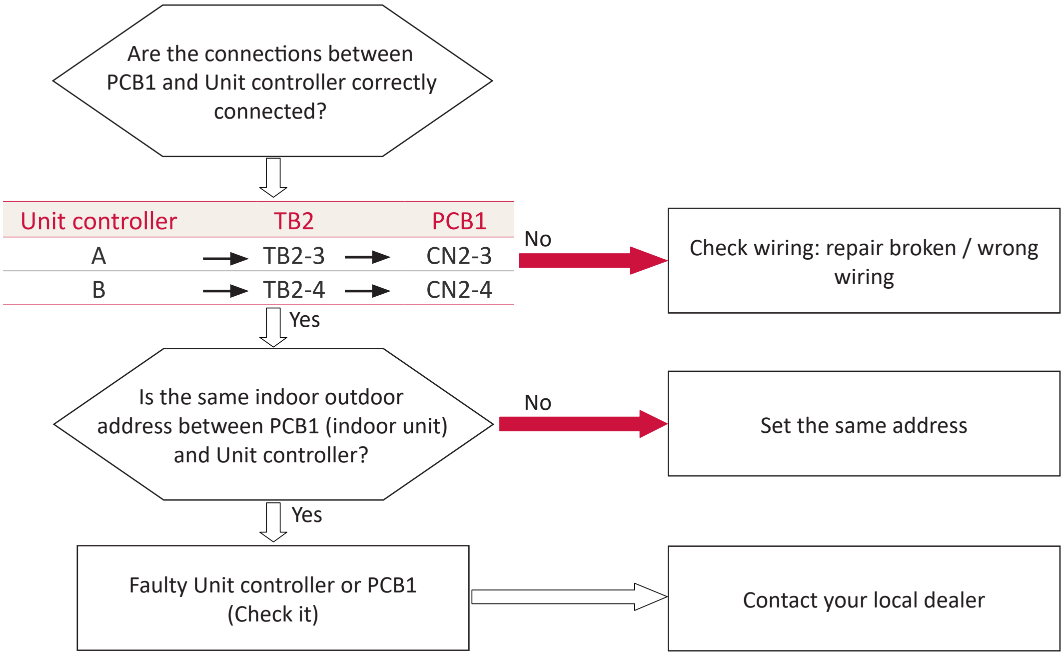
Alarm code	79	Unit capacity setting error

- The alarm code is displayed on the unit controller when there is a constant detection of no concordance between indoor and outdoor unit capacity.
- This alarm forces all operations to stop.
- To release the alarm the capacity correspondence between indoor and outdoor unit must be fix or the unit must be stopped.



Alarm code	80	RCS H-LINK communication failure between indoor unit and unit controller (PC-ARFH3E)

- The alarm code is displayed on the unit controller when there is no communication between indoor unit PCB and the unit controller for 90 seconds.
- This alarm forces all operations to stop.
- The unit should be stopped to release the alarm.



Alarm code	81	Momentary power interruption or low voltage detected

- This alarm is displayed to indicate a momentary power interruption or a low voltage detected during compressor operation.

  A brief power interruption (which may not cause the reset of the microcomputer), may cause, instead, the relay y52c or the cmc (contactor for compressor motor) to release. Abnormal conditions kept for more than 60 seconds is considered a "critical power supply problem", since no power is detected but microprocessor is still operating. In this case, alarm 81 is recorded.
- A power interruption shorter than 2 seconds is considered a "momentary power interruption". In this case, a control for recovery from "momentary power interruption" is performed.
- A power interruption longer than 3 seconds is considered a "power failure" and the unit is stopped as a normal stop. In this case no alarm is displayed.
- This alarm forces all operations to stop and force all digital outputs to an OFF state.
- The alarm is released when anomaly conditions are not detected for more than 10 seconds (power restored).

Alarm code	83	Low pressure anomaly in hydraulic circuit

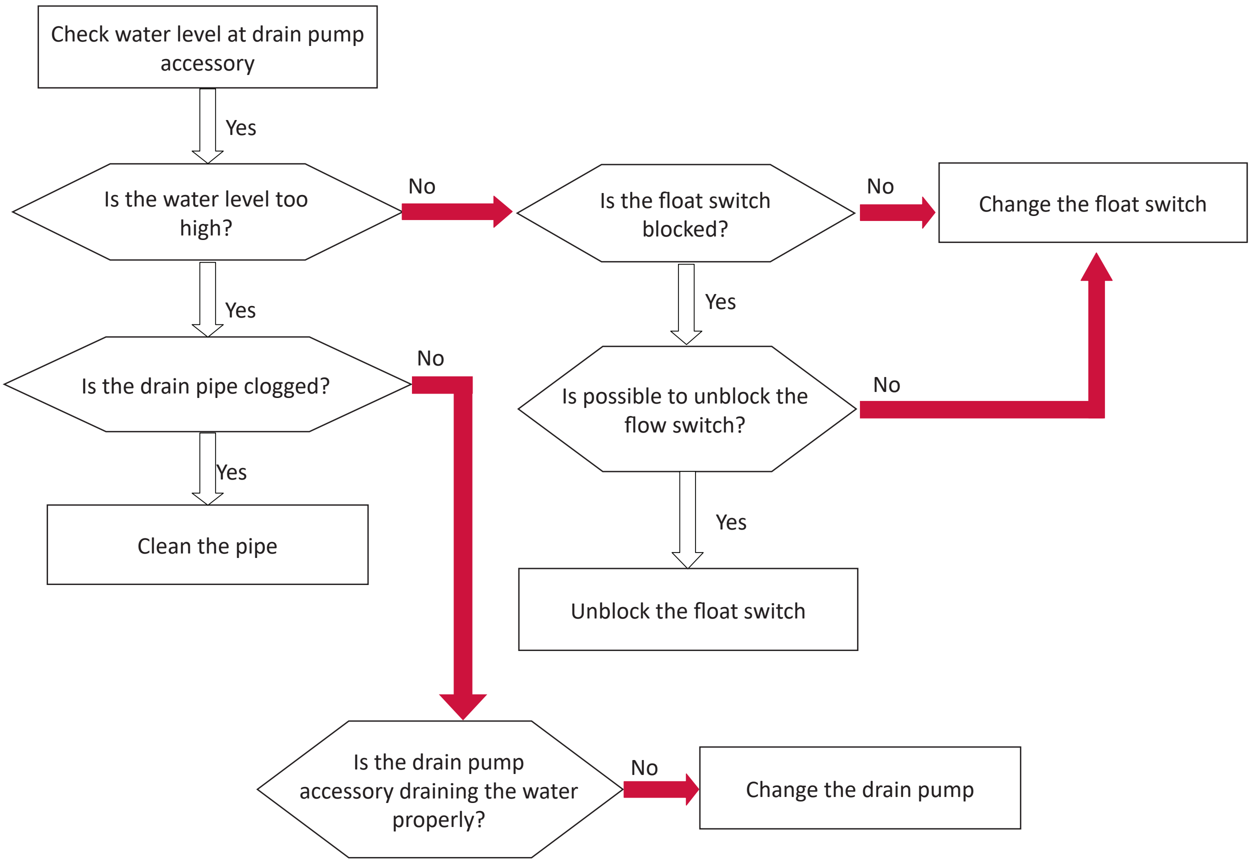
- This alarm is displayed when water pressure in the hydraulic circuit is below 0.7 bar for more than 60 seconds and a pump operation is still requested.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm and water pressure on the system shall be > 0.9 bar.

Alarm code	84	High water pressure

- This alarm is triggered in case water pressure measured by the pressure sensor ≥ 3.7 bar.
- This alarm forces all operations to stop (outdoor and indoor units).
- The unit should be stopped to release the alarm.

Alarm code	85	Float Switch Alarm

- The alarm code is displayed on the unit controller when the drain pipe is full of water.
- This alarm forces all operations to stop.
- The unit should be stopped to release the alarm.



Alarm code	202	Wrong settings of PC-ARFH3E

- This alarm is displayed when wrong settings of PC-ARFH3E are detected: More than 1 main, or more than one PC-ARFH3E controlling same circuit as room thermostat.
- Alarm recovery: after a proper configuration of the PC-ARFH3E and launching a "Check RT address" from the PC-ARFH3E main.

Alarm code	203	Sub PC-ARFH3E stops answering to Main PC-ARFH3E

- This alarm is displayed when a sub PC-ARFH3E stops answering to main PC-ARFH3E for more than 3 minutes or when 2 sub PC-ARFH3E are controlling the same circuit.
- Alarm recovery:
  - ✓ In case of an alarm detected because of a lost communication, the alarm is recovered when communication is established again.
  - ✓ In case of a configuration of 2 thermostats but only 1 is installed, it is required to launch a "Check RT address" from the PC-ARFH3E main.

Alarm code	204	Indoor unit stops answering to main PC-ARFH3E

- This alarm is displayed when an indoor unit stops answering to main PC-ARFH3E for more than 3 minutes.
- Alarm recovery: When the communication is established again the alarm is recovered.

Alarm code	208	Module with repeated H-LINK address

- This alarm is displayed when there is more than 1 outdoor unit connected to a Cascade Controller with the same address assigned.
- Alarm recovery: Assign a different address to each outdoor unit.

Alarm code	209	Sub DHW configured on unexisting module

- This alarm is displayed when there is an indoor unit configured to control a DHW tank that does not exist.
- Alarm recovery: When the indoor unit is configured to not control a DHW tank or to control a tank that actually exists.

Alarm code	21n	Alarm on the module "n"

- This alarm is displayed when the n-unit connected to a Cascade Controller has triggered an alarm.
- Alarm recovery: When the specific n-unit alarm is solved.

Alarm code	EE	Compressor protection

- This alarm code is displayed when one of the following alarms occurs 3 times within 6 hours. If the outdoor unit operates continuously without removing the cause of the alarm, the compressor may be seriously damaged.

Alarm code	Content of anomaly
02	Tripping of protection device in outdoor unit
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature
41	High pressure switch overload
42	Heating overload
47	Low pressure decrease protection activating

NOTE

- *These alarms can be checked using the check mode 1.*
- *The action indicated in each alarm chart must be followed.*
- *These alarms have to be cleared by turning OFF the main switch of the system.*

CAUTION

Pay special attention before starting. There is a possibility of causing serious damages to the compressor.

6.9 Checking procedure for main parts

6.9.1 Checking procedure for the DC fan motor

When ISPM/DIP-IPM is faulty and Alarm 03, 04 or 53 appears, the fan motor may also be damaged. To prevent ISPM/DIP-IPM damage which may result from operation combined with a faulty fan motor, check also if the fan motor is not damaged when ISPM/DIP-IPM is replaced.

CAUTION

- *Turn OFF main power before start working.*
- *Working and checking with the power ON may disturb correct diagnosis and may result in failure.*

Procedure in case of error diagnosis

1 Remove fan motor connectors for DC fan motor from the control PCB, ISPM or DIP-IPM and turn the fan motor shaft by hand.

Normal	The fan motor shaft turns smoothly.
Faulty	No continuous rotary torque movement felt when turning the motor by hand. This occurs because the internal magnet of the fan motor breaks the movement when the internal electronic circuit of the fan motor has a short-circuit fault.

2 Measure the fan motor resistance:

Measurement procedure	
Remove the fan motor connector from the control PCB, ISPM or DIP-IPM.	
Connect the black test lead of the tester to the black wire pin of the fan motor connector.	
Connect the red test lead to the wire connector pin to be checked.	
Results	
Normal	Observed values will be close to the normal values in the table below.
Faulty	Observed values will be deviated from the normal values in the table below. (Generally, an open-circuit fault shows ∞, and a short-circuit fault shows several Ω - kΩ).Internal electronic circuit fault of the fan motor including short-circuit and breakage can be checked.

Model	Motor model	Wire color for checking (Normal value)			
		Red-black	White-black	Grey-black	Blue-black
RASM-(2-3.5)VTW2E	0JD.300.36457	-	1 MΩ or greater	-	1 MΩ or greater
RASM-(4-6)(V)TW2E	FP063-6IA.BD.A3P1	22 MΩ or greater	0.52 MΩ or greater	290 kΩ or greater	∞

NOTE

Values are shown for referential purpose. While actual values may vary depending on the type of the tester, any tester can be used to determine any short-circuit or breakage based on ∞ or several Ω or 0 Ω or ∞.

6.9.2 Checking procedure for the electronic expansion valve for outdoor unit

	Outdoor unit electronic expansion valve
Locked with fully closed	Even in cooling or heating, if EV is blocked, the evaporation temperature should be near ambient temperature (<5 °C), and very different from saturation temperature (>10 °C) measured by discharge pressure (on cooling) or the suction pressure (on heating).
Locked with slightly open	In case EV control reaches 100% of aperture, no leakage on the refrigerant circuit, and discharge temperature is below Tdo (Objective Discharge Temperature) or < Tc + 10 °C (Condensation Temperarure + 10 °C)
Locked with fully open	This is the most difficult to detect. Be aware of bad discharge temperature regulation, specially for different compressor frequency loads and water temperatures. A high frequency and low water temperature should arise issues in case EV is stacked at a low %. Low frequency and high water temperature should arise issues in case EV is stacked at a high %.

Maintenance

7.1 Maintenance work

CAUTION

- *All inspections and checks of the outdoor unit and indoor unit have to be carried out by a licensed technician and never by the user itself.*
- *Before any inspection and check the unit main power supply has to be switched OFF.*
- *Wait minimum 10 minutes or more from all power supply have been turned OFF.*
- *Take care with the crankcase heater. It could operate even when compressor is OFF.*
- *Take care with the electrical box components. Some of them could remain hot after switching OFF the unit.*

NOTE

All these maintenance operations must be done with appropriate materials and following the technical documentation.

7.1.1 Outdoor unit

1 **Fan and fan motor**

- Lubrication: all the fan motors are pre-lubricated and sealed at the factory. Therefore no lubrication maintenance is required.
- Sound and vibration: Check for abnormal sounds and vibrations.
- Rotation: check the clockwise rotation and the rotating speed.
- Insulation: check the electrical insulation resistance.

2 **Heat exchanger**

- Clog: Inspect the heat exchanger at regular intervals and remove any accumulated dirt and any accumulated dust from the heat exchanger. You should also remove other obstacles such as the growing grass and the pieces of paper which might restrict the airflow.

3 **Cabinet**

- Stain: check for any stain and remove it cleaning if it is the case.
- Fixing screw: check for any loosened screw or any lost screw. Fix the loosened screws and the lost screws.
- Insulation material: check for any peeled thermal insulator on the cabinet. Repair the thermal insulator.

4 **Electrical equipment**

- Activation: check for an abnormal activation of the magnetic contactor, the auxiliary relay, the PCB and others.
- Line condition: pay attention to the working voltage, the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections, the oxidized contacts, the foreign matter and other items. Check the electrical

insulation resistance.

5 **Control device and protection device**

- Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point listed in the Installation and operation manual.

6 **Compressor**

- Sound and vibration: check for abnormal sounds and vibrations.
- Activation: check that the voltage drop of the power supply line is within 15 % at the start and within 2 % during the operation.

7 **Reverse valve**

- Activation: check for any abnormal activation sound.

8 **Strainer**

- Clog: check that there is no temperature difference between both ends.

9 **Ground wire**

- Ground line: check for the continuity to earth.

10 **Oil heater (crankcase heater of the compressor)**

- Activation: activate the oil heater at least twelve hours before the start-up by turning ON the main switch.

11 **Safety valve**

- Operation: check the correct operation of the outdoor unit safety valve (pressure relief valve) on the circuit. Open it manually and some water should be expelled by its connected drain pipe.

7.1.2 Indoor unit

7.1.2.1 General procedure

To ensure good operation and reliability of the indoor unit, its main parts and field wiring have to be checked periodically.

The following checks have to be done by qualified technicians at least once a year:

1 **Cabinet**

- Stain: check for any stain and remove it cleaning if it is the case.
- Fixing screw: check for any loosened screw or any lost screw. Tighten the loosened screws and replace the lost screws.
- Insulation material: check for any peeled thermal insulator on the indoor part of the covers. Repair the thermal insulator.

2 **Water piping connection**

- Leakage: check there are no water leakages neither in the inlet and outlet water connections (space heating and DHW if used), nor in the main water circuit nor the tank connections. Check all the joints, connections and circuit elements.

NOTE

- *If leakage is detected in the inlet/outlet water connections, repair it and remember to replace the gaskets.*
- *Pay special attention to the water pipe connection placed over the electrical box.*

3 **Water flow and pressure:**

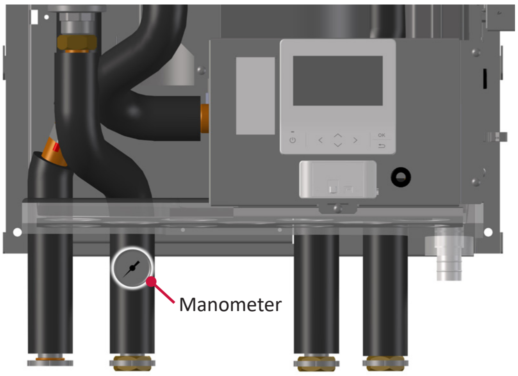
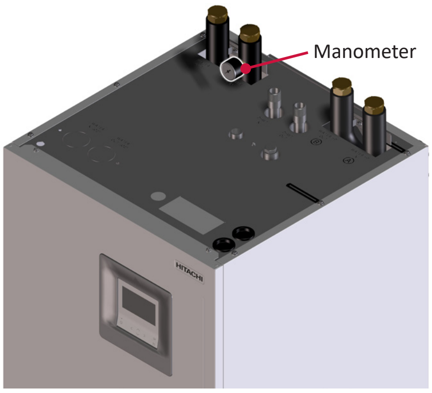
- Water flow:
  - ✓ Space heating: check the water flow (m^3/h) through the unit controller in the “Heat pump details” of the “Operation information” menu (remember that there are 2 pumps to be checked with hydraulic module combination).
  - ✓ DHW (if used): check whether the water circulation is correct along all the DHW circuit.
- Pressure checking:
  - ✓ Space heating: Check the water pressure using the manometer in the indoor unit (in **airH2O 800M** units, this manometer is field supplied). This value shall be between 1.5 and 2.0 bars approximately (1.8 bars is a proper value).
  - ✓ In case that the indoor unit is below or above the outdoor unit, ensure that the water pressure is below 2.0 bars on the outdoor unit through the controller in the “Heat pump details” of the “Operation information” menu.

4 **Manometer**

The manometer is placed at different positions according to each unit model.

Hydrosplit system

In **airH2O 800H** and **airH2O 800H Combi** models, the manometer is installed factory supplied as it is shown:

airH2O 800H	airH2O 800H Combi
	

Control Box system

For the Control Box it is highly recommended to install, field supplied, a manometer gauge attached to the water inlet pipe and after the shut-off valve.

NOTE

- *The water pressure must remain above 1 bar in order to prevent air from entering the circuit, and below 2.5 bars (safety valve opening value).*
- *DHW (if used): Check there is no loss of pressure and ensure that DHW pressure is not higher than 6 bars. Connect a gauge to the DHW drain port for this purpose.*

5 **Security water valve for DHW (if used):**

- Operation: check the correct operation of the security water valve (pressure and temperature relief valve) at the DHW inlet connection. Remember that this element must ensure that the following functions are provided: pressure protection, non-return function, shut-off valve, filling and draining.

6 **DHW Tank inspection hatch**

- The DHW tank has an inspection hatch at the bottom. This hatch allows the inspection of the interior of the tank.

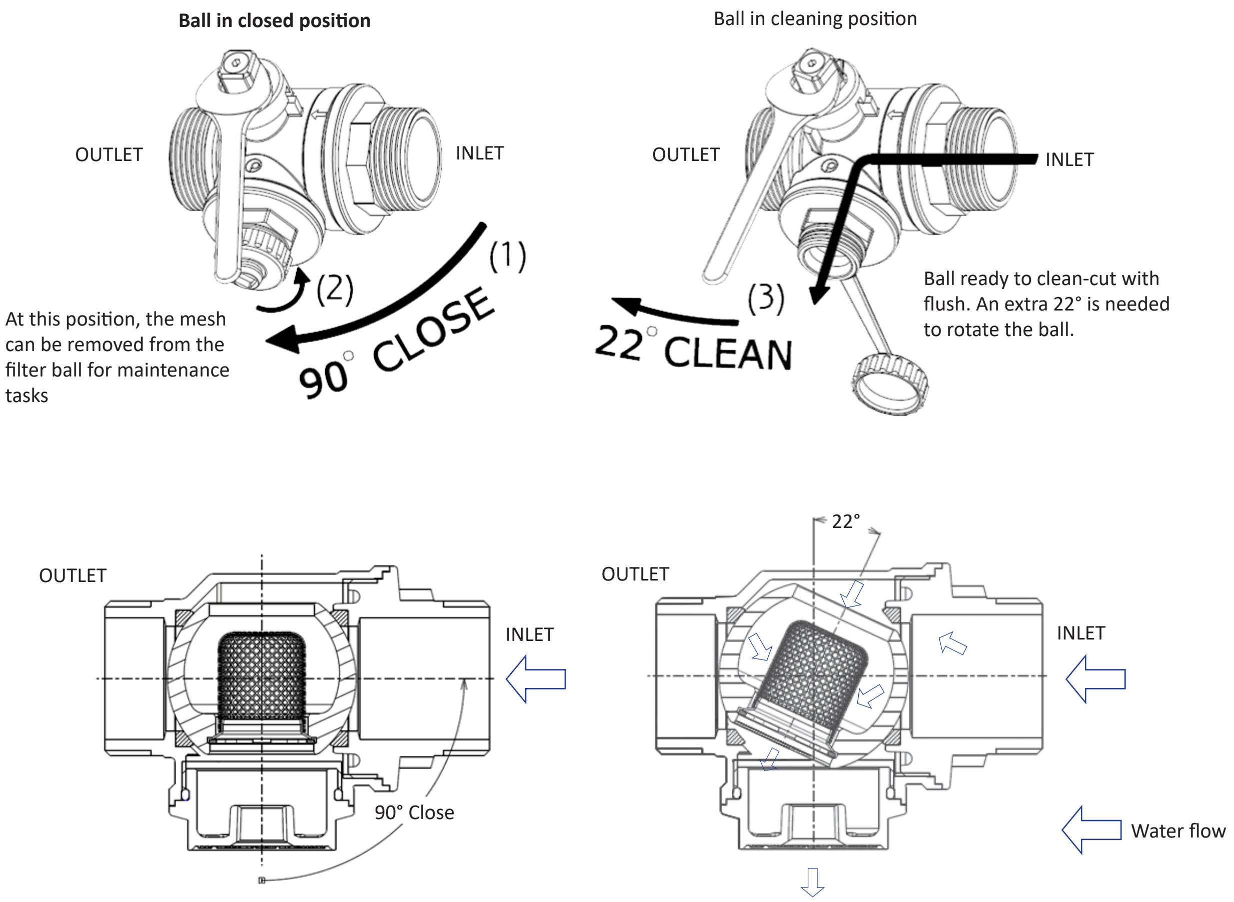
DANGER

Be careful when using this inspection hatch. There are high temperature and high pressure inside the tank. Before open it wait a reasonable time for the water to cool.

- For a safe operation using the inspection hatch, proceed as it is explained in the manual of the specific unit.
- Additional hydraulic elements are necessary in the DHW circuit.

7 Filter plus ball valve

- The filter plus ball valve is an on-off ball valve containing an interchangeable cylindrical filter which is easy to inspect and remove for normal maintenance operations. Normally, the filter plus ball valve is used as a shut-off valve by turning the handle 90° clockwise (1).
- The filter plus ball valve makes the maintenance operations easier. Once the valve is in closed position, open the draining port tap (2) and, by turning the handle up to 22° clockwise, the water from the inlet is guided behind the filter and runs in opposite direction through the draining port (3). The water circuit can be cleaned even under full pressure, avoiding the need to drain the unit prior the cleaning process. After cleaning, simply close the draining port tap (2), and open the valve again.



NOTE

The draining port must be connected to the sewage system by means of a hose or a pipe.

CAUTION

- *Take care when draining the unit. Ensure the connection of the hose or drain pipe in order to avoid water leakage on any electrical component.*
- *The expelled water could be hot and could keep in pressure. Take care with this draining.*

8 **Air purger**

- Excessive air: check the correct operation of the indoor unit air purger. Turn it twice at least, since there may be air in the water circuit, which needs to be expelled by this air purger.

NOTE

The air purger should only be opened once it is checked that there is no refrigerant leak at the water circuit. At the end of the process, ensure that all the interior purgers are closed.

9 **Water pump**

- Pump performance curves: check, as explained in point 3, that water flow and pressure is in accordance with the pump performance curves.

NOTE

In systems featuring a hydraulic separator, this check should be performed for each pump, and turning on only one pump at a time.

- Electrical connection: check the correct connection of the electrical wiring of the water pump. If moisture is detected in the pump surface, revise the water pipes, since a water leakage could have been occurred.

10 **Fixing points tightening**

- Check the fixing points of the indoor unit. Check the indoor unit wall support. The indoor unit has to be always in a vertical position.

11 **Electrical equipment**

- Activation: Check for an abnormal activation of the magnetic contactor, the relay, the PCBs and others.
- Line condition: pay attention to the working voltage, the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections, the oxidized contacts, the foreign matter and other items. Check the electrical insulation resistance.

12 **Control device and protection device**

- Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point listed in the service manual.

13 **Earth wire**

- Check for the continuity to earth in the main electrical components.

14 **Electrical box air filter**

- Periodically check the air filter in the electrical box and clean if necessary. Carry out the inspection more frequently depending on the environment and the level of dust in the air where the unit is installed.

7.1.2.2 Descaling operation

The production of scale and its deposition on the plate heat exchanger surface can be influenced by both water quality and set temperature, thereby impeding efficient heat exchange and compromising the overall performance of the unit.

NOTE

Regular descaling is essential and should be performed at specific intervals based on the quality of the supplied water. During routine maintenance, it is crucial to assess the scale level to uphold the unit's reliability.

Check the scale level when proceeding maintenance to ensure reliability of the unit.

If necessary, proceed with descaling:

1 Turn OFF the main power supply of the indoor unit.
2 Follow the "Draining" procedure to empty the water from the indoor unit.
3 Initiate the descaling process for the plate heat exchangers.
4 Ensure that the water quality remains compliant with the EU council directive 98/83 EC.

7.1.2.3 Draining operation

NOTE

Draining operation is unique for each model. Refer to the instructions detailed below.

◆ Draining operation for airH2O 800H

airH2O 800H models have no drain port factory supplied. It must be considered the installation of a drain port after the shutdown valve (factory supplied) and before the water inlet of the unit when proceeding to the installation of the unit.

◆ Draining operation for airH2O 800H Combi

Draining of the indoor unit

1 Switch OFF the main power supply of the indoor unit.
2 Close the 4 shutdown valves installed at the space heating and outdoor unit connections (water inlet and outlet connections).
3 Open manually the drain port for indoor unit water and collect the water into a bucket.
4 Once all the water has been drained, close again the drain port for indoor unit water.

CAUTION

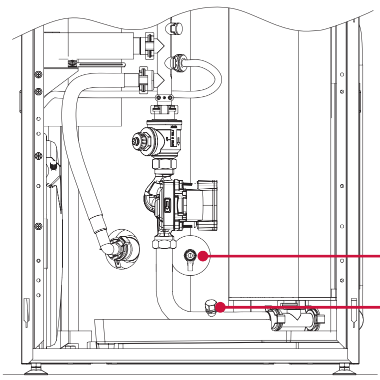
When draining the indoor unit water from its drain port, the released water could be hot and could keep in pressure. Perform the draining procedure carefully.

Draining of the DHW circuit

1 Switch OFF the main power supply of the indoor unit.
2 Close the main DHW inlet valve (water inlet shutdown valve) in order to avoid the tank filling.
3 Open the shutdown valve of the DHW outlet to allow draining without creating a vacuum. Ensure that valve at the highest level of the DHW system is also opened.
4 Connect a drain hose to the drain port for DHW and lead the other end to the general draining.
5 Manually open the drain port for DHW and allow sufficient time for complete water removal.

CAUTION

When draining the DHW from its drain port, the released water could be hot and could keep in pressure. Perform the draining procedure carefully.



◆ Draining operation for airH2O 800M

airH2O 800M has no drain port factory supplied. It is highly recommended to install a drain port valve attached to the water outlet of the **airH2O 800M** unit in order to ease the operation of draining. When the drain port is installed the draining procedure for the **airH2O 800M** follows the next steps:

1 Switch OFF the main power of the unit.
2 Close the shutdown valve installed at the water inlet connection (field supplied).
3 Connect a pipe or a drain hose to the drain port (field supplied) placed in the water outlet pipe of the unit.
4 Open manually the drain port of the shutdown valve (field supplied), and collect the water into a bucket (or to a sewage system)
5 Once all the water has been drained, and all maintenance operations have been finished, close again the drain port and open again the valve of the water inlet pipe to restart the normal operation of the unit.

7.1.3 Evacuation and refrigerant charge procedure

Refer to the *"Removal and evacuation"* section to know how to perform the evacuation and refrigerant charge procedure.

For maintenances requiring a system vacuum or refrigerant recharge, no specific actions should be performed on the outdoor unit.

DANGER

Remember to switch the unit OFF before performing any maintenance procedure.

CAUTION

- *Appropriate refrigerant:*
  - *The refrigerant used in each unit is identified on the specification label and manuals of the unit. Hitachi shall not be held liable for any failure, trouble, malfunction or accident caused by units illegally charged with refrigerants other than the specified one.*
- *Consequences of charging non-specified refrigerant:*
  - *It may cause mechanical failure, malfunction and other accidents. It may cause operational failure of protection and safety devices of air conditioners. It may also cause lubrication failure of the sliding part of the compressor due to deterioration of refrigerant oil.*
  - *In particular, other flammable refrigerants (such as R441A, R443A, GF-08, etc.) are not allowed, since they may cause major accidents such as fire and explosion in case of improper handling.*
- *Once a non-specified refrigerant has been charged, no further servicing (including draining of refrigerant) shall be performed, even in case of malfunction. Improper handling of refrigerant may be a cause of fire and explosion, and servicing in such cases may be considered an illegal act.*
- *End clients and costumers shall be informed that servicing is not approved, and the installer who charged the non-specified refrigerant shall be asked to fix the unit.*
- *Hitachi will accept no responsibility for units that have been charged with non-specified refrigerant once.*

7.2 Service and maintenance record

7.2.1 Outdoor unit

N°	Check item	Action	Judgement	
1	Is the service area sufficient?	—	Yes	No
2	Is there a short circuit of the discharged air?	—	Yes	No
3	Any heat influence?	—	Yes	No
4	Is the ground wire connected?	—	Yes	No
5	Refrigerant piping.	—	Good	Not Good
6	Fixing the unit.	—	Good	Not Good
7	Is there any damage on the outer surface or the internal surface?	—	Yes	No
8	Checking the screw and the bolts.	Tighten if loosened.	Tightened	Not Tightened
9	Tightening the terminal screws.	Tighten all the terminal screws with a Phillips screwdriver.	Tightened	Not Tightened
10	Are the compressor terminals tightly fixed?	Push all the terminals.	Pushed	Not Pushed
11	Insulation resistance.	Measure the insulation resistance with an insulation resistance meter. Compressor and fan motor: greater than 3 MΩ. Others: greater than 3 MΩ.	Good	Not Good
12	Does the drain water flow smoothly?	Check the smooth flow by pouring some water.	Good	Not Good
13	Check for a leakage in the compressor.	Check for any leakage.	Good	Not Good
14	Check for a leakage in the heat exchanger.	Check for any leakage.	Good	Not Good
15	Check for a leakage in the 4-way valve.	Check for any leakage.	Good	Not Good
16	Check for a leakage in the check valve.	Check for any leakage.	Good	No Good
17	Check for a leakage in the accumulator.	Check for any leakage.	Good	Not Good
18	Check for a leakage in the strainer.	Check for any leakage.	Good	Not Good
19	Check for a leakage in the electronic expansion valve	Check for any leakage.	Good	Not Good
20	Check for a leakage in the piping.	Check for any leakage.	Good	Not Good
21	Check the direction of the fan.	By viewing the airflow volume.	Good	Not Good
22	Vibration and sound.	Check the fan the compressor the piping and others.	Good	Not Good

N°	Check item	Action	Judgement	
23	Activation of each operation mode.	Check the activation of the HEAT switch, the STOP switch and the TEMP switch.	Good	Not Good
24	High-pressure cut-out switch.	Check the actual activation value.	Good	Not Good
25	Check the activation of the drain-up mechanism.	Check the activation during the cooling process.	Good	Not Good
26	Air inlet temperature of the outdoor unit DB/WB.	—	(°C)DB	(°C)WB
27	Air outlet temperature of the outdoor unit DB/WB.	—	(°C)DB	(°C)WB
28	High-pressure switch.	—	kg/cm^2G	
29	Operating voltage.	—	V	
30	Operating current.	—	A	
31	Instructions to the client for cleaning the air filter.	—	Done	Not yet
32	Instructions to the client about the cleaning method.	—	Done	Not yet
33	Instructions to the client about the operation.	—	Done	Not yet

7.2.2 Indoor unit

N°	Check item	Action	Judgement	
1	Is the service area sufficient?	—	Yes	No
2	Any heat influence?	—	Yes	No
3	Is the ground wire connected?	—	Yes	No
4	Refrigerant piping.	—	Good	Not Good
5	Water piping.	—	Good	Not Good
6	Fixing the unit	—	Good	Not Good
7	Is there any damage on the outer surface or the internal surface?	—	Yes	No
8	Checking the screw and the bolts.	Tighten if loosened.	Tightened	Not Tightened
9	Tightening the terminal screws.	Tighten all the terminal screws with a Phillips screwdriver.	Tightened	Not Tightened
10	Insulation resistance.	Measure the insulation resistance with an insulation resistance meter and check if it is greater than 3 MΩ.	Good	Not Good
11	Does the drain water flow smoothly?	Check the smooth flow by pouring some water.	Good	Not Good
12	Check for a leakage in the piping.	Check the smooth flow by pouring some water.	Good	Not Good
13	Check for a leakage in the water safety valve.	Check the smooth flow by pouring some water.	Good	Not Good
14	Check for a leakage in the water pump.	Check the smooth flow by pouring some water.	Good	Not Good
15	Voltage among each phase.	Higher than AC220 V.	Good	Not Good
16	Vibration and sound.	Check the pump motor.	Good	Not Good
17	Activation of each operation mode.	Check the activation of Space heating/cooling, DHW and swimming pool and solar panel if the case.	Good	Not Good
18	Water High-pressure cut-out switch.	Check the actual activation value.	Good	Not Good
19	Water flow switch	Check the actual activation value.	Good	Not Good
20	Water manometer.	Check the correct value indication.	Good	Not Good
21	Check the activation of the air purger.	Check by increasing the pressure.	Good	Not Good
22	Check the activation of the drain-up mechanism through the safety valve.	Check the activation during work.	Good	Not Good
23	Water inlet temperature of the indoor unit.	—	(°C)DB	(°C)WB
24	Water outlet temperature of the indoor unit.	—	(°C)DB	(°C)WB

N°	Check item	Action	Judgement	
25	Water pressure switch.	—	kg/cm^2G	
26	Operating voltage.	—	V	
27	Operating current.	—	A	
28	Instructions to the client about the cleaning method.	—	Done	Not yet
29	Instructions to the client about the operation.	—	Done	Not yet

7.3 Service and maintenance record using the 7-segment display

7.3.1 Indoor unit

The information presented in the table below for check items may vary across the **airH2O 800** range. Availability is contingent on the horsepower of the outdoor unit, with the specific classification indicated in brackets at the end of the table determining the items displayed.

Customer's name:	Date:
airH2O 800 model:	
Operation mode:	
Test run start time:	
Data collect start time:	
Read out data from 7-segment in PCB:	
Protection control code:	

Code display	Description	Displayed value
oP	Normal operation	
th	Heat water temperature setting (°C)	
tc	Cold water temperature setting (°C)	
in	Water inlet temperature at the outdoor unit plate exchanger (THM_{WI}) (°C)	
ot	Water outlet temperature at the outdoor unit plate exchanger (THM_{WO}) (°C)	
in.	Water inlet temperature from the installation (°C) (available only for **airH2O 800H Combi**)	
ot.	Water outlet temperature at the **airH2O 800H/H Combi** module (°C)	
o1	Water outlet temperature heat pump (THM_{WOHP}) (°C) (available only for **airH2O 800H/H Combi**)	
o2	Water outlet temperature circuit 2 (THM_{WO2}) (°C)	
A1	Auxiliary temperature 1 (THMaux1) (°C)	
oh.	Temperature of the upper sensor of the DHW (°C) (available only for **airH2O 800H Combi**)	
oh	Temperature of the lower sensor of the DHW tank in case of **airH2O 800H Combi**. Otherwise it is tank temperature (THM_{DHW}) (°C)	
A2	Auxiliary temperature 2 (THMaux2) (°C)	
tA	Outdoor unit ambient temperature (THM7) (°C)	
A3	Auxiliary temperature 3 (THMaux3) (°C)	
t1	Outdoor unit average ambient temperature (°C)	
t1.	Second outdoor unit average ambient temperature (°C)	
tL	Indoor unit refrigerant liquid temperature (THM_{L}) (°C)	
Pr	Water pressure (bar)	
td	Discharge gas temperature (°C)	

Code display	Description	Displayed value
tS	Evaporation gas temperature (°C)	
dF	Defrosting	
d1	Cause of stoppage	
h1	Inverter operation frequency (Hz)	
Eo	Outdoor expansion valve opening (%)	
PP	Water pump (0-100) (not available for Control Box)	
FF	Water pump feedback frequency (0-100) (not available for Control Box)	
FP	Secondary water flow (m^3/h) (not available for Control Box)	
FP.	Primary water flow (m^3/h)	
P1	Compressor running current (A)	
di	Digital inputs	
do	Digital outputs	
ou	Refrigerant cycle address	
iu	Indoor unit address	
no	ROM N°	
Cd	Capacity code	
Co	Outdoor capacity code	
CP	Unit type (see table below)	

NOTE

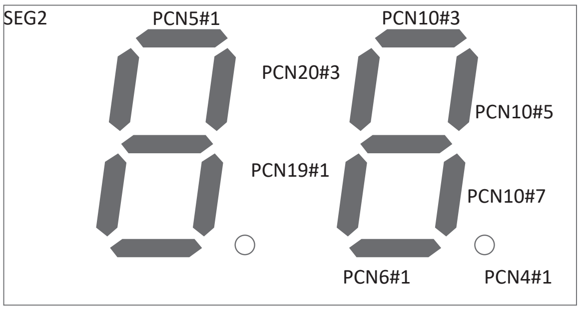
- *1. Indoor/outdoor unit capacity code:*

Unit	Code
airH2O 800M	30
airH2O 800H	1
airH2O 800H Combi	10

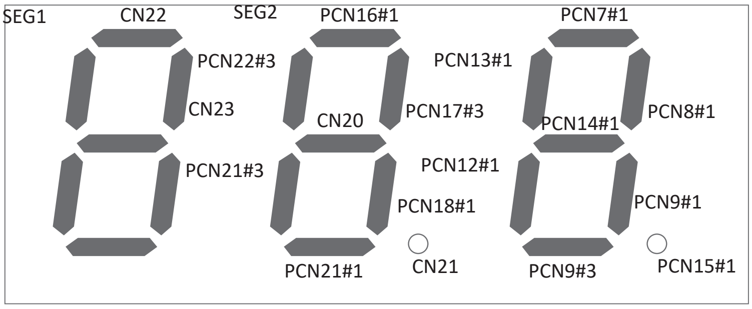
- *2. Unit type:*

Capacity	Code
2.0 HP	14
2.5 HP	18
3.0 HP	22
4.0 HP	32
5.0 HP	40
6.0 HP	48

- *3. Contents of indoor micro controller (water cycle PCB) input status*



- *4: Contents of indoor micro controller (water cycle PCB) output status*



7.4 Service and maintenance record by unit controller

Sheet for main data checking by unit controller:

Customer's name:	Date:
OU serial N°:	
OU N° / alarm code:	
IU serial N°:	
IU N° / alarm code:	

REF	Access mode	Description	Default Value	Range	Record setting	Units
		System Operation				
OPSt		Operation Status	OFF	OFF Cool D-OFF Cool T-OFF Cool ON Heat D-OFF Heat T-OFF Heat ON DHW OFF DHW ON SWP OFF SWP ON Alarm XXX (XXX= Code number)		-
HPEVO		Outdoor expansion valve opening (%)	-	Variable value		%
HPH4		Inverter operation frequency	-	Variable value		Hz
HPDEF		Defrosting	-	Variable value		-
HPDI		Cause of stoppage	-	Variable value		-
HPP1		Compressor running current	-	Variable value		A
PCB Firmware		Indoor PCB Firmware	-	Variable value		-
Uspec		Unit capacity	-	Variable value		HP
C2MVP		Mixing valve position (%)	-	Variable value		%
		Actual Temperatures				
HPTi		Water inlet temperature	-	Variable value		°C
HPTo		Water outlet temperature	-	Variable value		°C
C2Two		Water outlet temperature C2 (*2)	-	Variable value		°C
DHWt		DHW temperature (*3)	-	Variable value		°C
SWPt		Swimming pool temperature (*4)	-	Variable value		°C
OPTa		Outdoor ambient temperature	-	Variable value		°C
OPTa.2		Second ambient temperature	-	Variable value		°C
OPTav		Outdoor ambient average temperature	-	Variable value		°C
OPTav2.		Second ambient average temperature	-	Variable value		°C

REF	Access mode	Description	Default Value	Range	Record setting	Units
HPTd		Discharge gas temperature	-	Variable value		°C
HPPs		Suction gas temperature	-	Variable value		°C
C1Rt		Room temperature C1 (*6)	-	Variable value		°C
C2Rt		Room temperature C2 (*2)	-	Variable value		°C
Set Point						
OPst		Water temperature setting	-	Variable value		°C
C1OTCs		Water OTC Setting Temperature (*1)	-	Variable value		°C
C2OTCs		Water OTC Setting Temperature (*1)(*2)	-	Variable value		°C
C1Rt		Room temperature set point C1 (*7)	-	Variable value		°C
C2Rt		Room temperature set point C2 (*2)	-	Variable value		°C
DHWst		DHW temperature set point	-	Variable value		°C
SWPst		SWP temperature set point (*5)	-	Variable value		°C

: Available only for installer.

*(*1): Water OTC Setting T C1 and C2 will not be shown when Water calculation C1 is disabled.*

*(*2): It will be shown only when Circuit 2 is enabled and Room thermostat is installed.*

*(*3): DH Water T° (DHWst) will be only shown when DHW status (DHWs) is enabled.*

*(*4): Swimming pool T° (SWPt) will be shown only when Swimming pool status (SWP) is enabled.*

*(*5): SWP T° set point (SWPs) will be shown only when Swimming pool status (SWP) is enabled.*

*(*6): Room T°C1 (C1Rt) will be only shown when Room thermostat is installed.*

*(*7): Room T° set point C1 (C1Rs) will be only shown when Room thermostat is installed.*

Electrical and control settings

8.1 Electrical connection

◆ Safety instructions

NOTE

- *Check the requirements and recommendations in chapter "8.2 Wiring size and protection devices minimum requirements".*
- *The torque for the tightening of the screws of each Terminal board is explained in the table below:*

Terminal board	Tightening torque (N·m)
TB1	2.0~2.5
TB2	1.0~1.3

- *Key words:*

  ✓ PE: Protective earth

  ✓ ELB: Earth leakage breaker

  ✓ CB: Circuit breaker

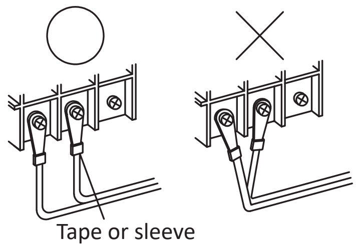
DANGER

- ***Do not connect the power supply to the unit before all connections have been previously done.***
- ***Do not connect the power supply to the unit prior to filling the space heating circuit (and DHW circuit if it were the case) with water and checking water pressure and the total absence of any water leakage.***
- ***Do not connect or adjust any wiring or connections unless the main power switch is OFF.***
- ***When using more than one power source, check and ensure that all of them are turned OFF before operating the unit.***
- ***Avoid wiring installation in contact with the water pipes, edges of plates and electrical components inside the unit to prevent damage, which may cause electric shock or short circuit.***

CAUTION

- *Use a dedicated power circuit for each unit. Do not use a power circuit shared with any other appliance.*
- *Make sure that all wiring and protection devices are properly selected, connected, identified and fixed to the corresponding terminals of the unit, specially the protection (earth) and power wiring, taking into account the applicable national and local regulations. Establish proper earthing; incomplete earthing may cause electrical shock.*
- *Protect the unit against the entry of small animals (like rodents) which could damage any internal wire or any other electrical part, leading to electric shock or short-circuit.*

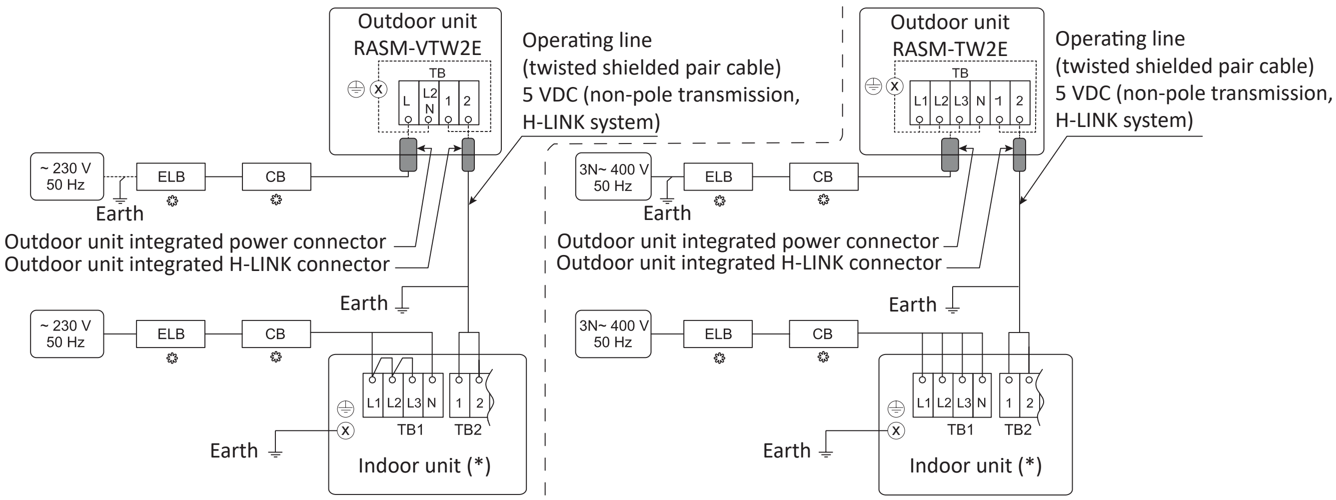
- *Keep a distance between each wiring terminal and attach insulation tape or sleeve as shown in the figure.*



8.1.1 System wiring diagram

Connect the units according to the following electric diagram:

TB	: Terminal board	——	: Field wiring
CB	: Circuit breaker	❂	: Field-supplied
ELB	: Earth leakage breaker	1,2	: Outdoor-Indoor communication



(*) Different connection particularities may apply depending on the specific indoor unit

Refer to the subsequent sections to know the specific connection details and procedures for each unit.

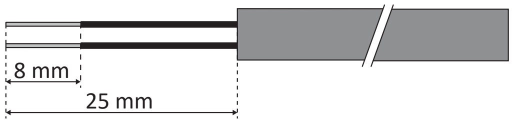
8.1.2 Transmission wiring between outdoor and indoor units

◆ H-LINK connector assembly

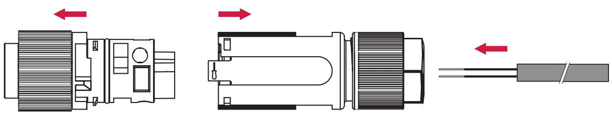
1 Prepare a 2-wires cable:

- ✓ Use twist pair wires (0.75 mm²) for operation wiring between outdoor unit and indoor unit. The wiring must consist of 2-core wires (do not use wire with more than 3 cores).
- ✓ Use shielded wires for intermediate wiring to protect the units from noise interference, with a length of less than 300 m and a size in compliance with local codes.

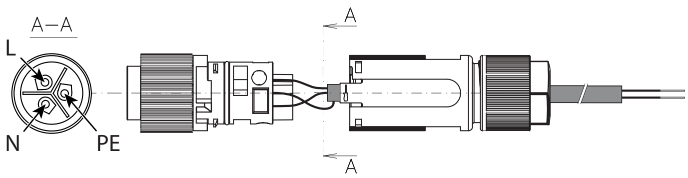
2 Stripe 25 mm of the sheath and 8 mm of each wire:



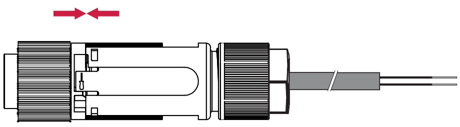
3 Open the outdoor unit factory-supplied H-LINK connector and pass the striped cable through it:



4 Screw the 2 wires to the ports L and N (no polarity is to be considered), and use another wire to connect the cable shield to the PE port. Tighten all to 0.4 N·m:

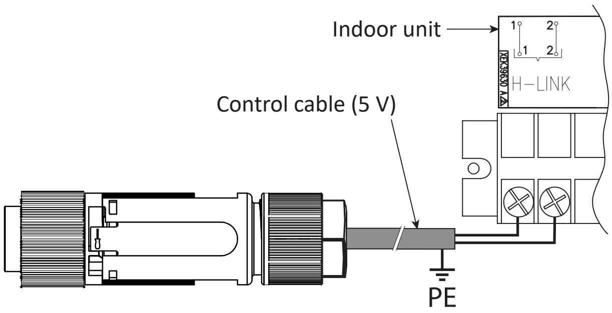


5 Close the H-LINK connector:



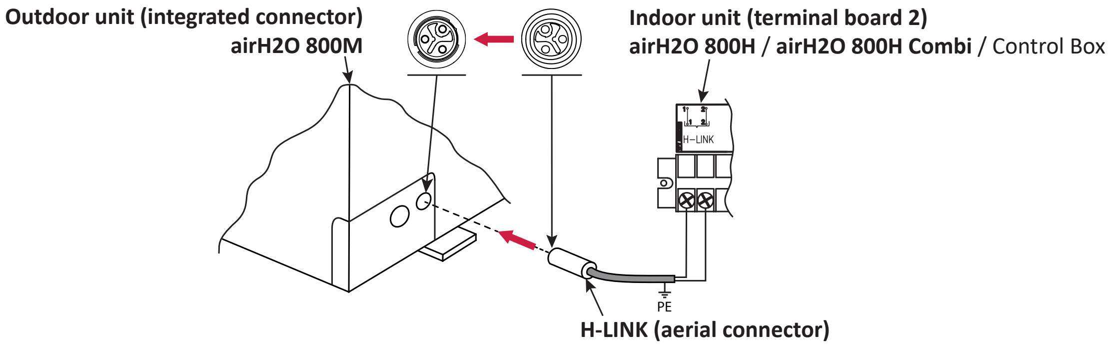
◆ Connection with indoor unit

The connection to the indoor unit is performed bolting the free endings of each wire to the Terminal Board 2 (TB2)as indicated in the picture (no polarity is to be considered) and the shield to the ground:



◆ Connection with outdoor unit

Then, the connection to the outdoor unit is simply performed inserting the previously assembled connector to its counterpart found integrated in the lower part of the rear cover of the outdoor unit:



⚠ **CAUTION**

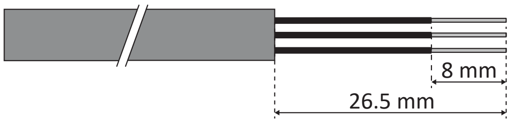
Ensure that the transmission wiring is not wrongly connected to any live part that could damage the PCB.

8.1.3 Outdoor units power wiring connection

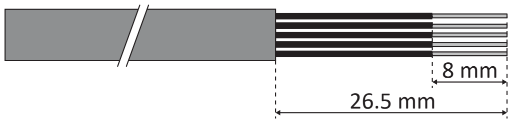
◆ Power connectors assembly

1 Prepare a 3-wires (single-phase units) or 5-wires (three-phase units) cable (see section *"8.2 Wiring size and protection devices minimum requirements"*).

2 Stripe 26.5 mm of the sheath and 8 mm of each wire:

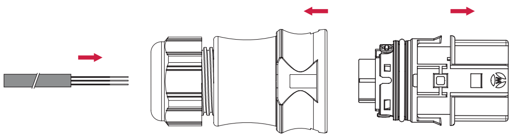


3-wires cable (single-phase units)

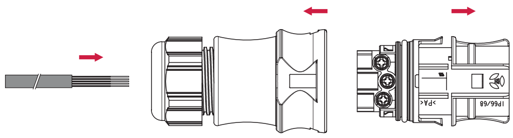


5-wires cable (three-phase units)

3 Open the factory-supplied power connector and pass the cable through it:

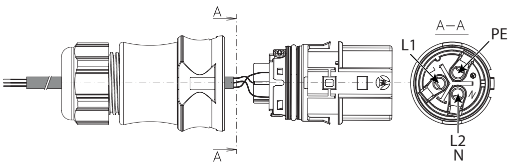


3-poles power connector (single-phase units)

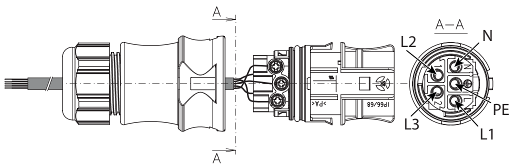


5-poles power connector (three-phase units)

4 Screw the wires to the 3/5 ports, tightening to 0.8 N·m - 1 N·m:

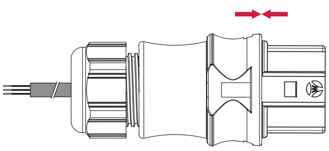


3-poles power connector (single-phase units)

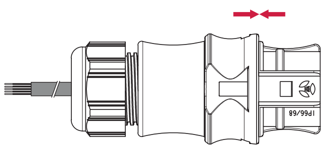


5-poles power connector (three-phase units)

5 Close the power connector:



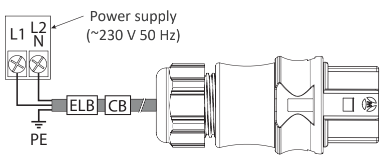
3-poles power connector (single-phase units)



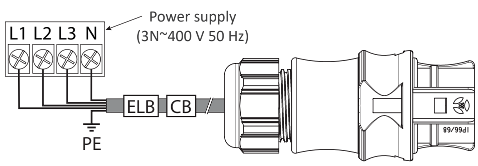
5-poles power connector (three-phase units)

◆ Connection with the grid

Connect the other endings of the wires to the power supply as indicated in the drawing, being careful not to confuse them. Be sure to place the corresponding ELB and CB in between:



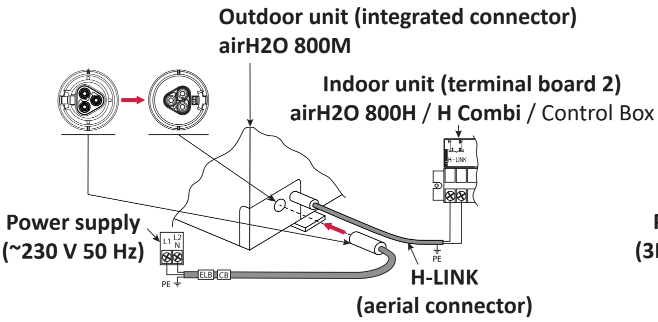
Single-phase units grid connection



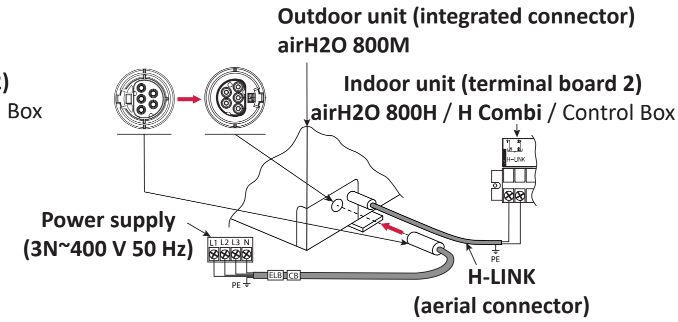
Three-phase units grid connection

◆ Connection with outdoor unit

Connect the power connector coming from the power supply to its counterpart in the outdoor unit (below, in the rear).



Single-phase units grid connection

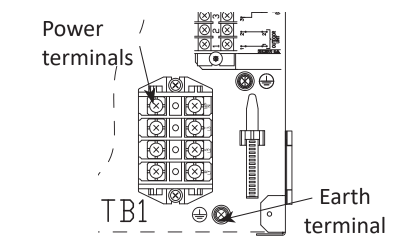
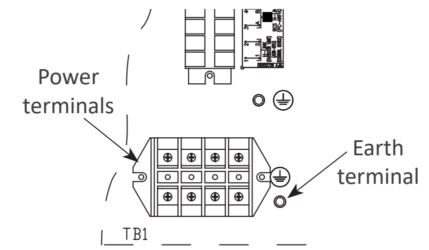
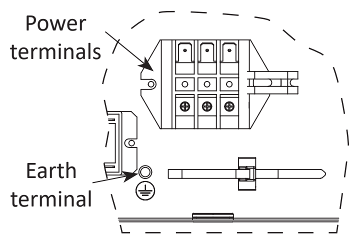


Three-phase units grid connection

8.1.4 Indoor units power wiring connection

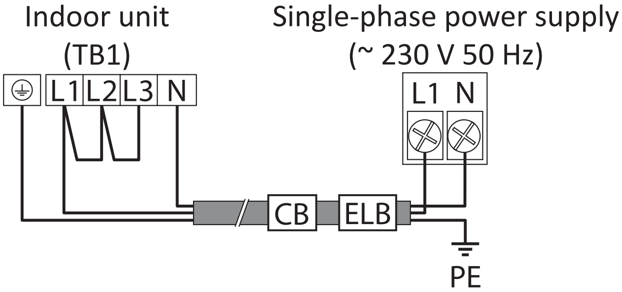
Connect the power supply wires to the Terminal Board 1 (TB1), and the earth conductor to the earth screw in the electrical box plate.

Depending on the indoor unit, the TB1 and earth screw locations are as follows:

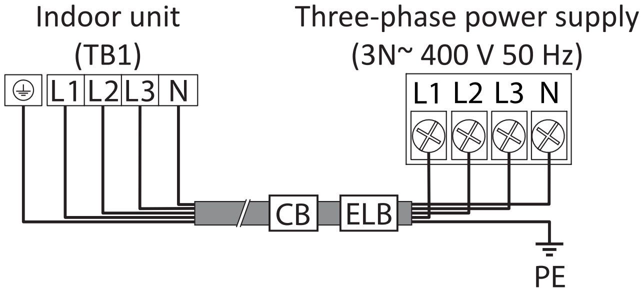
airH2O 800H	airH2O 800H Combi	Control Box
		

Using the appropriate cable, connect the power circuit to the appropriate terminals as shown on the wiring labels and the illustrations below:

◆ airH2O 800H + airH2O 800H Combi



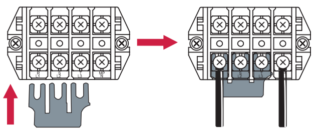
Single-phase grid connection



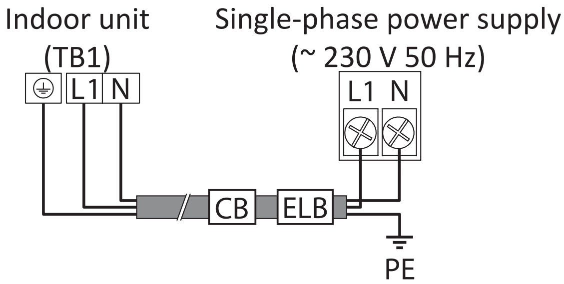
Three-phase grid connection

NOTE

In the case of a single-phase power supply, use the power connection bridge attached in the accessory bag, following these instructions:



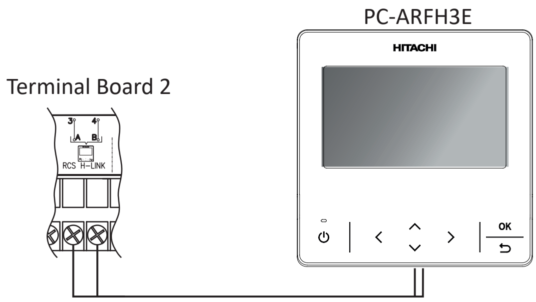
◆ Control Box



Single-phase grid connection

8.1.5 Unit controller (PC-ARFH3E) connection

Connection for the Unit controller PC-ARFH3E should be done on the Terminal Board 2 (TB2) as shown in the next figure:



CAUTION

- *The installation and connection is already factory-performed in the* **airH2O 800H** *and* **airH2O 800H Combi***.*
- *For the Control Box, it is mandatory to install the Unit controller in the service cover. A cable is supplied for the connection.*

8.1.6 Optional accessories connection

Carry out the necessary electrical connections of the optional accessories using the Terminal Board 2 (TB2). Consult its label and the Technical Catalogue for a better understanding.

8.2 Wiring size and protection devices minimum requirements

CAUTION

- *Check to ensure that the field supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated on this chapter and they comply with national and local codes. If it is necessary, contact with your local authority in regards to standards, rules, regulations, etc.*
- *Use a dedicated power circuit for each unit. Do not use a power circuit shared with any other appliance.*
- *Ensure specifically that there is an Earth Leakage Breaker (ELB) and a Circuit Breaker (CB) installed for the units (outdoor and indoor units) in the power supply lines.*
- *If the installation is already equipped with an Earth Leakage Breaker (ELB), ensure that its rated current is large enough to hold the current of the units (outdoor and indoor units).*

NOTE

- *Electric fuses can be used instead of magnetic Circuit Breakers (CB). In that case, select fuses with similar rated values as the CB.*
- *The Earth Leakage Breaker (ELB) mentioned on this manual is also commonly known as Residual Current Device (RCD) or Residual Current Circuit Breaker (RCCB).*
- *The Circuit Breakers (CB) are also known as Thermal-Magnetic Circuit Breakers or just Magnetic Circuit Breakers (MCB).*
- *Use wires which are not lighter than the polychloroprene sheathed flexible cord (code designation 60245 IEC 57).*

8.2.1 Outdoor units

◆ airH2O 800M - RASM-(2-6)(V)TW2E

Model	Power supply	Max current (A)	Power supply cables	Transmitting cables	CB (A)	ELB (no. of poles/A/mA)
RASM-2VTW2E	~ 230 V 50 Hz	14.2	2 x 2.5 mm² + GND	2 x 0.75 mm²	16	2/40/30
RASM-3VTW2E		17.7	2 x 4 mm² + GND		20	
RASM-3.5VTW2E		20.7	2 x 6 mm² + GND		25	
RASM-(4-6)VTW2E		29.2	2 x 6 mm² + GND		32	
RASM-(4-6)TW2E	3N~ 400 V 50 Hz	16.7	4 x 4 mm² + GND		20	4/40/30

8.2.2 Indoor units - Hydrosplit system

◆ airH2O 800H - HWM-W2E(-B)

Model	Power supply	Operation mode	Max current (A)	Power supply cables EN 60335-1	Transmitting cables	Actuator cables	CB (A)	ELB (nº of poles/A/mA)
HWM-W2E(-B)	~ 230 V 50 Hz	Without electric heaters	0.7	2 x 0.75 mm² + GND	2 x 0.75 mm²	2 x 0.75 mm² + GND	5	2/40/30
		With electric heater	26.7	2 x 6.0 mm² + GND			32	
		With DHW tank heater	13.7	2 x 2.5 mm² + GND			16	
		With electric and DHW tank heaters	39.8	2 x 10.0 mm² + GND			50	2/63/30
	3N~ 400 V 50 Hz	Without electric heaters	0.7	4 x 0.75 mm² + GND			5	4/40/30
		With electric heater	9.3	4 x 2.5 mm² + GND			16	
		With DHW tank heater	13.7	4 x 2.5 mm² + GND			16	
		With electric and DHW tank heaters	22.4	4 x 6.0 mm² + GND			25	

NOTE

The data corresponding to DHW tank heater is calculated in combination with the domestic hot water tank accessory "DHWT-(200/300)S-3.0H2E".

◆ airH2O 800H Combi - HWD-W2E-220S(-K)

Model	Power supply	Operation mode	Max. current (A)	Power supply cables	Transmitting cables	Actuator cables	CB (A)	ELB (no. of poles/A/mA)
HWD-W2E-220S(-K)	~ 230 V 50 Hz	Without electric heaters	0.7	2 x 0.75 mm² + GND	2 x 0.75 mm²	2 x 0.75 mm² + GND	5	2/40/30
		With electric heater	26.7	2 x 6.0 mm² + GND			32	
		With DHW tank heater	12.6	2 x 2.5 mm² + GND			16	
		With electric and DHW tank heaters	38.7	2 x 10.0 mm² + GND			50	2/63/30
	3N~ 400 V 50 Hz	Without electric heaters	0.7	4 x 0.75 mm² + GND			5	4/40/30
		With electric heater	17.3	4 x 4.0 mm² + GND			20	
		With DHW tank heater	12.6	4 x 2.5 mm² + GND			16	
		With electric and DHW tank heaters	17.3	4 x 4.0 mm² + GND			20	

8.2.3 Indoor units - Control Box system

◆ Control Box - ATW-CBX-01

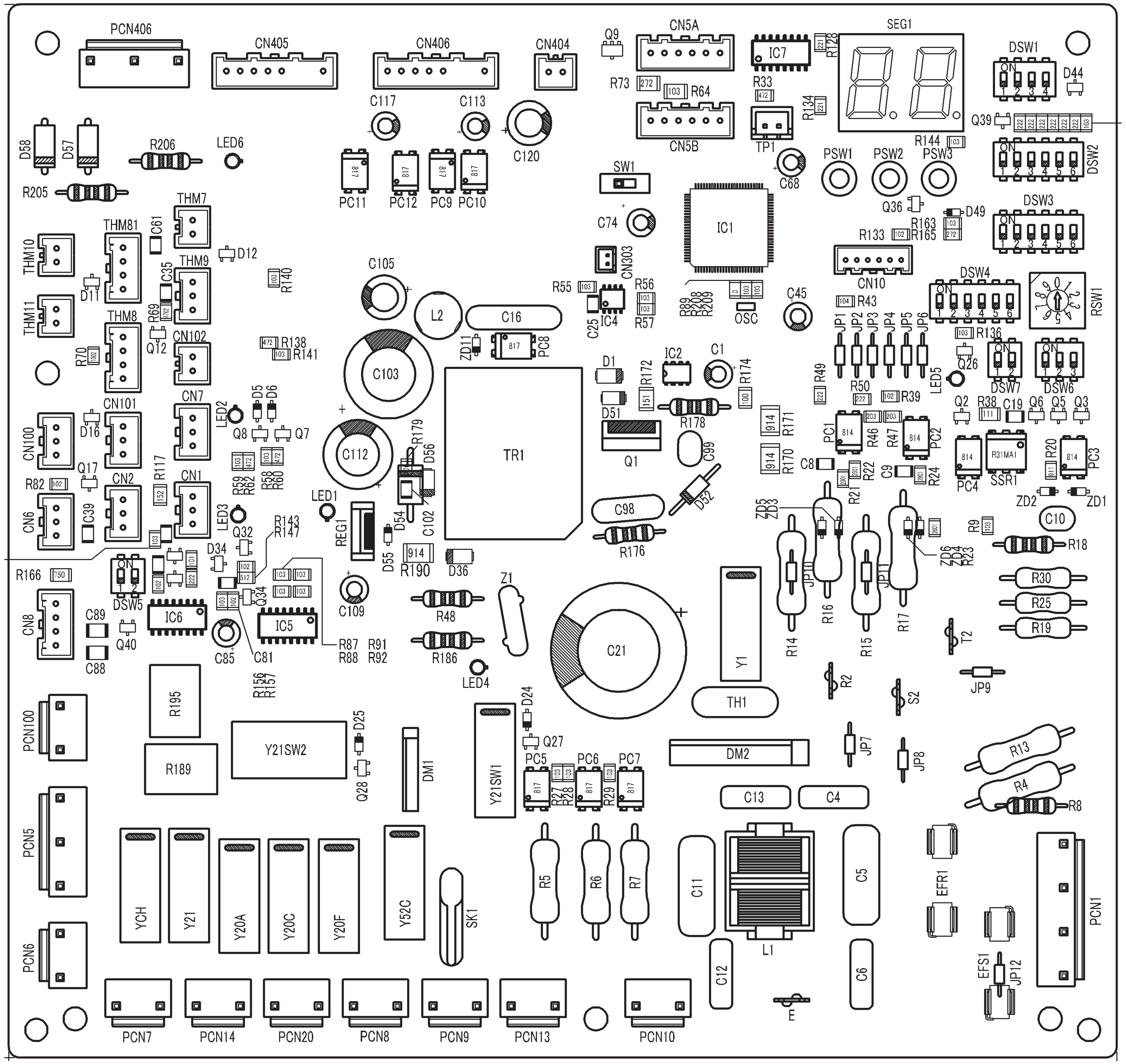
Power supply	Operation mode	Max. Current (A)	Power supply cables EN 60335-1	Transmitting cables EN 60335-1	CB (A)	ELB (nº of poles/A/ mA)
~230 V 50 Hz	-	5	2 x 0.75 mm^2	2 x 0.75 mm^2	5	2/40/30
	With DHW Tank	19	2 x 4 mm^2		20	

8.3 Printed circuit board (PCB)

8.3.1 Outdoor units

8.3.1.1 Main control board (PCB1)

◆ **airH2O 800M - RASM-(2-6)(V)TW2E**

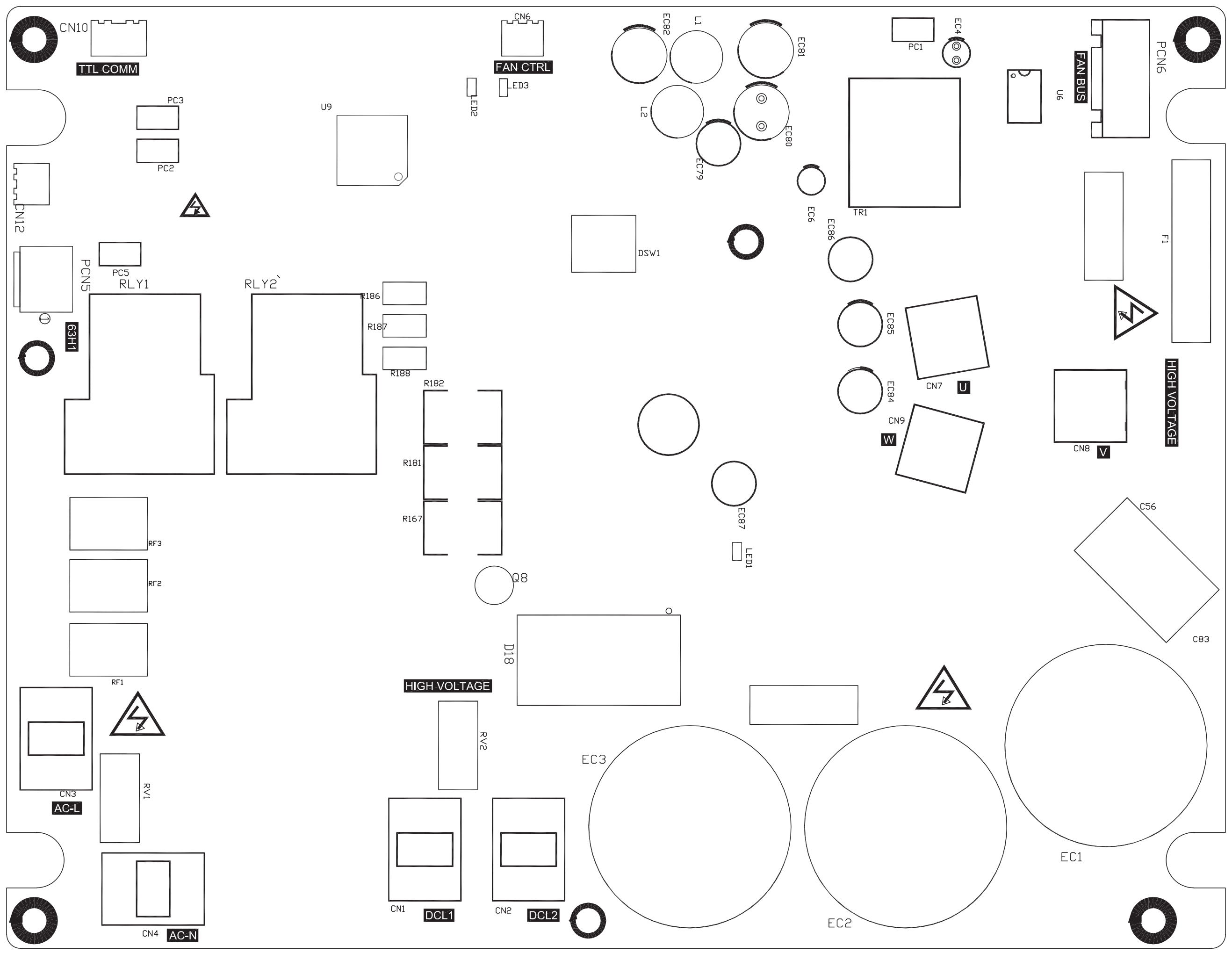


Connectors	
Name	**Function**
CN1	Temperature thermistor for water input / Output water pressure sensor"
CN2	Leak sensor input
CN5B	Microelectronic expansion valve
CN6	Connection between PCB1 and PCB2 (Inverter)
CN8	Transmission between outdoor and indoor units
CN10	Control for water pump on outdoor unit (WP1)
CN100	Discharge pressure sensor
CN101	Suction pressure sensor
CN404	Connection between PCB1 and PCB3 (+15 V)
CN405	Power for fan motor on outdoor unit (MOF1)
CN406	Control for fan motor on outdoor unit (MOF1)
PCN1	Power source for PCB1
PCN5	Crankcase heater
PCN6	Plate heat exchanger heater
PCN7	Solenoid valve
PCN9	Power for water pump on outdoor unit (WP1)
PCN100	4-way valve
PCN406	Connection between PCB1 and PCB3 (high voltage)
THM7	Temperature thermistor for ambient temperature
THM8	Temperature thermistor for evaporation temperature
THM9	Temperature thermistor for discharge temperature
THM11	Temperature thermistor for liquid temperature
THM81	Temperature thermistor for water output temperature
R2, S2, T2	Phase order detector (only for 3-phase units)

LED indication		
Name	**Color**	**Indication**
LED1	Red	Power source indicator for main board (low voltage). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED2	Green	It indicates the communication state between the Main Board and driven board. Normal condition: Flashing. Abnormal condition: Deactivated / OFF.
LED3	Yellow	It indicates the communication state between the indoor unit and outdoor unit. Normal condition: Flashing. Abnormal condition: Deactivated / OFF.
LED4	Red	Power source indicator for outdoor unit PCB (280 VDC). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED6	Red	Power source indicator for outdoor unit PCB (from PCB2). Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
SEG1	-	It indicates: “Alarm”, “Protective Safety Device has Tripped” or “Checking Items”.

8.3.1.2 Inverter board (PCB2)

◆ **airH2O 800M - RASM-(2-6)VTW2E**



Connectors	
Name	**Function**
AC-L, AC-N	Power source line (L, N)
DCL1, DCL2	Connection for reactor
PCN5	High pressure breaker device (PSH)
CN2	Temperature thermistor for FIN temperature
CN10	Transmission between PCB1 and PCB2
CN6	Connection between PCB1 and PCB2 (+15 V)
PCN6	Connection between PCB1 and PCB2 (high voltage)
CN7, CN8, CN9	Connection to the compressor

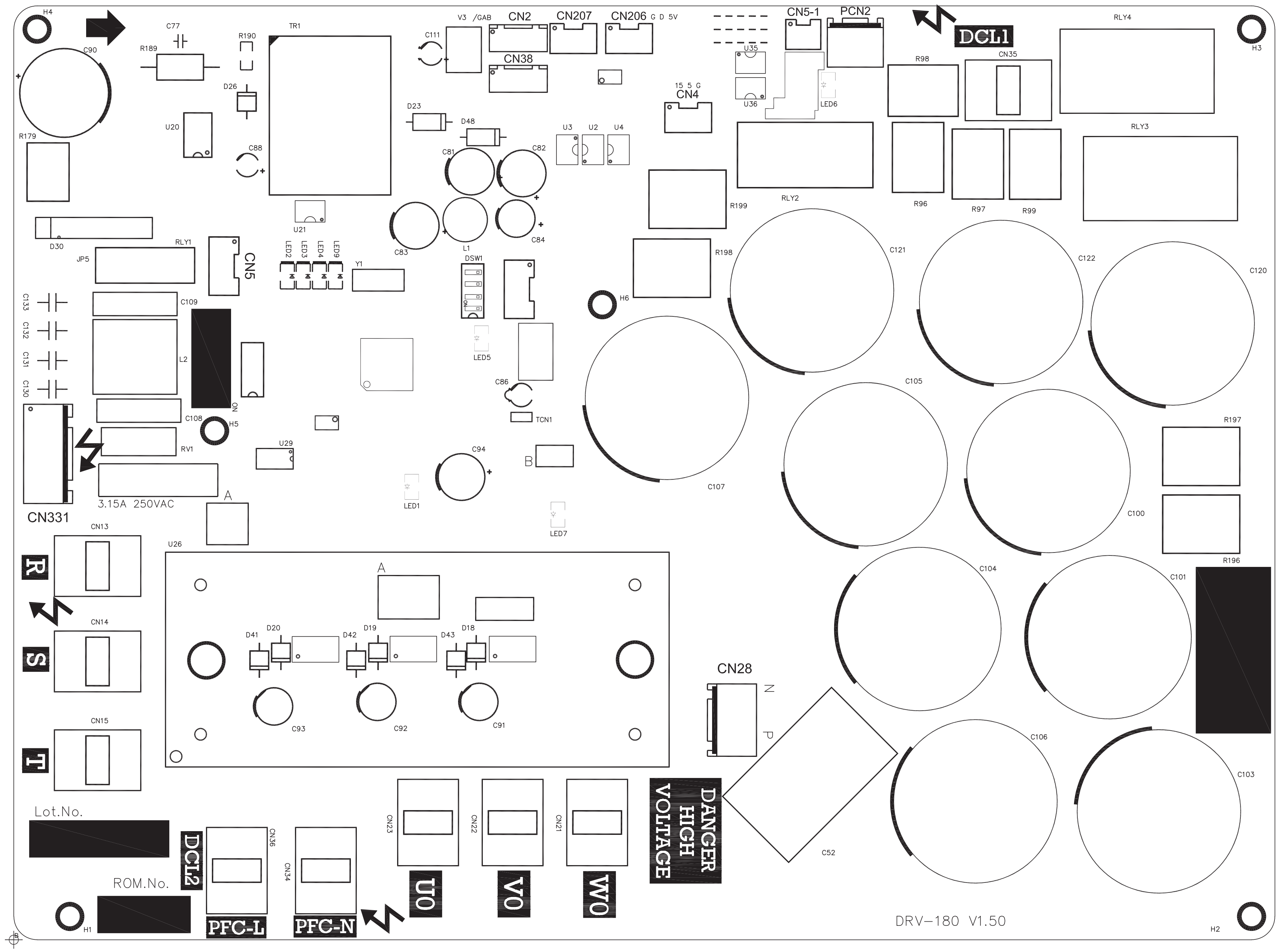
Switches	
Name	**Function**
DSW1	No setting is required

LED indication		
Name	**Color**	**Indication**
LED1	Red	It indicates that capacitors are electrically charged. Normal condition: Activated / ON Abnormal condition: Deactivated / OFF"
LED2	Orange	It indicates if there is any alarm on the PCB2. Normal condition: Activated / ON Abnormal condition: Deactivated / OFF / Flashing”

NOTE

Flash represent that the LED is ON for 0.5 second and then it is OFF for 0.5 second repeatedly.

◆ airH2O 800M - RASM-(4-6)TW2E



Connectors	
Name	**Function**
CN331	Power line (L,N)
PCN2	High pressure breaker device (PSH)
CN206	Connection between PCB1 and PCB2 (Inverter)
U0,V0,W0	Connection to the compressor
R,S,T	Power line (L1, L2, L3)

Switches		
Name	**Function**	
DSW1	Operation / Display	No Setting is Required

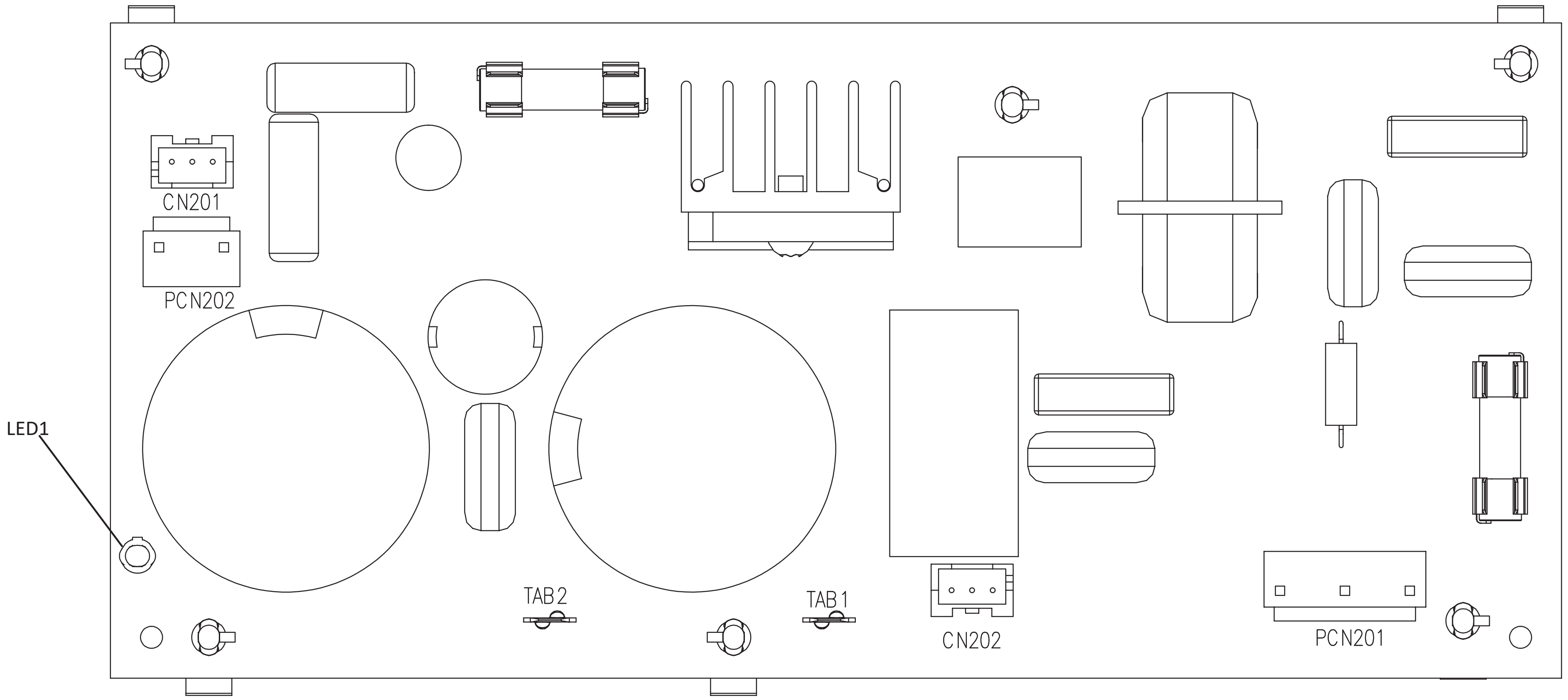
LED indication		
Name	**Color**	**Indication**
LED1	Green	Communication Indicator. Normal condition: Flashing. Abnormal condition: ON / OFF.
LED7	Red	Power Source Indicator for Driver Board. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED5	Green	Power Source Indicator for Control Part. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED6	Red	Power source indicator for Precharge Relay. Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.
LED4 LED3 LED2	Green Yellow Red	Compressor is Working: ON OFF OFF Frequency Decrease for Overcurrent: ON ON OFF Frequency Limit for Overcurrent: ON ON ON Frequency Limit for Overheat: ON Flash OFF Frequency Decrease for Overheat: ON Flash Flash Compressor is Ready to Operate. (The Main Relay is Activated)Flash OFF OFF

NOTE

Flash represent that the LED is ON for 0.5 second and then it is OFF for 0.5 second repeatedly.

8.3.1.3 Fan power board (PCB3)

◆ **airH2O 800M - RASM-(4-6)TW2E**

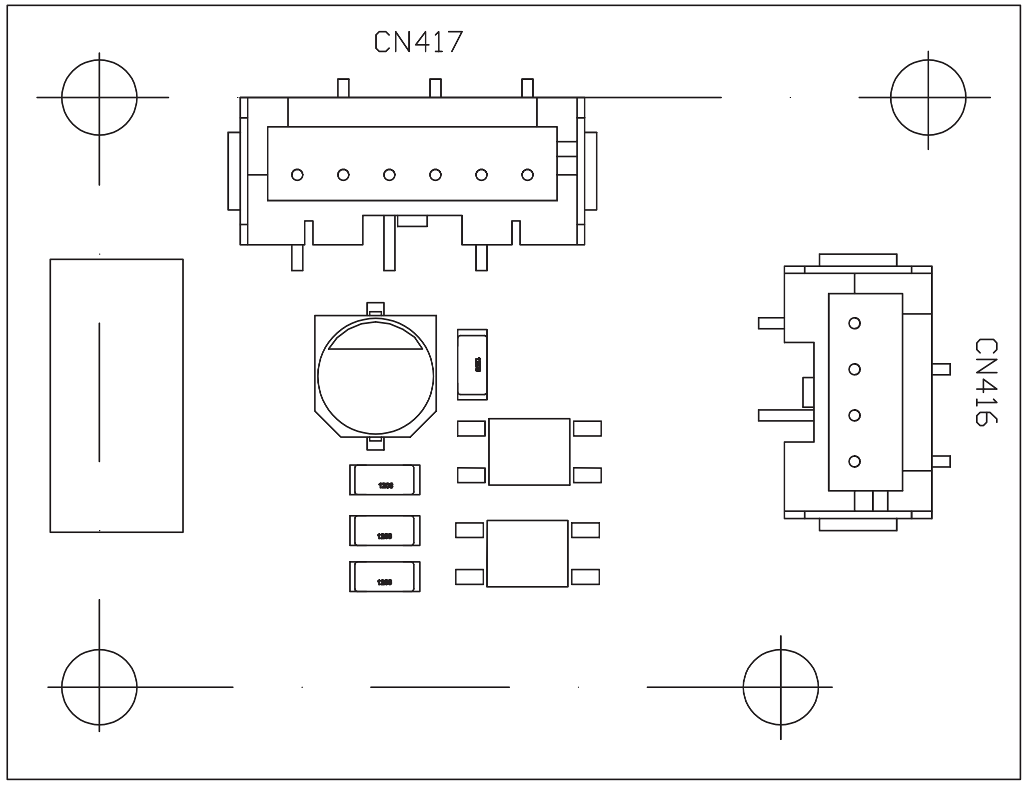


Connectors	
Name	Function
PCN201	Power line (L,N)
ERF1	Power protection (fuse)
PCN202	Connection between PCB1 and PCB3
CN201	Connection between PCB1 and PCB3
CN202	Connection between PCB1 and PCB3

LED indication		
Name	Color	Indication
LED1	Red	PCB1 power indication Normal condition: Activated / ON. Abnormal condition: Deactivated / OFF.

8.3.1.4 Fan control board (PCB4)

◆ **airH2O 800M - RASM-(4-6)(V)TW2E**

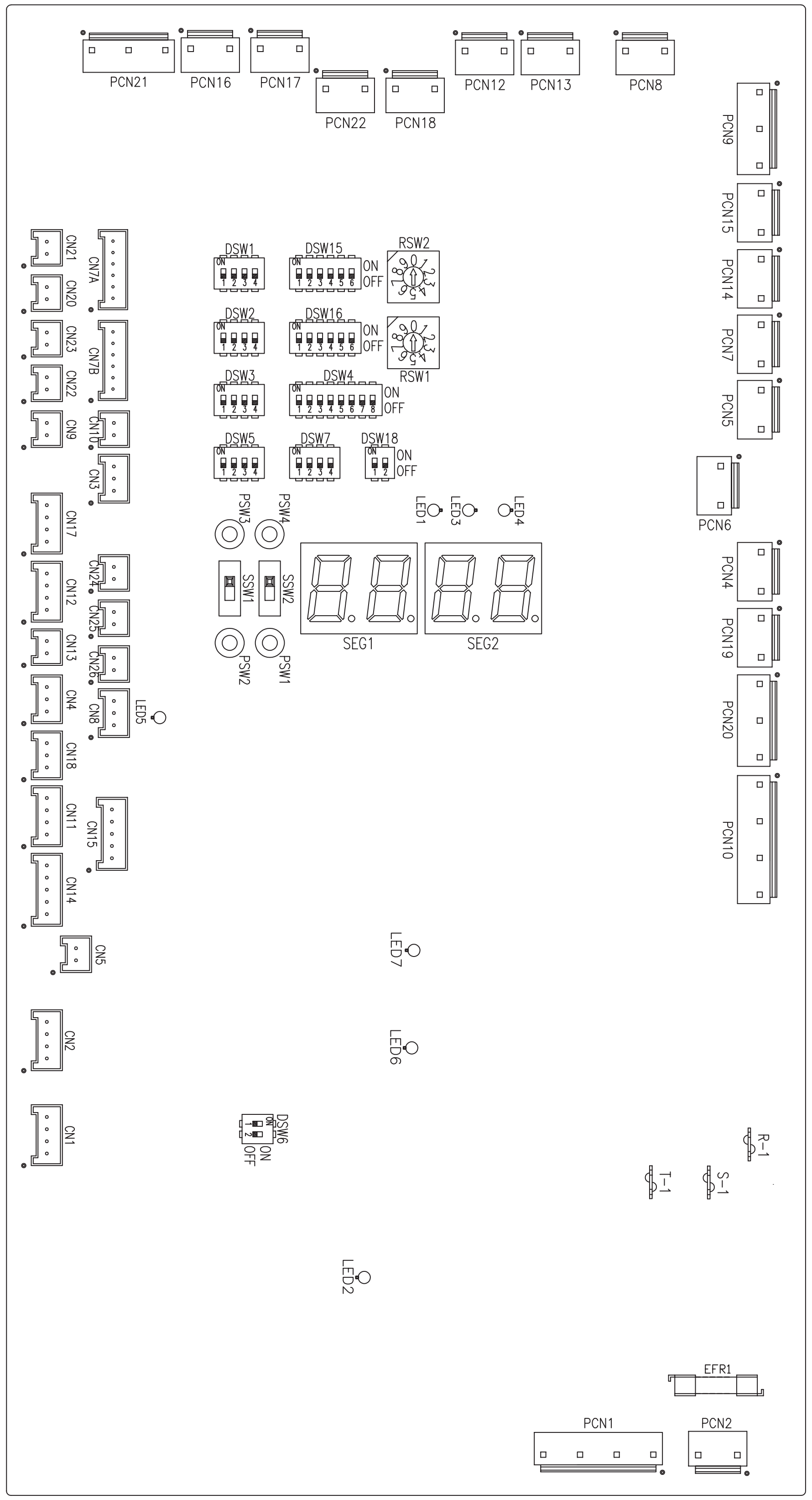


Connectors	
Name	Function
CN416	Communication with main control board
CN417	Communication with fan motor

8.3.2 Indoor units - Hydrosplit system

8.3.2.1 Main control board

◆ airH2O 800H - HWM-W2E(-B)

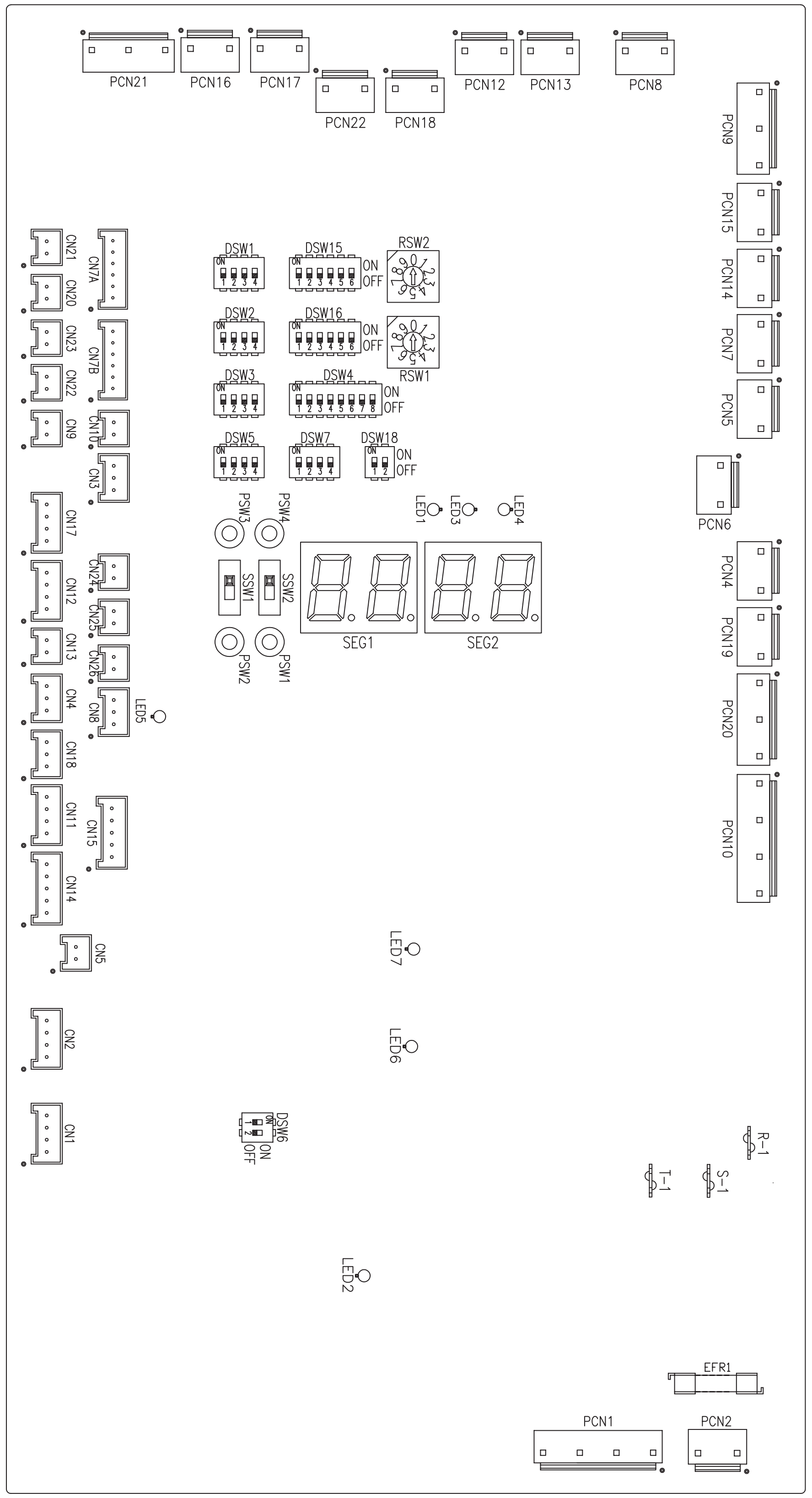


Connectors	
Name	**Function**
CN1	H-LINK for communication
CN2	H-LINK for remote controller switch communication
CN5	Auxiliary thermistor input
CN10	DHWT1 water temperature input
CN11	Outlet heat pump water input
CN13	Outlet water temperature input
CN14	Water pump output for control
CN16	IOT gateway
CN20/21/22/23	Auxiliary output signals accessory
CN24	Outlet water temperature input (Circuit 2)
CN25/26	Auxiliary thermistor input
PCN1	Power supply
PcN5	Contactor to switch tank's heater manually
PCN5/13	Contactor to switch ON and switch OFF heater tank (power)
PCN6/10/19/20	Optional input (A.D input 230 V)
PCN7	Contactor space heater step switch (AR1)
PCN14	Contactor space heater step switch (AR2)
PCN9	Second circuit - 2-way valve for DHW
PCN12	Outputs for options - 2-way valve for DHW
PCN15/9	Water pump 2 output
PCN15/6	Auxiliary power (L-N)
PCN16	Water pump 1 / Aquastat zone 1
PCN18	Output options (output 4)
PCN21	Output for options - 3-way valve for swimming pool (output 1)
PCN22	Output for options (output 3 - boiler)
PSW1~4	Check mode
EFR1	Power protection fuse

Switches		
Name	**Function**	
DSW1	Operation / Display	Additional setting
DSW2		Unit capacity setting
DSW3		Additional setting 1
DSW4		Additional setting 2
DSW5		Additional setting 3
DSW6		Terminating resistance setting H-LINK
DSW7		Additional setting 4
DSW15		Refrigerant address
RSW2		
DSW16		IU address
RSW1		
DSW18		Additional setting 5
SSW1		Remote/Local operation
SSW2		Cool/Heat operation

LED indication		
Name	**Color**	**Indication**
LED1	Green	Power Indication
LED2	Red	Power Indication
LED3	Red	Heat pump operation (thermo ON/OFF)
LED4	Yellow	Alarm (flickering with 1 s interval)
LED5	Green	Not used
LED6	Yellow	H-LINK transmission
LED7	Yellow	H-LINK RCS transmission

◆ airH2O 800H Combi - HWD-W2E-220S(-K)



Connectors	
Name	**Function**
CN1	H-LINK for communication
CN2	H-LINK for remote controller switch communication
CN5	Auxiliary thermistor input
CN9	Water inlet temperature input
CN10	DHWT1 water temperature input
CN11	Outlet heat pump water input
CN13	Outlet water temperature input
CN14	Water pump output for control
CN15	3-way valve
CN16	IOT gateway
CN18	DHWT2 water temperature input
CN20/21/22/23	Auxiliary output signals accessory
CN24	Outlet water temperature input (Circuit 2)
CN25/26	Auxiliary thermistor input
PCN1	Power supply
PCN5	Contactor to switch tank's heater manually
PCN5/13	Contactor to switch ON and switch OFF heater tank (power)
PCN6/10/19/20	Optional input (A.D input 230 V)
PCN7	Contactor space heater step switch (AR1)
PCN14	Contactor space heater step switch (AR2)
PCN9	Second circuit - 2-way valve for DHW
PCN12	Outputs for options - 2-way valve for DHW
PCN15/9	Water pump 2 output
PCN15/6	Auxiliary power (L-N)
PCN16	Water pump 1 / Aquastat zone 1
PCN18	Output options (output 4)
PCN21	Output for options - 3-way valve for swimming pool (output 1)
PCN22	Output for options (output 3 - boiler)
PSW1~4	Check mode
EFR1	Power protection fuse

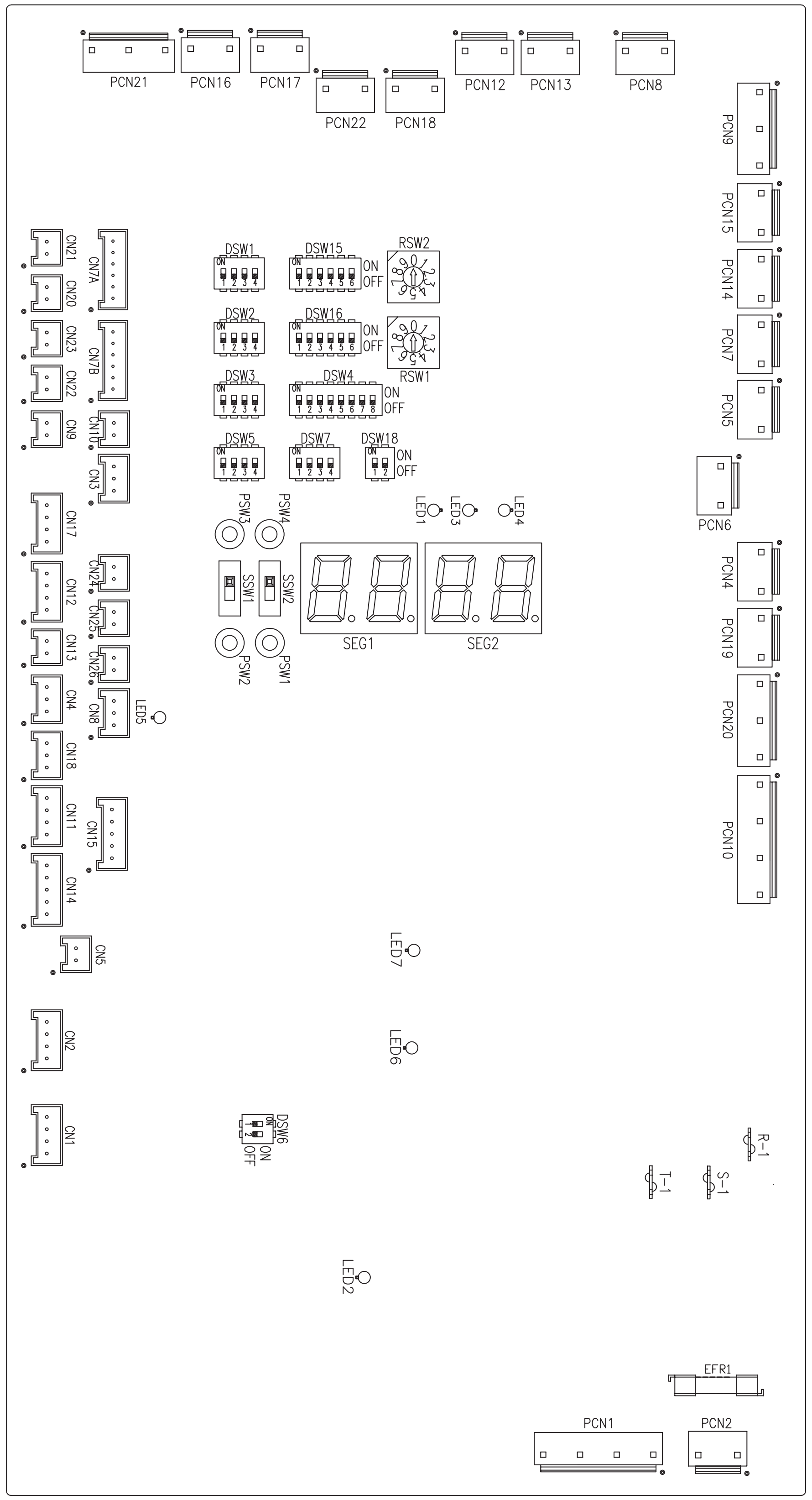
Switches		
Name	**Function**	
DSW1	Operation / Display	Additional setting
DSW2		Unit capacity setting
DSW3		Additional setting 1
DSW4		Additional setting 2
DSW5		Additional setting 3
DSW6		Terminating resistance setting H-LINK
DSW7		Additional setting 4
DSW15		Refrigerant address
RSW2		
DSW16		Indoor unit address
RSW1		
DSW18		Additional setting 5
SSW1		Remote/Local operation
SSW2		Cool/Heat operation

LED indication		
Name	**Color**	**Indication**
LED1	Green	Power Indication
LED2	Red	Power Indication
LED3	Red	Heat pump operation (Thermo ON/OFF)
LED4	Yellow	Alarm (flickering with 1 s interval)
LED5	Green	Not used
LED6	Yellow	H-LINK transmission
LED7	Yellow	H-LINK RCS transmission

8.3.3 Indoor units - Control Box system

8.3.3.1 Main control board

◆ Control Box - ATW-CBX-01



Connectors	
Name	**Function**
CN1	H-LINK for communication
CN2	H-LINK for remote controller switch communication
CN5	Auxiliary thermistor input
CN10	DHWT1 water temperature input
CN16	IOT gateway
CN20/21/22/23	Auxiliary output signals accessory
CN24	Outlet water temperature input (Circuit 2)
CN25/26	Auxiliary thermistor input
PCN1	Power supply
PCN5/13	Contact to switch ON and switch OFF heater tank (power)
PCN9	Second circuit - 2-way valve for DHW
PCN6/10/19/20	Optional input (A.D input 230 V)
PCN12	Outputs for options - 2-way valve for DHW
PCN15/6	Auxiliary power (L-N)
PCN15/9	Water pump 2 output
PCN18	Output options (output 4)
PCN21	Output for options - 3-way valve for swimming pool (output 1)
PCN22	Output for options (output 3 - boiler)
PSW1~4	Check mode
EFR1	Power protection fuse

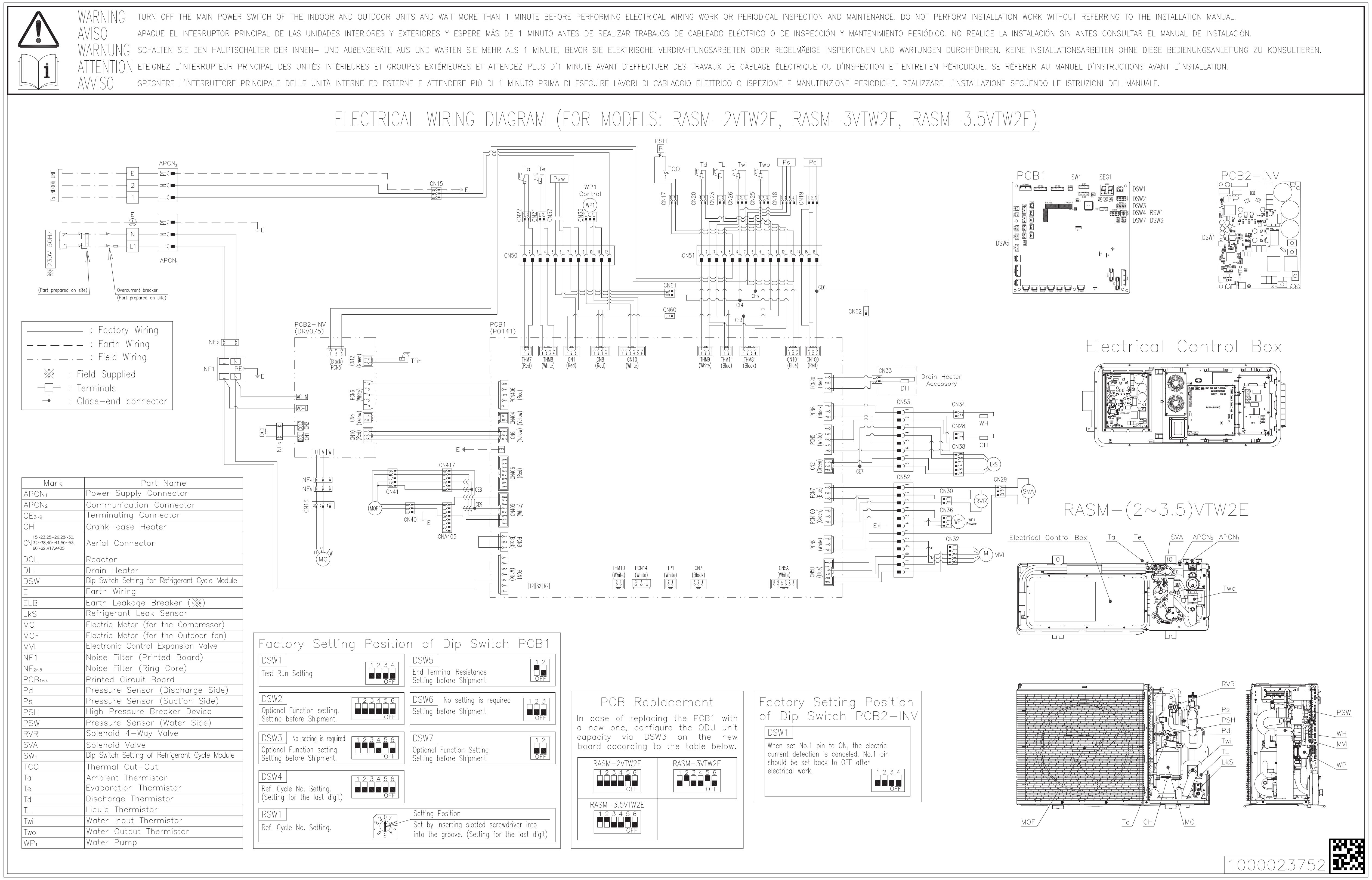
Switches		
Name	**Function**	
DSW1	Operation / Display	Additional setting
DSW2		Unit capacity setting
DSW3		Additional setting 1
DSW4		Additional setting 2
DSW5		Additional setting 3
DSW6		Terminating resistance setting H-LINK
DSW7		Additional setting 4
DSW15		Refrigerant address
RSW2		
DSW16		IU address
RSW1		
DSW18		Additional setting 5
SSW1		Remote/Local operation
SSW2		Cool/Heat operation

LED indication		
Name	**Color**	**Indication**
LED1	Green	Power Indication
LED2	Red	Power Indication
LED3	Red	Heat pump operation (thermo ON/OFF)
LED4	Yellow	Alarm (flickering with 1 sec interval)
LED5	Green	Not used
LED6	Yellow	H-LINK transmission
LED7	Yellow	H-LINK RCS transmission

8.4 Electrical Wiring Diagrams

8.4.1 Outdoor units

◆ **airH2O 800M - RASM-(2-3.5)VTW2E (~ 230 V 50 Hz)**

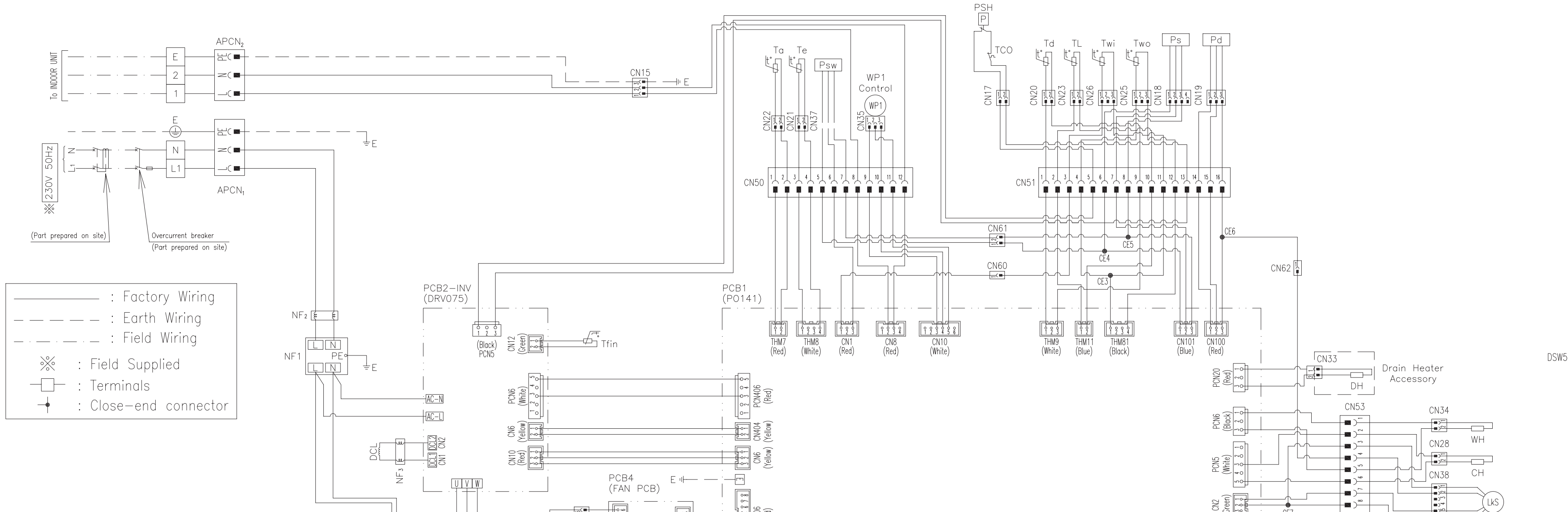


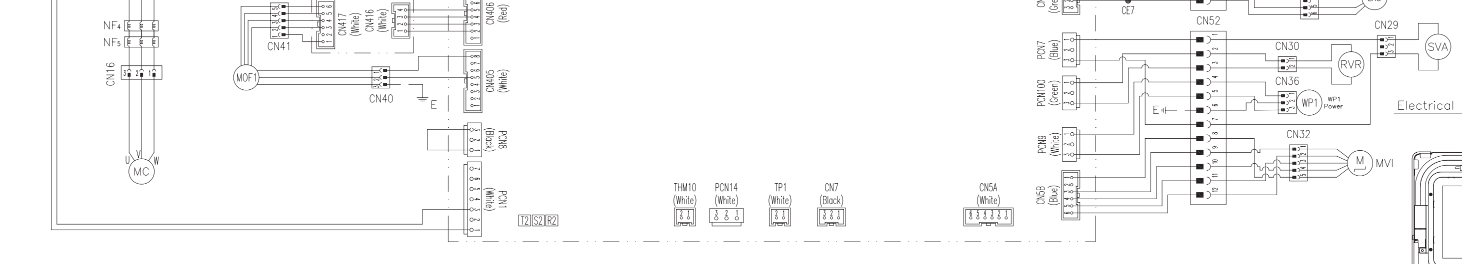
Mark	Part Name
$APCN_1$	Power Supply Connector
$APCN_2$	Communication Connector
$CE_{3\sim9}$	Terminating Connector
CH	Crank-case Heater
CN 15~23,25–26,28~30, 32~38,40~41,50~53, 60~62,417,A405	Aerial Connector
DCL	Reactor
DH	Drain Heater
DSW	Dip Switch Setting for Refrigerant Cycle Module
E	Earth Wiring
ELB	Earth Leakage Breaker (※)
LkS	Refrigerant Leak Sensor
MC	Electric Motor (for the Compressor)
MOF	Electric Motor (for the Outdoor fan)
MVI	Electronic Control Expansion Valve
NF1	Noise Filter (Printed Board)
$NF_{2\sim5}$	Noise Filter (Ring Core)
$PCB_{1\sim4}$	Printed Circuit Board
Pd	Pressure Sensor (Discharge Side)
Ps	Pressure Sensor (Suction Side)
PSH	High Pressure Breaker Device
PSW	Pressure Sensor (Water Side)
RVR	Solenoid 4-Way Valve
SVA	Solenoid Valve
SW_1	Dip Switch Setting of Refrigerant Cycle Module
TCO	Thermal Cut-Out
Ta	Ambient Thermistor
Te	Evaporation Thermistor
Td	Discharge Thermistor
TL	Liquid Thermistor
Twi	Water Input Thermistor
Two	Water Output Thermistor
WP_1	Water Pump

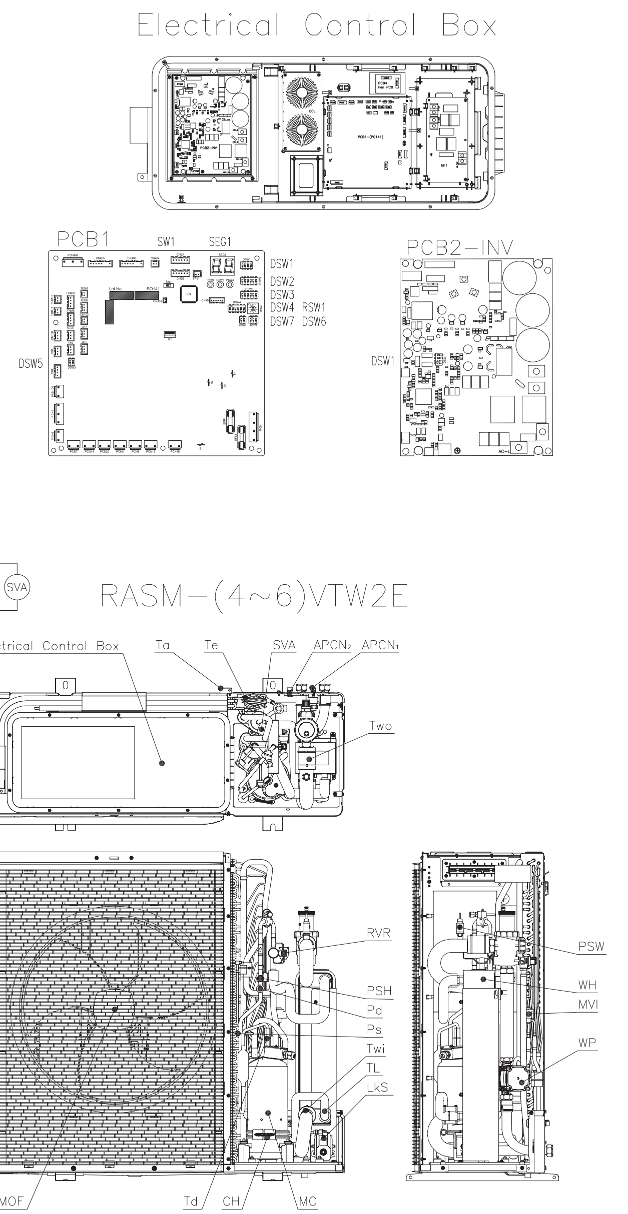
◆ airH2O 800M - RASM-(4-6)VTW2E (~ 230 V 50 Hz)

WARNING	TURN OFF THE MAIN POWER SWITCH OF THE INDOOR AND OUTDOOR UNITS AND WAIT MORE THAN 1 MINUTE BEFORE PERFORMING ELECTRICAL WIRING WORK OR PERIODICAL INSPECTION AND MAINTENANCE. DO NOT PERFORM INSTALLATION WORK WITHOUT REFERRING TO THE INSTALLATION MANUAL.
AVISO	APAGUE EL INTERRUPTOR PRINCIPAL DE LAS UNIDADES INTERIORES Y EXTERIORES Y ESPERE MÁS DE 1 MINUTO ANTES DE REALIZAR TRABAJOS DE CABLEADO ELÉCTRICO O DE INSPECCIÓN Y MANTENIMIENTO PERIÓDICO. NO REALICE LA INSTALACIÓN SIN ANTES CONSULTAR EL MANUAL DE INSTALACIÓN.
WARNUNG	SCHALTEN SIE DEN HAUPTSCHALTER DER INNEN– UND AUßENGERÄTE AUS UND WARTEN SIE MEHR ALS 1 MINUTE, BEVOR SIE ELEKTRISCHE VERDRAHTUNGSARBEITEN ODER REGELMÄßIGE INSPEKTIONEN UND WARTUNGEN DURCHFÜHREN. KEINE INSTALLATIONSARBEITEN OHNE DIESE BEDIENUNGSANLEITUNG ZU KONSULTIEREN.
ATTENTION	ETEIGNEZ L'INTERRUPTEUR PRINCIPAL DES UNITÉS INTÉRIEURES ET GROUPES EXTÉRIEURES ET ATTENDEZ PLUS D'1 MINUTE AVANT D'EFFECTUER DES TRAVAUX DE CÂBLAGE ÉLECTRIQUE OU D'INSPECTION ET ENTRETIEN PÉRIODIQUE. SE RÉFERER AU MANUEL D'INSTRUCTIONS AVANT L'INSTALLATION.
AVVISO	SPEGNERE L'INTERRUTTORE PRINCIPALE DELLE UNITÀ INTERNE ED ESTERNE E ATTENDERE PIÙ DI 1 MINUTO PRIMA DI ESEGUIRE LAVORI DI CABLAGGIO ELETTRICO O ISPEZIONE E MANUTENZIONE PERIODICHE. REALIZZARE L'INSTALLAZIONE SEGUENDO LE ISTRUZIONI DEL MANUALE.

ELECTRICAL WIRING DIAGRAM (FOR MODELS: RASM–4VTW2E, RASM–5VTW2E, RASM–6VTW2E)







Mark	Part Name
$APCN_1$	Power Supply Connector
$APCN_2$	Communication Connector
$CE_{3\sim7}$	Terminating Connector
CH	Crank–case Heater
CN 15~23,25–26,28~30, 32~38,40~41,50~53, 60~62	Aerial Connector
DCL	Reactor
DH	Drain Heater
DSW	Dip Switch Setting for Refrigerant Cycle Module
E	Earth Wiring
ELB	Earth Leakage Breaker (※)
LkS	Refrigerant Leak Sensor
MC	Electric Motor (for the Compressor)
MOF	Electric Motor (for the Outdoor fan)
MVI	Electronic Control Expansion Valve
NF1	Noise Filter (Printed Board)
$NF_{2\sim5}$	Noise Filter (Ring Core)
$PCB_{1\sim4}$	Printed Circuit Board
Pd	Pressure Sensor (Discharge Side)
Ps	Pressure Sensor (Suction Side)
PSH	High Pressure Breaker Device
PSW	Pressure Sensor (Water Side)
RVR	Solenoid 4–Way Valve
SVA	Solenoid Valve
SW_1	Dip Switch Setting of Refrigerant Cycle Module
TCO	Thermal Cut–Out
Ta	Ambient Thermistor
Te	Evaporation Thermistor
Td	Discharge Thermistor
TL	Liquid Thermistor
Twi	Water Input Thermistor
Two	Water Output Thermistor
WP_1	Water Pump

Factory Setting Position of Dip Switch PCB1

- DSW1 — Test Run Setting
- DSW2 — Optional Function setting. Setting before Shipment.
- DSW3 — No setting is required. Optional Function setting. Setting before Shipment.
- DSW4 — Ref. Cycle No. Setting. (Setting for the last digit)
- DSW5 — End Terminal Resistance Setting before Shipment
- DSW6 — No setting is required. Setting before Shipment
- DSW7 — Optional Function Setting. Setting before Shipment
- RSW1 — Ref. Cycle No. Setting. Setting Position: Set by inserting slotted screwdriver into into the groove. (Setting for the last digit)

PCB Replacement

In case of replacing the PCB1 with a new one, configure the ODU unit capacity via DSW3 on the new board according to the table below.

RASM–4VTW2E, RASM–5VTW2E, RASM–6VTW2E

Factory Setting Position of Dip Switch PCB2–INV

DSW1 — When set No.1 pin to ON, the electric current detection is canceled. No.1 pin should be set back to OFF after electrical work.

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◆ airH2O 800M - RASM-(4-6)TW2E (3N~ 400 V 50 Hz)

WARNING TURN OFF THE MAIN POWER SWITCH OF THE INDOOR AND OUTDOOR UNITS AND WAIT MORE THAN 1 MINUTE BEFORE PERFORMING ELECTRICAL WIRING WORK OR PERIODICAL INSPECTION AND MAINTENANCE. DO NOT PERFORM INSTALLATION WORK WITHOUT REFERRING TO THE INSTALLATION MANUAL.

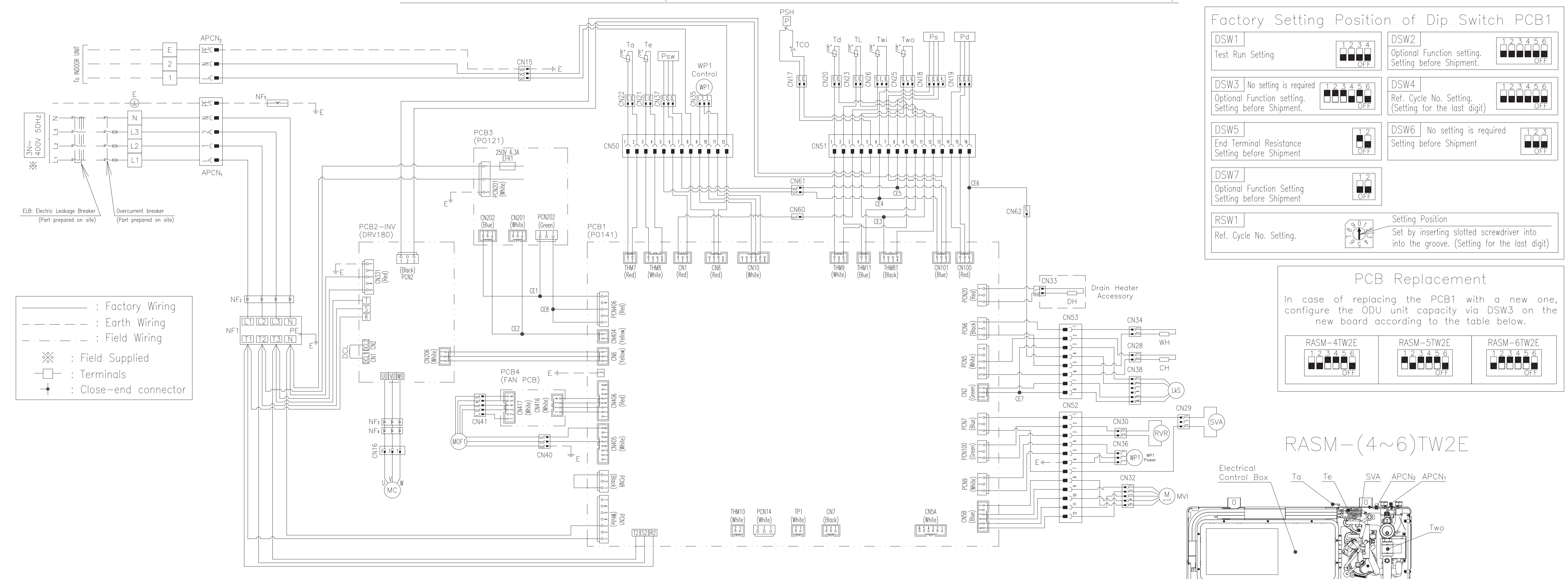
AVISO APAGUE EL INTERRUPTOR PRINCIPAL DE LAS UNIDADES INTERIORES Y EXTERIORES Y ESPERE MÁS DE 1 MINUTO ANTES DE REALIZAR TRABAJOS DE CABLEADO ELÉCTRICO O DE INSPECCIÓN Y MANTENIMIENTO PERIÓDICO. NO REALICE LA INSTALACIÓN SIN ANTES CONSULTAR EL MANUAL DE INSTALACIÓN.

WARNUNG SCHALTEN SIE DEN HAUPTSCHALTER DER INNEN– UND AUßENGERÄTE AUS UND WARTEN SIE MEHR ALS 1 MINUTE, BEVOR SIE ELEKTRISCHE VERDRAHTUNGSARBEITEN ODER REGELMÄßIGE INSPEKTIONEN UND WARTUNGEN DURCHFÜHREN. KEINE INSTALLATIONSARBEITEN OHNE DIESE BEDIENUNGSANLEITUNG ZU KONSULTIEREN.

ATTENTION ETEIGNEZ L'INTERRUPTEUR PRINCIPAL DES UNITÉS INTÉRIEURES ET GROUPES EXTÉRIEURES ET ATTENDEZ PLUS D'1 MINUTE AVANT D'EFFECTUER DES TRAVAUX DE CÂBLAGE ÉLECTRIQUE OU D'INSPECTION ET ENTRETIEN PÉRIODIQUE. SE RÉFERER AU MANUEL D'INSTRUCTIONS AVANT L'INSTALLATION.

AVVISO SPEGNERE L'INTERRUTTORE PRINCIPALE DELLE UNITÀ INTERNE ED ESTERNE E ATTENDERE PIÙ DI 1 MINUTO PRIMA DI ESEGUIRE LAVORI DI CABLAGGIO ELETTRICO O ISPEZIONE E MANUTENZIONE PERIODICHE. REALIZZARE L'INSTALLAZIONE SEGUENDO LE ISTRUZIONI DEL MANUALE.

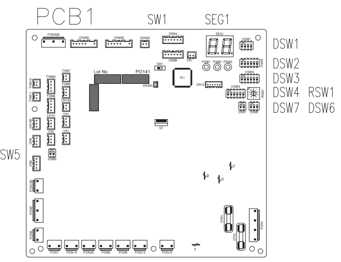
ELECTRICAL WIRING DIAGRAM (FOR MODELS: RASM-4TW2E, RASM-5TW2E, RASM-6TW2E)

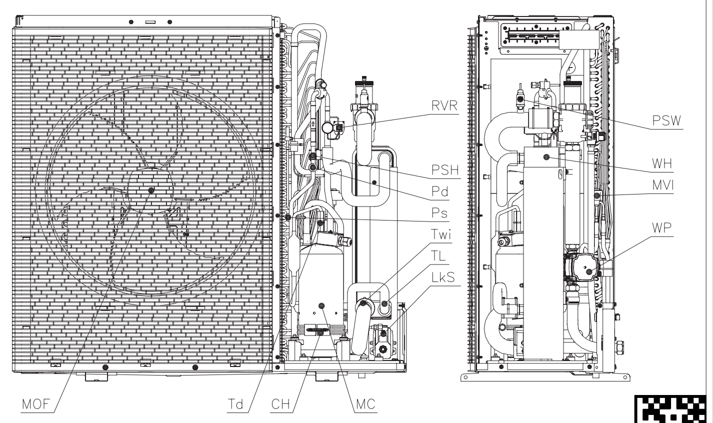


Mark	Part Name
$APCN_1$	Power Supply Connector
$APCN_2$	Communication Connector
$CE_{1\sim8}$	Terminating Connector
CH	Crank-case Heater
CN 15~23,25~26,28~30, 32~38,40~41,50~53, 60~62	Aerial Connector
DCL	Reactor
DH	Drain Heater
DSW	Dip Switch Setting for Refrigerant Cycle Module
E	Earth Wiring
ELB	Earth Leakage Breaker (※)
LkS	Refrigerant Leak Sensor
MC	Electric Motor (for the Compressor)
MOF	Electric Motor (for the Outdoor fan)
MVI	Electronic Control Expansion Valve
NF1	Noise Filter (Printed Board)
$NF_{2\sim5}$	Noise Filter (Ring Core)

Mark	Part Name
$PCB_{1\sim4}$	Printed Circuit Board
Pd	Pressure Sensor (Discharge Side)
Ps	Pressure Sensor (Suction Side)
PSH	High Pressure Breaker Device
PSW	Pressure Sensor (Water Side)
RVR	Solenoid 4-Way Valve
SVA	Solenoid Valve
SW_1	Dip Switch Setting of Refrigerant Cycle Module
TCO	Thermal Cut-Out
Ta	Ambient Thermistor
Te	Evaporation Thermistor
Td	Discharge Thermistor
TL	Liquid Thermistor
Twi	Water Input Thermistor
Two	Water Output Thermistor
WP_1	Water Pump

Electrical Control Box





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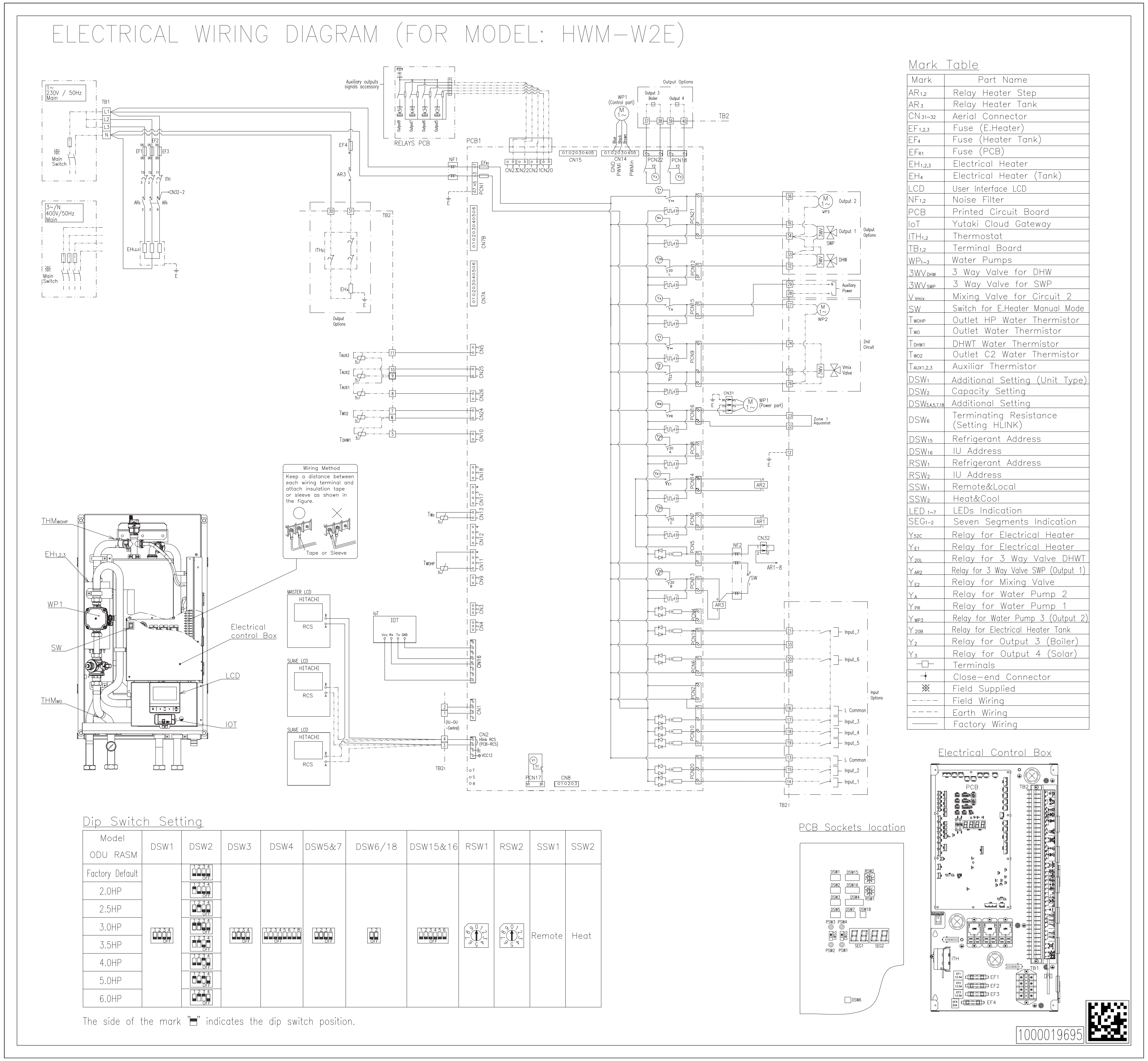
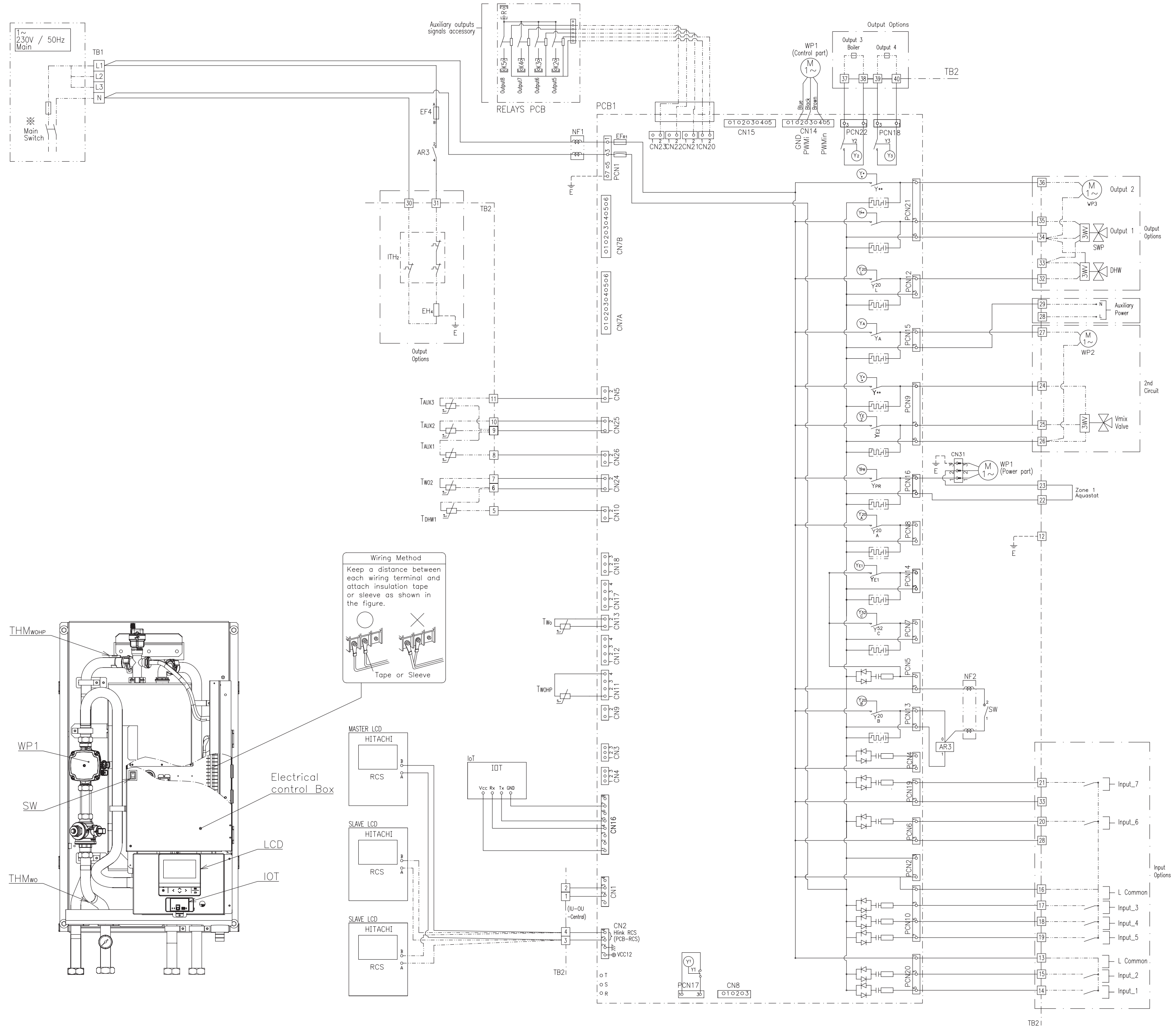
8.4.2 Indoor units - Hydrosplit system

◆ **airH2O 800H - HWM-W2E**



◆ airH2O 800H - HWM-W2E-B

ELECTRICAL WIRING DIAGRAM (FOR MODEL: HWM-W2E-B)



Mark Table

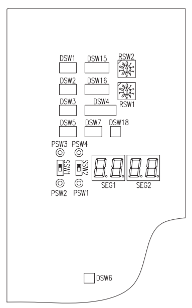
Mark	Part Name
AR_3	Relay Heater Tank
$CN_{31\sim32}$	Aerial Connector
EF_4	Fuse (Heater Tank)
EF_{R1}	Fuse (PCB)
EH_4	Electrical Heater (Tank)
ITH_2	Thermostat
LCD	User Interface LCD
$NF_{1,2}$	Noise Filter
PCB	Printed Circuit Board
IoT	Yutaki Cloud Gateway
$TB_{1,2}$	Terminal Board
$WP_{1\sim3}$	Water Pumps
$3WV_{DHW}$	3 Way Valve for DHW
$3WV_{SWP}$	3 Way Valve for SWP
V_{Vmix}	Mixing Valve for Circuit 2
SW	Switch for E.Heater Manual Mode
T_{WOHP}	Outlet HP Water Thermistor
T_{WO}	Outlet Water Thermistor
T_{DHW1}	DHWT Water Thermistor
T_{WO2}	Outlet C2 Water Thermistor
$T_{AUX1,2,3}$	Auxiliar Thermistor
DSW_1	Additional Setting (Unit Type)
DSW_2	Capacity Setting
$DSW_{3,4,5,7,18}$	Additional Setting
DSW_6	Terminating Resistance (Setting HLINK)
DSW_{15}	Refrigerant Address
DSW_{16}	IU Address
RSW_1	Refrigerant Address
RSW_2	IU Address
SSW_1	Remote&Local
SSW_2	Heat&Cool
$LED_{1\sim7}$	LEDs Indication
$SEG_{1\sim2}$	Seven Segments Indication
Y_{52C}	Relay for Electrical Heater
Y_{E1}	Relay for Electrical Heater
Y_{20L}	Relay for 3 Way Valve DHWT
Y_{AR2}	Relay for 3 Way Valve SWP (Output 1)
Y_{E2}	Relay for Mixing Valve
Y_A	Relay for Water Pump 2
Y_{PR}	Relay for Water Pump 1
Y_{WP3}	Relay for Water Pump 3 (Output 2)
Y_{20B}	Relay for Electrical Heater Tank
Y_2	Relay for Output 3 (Boiler)
Y_3	Relay for Output 4 (Solar)
	Terminals
	Close-end Connector
	Field Supplied
	Field Wiring
	Earth Wiring
	Factory Wiring

Dip Switch Setting

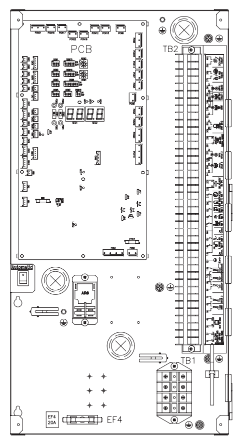
Model ODU RASM	DSW1	DSW2	DSW3	DSW4	DSW5&7	DSW6/18	DSW15&16	RSW1	RSW2	SSW1	SSW2
Factory Default										Remote	Heat
2.0HP											
2.5HP											
3.0HP											
3.5HP											
4.0HP											
5.0HP											
6.0HP											

The side of the mark "▀" indicates the dip switch position.

PCB Sockets location



Electrical Control Box



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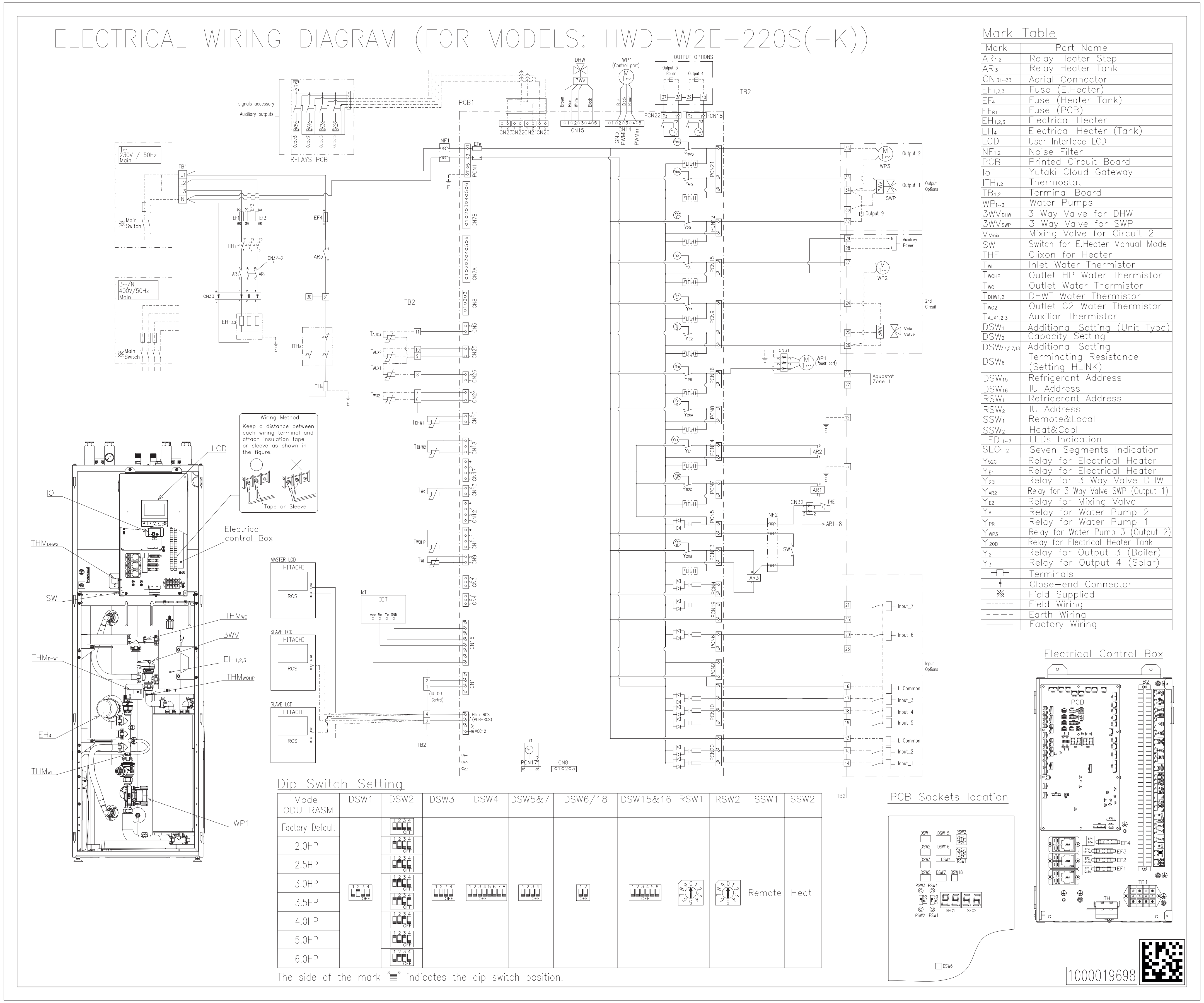
◆ airH2O 800H Combi - HWD-W2E-220S(-K)



Mark Table

Mark	Part Name
$AR_{1,2}$	Relay Heater Step
AR_3	Relay Heater Tank
$CN_{31\sim33}$	Aerial Connector
$EF_{1,2,3}$	Fuse (E.Heater)
EF_4	Fuse (Heater Tank)
EF_{R1}	Fuse (PCB)
$EH_{1,2,3}$	Electrical Heater
EH_4	Electrical Heater (Tank)
LCD	User Interface LCD
$NF_{1,2}$	Noise Filter
PCB	Printed Circuit Board
IoT	Yutaki Cloud Gateway
$ITH_{1,2}$	Thermostat
$TB_{1,2}$	Terminal Board
$WP_{1\sim3}$	Water Pumps
$3WV_{DHW}$	3 Way Valve for DHW
$3WV_{SWP}$	3 Way Valve for SWP
V_{Vmix}	Mixing Valve for Circuit 2
SW	Switch for E.Heater Manual Mode
THE	Clixon for Heater
T_{WI}	Inlet Water Thermistor
T_{WOHP}	Outlet HP Water Thermistor
T_{WO}	Outlet Water Thermistor
$T_{DHW1,2}$	DHWT Water Thermistor
T_{WO2}	Outlet C2 Water Thermistor
$T_{AUX1,2,3}$	Auxiliar Thermistor
DSW_1	Additional Setting (Unit Type)
DSW_2	Capacity Setting
$DSW_{3,4,5,7,18}$	Additional Setting
DSW_6	Terminating Resistance (Setting HLINK)
DSW_{15}	Refrigerant Address
DSW_{16}	IU Address
RSW_1	Refrigerant Address
RSW_2	IU Address
SSW_1	Remote&Local
SSW_2	Heat&Cool
$LED_{1\sim7}$	LEDs Indication
SEG_{1-2}	Seven Segments Indication
Y_{52C}	Relay for Electrical Heater
Y_{E1}	Relay for Electrical Heater
Y_{20L}	Relay for 3 Way Valve DHWT
Y_{AR2}	Relay for 3 Way Valve SWP (Output 1)
Y_{E2}	Relay for Mixing Valve
Y_A	Relay for Water Pump 2
Y_{PR}	Relay for Water Pump 1
Y_{WP3}	Relay for Water Pump 3 (Output 2)
Y_{20B}	Relay for Electrical Heater Tank
Y_2	Relay for Output 3 (Boiler)
Y_3	Relay for Output 4 (Solar)
─□─	Terminals
─•─	Close-end Connector
※	Field Supplied
—··—··—	Field Wiring
– – – –	Earth Wiring
————	Factory Wiring

8.4.3 Indoor units - Control Box system

◆ Control Box - ATW-CBX-01

Mark Table

Mark	Part Name
AR	Relay Heater Step
EF_1	Fuse (Heater Tank)
EF_{R1}	Fuse (PCB)
EH	Electrical Heater (Tank)
LCD	User Interface LCD
NF	Noise Filter
$PCB_{1,3}$	Printed Circuit Board
IOT	Cloud Gateway
ITH	Thermostat
$TB_{1,2}$	Terminal Board
$WP_{2,3}$	Water Pumps
$3WV_{DHW}$	3 Way Valve for DHW
$3WV_{SWP}$	3 Way Valve for SWP
$3WV_{Vmix}$	Mixing Valve for Circuit 2
SW	Emergency Switch (DHW) E.Heater
THM_{DHW}	DHWT Water Thermistor
THM_{WO2}	Outlet C2 Water Thermistor
$THM_{AUX1,2,3}$	Auxiliar Thermistor
DSW_1	Additional Setting (Unit Type)
DSW_2	Capacity Setting
$DSW_{3,4,5,7,18}$	Additional Setting
DSW_6	Terminating Resistance (Setting HLINK)

Mark	Part Name
DSW_{15}	Refrigerant Address
DSW_{16}	IU Address
RSW_1	Refrigerant Address
RSW_2	IU Address
SSW_1	Remote&Local
SSW_2	Heat&Cool
$LED_{1\sim7}$	LEDs Indication
SEG_{1-2}	Seven Segments Indication
Y_{20L}	Relay for 3 Way Valve DHWT
Y_{WP3}	Relay for 3 Way Valve SWP (Output 1)
Y_{MIX}	Relay for Mixing Valve
Y_{E2}	Relay for Mixing Valve
Y_A	Relay for Water Pump 2
Y_{AR2}	Relay for Water Pump 3 (Output 2)
Y_{20B}	Relay for Electrical Heater Tank
Y_2	Relay for Output 3 (Boiler)
Y_3	Relay for Output 4 (Solar)
-□-	Terminals
-•-	Close-end connector
※	Field Supplied
-·-·-·	Field Wiring
------	Earth Wiring
——	Factory Wiring

ATW-CBX-01
Position of Dip Switch

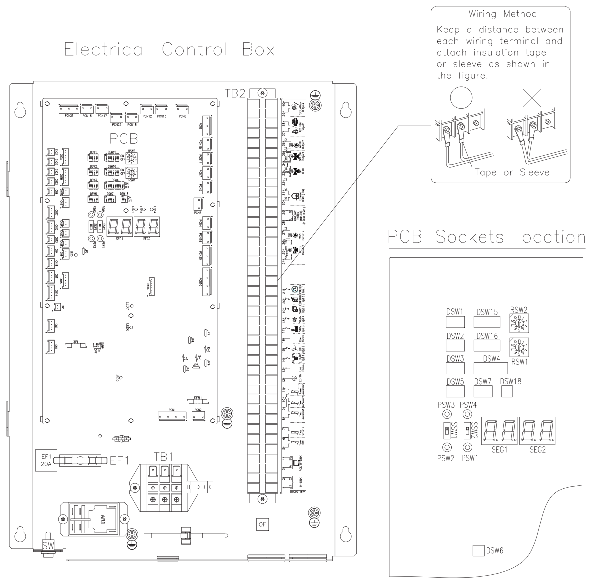
DSW CONFIGURATION	PCB3										
	DSW1	DSW2	DSW3	DSW4	DSW5&7	DSW6&18	DSW15&16	RSW1	RSW2	SSW1	SSW2
Factory Setting											
RASM-2VTW2E											
RASM-3VTW2E											
RASM-3.5VTW2E										Remote	Heat
RASM-4(V)TW2E											
RASM-5(V)TW2E											
RASM-6(V)TW2E											

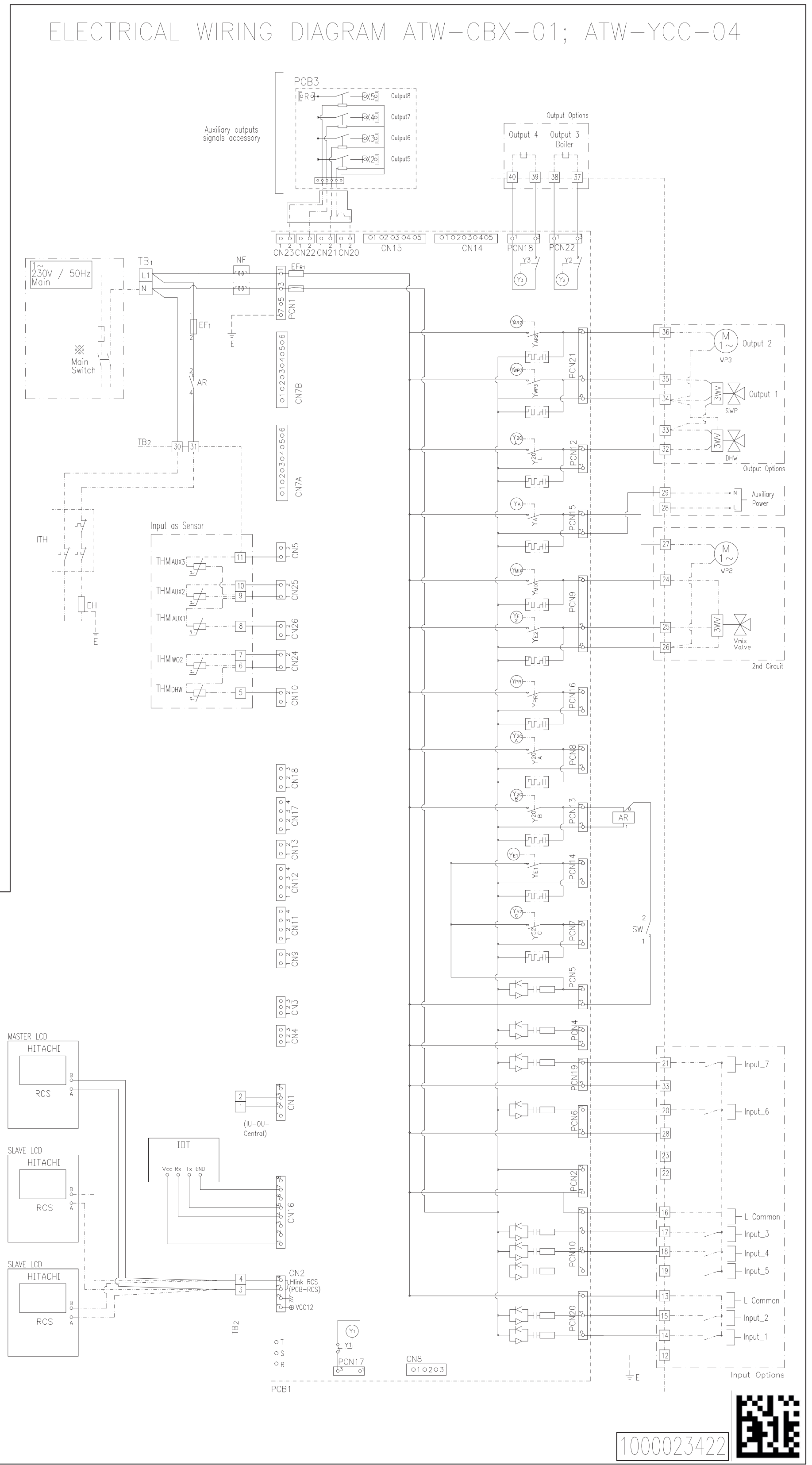
The side of the mark "▀" indicates the dip switch position.

ATW-YCC-04
Position of Dip Switch

DSW CONFIGURATION	PCB3											
	DSW1	DSW2	DSW3	DSW4	DSW5	DSW7	DSW6&18	DSW15&16	RSW1	RSW2	SSW1	SSW2
Factory Setting												
3.5HP	S / H											
4.0HP												
5.0HP	SC / HC										Remote	Heat
6.0HP												
8.0HP	M / CBX											
10.0HP												

The side of the mark "▀" indicates the dip switch position.



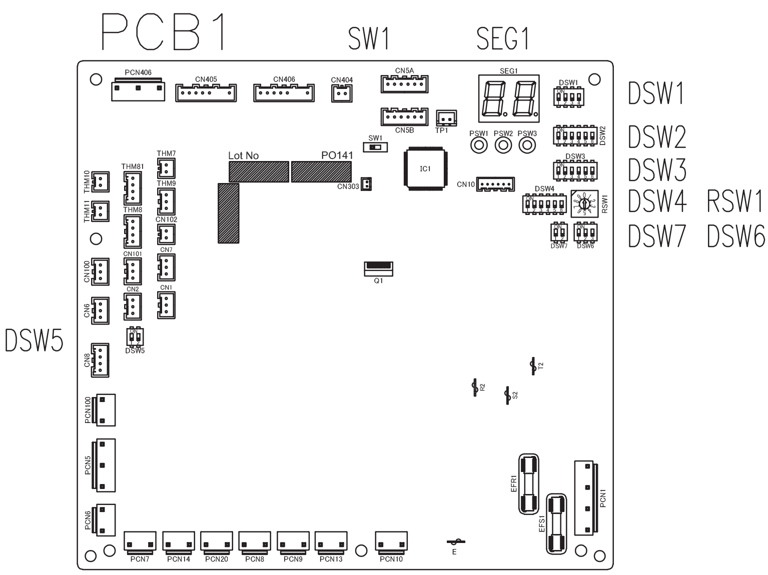


8.5 Setting of DIP switches and rotary switches

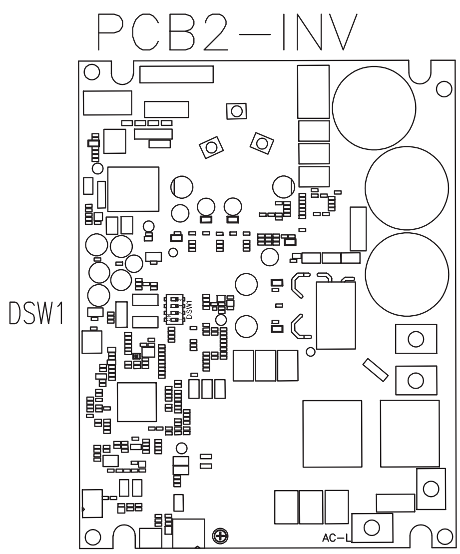
8.5.1 Location of DIP switches and rotary switches

The PCBs in the outdoor and indoor units are operating with DIP switches and rotary switches. The locations are as follows:

◆ Outdoor units - airH2O 800M



PCB1 - Refrigerant cycle

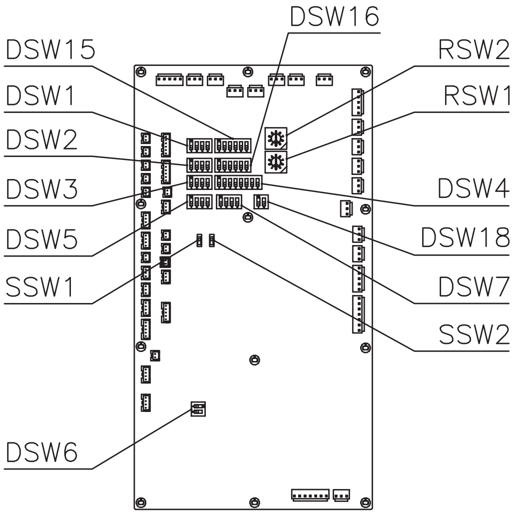


PCB2 - Inverter (*)

NOTE

- *PCBs are enclosed inside a sealed electrical box, which should only be opened in the following cases:*
  - » *PCBs replacement (as setting of the PCB1 DSW3 becomes mandatory).*
  - » *Connection to a Cascade Controller (as address and end resistance settings become mandatory).*
- *Other procedures such as performing the test run or modifying the optional functions shall now be done by means of the indoor unit controller.*
- *(*) Image corresponding to the single-phase units PCB2 (DRV-075), whose DSW1 may be configured (which is not the case of the 3-phase units).*

◆ **Indoor units - airH2O 800H, airH2O 800H Combi and Control Box**



PCB - Water cycle

8.5.2 Function of DIP switches and rotary switches

NOTE

- *The mark "■" indicates the position of DIP switches.*
- *No mark "■" indicates pin position is not affecting.*
- *The figures show the settings before shipment or after selection.*
- *"Not used" means that the pin must not be changed. A malfunction might occur if changed.*

DANGER

Before setting DIP switches, first turn the power source off and then set the position of the DIP switches. In case of setting the switches without turning the power source off, the contents of the setting are invalid.

8.5.2.1 Outdoor unit PCB1 - Refrigerant cycle

◆ DSW1

Test run mode

Function	DSW1 setting
Factory setting	

NOTE

- *This operation is reset once the compressor is in Thermo-ON mode.*
- *During the test run operation the units will operate continuously during 2 hours without Thermo-OFF and the 3 minutes guard for compressor protection will be effective.*
- *Test run will start within 20 seconds after setting DSW1 pin 1 to ON position.*

◆ DSW2

Optional function setting

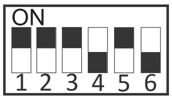
Function	DSW2 setting
Factory setting	

◆ DSW3

Outdoor unit setting

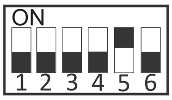
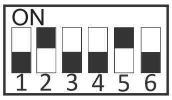
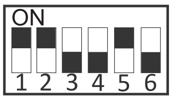
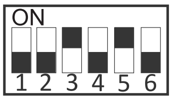
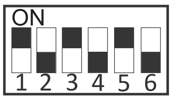
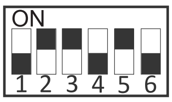
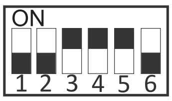
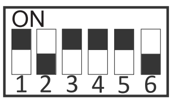
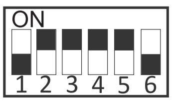
NOTE

All outdoor units come with the same DSW3 factory setting, being then characterised remotely at the moment of its manufacturing.

Outdoor unit	DSW3 setting
Factory setting	

NOTE

In case of replacing the PCB1 with a new spare unit, the following settings must be taken into account to properly characterise the outdoor unit in which it is to be installed.

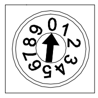
Outdoor unit	DSW3 setting
RASM-2VTW2E	
RASM-3VTW2E	
RASM-3.5VTW2E	
RASM-4VTW2E	
RASM-5VTW2E	
RASM-6VTW2E	
RASM-4TW2E	
RASM-5TW2E	
RASM-6TW2E	

◆ DSW4 / RSW1

Refrigerant cycle selection

NOTE

This setting is necessary when combining more than one unit in the same H-LINK in a system with ATW-YCC-04.

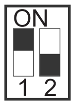
Function	DSW4 setting	RSW1 setting
Tens place / ones place		

◆ DSW5

Terminal resistance

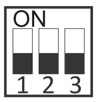
NOTE

This setting is necessary when combining more than one unit in the same H-LINK in a system with ATW-YCC-04.

Function	DSW5 setting
Factory setting	

◆ DSW6

Function selection

Function	DSW6 setting
Factory setting	

◆ DSW7

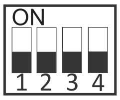
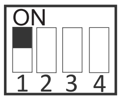
Function selection

Function	DSW7 setting
Factory setting	

8.5.2.2 Outdoor unit PCB2 - Inverter (DRV075, only single-phase units)

◆ DSW1

Current detection cancellation

Function	DSW1 setting
Factory setting	
Current detection cancellation	

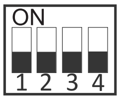
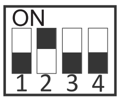
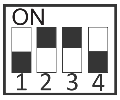
NOTE

This setting is necessary for maintenance tasks where the system has to be operated but with the compressor disconnected, since it cancels the current detection control for approximately 3 minutes.

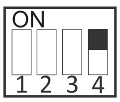
8.5.2.3 Indoor unit PCB - Water cycle

◆ DSW1

Indoor unit type setting

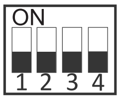
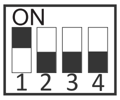
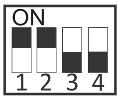
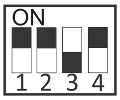
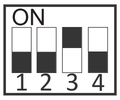
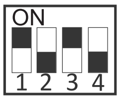
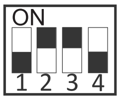
Indoor unit	DSW1 setting
airH2O 800H - HWM-W2E(-B)	
airH2O 800H Combi - HWD-W2E-220S(-K)	
Control Box - ATW-CBX-01	

Enable cooling operation

Function	DSW1 setting
Cooling operation setting (in case of installing the cooling kit accessory)	

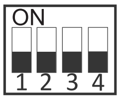
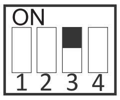
◆ DSW2 (setting required)

Unit capacity setting

Function	Outdoor units		DSW2 setting
	Capacity (HP)	Models	
Factory setting	-	-	
Setting required for combination with	2.0	RASM-2VTW2E	
	3.0	RASM-3VTW2E	
	3.5	RASM-3.5VTW2E	
	4.0	RASM-4(V)TW2E	
	5.0	RASM-5(V)TW2E	
	6.0	RASM-6(V)TW2E	

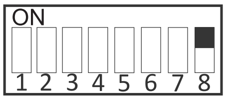
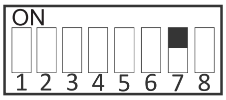
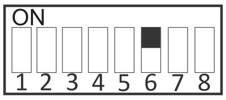
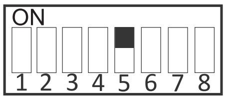
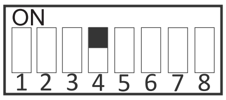
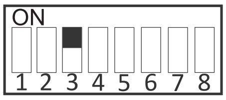
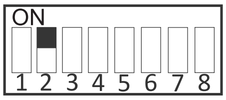
◆ DSW3

Additional setting 1

Function	DSW3 setting
Factory setting	
1 step heater for 3 phase unit option	

◆ DSW4

Additional setting 2

Function	DSW4 setting
Factory setting (except for HWM-W2E-B)	
DHW defrost	
Heater forced OFF (HWM-W2E-B factory setting)	
Unit and installation pipes antifreeze protection	
Standard / ECO water pump operation	
Electric heater or boiler emergency mode	
DHW tank's heater operation	
DHW 3 way valve forced ON	

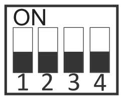
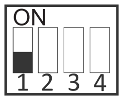
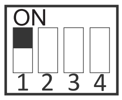
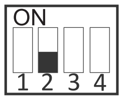
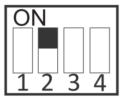
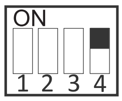
⚠ CAUTION

- *Never turn all DSW4 DIP switch pins ON. If this happens, the software of the unit will be removed.*
- *Never activate "Heater Forced OFF" and "Electric heater or boiler emergency mode" at the same time.*

DSW5

Additional setting 3

In the cases where the outdoor unit is installed into a location where its own outdoor ambient temperature sensor cannot give a suitable temperature measurement to the system, it is available the 2nd outdoor ambient temperature sensor as accessory. By means of DSW5 setting, the preferable sensor for each circuit (C1 or C2) can be selected.

Function	DSW5 setting
Factory setting	
C1 : Outdoor unit sensor	
C1 : Auxiliary sensor	
C2 : Outdoor unit sensor	
C2 : Auxiliary sensor	
Use max (Two/Two3) for water control	

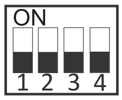
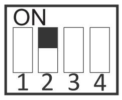
DSW6 (only if available)

Not used

Function	DSW6 setting
Factory setting (do not change)	

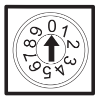
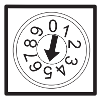
◆ DSW7

Additional setting 4

Function	DSW7 setting
Factory setting	
Compatibility with ATW-RTU-04 (when cooling mode operation is needed)	

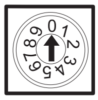
◆ DSW15 / RSW2

Refrigerant cycle address

Function	DSW15 setting	RSW2 setting
Factory setting		
Refrigerant cycle address setting (required only when Cascade Controller is installed)	Example of system setting with a value of: 5	
		

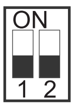
◆ DSW16 / RSW1

Not used

Function	DSW16 setting	RSW1 setting
Factory setting (do not change)		

◆ DSW18

Not used

Function	DSW18 setting
Factory setting (do not change)	

◆ SSW1

Remote/Local

Function	SSW1 setting
Factory setting	REMOTE LOCAL

◆ SSW2

Heat/Cool

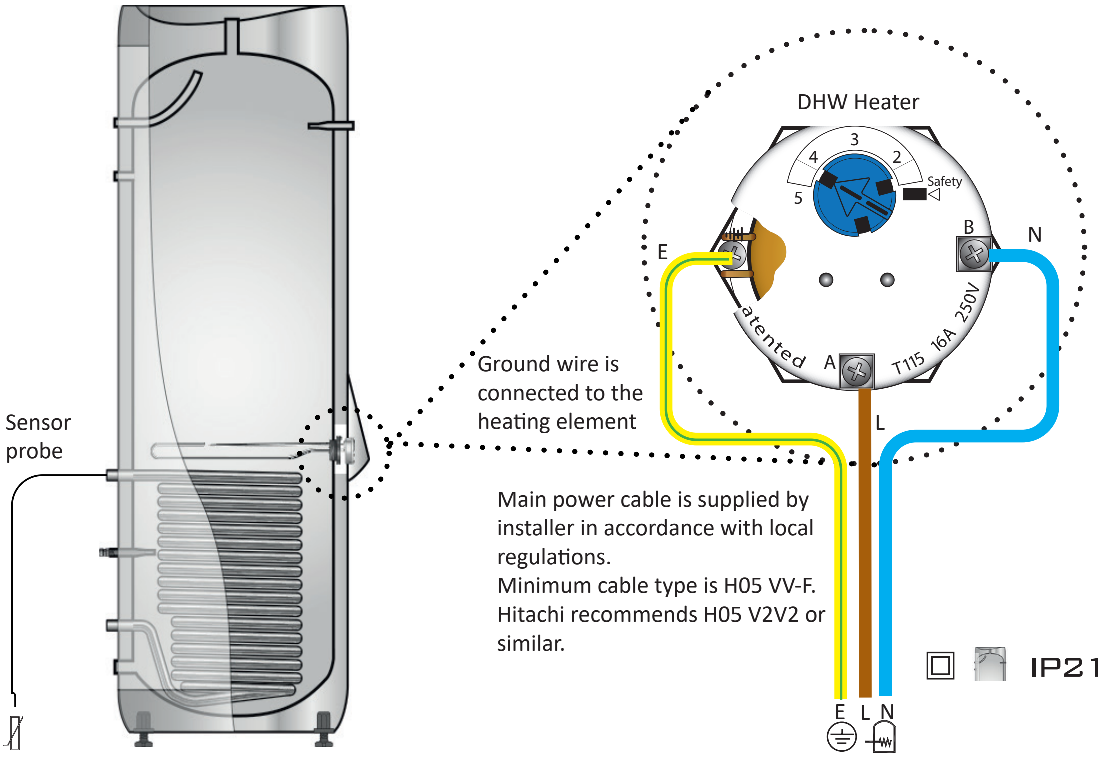
Function	SSW2 setting
Factory setting	HEAT COOL

8.6 Domestic hot water tank accessory

8.6.1 Electrical wiring connection

The electrical wiring connection between DHWT and **airH2O 800** system is as follows:

Customer connection:



T DHWT
airH2O 800 TERMINAL BOARD 2 (5,6)

airH2O 800 TERMINAL BOARD 2 (30,31)

8.6.2 Wire size

- Recommended minimum size for field provided wires:

Model	Power supply	Maximum current (A)	Power supply cable size	Sensor cable size
			EN60335-1	EN60335-1
DHWT	~ 230 V 50 Hz	15	2.5 mm²	0.75 mm²

- Type of switches:

Select the main switches in accordance with the following table:

Model	Power supply	Maximum current (A)	CB (A)	ELB (n° of poles/A/mA)
DHWT	~ 230 V 50 Hz	15	20	2/40/30

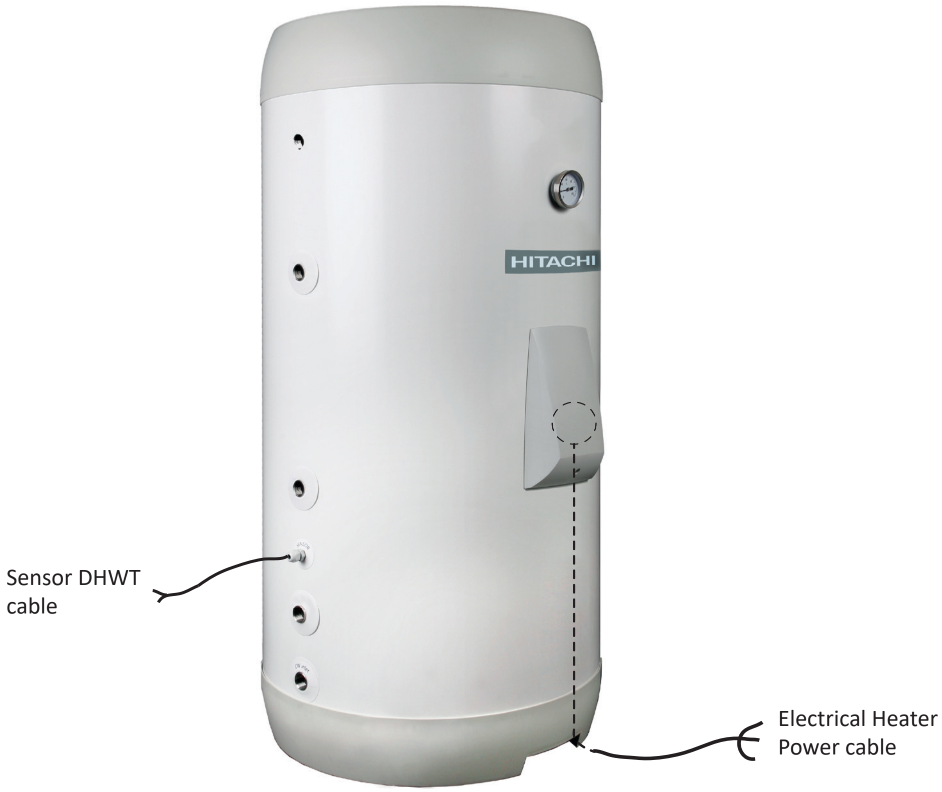
CB: Circuit Breaker

ELB: Earth Leakage Breaker

Follow local codes and regulations when selecting field wires, Circuit Breakers and Earth Leakage Breakers.

Use wires which are not lighter than the ordinary polychloroprene sheated flexible cord (code designation H05RN-F).

◆ Internal wiring



8.6.3 Electric heater

The electric heater is made of Incoloy alloy 825 and complies with the European Low Voltage Directive 2006/95/EC.

It comprises a flange that holds three U-Shaped heating elements for 3.0 kW power resistances.

8.6.4 General check

1 Ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated. Make sure that they comply with national and regional electrical codes.
2 Electrical connection must be done by professional installer.
3 Check to ensure that the power supply voltage is within +/-10% of the rated voltage.
4 Make sure that power supply has an impedance low enough to ensure that it does not reduce the starting voltage more than 85% of the rated voltage.
5 Check that the earth wire is securely connected, tagged and locked in accordance with national and local codes.
6 Connect a fuse of specified capacity.
7 Check periodically the electrical connection tightening.

⚠ **CAUTION**

- *Check to ensure that screws for terminal block are tightly tightened.*
- *Protect the wires, drain pipe, electrical parts, from rats or other small animals. If not protected, rats may damage unprotected parts, and at the worst, a fire will occur.*
- *Wrap the accessory packing around the wires to protect the product from any condensed water and insects.*
- *Tightly secure the wires with the cord clamp inside the unit.*
- *Lead the wires avoiding any contact with water piping.*
- *Wrap the accessory packing around the wires from system controller.*

⚠ **DANGER**

- ***Do not connect or adjust any wiring or connections unless the main power switch is OFF.***
- ***When there are more than one power switch for ON/OFF, check and test to ensure that all are turned OFF.***

Hitachi certifies that our products have met EU consumer safety, health and environmental requirements.

AENOR GESTIÓN DE LA CALIDAD ISO 9001 ER-0198/1996

AENOR GESTIÓN AMBIENTAL ISO 14001 GA-1999/0044

Johnson Controls-Hitachi Air Conditioning Spain, S.A.U. is certified with:
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ISO 14001 of AENOR Spain for its Environmental Management systems accordance with the standard.

Hitachi meets the requirements of the KEYMARK Certification Scheme.
See Heat Pump KEYMARK database for detailed information.

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