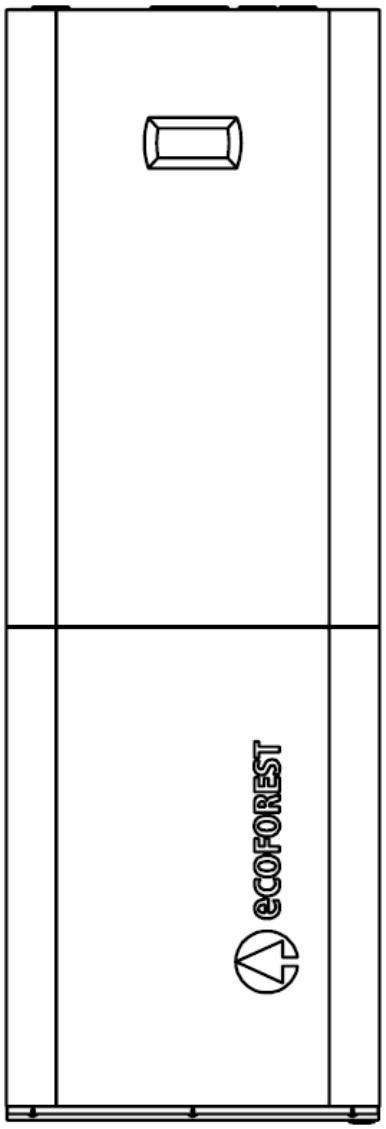


ecoGEO C

Installation and user manual

Table of contents

1 General Information

Thank you for purchasing an ECOFOREST ecoGEO C heat pump.

In this manual you will find information on installing, commissioning, maintaining and troubleshooting the equipment. You can also find useful user information, such as navigation and parameter settings using the front panel.

To get the most benefit from your ecoGEO C heat pump, it is highly recommended you read this manual carefully before installing and commissioning the equipment. Keep this manual handy for future reference.

This manual contains two different types of warnings –shown below– and it is important to pay particular attention to them.

DANGER!

- This warns of an imminent or potential danger, which, if not avoided, can result in injury or death. It can also serve to warn against unsafe practices.

NOTE

- This indicates a situation that may damage the equipment or cause it to malfunction. It can also serve to indicate whether or not a practice is recommended for the equipment.

ecoGEO C heat pumps are designed for servicing heating/cooling systems and producing hot water. Any other use of the equipment could result in personal and/or material injury or malfunction of the equipment. The manufacturer is not liable for damage to property and/or personal injury from improper use of the equipment.

The heat pump must be installed by a qualified installer in accordance with the local laws and regulations and in accordance with the installation instructions described in this manual.

2 Safety issues

The instructions in this section cover important safety aspects, so be sure to abide by them.

DANGER!

- All installation and maintenance work described in this manual should be performed by an authorized technician. Otherwise personal and/or material injury could occur.
- Improper installation or use of the equipment may cause electric shock, short circuit, leakage of the working fluids, fire, or other damage to people and/or property. If you are unsure of installation, maintenance or use of the equipment, contact your local dealer or a service representative for advice.
- If you are unsure about the operation of the unit or detect a malfunction, please contact your local dealer or a service representative to resolve your concerns.
- This equipment should not be handled by persons with physical, sensory or psychological disabilities, children and people with no experience or knowledge to do so, unless under the supervision or direction of a person responsible for their safety. Otherwise personal and/or material injury could occur.
- When performing installation operations, maintenance or commissioning of the heat pump, always use appropriate personal protective equipment (goggles, gloves, etc..).
- Keep the plastic bags included in the packaging out of reach of children. Injury from asphyxia may occur.

2.1 Refrigerant circuit

DANGER!

- In case of accidental refrigerant leak, never directly touch the area where the leak occurs. Serious injury could occur by freezing.
- The maximum working pressure of the refrigerant circuit is 4.2 MPa (42 bar).
- Do not touch the pipes, compressor or other components of the refrigerant circuit during or immediately after operation of the heat pump, as they may be very hot or very cold. If you touch them you might suffer burns from heat or cold. If you must touch these components, allow sufficient time for the temperature to stabilize and wear protective gloves to avoid injury.

The refrigeration system uses R410A as the working fluid. This refrigerant is not harmful to the environment since it contains no chlorine, and therefore does not contribute to the destruction of the ozone layer. However, any action on the refrigerant circuit should be performed only by authorized personnel according to applicable local regulations and the instructions provided in this manual.

Toxicity

Under normal operating conditions, the heat pump refrigerant is not toxic. However, despite its low toxicity, injury can occur during abnormal operation.

- In its gaseous state, the refrigerant is heavier than air, so it tends to accumulate in low areas. If the equipment is installed in a place where refrigerant vapour may accumulate at ground level, it must be well ventilated.
- Directly exposing the refrigerant to a flame produces toxic gas. However, this gas is detectable by smell at concentrations well below the permitted limit. If you notice an unusual smell, evacuate and ventilate the area to ensure complete removal of the gas.
- In case of accidental refrigerant leakage, ventilate the room immediately.
- Everyone who has come into contact with refrigerant vapour must be evacuated immediately and breathe fresh air.

Inflammability

Normally, there is no risk of explosion or combustion of the refrigerant in the refrigerant circuit.

Repairs and scrapping

To service the refrigerant circuit, the refrigerant contained therein should not be discharged into the atmosphere, but should be recovered and destroyed in special treatment plants designed for that purpose.

Because R410A is a refrigerant mixture, in the event of a leak, it is necessary to add additional refrigerant liquid. Adding the refrigerant in its gaseous state alters its composition and can cause the heat pump to malfunction.

Before scrapping the heat pump, its refrigerant must be recovered for destruction in a treatment plant, according to current regulations.

2.2 Hydraulic circuits

DANGER!

■ Do not touch the pipes, or other components of the heating, brine or DHW circuits during or immediately after operation of the heat pump, as they may be very hot or very cold. If you touch them you might suffer burns from heat or cold. If you must touch these components, allow sufficient time for the temperature to stabilize and wear protective gloves to avoid injury.

However, any action on the heating/cooling, brine or DHW circuits should be performed only by authorized personnel according to applicable local regulations and the instructions provided in this manual.

2.3 Electrical Installation

DANGER!

- Before performing any operation on the electrical panel, disconnect the power supply.
- When the upper front cover of the heat pump is removed, the electric panel is exposed and the user might accidentally touch its components. During installation and maintenance of equipment never leave the electrical panel unattended while it is exposed.
- Do not touch any component in the electrical panel with damp hands, as this may cause electric shock.
- Do not touch any electrical component of the heat pump (including pumps, valves, DHW electrical support element, etc.) during or immediately after operation. This may cause burns or electric shock.
- Do not use water or other liquids to clean the heat pump, as this can cause an electric shock or fire.

Any action on the electrical installation should be performed only by authorized personnel according to applicable local regulations and the instructions provided in this manual.

3 Overview of the heat pump

3.1 Identifying the model

The ecoGEO C heat pump range includes a built-in, 170 litre hot water tank. This heat pump range is available in 6 different models depending on their scope and thermal power, as stated in **Table 3.1** .

Model	Heating and DHW	Free cooling	Active cooling	Heating output (kW)
ecoGEO C1 3-12	•			3-12
ecoGEO C1 5-22	•			5-22
ecoGEO C2 3-12	•	•		3-12
ecoGEO C2 5-22	•	•		5-22
ecoGEO C3 3-12	•		•	3-12
ecoGEO C3 5-22	•		•	5-22

Table 3.1. Models available in the ecoGEO C heat pump range.

ecoGEO C1 versions provide non-simultaneous heating and DHW by use of a 3-way valve. ecoGEO C2 versions, besides the above, provide free cooling, which allows moderate cooling of the dwelling with a minimum consumption by the heat pump (consumption only by the circulation pumps). ecoGEO C3 models provide simultaneous heating/active cooling and DHW through cycle inversion. Finally, each of these three versions can provide modular heating power in the 3-12 kW and 5-22 kW ranges through inverter compressors.

Accessories

The following accessories are included with the heat pump.

Component	Units
Manual	1
1'' flexible hose L = 1200 mm	4
1" Particle filter	2
Rubber Seal Kit	1
th-Tune indoor terminal	1
Outdoor temperature probe	1
Temperature probe for external tank	1

Table 3.2. Accessories included with the ecoGEO C heat pump.

3.2 Operating principles

ECOFOREST geothermal pumps are designed to be easy to install, and provide heating, cooling and DHW all year round, while ensuring maximum energy efficiency.

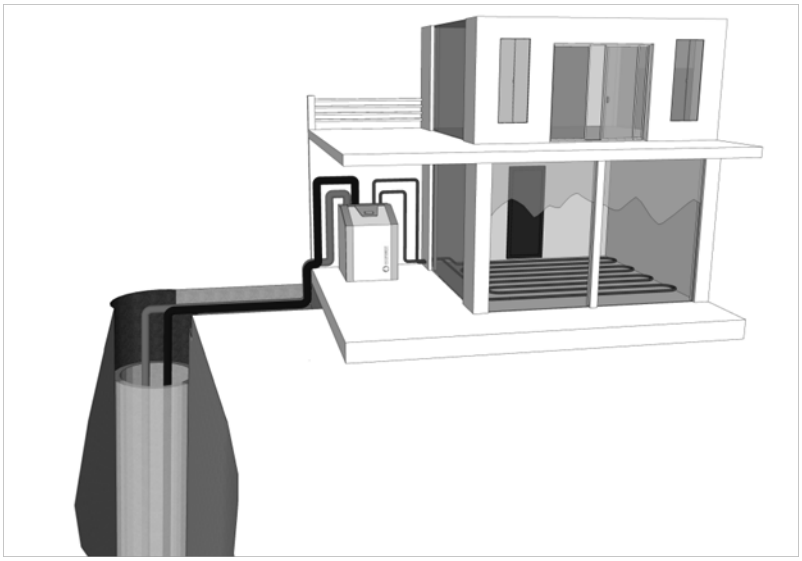


Figure 3.1. Geothermal heat pump

Installations using geothermal heat pumps are composed of three main circuits (refrigerant circuit, brine circuit and heating/cooling circuit) in which, through the use of various fluids (refrigerant, antifreeze/water mixture and water) thermal energy is exchanged between the ground and the building's heating/cooling system. These circuits use different fluids, and therefore the transfer of thermal energy from one fluid to another is accomplished by heat exchangers, where the higher temperature fluid transfers heat to the fluid at a lower temperature without mixing.

The following describes the operation modes provided by the various technologies incorporated into ECOFOREST geothermal heat pumps.

HEATING mode

During the normal operating cycle, heat pumps extract energy from the ground to produce hot water for the heating system. The operation can be divided into four sub-processes that are repeated cyclically.

1. The antifreeze mixture is circulated by a circulator pump through the brine system, which absorbs heat from the ground, and the evaporator, which transfers heat to the refrigerant in the refrigerant circuit. The liquid refrigerant in the evaporator is at low pressure and temperature, and is vaporised by the heat absorbed by the antifreeze mixture.
2. The refrigerant vapour from the evaporator is led to the inverter compressor (variable speed), which raises its pressure and temperature (hot gas) just enough to meet the demand of the heating system at any time.

3. The hot gas from the compressor is led to the condenser where it releases its heat to the water in the heating system. Following this transfer of heat, the refrigerant is cooled and condensed, becoming liquid.
4. The liquid refrigerant fluid is conducted back to the evaporator through the electronic expansion valve that accurately controls the flow rate of refrigerant according to the heating system needs. At the same time, as it passes through the electronic expansion valve, the pressure and temperature of the refrigerant is reduced so that it can again absorb heat from the antifreeze mixture in the evaporator.

ACTIVE COOLING mode (ecoGEO C3 models only)

Active cooling consists of inverting the operation cycle of the heat pump refrigerant circuit via a 4-way valve. This implies that the condenser in the normal cycle becomes the evaporator inverted cycle and vice versa. In this mode, the indoor system fluid (water) extracts heat from the house and releases it to the refrigerant in the evaporator, while the antifreeze mixture absorbs heat from the refrigerant in the condenser and gives it up to the ground. This mode of operation is called active cooling or inverted cycle refrigeration.

This technology allows homes (or premises) to be climate controlled throughout the year, even in areas where high temperatures are reached in the warmer months.

PASIVE COOLING mode (ecoGEO C2 models only)

The heat pump includes another heat exchanger that allows direct heat exchange between the coolant mixture in the brine circuit and the water in the cooling system, so that no refrigerant circuit is used. In this operating mode, the compressor is off and cooling and brine circuits are led to the free cooling exchanger using 3-way valves. Thus, the equipment drives cool water –obtained by heat exchange with antifreeze mixture from the brine system– to the indoor cooling system, all of which is powered by the circulating pumps.

This technology allows homes (or premises) to be climate controlled throughout the year in temperate zones where temperatures in the warm months are not excessively high. It should be stressed that, in FREE COOLING mode, power consumption is very low due to the high efficiency of the circulation pumps.

DHW mode

Domestic hot water (DHW) is produced using two different technologies, according to model.

In ecoGEO C1 and ecoGEO C2 models, DHW heating is produced by diverting the hot water from the condenser to the DHW hot water tank coil via a 3-way valve.

ecoGEO C3 models feature the patented CHW technology (Closed Hot Water Production System). This totally innovative technology consists of the introduction of an additional heat exchanger (desuperheater) solely for producing DHW. This exchanger is placed in series with the main condenser and provides hot water to the hot water tank coil via a closed circuit. Furthermore, since the reverse cycle is performed after the desuperheater, it allows simultaneous production of hot water and air conditioning (active heating or cooling).

LEGIONELLA PROTECTION mode

The heat pump has an electric heater installed in the hot water tank that is used only to prevent possible outbreaks of legionella. Once a week, the heat pump increases the temperature in the tank to 50°C. Subsequently the electric heater is activated to raise the temperature of the hot water tank from 50°C to 70°C.

At this temperature the bacteria cannot survive for over 20 minutes. It is recommended that these heating procedures be done at night, when it is more likely that the hot water tank is at a higher temperature and when no DHW is consumed, thereby reducing the power input needed.

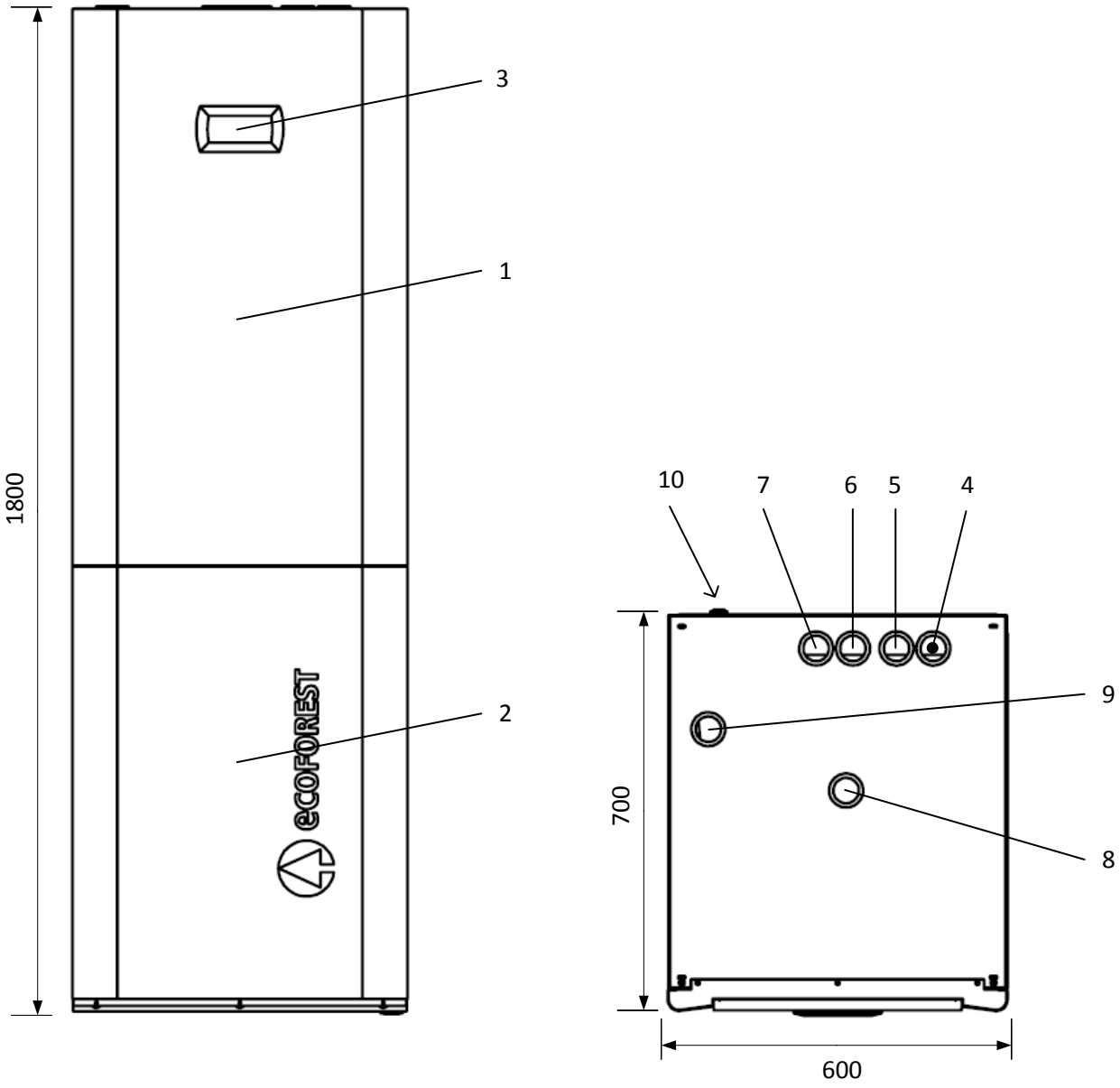
During normal operation, the electric heater cannot be activated for other purposes than legionella protection; that is, the electric heater is never used for DHW production, or to support the heating system.

FAULT mode

In the event of a possible failure of the heat pump that does not allow the compressor to start up, the electric heater may be activated to produce DHW. This guarantees DHW poduction if the heat pump fails.

3.3 Dimensions and Connections

The overall dimensions of the heat pumps ecoGeo C range are specified in **Figure 3.2** .

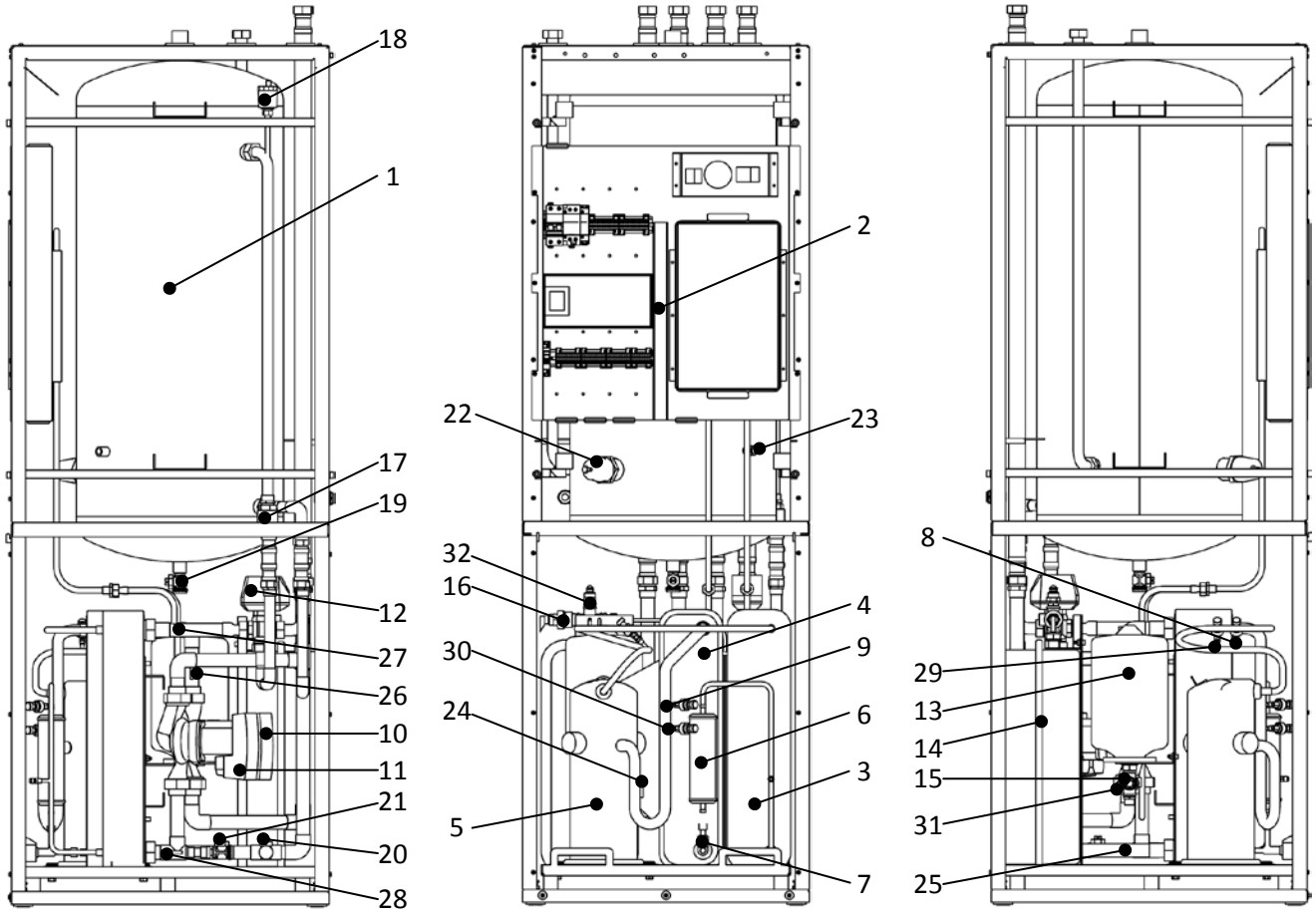


Number	Description	Number	Description
1	Upper module	6	Brine outlet (G1'' F)
2	Lower module	7	Brine inlet (G1'' F)
3	Front panel	8	DHW outlet (G1'' F)
4	Heating/cooling outlet (G1'' F)	9	Cold water inlet (G1'' F)
5	Heating/cooling inlet (G1'' F)	10	Power input

Figure 3.2. Dimensions and Connections

3.4 Main components

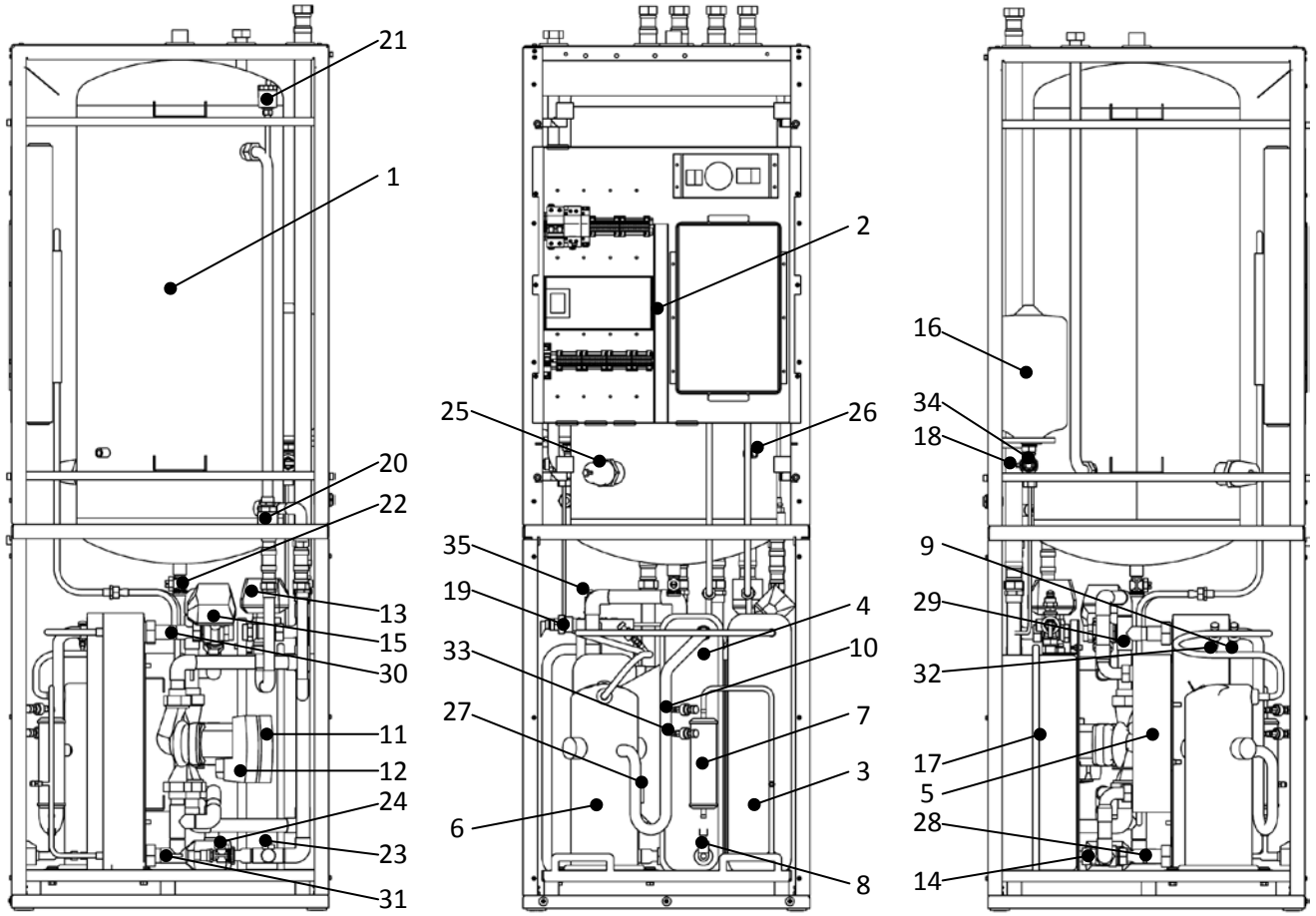
ecoGEO C1 Models



Number	Description	Number	Description
1	DHW tank (170 l)	17	DHW circuit check valve
2	Electrical cabinet	18	DHW circuit automatic air vent
3	Condenser	19	DHW tank drain valve
4	Evaporator	20	Brine circuit drain valve
5	Inverter compressor	21	Heating circuit drain valve
6	Liquid tank with filter	22	Electric heater (legionella protection)
7	Electronic expansion valve	23	DHW tank temp. probe
8	High pressure switch	24	Compressor suction temp. probe
9	Low pressure switch	25	Brine outlet temp. probe
10	Brine pump	26	Brine inlet temp. probe
11	Heating pump	27	Heating outlet temp. probe
12	3-way heating/DHW valve	28	Heating inlet temp. probe
13	Brine expansion vessel (5 l)	29	High pressure transducer
14	Heating expansion vessel (12 l)	30	Low pressure transducer
15	Brine safety valve (6 bar)	31	Brine pressure transducer
16	Heating safety valve (6 bar)	32	Heating pressure transducer

Figure 3.3. Location of components in ecoGEO C1 models.

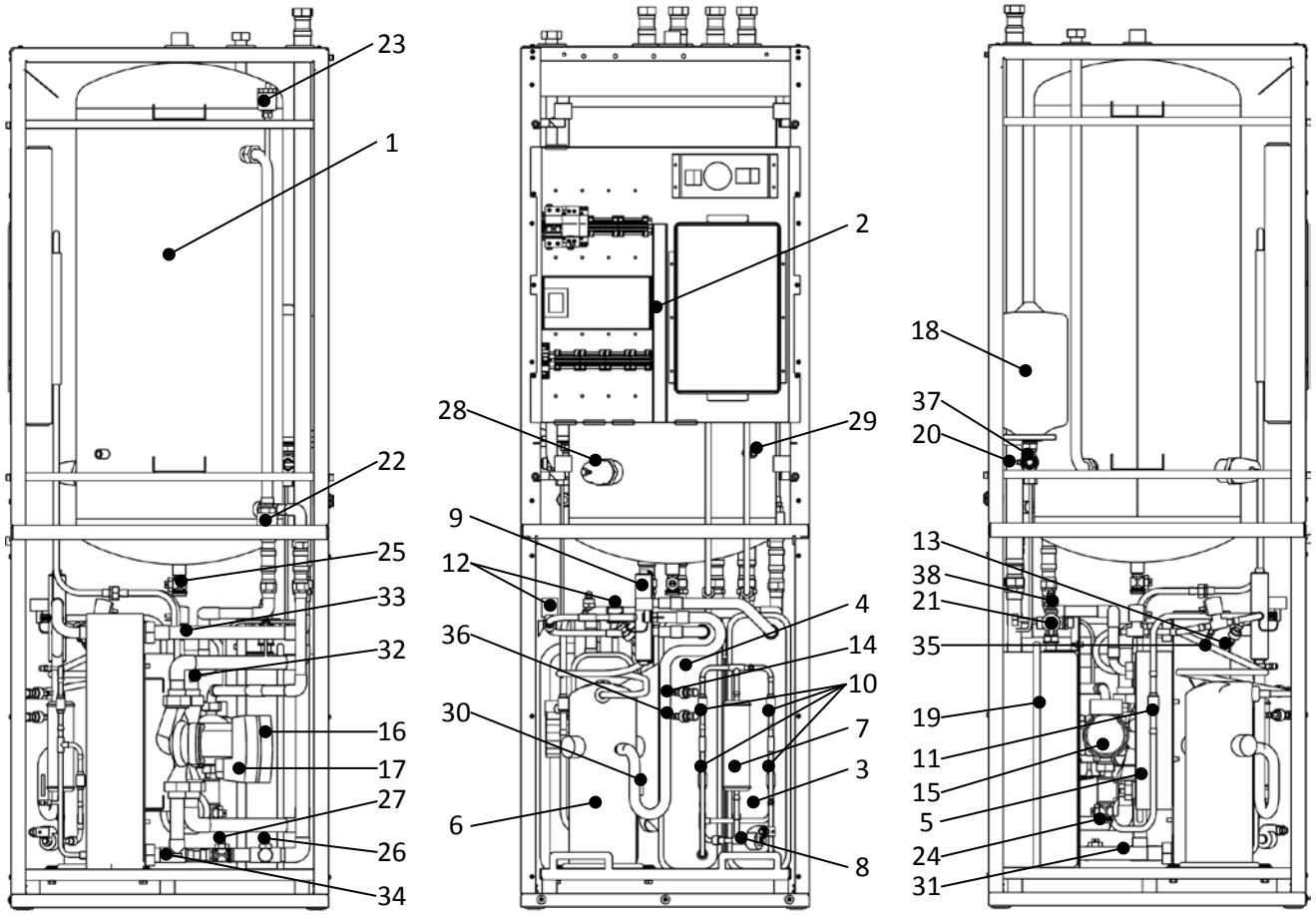
ecoGEO C2 Models



Number	Description	Number	Description
1	DHW tank (170 l)	19	Heating/cooling safety valve (6 bar)
2	Electrical cabinet	20	DHW circuit check valve
3	Condenser	21	DHW circuit automatic air vent
4	Evaporator	22	DHW tank drain valve
5	Free cooling heat exchanger	23	Brine circuit drain valve
6	Inverter compressor	24	Heating/cooling circuit drain valve
7	Liquid tank with filter	25	Electric heater (legionella protection)
8	Electronic expansion valve	26	DHW tank temp. probe
9	High pressure switch	27	Compressor suction temp. probe
10	Low-pressure switch	28	Brine outlet temp. probe
11	Brine pump	29	Brine inlet temp. probe
12	Heating/cooling pump	30	Heating/cooling outlet temp. probe
13	3-way heating/DHW valve	31	Heating/cooling inlet temp. probe
14	3-way free cooling valve (brine)	32	High pressure transducer
15	3-way free cooling valve (cooling)	33	Low pressure transducer
16	Brine expansion vessel (5 l)	34	Brine pressure transducer
17	Heating/cooling expansion vessel (12 l)	35	Heating/cooling pressure transducer
18	Brine safety valve (6 bar)		

Figure 3.4. Location of components in ecoGEO C2 models.

ecoGEO C3 Models



Number	Description	Number	Description
1	DHW tank (170 l)	20	Brine safety valve (6 bar)
2	Electrical cabinet	21	Heating/cooling safety valve (6 bar)
3	Condenser/Evap. (normal/reverse cycle)	22	DHW circuit check valve
4	Condenser/Evap. (normal/reverse cycle)	23	DHW circuit automatic air vent
5	DHW desuperheater	24	DHW circuit drain valve
6	Inverter compressor	25	DHW tank drain valve
7	Liquid tank with filter	26	Brine circuit drain valve
8	Electronic expansion valve	27	Heating/cooling circuit drain valve
9	Reversing cycle valve	28	Electric heater (legionella protection)
10	Liquid line check valve (x4)	29	DHW tank temp. probe
11	Discharge line check valve	30	Compressor suction temp. probe
12	Discharge line solenoid valve (x2)	31	Brine outlet temp. probe
13	High pressure switch	32	Brine inlet temp. probe
14	Low-pressure switch	33	Heating/cooling outlet temp. probe
15	DHW circulation pump	34	Heating/cooling inlet temp. probe
16	Brine pump	35	High pressure transducer
17	Heating/cooling pump	36	Low pressure transducer
18	Brine expansion vessel (5 l)	37	Brine pressure transducer
19	Heating/cooling expansion vessel (12 l)	38	Heating/cooling pressure transducer

Figure 3.5. Location of components in ecoGEO C3 models.

3.5 Access to the interior

NOTE

- When removing the upper front cover, be careful to remove the wire from the electrical cabinet to the front panel without damaging it. Damage may cause equipment malfunction.

Installation, commissioning and maintenance of the heat pump requires access to various points inside the heat pump. To do so, it may be necessary to remove one or more of the equipment's covers.

ecoGEO C heat pumps have front, side and rear removable covers divided into two. The covers located at the bottom allow you to access module components, while those on top allow access to the components on the top (see section 3.4). You can also get inside the equipment through the top cover.

Access to the upper front part

1. Remove the screws located on the top of the lid.
2. Pull the cover upwards to disengage the lower part of the cover from the structure.
3. Remove the cover by pulling forward and put it in a place where it can not be damaged.

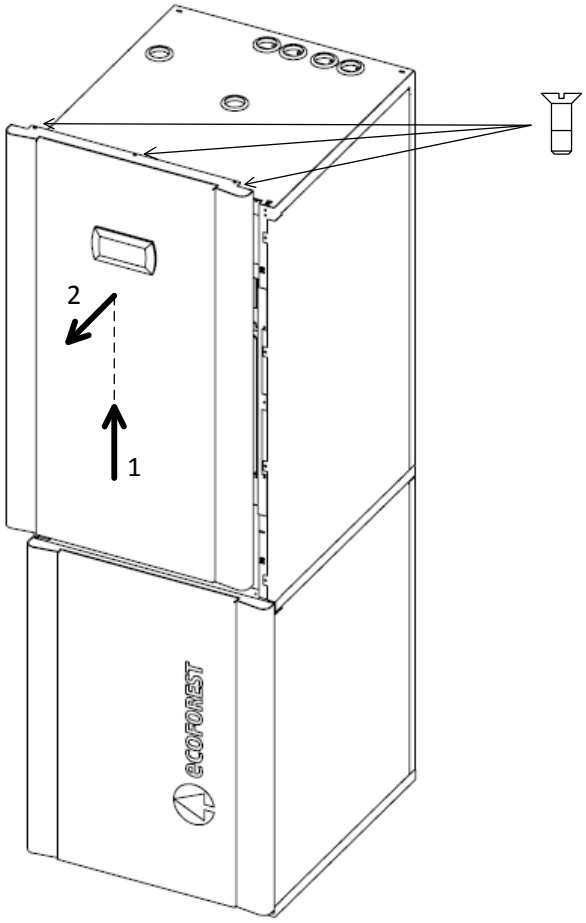


Figure 3.6. Removing the upper front cover.

Access to the lower front part

1. Remove the upper front cover as described above.
2. Remove the fixing screws located on the top of the lid.
3. Pull the cover upwards to disengage the cover from the structure.
4. Remove the cover by pulling forward and put it in a place where it can not be damaged.

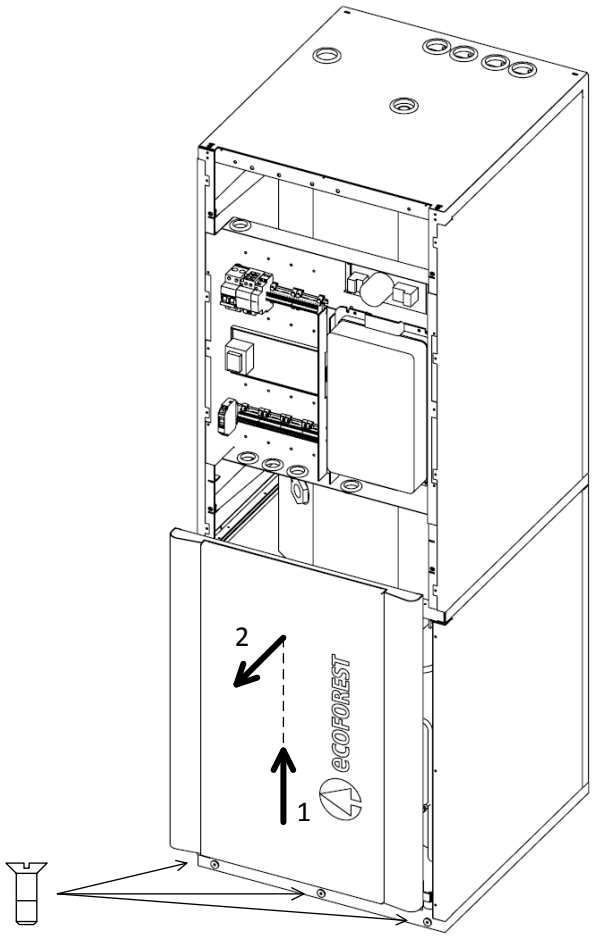


Figure 3.7. Removing the lower front cover.

Access to the sides

1. To access the lower side of the module, remove the upper and lower front covers. To access the side of the upper module, remove only the top front cover.
2. Remove the fixing screws located on the top of the side cover you wish to remove.
3. Pull the side of the lid using the screws to get it out of the structure.
4. Remove the cover by pulling forward and put it in a place where it can not be damaged.

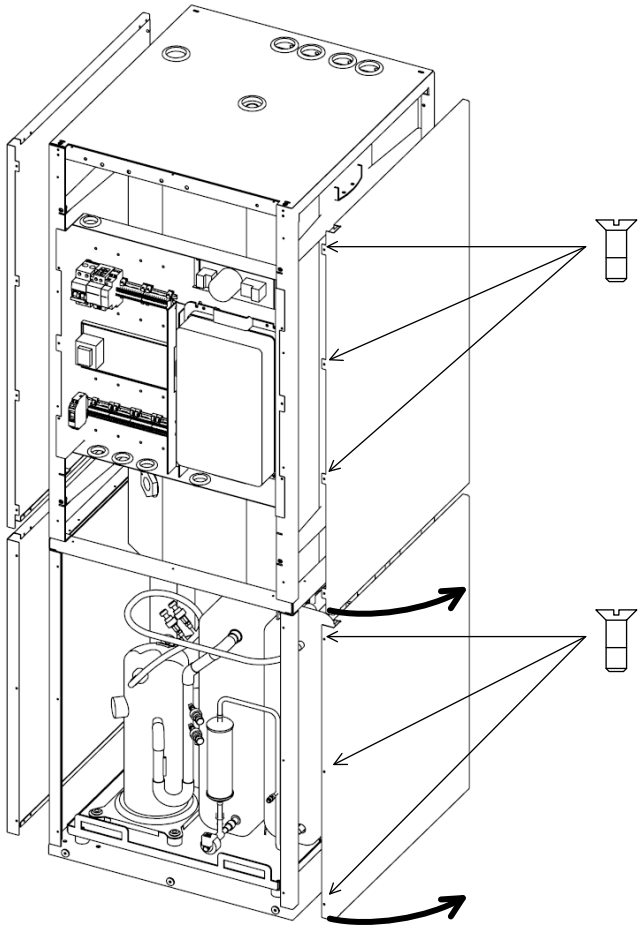


Figure 3.8. Removing the side covers.

Access to the rear and the top

The covers of the rear and top of the heat pump can also be removed if necessary.

1. Remove the screws holding the cover to the frame.
2. Remove the cover and put it in a place where it can not be damaged.

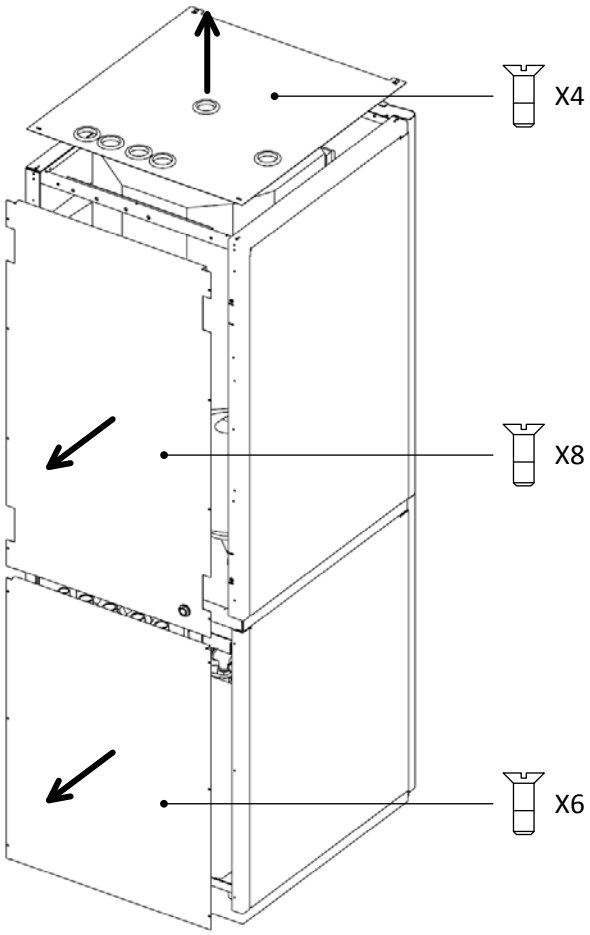
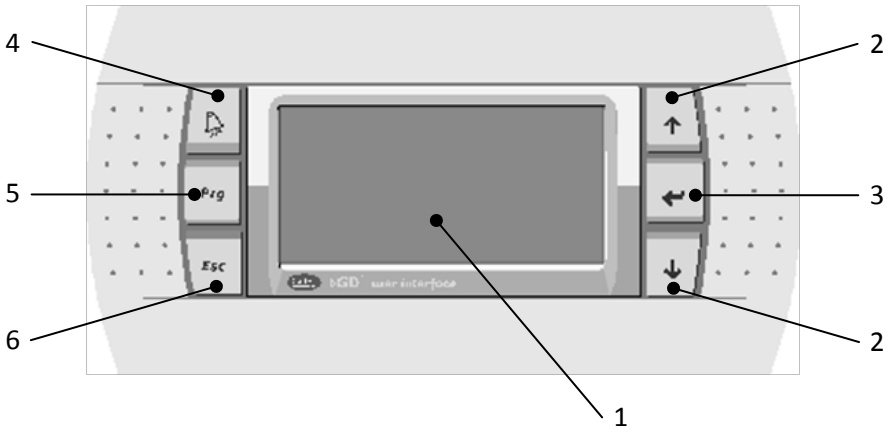


Figure 3.9. Remove the back covers and top cover.

4 User Guide

4.1 Description of the front panel

The heat pump front panel consists of a monochromatic display and 6 buttons, as shown in **Figure 4.1**. The general functions of each of the buttons is shown below the picture. To access certain menus, button combinations are needed; these are shown below.



Number	Description	Number	Description
1	Screen	4	Direct access button to alarm menu [Alarm]
2	Navigation buttons [↑] / [↓]	5	Direct access button to user menu [Prog]
3	Select and accept button [←]	6	Back button [Esc]

Figure 4.1. Front panel.

Navigation buttons [↑] / [↓]

The navigation buttons are used for three types of actions. First, to scroll through menu lists on a screen. Second, to switch from one screen to the next or back in a menu. Third, to change the value of the parameters when they are selected.

Select and accept button [←]

This button is used for several purposes. On one hand, to select the desired menu lists within a screen. Also, in a settings screen with modifiable values, press this button to perform the desired changes; once a value has been edited, press this button to accept it and move to next.

4.2 Programs

ECOFOREST ecoGEO C heat pumps have three main operating programs, described below.

WINTER Program

The heat pump only permits activation of the operating modes HEATING, DHW, LEGIONELLA PROTECTION and FAULT. The ACTIVE COOLING and FREE COOLING operating modes cannot be operated.

SUMMER Program

The heat pump only permits activation of the operating modes FREE COOLING and ACTIVE COOLING, DHW, LEGIONELLA PROTECTION and FAULT. HEATING mode is not allowed.

AUTO Program

The heat pump automatically selects between WINTER/SUMMER programs, depending on various environmental parameters.

4.3 Operating schemes

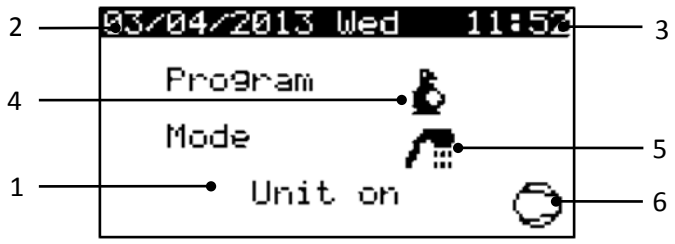
The ecoGEO heat pump is designed to work in a series of standard installations. Three operating schemes have been created, as listed below.

- Buffer tank (Scheme 1).
- 1 zone (Scheme 3).
- 2 zones (Scheme 4).

From now on we will use the codes written in brackets to refer to each operating scheme.

4.4 Main Screen

The front panel lights when the external heat pump switch is operated (see section 5.7). While the management program is loading, a presentation screen displays the ECOFOREST logo. After a few seconds, the main screen displays several icons and text to report on the status of the heat pump (operating program, mode, date and time, and state). In **Figure 4.2** an image is displayed on the main screen and **Table 4.1** displays the lists of the meanings of the icons that can appear on it.



Number	Description	Number	Description
1	Status of the heat pump	4	Operating program
2	Date	5	Operating mode
3	Time	6	Compressor status

Figure 4.2. Main Screen

Icon	Meaning
	WINTER Program activated
	SUMMER Program activated
AUTO	AUTO Program activated
	HEATING mode activated
	FREE COOLING/ACTIVE COOLING mode activated
	DHW mode activated
	LEGIONELLA PROTECTION mode activated
	FAULT mode activated
	Compressor operational

Table 4.1. Meaning of the icons on the main screen.

The management program is divided into three main menus, as shown in **Table 4.2**, and detailed in the following sections.

Main Screen
1. User Menu
2. Service Menu
3. Alarms Menu

Table 4.2. Main menus of the management program.

4.5 USER Menu

This menu is accessed from anywhere in the program by pressing **[Prg]**. From the menu, the user can turn on or turn off the equipment, configure some operating parameters and control the heat pump. **Table 4.3** shows the structure of the USER menu submenus.

1. USER Menu	
Submenu level 1	**Submenu level 2**
1.1. On/Off	
	1.1.1. On/Off ecoGEO 1
	1.1.2. On/Off ecoGEO 2
1.2. Schedule	
	1.2.1. Time Schedule
	1.2.2. ecoGEO Schedule 1
	1.2.3. ecoGEO Schedule 2
	1.2.4. ecoGEO Schedule 3

	1.2.5. ecoGEO Schedule 4
	1.2.6. ecoGEO Schedule 5
	1.2.7. Date/Hour
	1.2.8. Clock
1.3. Heating	
	1.3.1. Heating 1
	1.3.2. Heating 2
1.4. DHW	
	1.4.1. DHW
	1.4.2. Legionella protection
1.5. Active cooling	
	1.5.1. Active Cooling 1
	1.5.2. Active Cooling 2
1.6. Free cooling	
	1.6.1. Free cooling 1
	1.6.2. Free cooling 2
1.7. Information	
	1.7.1. Information 1
	1.7.2. Information 2
	1.7.3. Information 3
	1.7.4. Information 4
	1.7.5. Information 5
	1.7.6. Information 6
1.8. Alarms	
	1.8.1 Alarms
	1.8.2 Reset alarms
	1.8.3 Alarm log

Table 4.3. USER menu structure.

MENU 1.1. On/Off

Switches heat pump off or on via the front panel and selection of the operating program.

MENU 1.1.1 On/Off ecoGEO 1

Select heat pump status, off or on, and adjust the operation of the program itself (automatic, winter or summer). We recommend selecting the AUTO program. You can modify the operating program from th-Tune indoor terminals. Also note that the status selected in this front panel display can be modified by calendar, alarms or digital inputs.

MENU 1.1.2 On/Off ecoGEO 2

Additional information about the status of the heat pump is displayed.

MENU 1.2. Schedule

MENU 1.2.1 Time schedule

Choosing the type of time programming between none, from the th-Tune indoor terminal, or from the heat pump front panel. Programming by th-Tune is only displayed and selectable if the option is enabled for th-Tune (menu 2.4.3.1). The submenus from 1.2.3 to 1.2.7, described below, are shown if programming from the front panel of the pump "From ecoGEO heat pump" is selected. They are also displayed if some kind of thermostat is enabled, either th-Tune (Menu 2.2.5) or conventional relay thermostats (Menu 2.4.4).

MENU 1.2.2 ecoGEO schedule 1

Displayed only if in Scheme 3 or Scheme 4 and is an installation fitted with indoor th-Tune terminals. Setpoints for programming the heat pump during the winter are defined.

MENU 1.2.3 ecoGEO schedule 2

Displayed only if in Scheme 3 or Scheme 4 and is an installation fitted with indoor th-Tune terminals. Setpoints for programming the heat pump during the summer are defined.

MENU 1.2.4 ecoGEO schedule 3 (Scheme 3 or Scheme 4 with th-Tune) / ecoGEO schedule 1 (Remaining operating schemes)

For all operation programs hourly slots are defined for each day of the week. The operating condition is heat pump on/off (On/Off), for Scheme 1 in any case and for Scheme 3 and Scheme 4 if conventional relay thermostats are enabled. For Scheme 3 and Scheme 4 with indoor th-Tune terminal type, the two conditions are the defined setpoints, SET1 and SET2, and off condition (Off). For proper operation of the heat pump using the calendar in the front panel, note that you must define at least two slots, with their settings. An example is shown in the **Figure 4.3**.

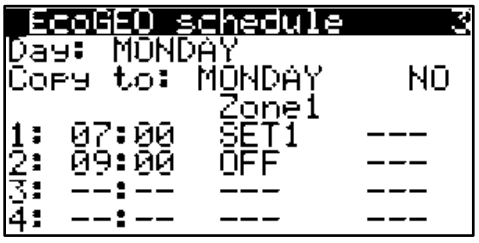


Figure 4.3. Screen for establishing hourly slots, minimum setpoints for proper calendar operation.

It is necessary to remember that each day is individually programmed and is independent from the rest. This means that when making setting the hourly schedules, if not specified otherwise, the heat pump will shut down at the end of the calendar day (24:00). According to the example shown in **Figure 4.4**, the heat pump is turned on at 07:00 and operates according to the setpoint SET1 until 09:00 when

it is turned off. At 23:00 it comes on again, with setpoint SET2, shutting down at 24:00, at the end of the day.

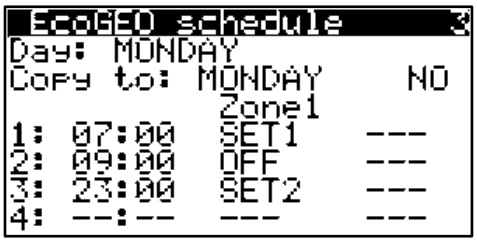


Figure 4.4. Screen for setting hourly slots, example with the heat pump turned off at 24:00.

Another situation that must be taken into account when setting scheduling via the heat pump front panel is when you want the heat pump to remain on from one day to another. To do this, you must set a setpoint for a day of the week and the same setpoint (or a different one but never OFF) at the start of the next day, to keep it on. An example of this would be the joining of **Figure 4.4** and **Figure 4.5** . In this way the heat pump would continue on from Monday to Tuesday and work the rest of the day according to the other slots.

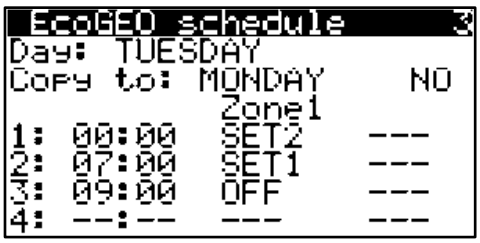


Figure 4.5. Screen for setting time periods, an example of continuation in operation of the heat pump at 24:00 between Monday, shown in **Figure 4.4** and Tuesday.

MENU 1.2.5 ecoGEO schedule 4 (Scheme 3 or Scheme 4 with th-Tune) / ecoGEO schedule 2 (Remaining operating schemes)

Present in all operating programs. "Holiday" periods are defined in which the pump operation will be different from usual. Therefore, it is understood that what is selected in this screen, overrides the usual heat pump schedule. For Scheme 1 in any case and for Scheme 3 and Scheme 4 if relay thermostats are enabled in each "holiday" period, you can define an on or off state (On / Off) for the heat pump. For Scheme 3 and Scheme 4 with indoor th-Tune terminal type, the settings are SET 1, SET 2 or OFF. If you want to set holiday periods during which the year changes; that is, beginning in one calendar year and ending in the next, divide this holiday period into two, one for each calendar year. **Figure 4.6** contains a situation as an example in which the holiday period would last from December 25 to January 6, but the programming is divided into two parts.

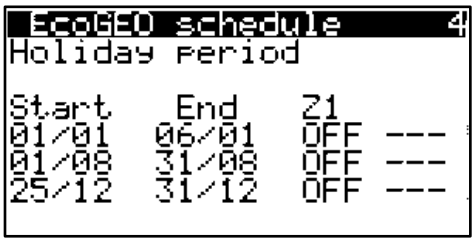


Figure 4.6. Screen for configuring holiday periods, an example that solves the event of a holiday period with change of year.

MENU 1.2.6 ecoGEO schedule 5 (Scheme 3 or Scheme 4 with th-Tune) / ecoGEO schedule 3 (Remaining operating schemes)

Specific days are defined in which the pump operation will be different from usual. What is selected here overrides any other front panel calendar.

MENU 1.2.7 Date/Hour.

Sets the date and time on the front panel.

MENU 1.2.8. Clock

Enable/Disable the time change depending on the season, selecting the transition time and date of each transition.

MENU 1.3. Heating

MENU 1.3.1 Heating 1

For Scheme 1 shows the setpoint temperature for heating accumulation, which can be modified, and the pressure and return temperatures of the heating system. For Scheme 3 and Scheme 4 shows the outlet temperature setpoints calculated for the heating system, measured pressure and return temperatures. For Scheme 4, adds a calculated setpoint for the 2nd zone.

MENU 1.3.2 Heating 2

The heating temperature offset is selected; that is, the degrees below the setpoint temperature at which heat production begins. Furthermore, if enabled indoor th-Tune terminal and Scheme 3, the slope of the heating curve can be changed (or of the two heating curves for Scheme 4).

MENU 1.4. DHW

MENU 1.4.1 DHW

Selecting the setpoint temperature for DHW and the offset to begin production; that is, the degrees below the setpoint which, as a minimum, must be measured in the DHW temperature probe for it to begin DHW production. The pressure and return temperatures of the DHW system are displayed.

MENU 1.4.2 Legionella protection

Enables the LEGIONELLA PROTECTION mode, programming day of the week and the time that the weekly legionella protection treatment will take place. Remember that for this to take place, the heat pump must not be off.

MENU 1.5. Active cooling

Only available for ecoGEO C3 model . We recommended its use in Scheme 1 if there is a buffer tank intended for the accumulation of cold or Scheme 3 and Scheme 4.

MENU 1.5.1 Active Cooling 1

For Scheme 1 shows the setpoint temperature for buffer tank, which can be modified, and the inlet and outlet temperatures of the cooling system. For Scheme 3 and Scheme 4 shows the outlet temperature setpoint calculated for the cooling system and the measured inlet and outlet temperatures. For Scheme 4, adds a calculated outlet temperature setpoint for the 2nd zone.

MENU 1.5 2 Active cooling 2

The cooling outlet temperature offset is selected; that is, the degrees above the setpoint temperature at which active cooling production begins.

MENU 1.6. Free cooling

Only available for ecoGEO C2 model.

MENU 1.6.1 Free cooling 1

It allows free cooling to be activated. The inlet and outlet temperatures of the cooling system are displayed.

MENU 1.5.2 Free cooling 2

The cooling outlet temperature offset is selected; that is, the degrees above the setpoint temperature at which free cooling production begins.

MENU 1.7. Information

Compiles all the relevant information when observing the operation of the heat pump. You can access this menu quickly, by pressing the **[←]** button on the Front panel from the Start screen.

MENU 1.7.1 Information 1

For all operating schemes, the temperature of the DHW tank is shown. Also, for Scheme 1, the measured temperature in the buffer tank is read.

MENU 1.7.2 Information 2

It shows the measured outdoor temperature. For Scheme 3 and Scheme 4 with th-Tune enabled, the temperatures of the single or twin areas are incorporated, respectively.

MENU 1.7.3 Information 3

Shows the pressure and temperature of the compressor suction and discharge.

MENU 1.7.4 Information 4

Shows the inlet and outlet temperatures of brine and heating/cooling circuits, the temperature difference between the inlet and outlet at each circuit, and the percentage regulation of each circulator pump.

MENU 1.7.5 Information 5

Compressor/inverter operating parameters are displayed, such as the compressor rotation speed, discharge temperature or the inverter temperature.

MENU 1.7.6 Information 6

Shows various operating parameters of the expansion valve.

MENU 1.8. Alarms

MENU 1.8.1 Alarms

Shows a screen prior to the active alarm log at all times, which is accessed by pressing the **[←]** button on the front panel.

MENU 1.8.2 Reset alarms

It allows active alarms to be "cleaned" by changing the value of "Reset Alarm" to Yes

MENU 1.8.3 Alarm log

Screen that gives access to the alarm log. Sorts the alarms that have been activated during operation of the heat pump, giving details of the date and time that were activated and the nature of the event that triggered it.

4.6 SERVICE Menu

The service menu of the ECOFOREST ecoGEO heat pump is intended for less frequent use than the previous one and includes submenus for changing the language, configuration or secondary information on the heat pump. It can be accessed from anywhere in the program by simultaneously pressing the ***[Prg]*** and ***[Esc]*** buttons on the front panel. The submenus included in this section are described below.

2. SERVICE Menu		
Submenu level 1	**Submenu level 2**	**Submenu level 3**
2.1. Change language		
2.2. Version		
2.3. Work hours		
2.4. Installer conf.		
	2.4.1. Operating scheme	
	2.4.2. Climate control	
		2.4.2.1 Design parameters 1
		2.4.2.2 Design parameters 2
		2.4.2.3 Design parameters 3
		2.4.2.4 Design parameters 4
		2.4.2.5 Design parameters 5
	2.4.3. th-Tune	
		2.4.3.1 th-Tune
		2.4.3.2 BMS configuration
	2.4.4. Manual Conf.	
		2.4.4.1 Digital inputs
		2.4.4.2 Brine pump
		2.4.4.3 Heating pump
		2.4.4.4 Inverter contactor
		2.4.4.5 Elec. Heater cont.
		2.4.4.6 Zone valve and pump
		2.4.4.7 Alarm system
		2.4.4.8 DHW valve
		2.4.4.9 DHW pump
		2.4.4.10 Free cooling valve
		2.4.4.11 Reversing valve
	2.4.5. Probe conf.	
		2.4.5.1 Brine outlet Temp.
		2.4.5.2 Brine inlet Temp.
		2.4.5.3 Heating outlet Temp.
		2.4.5.4 Heating inlet Temp.
		2.4.5.5 Brine Pressure

		2.4.5.6 Heating Pressure
		2.4.5.7 Suction Temp.
		2.4.5.8 Suction Pressure
		2.4.5.9 Discharge pressure
		2.4.5.10 DHW Temp.
		2.4.5.11 Temp. dep. 2/outlet Temp. 2
		2.4.5.12 Outdoor Temp.
	2.4.6. Alarm log	
	2.4.7. Default values	
	2.4.8. Change Password	

Table 4.4. SERVICE menu structure.

MENU 2.1. Change language

Change the front panel menus language.

MENU 2.2. Version

Shows information on the version of the management program implemented in the heat pump, the controller card installed and the expansion valve used.

MENU 2.3. Work hours

It includes a counter for recording the accumulated operating hours of the ecoGEO heat pump compressor.

MENU 2.4. Installer conf.

This menu lists the parameters the installer must select during commissioning of the ecoGEO heat pump for proper operation and for clearing the alarm log or selecting the factory defaults. To access the installer settings you need to enter the installer password.

MENU 2.4.1 Operating scheme

This accesses a screen where you can select from the different operation programs in which the heat pump operates (see section 4.3). You can also select the maximum thermal power the heat pump will provide; this is set by limiting the maximum rotational speed of the compressor. Section 8.7 includes graphics with relationships between the thermal power provided by different models of the heat pump in relation to the compressor speed under various operating conditions. Section 8.8 include graphics with relationships between the power consumption of the different models of the heat pump in relation to the compressor speed under various operating conditions.

MENU 2.4.2 Climate control

Selection of system and dwelling parameters for establishing and defining the heating curve. **Table 6.2** details the recommended values for each of the parameters depending on the system chosen.

MENU 2.4.2.1. Design parameters 1

Defines the indoor and outdoor design temperature.

MENU 2.4.2.2. Design parameters 2

Defines the outdoor design temperature. For Scheme 4 it also enters the outdoor design temperature for the 2nd zone.

MENU 2.4.2.3. Design parameters 3

Defines the heat emission systems in the installation (underfloor heating, fan coils or low temperature radiators). For Scheme 4, it also adds this datum for the 2nd zone.

MENU 2.4.2.4. Design parameters 4

Sets the type of building insulation (good, medium or poor).

MENU 2.4.2.5. Design parameters 5

Sets the maximum outdoor temperature for heating and minimum for cooling.

MENU 2.4.3. th-Tune

Sets th-Tune indoor terminals for the heat pump.

MENU 2.4.3.1. th-Tune

If the indoor terminal type th-Tune is installed, it can be enabled here. If the installation uses Scheme 4, the main indoor terminal and the indoor terminal for 2nd zone addresses can be set here. It is recommended to use values of 1 and 2, respectively.

NOTE

- Remember that if your installation follows Prog 1 or Prog 2, you should not enable the indoor environment th-Tune terminal.
- Indoor environment th-Tune terminals and conventional relay type thermostats for controlling the pump cannot coexist. This may cause the machine to malfunction.

MENU 2.4.3.2. BMS configuration

Basic parameters for the BMS configuration of the indoor terminals. The recommended values are shown in **Figure 4.7**.

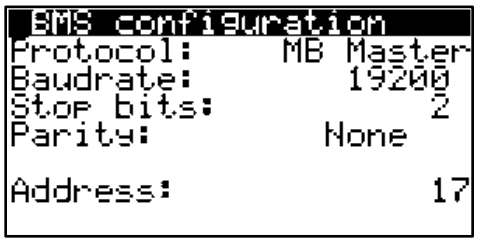


Figure 4.7. BMS configuration screen for th-Tune indoor terminals, with the recommended values for the correct operation of the heat pump.

MENU 2.4.4 Manual conf.

This allows the activation of the relays that control various heat pump devices and their regulation as required. According to the ecoGEO heat pump model, one or another screens appear.

MENU 2.4.4.1. Digital Inputs

The digital inputs of the heat pump mean it can be controlled according to a number of criteria that depend on the installation. The first, identified on screen as THERMOSTAT IMPUT DI1 is used to enable the on-off control of the heat pump by relay type thermostats. When it is enabled, its operating logic must also be chosen, NC or NO (normally closed or normally open). If you choose the NC option, the input must be entered in contacts 38 and 39 (see section 8.3) so the pump is activated in an open circuit. If the NA option is chosen, the input required for the activation of the pump is a closed circuit. For ecoGEO C3 model, the same thermostat can be used to control the production of active heating and cooling. This requires taking into account the production of heating when choosing the strategy.

The other input available, ecoGEO IMPUT DI2, allows external control of the heat pump. The logic for this operation input is analogous to that explained in the previous case.

NOTE

- th-Tune indoor terminals and conventional relay type thermostats for controlling the pump cannot coexist. This may cause the machine to malfunction.
- The signal for THERMOSTAT IMPUT DI1 should be a voltage-free signal.
- The signal for ecoGEO IMPUT DI2 should be a voltage-free signal.

MENU 2.4.4.2. Brine pump

For all ecoGEO heat pump models. The status of the brine pump (On/Off) and its speed can be defined.

MENU 2.4.4.3. Heating pump

For all ecoGEO heat pump models. The status of the heating pump (On/Off) and its speed can be defined.

MENU 2.4.4.4. Inverter Contactor

For all ecoGEO heat pump models. The status (On / Off) the inverter contactor can be defined.

MENU 2.4.4.5. Elect. Heater cont.

For all ecoGEO heat pump models and all operating schemes. The status (On / Off) of the electric heater (legionella protection) contactor can be defined.

MENU 2.4.4.6. Zone valve and pump

For all ecoGEO heat pump models in installations with Scheme 4. The status (On/Off) of the 2nd zone pump and the 2nd zone valve con be defined.

MENU 2.4.4.7. Alarm system

For all ecoGEO heat pump models. The status (On / Off) of the alarm system signal can be defined.

MENU 2.4.4.8. DHW valve

For all ecoGEO C1 and ecoGEO C2 heat pump models. The status (On/Off) of the DHW valve can be defined.

MENU 2.4.4.9. DHW pump

For the ecoGEO C3 heat pump model. The status (On / Off) of the DHW production system, which includes the activation of the circulation pump and the DHW solenoid valve can be defined.

MENU 2.4.4.10. Free cooling valve

For the ecoGEO C2 heat pump model. The status (On / Off) of the free cooling system valves can be defined.

MENU 2.4.4.11. Reversing valve

For the ecoGEO C3 heat pump model. The status (On/Off) of the reversing cycle valve can be defined.

MENU 2.4.5 Probe conf.

Shows the type of each of the temperature probes in the installation, the measured value for each and allows the correction of its values. Correction is recommended only when long probe cable lengths are used.

MENU 2.4.5.1 Brine outlet Temp.

Displays the type and value measured by the brine outlet temperature probe with an offset for correcting the value.

MENU 2.4.5.2 Brine inlet Temp.

Displays the type and value measured by the brine inlet temperature probe with an offset for correcting the value.

MENU 2.4.5.3 Heating outlet Temp.

Displays the type and value measured by the heating/cooling outlet temperature probe with an offset for correcting the value.

MENU 2.4.5.4 Heating inlet Temp.

Displays the type and value measured by the heating/cooling inlet temperature probe with an offset for correcting the value.

MENU 2.4.5.5 Brine Pressure.

Displays the type and value measured by the brine circuit pressure transducer with an offset for correcting the value.

MENU 2.4.5.6 Heating Pressure.

Displays the type and value measured by the heating/cooling circuit pressure transducer with an offset for correcting the value.

MENU 2.4.5.7 Suction Temp.

Displays the type and value measured by the compressor suction temperature probe with an offset for correcting the value.

MENU 2.4.5.8 Suction Pressure

Displays the type and value measured by the compressor suction pressure transducer with an offset for correcting the value.

MENU 2.4.5.9 Discharge pressure

Displays the type and value measured by the compressor discharge pressure transducer with an offset for correcting the value.

MENU 2.4.5.10 DHW Temperature

Displays the type and value measured by the DHW temperature probe with an offset for correcting the value.

MENU 2.4.5.11 Temp. dep. 2/outlet Temp. 2

Displays the type and value measured by the buffer tank temperature probe (Scheme 1), or of the outlet temperature probe in the 2nd zone (Scheme 4). Correction with an offset value can be applied.

MENU 2.4.5.12 Outdoor Temp.

Displays the type and value measured by the outdoor temperature probe with an offset for correcting the value.

MENU 2.4.6 Alarm log

Accesses a screen on which the heat pump alarm log can be erased.

MENU 2.4.7 Default value

The settings established by the user can be substituted by default values.

MENU 2.4.8 Change Password

It allows to change the service password (PW1).

4.7 ALARMS Menu

It is accessed by pressing the ***[Alarm]***button. For more information see Section 4.5, menu 1.8.

5 Installation

To carry out the installation of the heat pump follow these steps in the order listed.

1. Carefully remove the packaging of the heat pump (wooden box, plastic, etc.).
2. Carefully remove the fasteners that fix the heat pump to the pallet.
3. Check that the heat pump has not been damaged in transit and all components are present.
4. Place the heat pump at its installation site. Bear in mind the recommendations on transport and location in sections 5.1 to 5.3.
5. Connect the heating/cooling indoor circuit by following the directions in 5.4.
6. Connect the DHW circuit by following the directions in 5.5.
7. Connect the brine circuit by following the directions in 5.6.
8. Make the necessary installations in the electrical cabinet as described in the section 5.7.

5.1 Transport and handling

DANGER!

- The heat pump can weigh up to 240 kg net. The device should be handled by at least two operators using a truck rack to avoid strains and / or personal injury.

NOTE

- Under no circumstances should the heat pump be tilted more than 45 degrees from the vertical. This may cause the equipment to malfunction.
- If the lower and upper modules are disassembled, the lower module should not be tilted more than 45° from the horizontal. No such restrictions on this apply to the upper module.

ecoGEO C heat pumps must be transported in an upright position and in such a way that they are not exposed to the weather.

When moving the heat pump to your site, it must be carefully handled. If absolutely necessary, the heat pump can be disassembled into two modules for easy transport and handling.

5.2 Recommendations for location

NOTE

- Do not install the heat pump near equipment that emits electromagnetic waves, as they may interfere with the electronics and cause your equipment to malfunction.

The heat pump must be installed on a stable base, preferably concrete, capable of supporting the total weight indicated in the technical specifications (see section 8.1) as well as the volume of water contained in the hot water storage tank (170 kg approx.) If the heat pump is installed on an unstable base (for example, wood), this must be reinforced so that it supports the total weight of equipment.

Before selecting the place the heat pump will be installed, consider the following recommendations.

- Choose a dry place where there is no risk of frost.
- If possible, install the heat pump with the back towards an outer wall and in a room where noise emissions do not pose a problem. Whenever possible avoid installation against bedroom walls or other rooms where noise can be annoying. Avoid installing the heat pump near a corner, as this can amplify the equipment's noise emission level.
- Check that the heating/cooling, brine, cold water and DHW piping can be properly inlalled. To avoid condensation in the piping of the brine circuit, try minimize these sections inside the building and insulate them properly.
- Check that there is sufficient space to carry out the installation and maintenance work on the heat pump comfortably (see section 5.3).

Once the heat pump positioned in its final location, it is necessary to level it so that it remains horizontal. To this end it is fitted with adjustable feet of up to 25 mm in height to compensate for possible irregularities of the base surface. If the irregularities of the base cannot be compensated by the height-adjustable feet, the base must be sufficiently levelled before installing the heat pump.

5.3 Service areas

We recommend leaving enough space around the heat pump to facilitate the installation and maintenance work. Recommended minimum distances from walls and other structures are indicated below.

- 300 mm from both sided.
- 300 mm from the top.
- 600 mm from the front.
- 10 mm from the back.

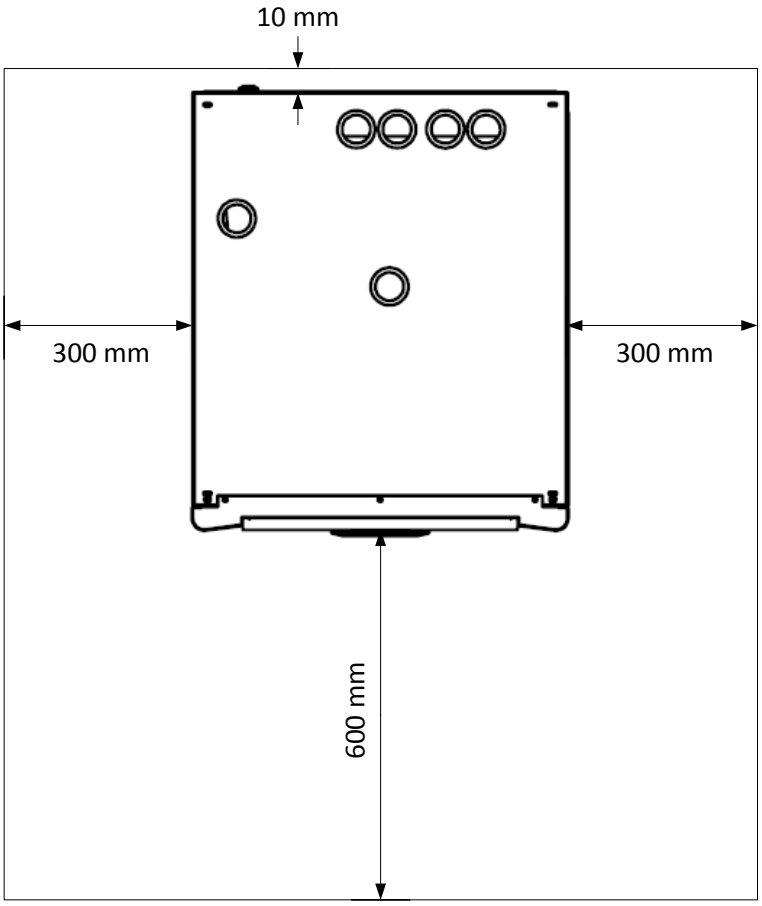


Figure 5.1. Minimum recommended service areas around the heat pump.

5.4 Heating/cooling circuit connection

DANGER!

- Do not install components that may clog the inlet or outlet of the safety valve of the heating/cooling system. There may be risk of breaking some of its components and causing injury and damage to property or both.
- When installing the heating/cooling circuit, special care must be taken to avoid getting water on the electrical panel. This could result in personal injury from electrical shock and cause equipment malfunction or both.

NOTE

- ecoGEO C heat pumps must not be used in heating systems with high temperature radiators, or in other applications that require outlet temperatures of above 55ºC; these would cause equipment malfunction.
- Make sure the pipe connections are not subject to stress. This may cause leaks.
- The inlet and outlet pipes of the heating/cooling circuit must be insulated to prevent heat loss and avoid unnecessary risks of freezing the fluid.

ecoGEO C heat pumps are designed for use in heating systems with low temperature heat radiators (underfloor heating or fan coil) or medium temperature radiators (convector or low temperature radiators).

For maximum energy efficiency of the heat pump we recommend designing the heating system with a forward temperature as low as possible (ideally around 30°C), since the increase of the forward temperature causes a significant reduction of energy efficiency.

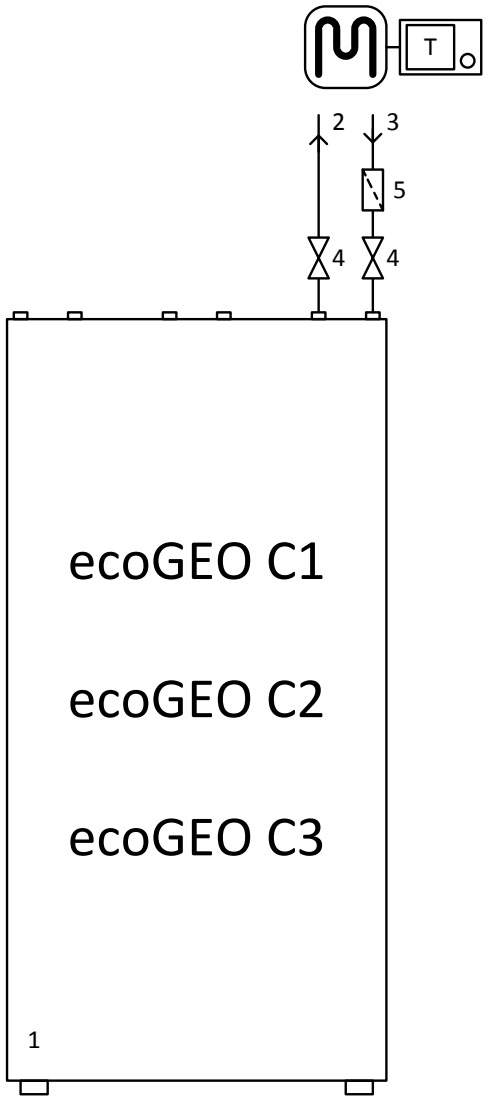
Inside the heat pump are included the following components required for the heating/cooling system (see section 3.4).

- Variable speed and high efficiency pump (energy class A).
- Expansion vessel (12 l).
- Safety valve (6 bar).
- Drain valve.

To connect the heating/cooling circuit piping, take into account the note in **Figure 5.2** and the following recommendations.

- Use the flexible hoses that come with the heat pump to avoid excessive stress in the inlet and outlet pipes.
- Install shut-off valves on the heating/cooling outlet and inlet circuits. These should be as close to the heat pump as possible to facilitate future maintenance work on the heat pump.
- Install a particle filter in the heating/cooling inlet circuit.
- Install air vents at all points of the installation where air pockets may form.

- We recommend connecting the heating/cooling indoor circuit to the mains water through a pressure reducing valve. This ensures the correct operating pressure of the heating/cooling system in the event of possible water leaks or removal of air bubbles by the air vents.
- Thermally insulate the inlet and outlet circuits to prevent unnecessary heat loss and condensation problems.



Number	Description	Number	Description
1	Heat pump	4	Shut-off valve
2	Heating outlet (G1'' F)	5	Particle filter
3	Heating inlet (G1'' F)		

Figure 5.2. General diagram of heating/cooling indoor circuit connections.

5.5 DHW circuit connection

DANGER!

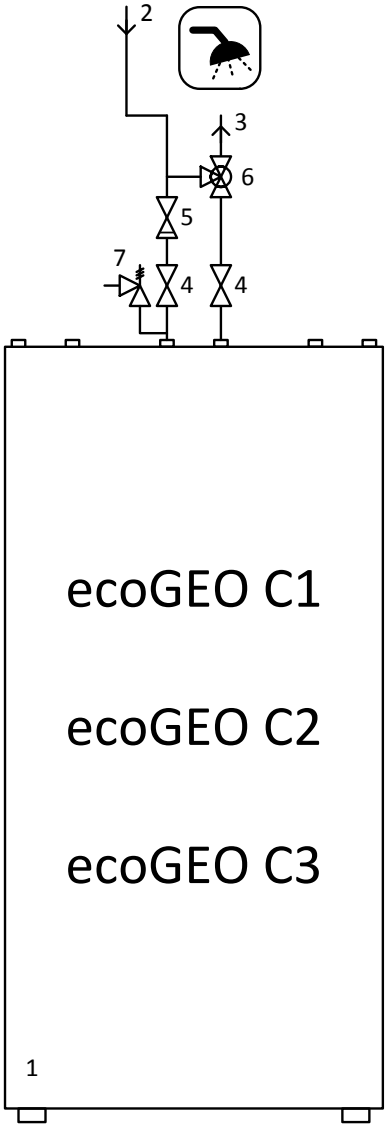
- Do not install components that may clog the inlet or outlet of the safety valve of the DHW tank. There may be risk of breaking the tank and causing injury, damage to property or both.
- The DHW tank can reach temperatures of 70°C due to the anti-legionellosis protection, so scalding injuries can occur.
- When installing the DHW circuit, special care must be taken to avoid getting water on the electrical panel. This could result in personal injury from electrical shock and cause equipment malfunction or both.

NOTE

- Bear in mind that the mains water pressure is reduced during periods of high water consumption. Check that under these conditions the minimum operating pressure of the installation is ensured.
- Make sure the pipe connections are not subject to stress as leaks may occur.
- Thermally insulate the DHW pipes to prevent unnecessary heat loss.

To connect the DHW circuit piping, take into account the note in **Figure 5.3** and the following recommendations.

- To facilitate future maintenance work on the heat pump, install shut-off valves in the mains water inlet and DHW outlet
- Install a check valve at the cold water inlet to avoid hot water returning from the accumulator to the main network.
- Install a safety valve (8 bar) at the inlet of the water mains to prevent excessive pressure in the DHW tank.
- Because of the legionella protection (see section 3.2) water temperature in the DHW tank can reach 70°C. If the DHW installation in the dwelling does not have thermostatic taps we recommend fitting a thermostatic mixing valve on the DHW outlet to avoid risk of scalding.
- If the maximum system pressure can exceed 5 bar, we recommend installing a pressure reducing valve in the mains input to prevent overpressure in the tank.
- Thermally insulate the DHW outlet pipes to prevent unnecessary heat loss.



Number	Description	Number	Description
1	Heat pump	5	Check Valve
2	Mains water input (G1'' F)	6	Thermostatic mixing valve
3	DHW outlet (G1'' F)	7	Safety valve (8 bar)
4	Shut-off valve		

Figure 5.3. General diagram of DHW circuit connections.

For correct operation of the installation, you must ensure a mains water pressure of at least 2 bar to obtain a DHW flow rate of at least 20-25 l/min.

5.6 Brine circuit connection

DANGER!

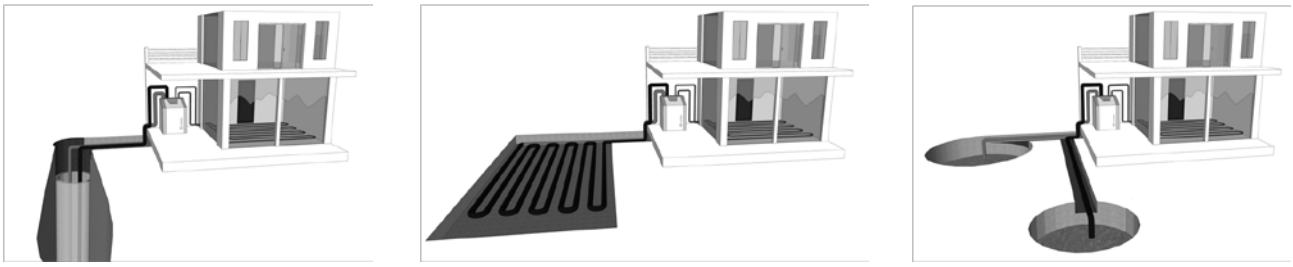
- Do not install components that may clog the inlet or outlet of the safety valve of the brine system. There may be risk of breaking some of its components and causing injury and damage to property or both.
- When installing the brine circuit, special care must be taken to avoid getting liquid on the electrical panel. This could result in personal injury from electrical shock and cause equipment malfunction or both.

NOTE

- Thermally insulate the brine circuit pipes to prevent condensation and/or frost formation, since the brine circuit pipes may reach temperatures below 0°C.
- Make sure the pipe connections are not subject to stress as leaks may occur.
- In brine systems with groundwater we recommend using an intercooler to prevent freezing problems and evaporator fouling.

ecoGEO C heat pumps can be used with horizontal, vertical or groundwater brine systems. The geothermal collectors/probes must be properly dimensioned, taking into account the geographical area, the terrain, the heating and brine systems used and the thermal power of the heat pump.

When using brine systems with more than one circuit, these must be connected in parallel so that the flow rate through each is similar. The maximum length of the brine circuitry should not exceed 400 m.



Vertical probe | Horizontal collector | groundwater

Figure 5.4. Types of brine systems.

In horizontal brine systems, we recommend burying the coil between 1.2 and 2 meters deep and with a separation between tubes of at least 1 metre.

In vertical brine systems, use of circuits between 80 and 150 m long, with a minimum separation between circuits of at least 8 meters.

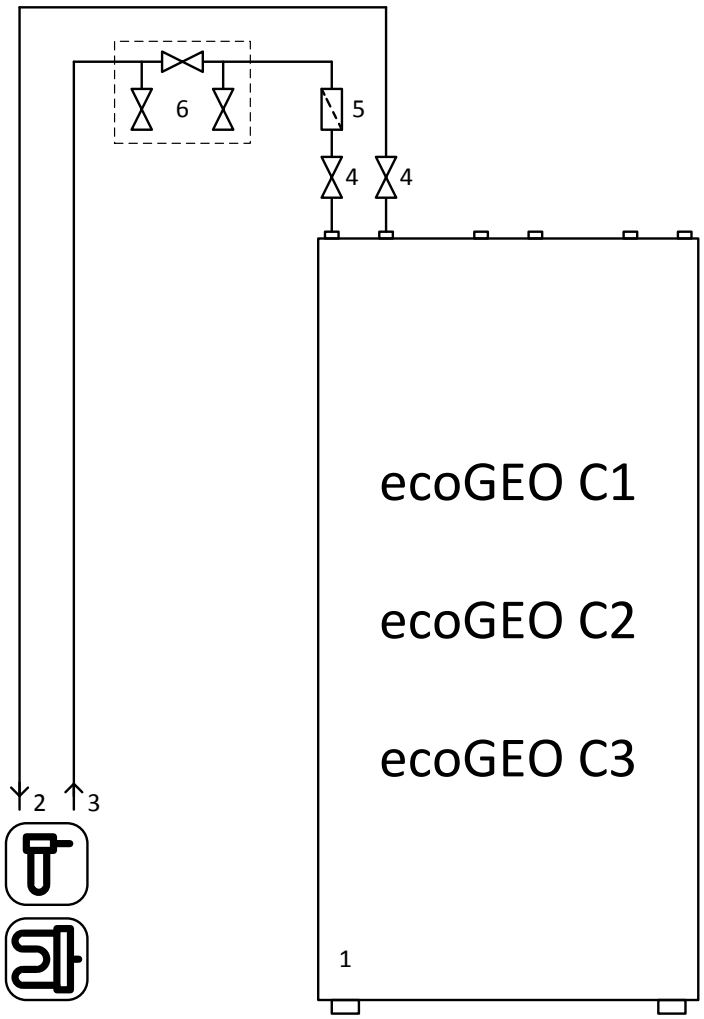
The refrigerant evaporation temperature can fall below 0 ° C. Thus, in brine systems with groundwater we recommend using an intercooler to prevent freezing problems and evaporator fouling.

Inside the heat pump are included the following components required for the brine system (see section).

- Variable speed and high efficiency pump (energy class A).
- Expansion vessel (5 l).
- Safety valve (6 bar).
- Drain valve.

To connect the brine circuit piping, take into account the note in **Figure 5.5** and the following recommendations.

- Use the flexible hoses that come with the heat pump to avoid excessive stress in the inlet and outlet pipes.
- Install shut-off valves on the brine outlet and inlet circuits, these should be as close to the heat pump as possible, to facilitate future maintenance work.
- Install the components necessary to carry out the filling / emptying in the return pipe.
- Install a particle filter in the return line. We recommend installing valves just before and after the filter to avoid losing antifreeze mixture during cleaning or filter replacement.
- Install air vents at all points of the installation where air pockets may form.
- Thermally insulate the pipes of the brine circuit to avoid condensation problems.



Number	Description	Number	Description
1	Heat pump	4	Shut-off valve
2	Brine outlet, (G1'' F)	5	Particle filter
3	Brine inlet, (G1'' F)	6	Brine filling fitting

Figure 5.5. General diagram of brine circuit connections.

5.7 Electrical Installation

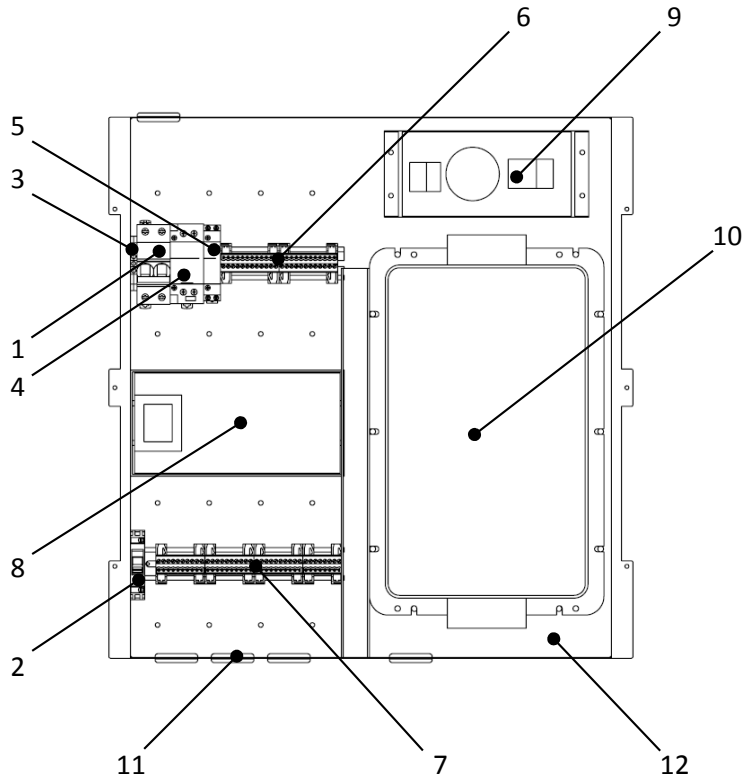
DANGER!

- To carry out the installation and maintenance work on the heat pump an external switch that shuts off all circuits (phase and neutral) must be installed. Personal injury due to electrocution could occur.

NOTE

- The power cord should only be connected to the terminals indicated; otherwise equipment malfunction may occur.

The electrical installation of the heat pump should be performed by a qualified installer in accordance with applicable local regulations and instructions. **Figure 5.6** indicates the location of the main components of the electrical cabinet.



Number	Description	Number	Description
1	Power circuit breaker	7	Lower terminal block
2	Micro-controller circuit breaker	8	Micro-controller
3	Ground terminal	9	EMI Filter
4	Inverter / compressor contactor	10	Inverter
5	Electric heater contactor (legionella protection)	11	Cable glands
6	Upper terminal block	12	Housing

Figure 5.6. Location of main components of the electrical cabinet.

The internal components of the heat pump are factory connected to the electrical cabinet with terminal blocks for quick free standing connections. For more detailed information on the electrical cabinet connections see sections 8.3 to 8.6.

The electrical installation required for the heat pump is only the power cord connection, the external temperature probes and external control valve connections.

Power supply

All models in the range ecoGEO C require single-phase 230 V / 50 Hz, 1/N/PE ~ power supply. To carry out electrical installation follow these steps.

1. Insert the power cord through the cable glands located at the bottom of the back cover of the heat pump. To do so, remove the upper front cover and side covers (see section 3.5).
2. Feed the cable through cable gland located at the top left of the electrical cabinet, fixing the cable properly to the structure.
3. Connect the power cable following **Figure 5.7** diagram (Also see sections 8.3 to 8.6).
4. We recommend installing an external switch that shuts off all circuits (phase and neutral).

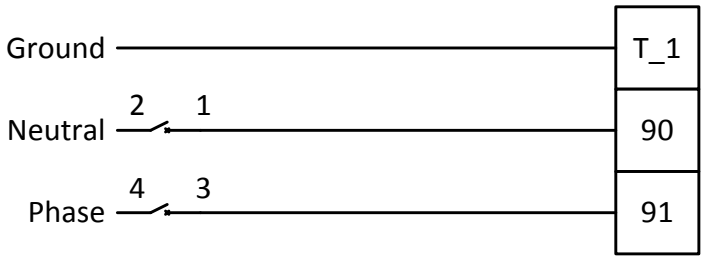


Figure 5.7. Wiring diagram of the power supply.

Table 5.1 shows the sections required for the power cord and the minimum current for which the external switch must be rated.

Model	Cable Section:	External switch
ecoGEO B 3-12 kW	6 mm^2	32 A
ecoGEO C 5-22 kW	10 mm^2	40 A

Table 5.1. Dimensioning of the power cord and the external switch.

th-Tune indoor terminal

NOTE

- Remember that if your installation follows Scheme 1, you should not enable the indoor th-Tune terminal.
- Indoor th-Tune terminals and conventional relay type thermostats for controlling the pump cannot coexist. This may cause the machine to malfunction.

ECOFOREST geothermal pumps are programmed to be used with Carel th-Tune indoor terminals, but can be used with any other terminal with Modbus connections. These terminals, along with the heat pump control card, allow the user precise control over the indoor temperature.

To install the terminal both the power supply and the RS485 serial cable must be connected. Before installation, bear in mind the following recommendations.

1. Before connecting the power supply terminal carefully read the instructions in the Th-tune manual. Check that the supply voltage is correct. There are 24 Vac/Vdc and 230 Vac models.
2. To connect the RS485 serial port use AWG type 20-22 two-pole shielded cable. For cable lengths exceeding 500 m a 120 Ohm resistor must be installed between Rx+/Tx+ and Rx-/Tx- in the first and last terminal to avoid possible communication problems. For more information refer to the Th-Tune manual.

The RS485 serial cable connection is made directly to the card in the BMS micro-controller connector, as shown in the **Figure 5.8** diagram (See also sections 8.3 to 8.6).

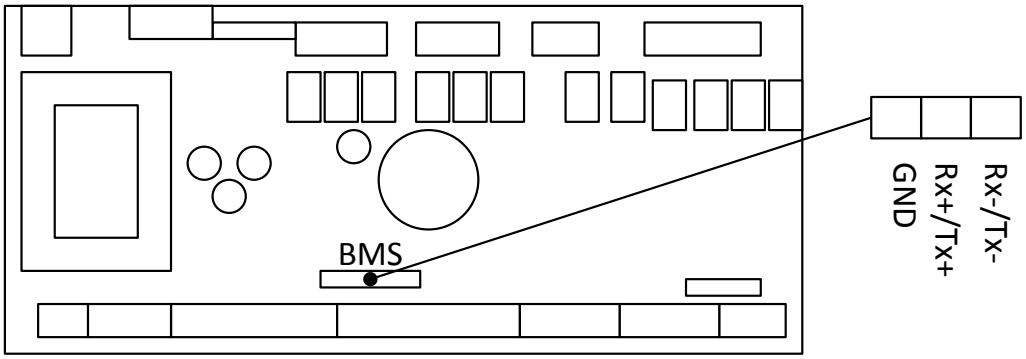


Figure 5.8. Diagram for wiring the RS485 serial cable to the electrical cabinet.

Set the address of the terminal according to the settings in the heat pump management program (see section 4.6, Menu 2.4.3). You can find more detailed information on the installation and operation of the terminal in the Th-Tune manual.

Conventional relay type thermostats

NOTE

- Indoor environment th-Tune terminals and conventional relay type thermostats for controlling the pump cannot coexist. This may cause the heat pump to malfunction.
- The signal for " Thermostat input DI1" should be a voltage-free signal.
- The signal for "ecoGEO input DI2" should be a voltage-free signal.

ECOFOREST geothermal pumps can be controlled by one or more relay type thermostats (T1, T2, ..., Tn), allowing the switching on and off of the heat pump according to heating needs of the dwelling. The control input signal must be connected as shown in **Figure 5.9** (See also sections 8.3 to 8.6).

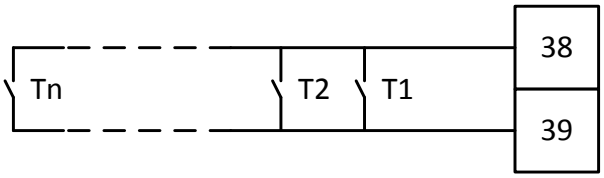


Figure 5.9. Wiring of one or more conventional relay type thermostats.

Outdoor temperature probe

The outdoor temperature probe is connected by twin-pole cables to the lower terminal strip of the electrical cabinet, as indicated in **Figure 5.11** (See also sections 8.3 to 8.6). To install the temperature probe, bear in mind the following recommendations.

1. Install the outdoor temperature probe to the north or northeast of the house.
2. Place the outdoor temperature probe in a place that is well ventilated but sheltered from the wind.
3. Do not install the outdoor temperature probe within a distance of 1 m from windows or doors to avoid the possible effect of warm air currents.
4. Use cable of 50 m maximum length and a minimum diameter of 0.75 mm^2 for connecting the temperature probe. For longer lengths (up to 120 m) 1.5 mm^2 cable is recommended.

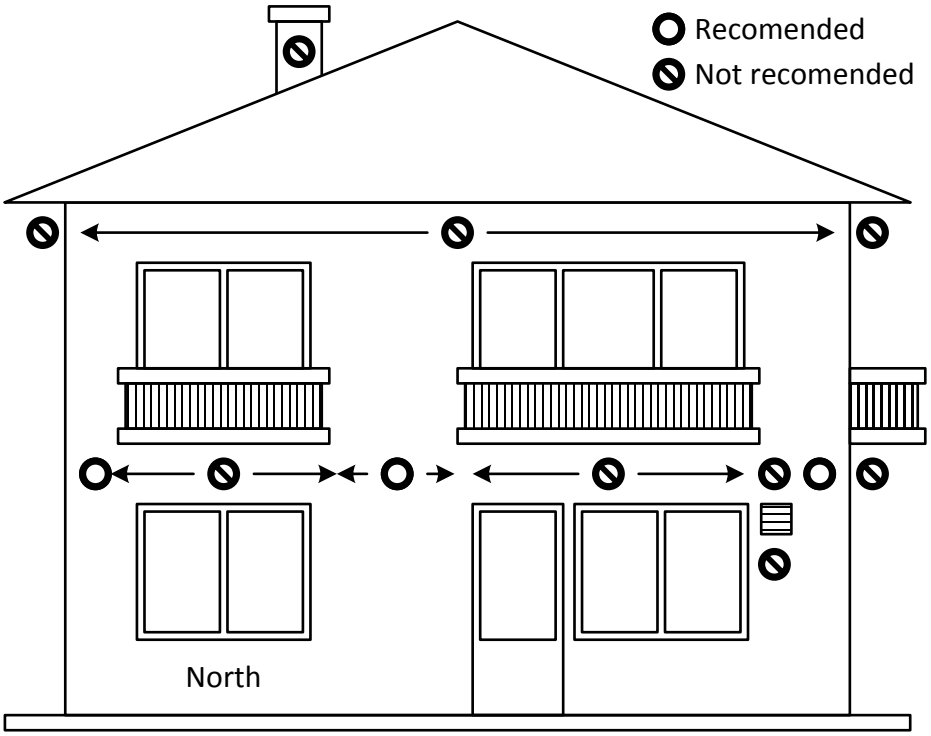


Figure 5.10. Recommended locations for installation of the outdoor temperature probe.

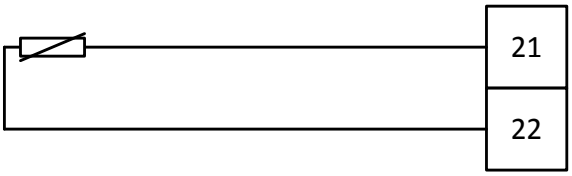


Figure 5.11. Wiring diagram for the outdoor temperature probe to the electrical cabinet.

Buffer tank temperature probe (facilities with intermediate buffer tank)

The buffer storage temperature probe is connected by twin-pole cables to the lower terminal strip of the electrical cabinet, as indicated in **Figure 5.12** (See also sections 8.3 to 8.6).

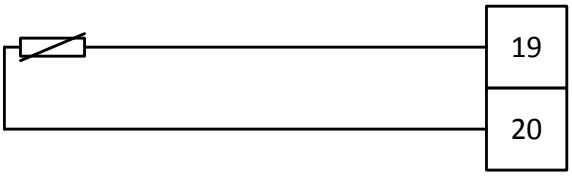
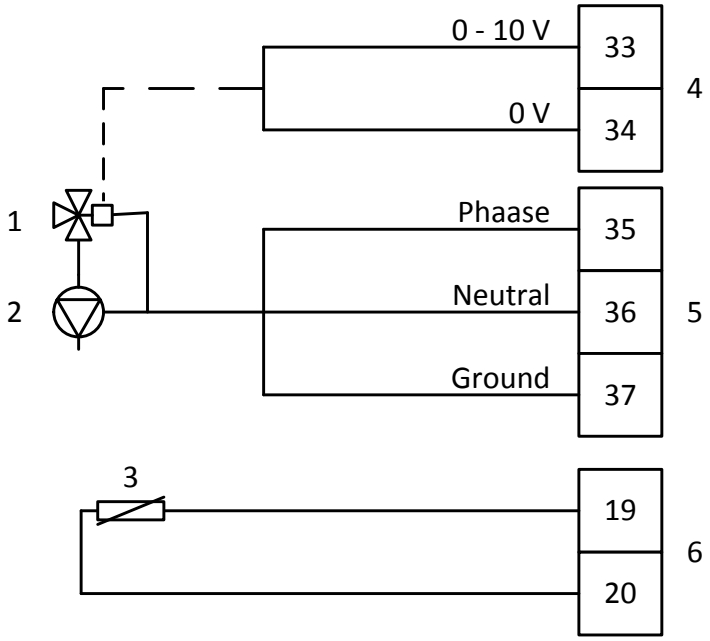


Figure 5.12. Wiring diagram of the buffer tank temperature probe.

2nd zone pump and modulating 3-way valve (for installations with heating/cooling outlet temperatures at two temperature levels)

The heat pump can manage an external circulating pump and modulating 3-way valve to produce a second temperature level for the heating/cooling system. Follow the diagram in **Figure 5.13** diagram (Also see sections 8.3 to 8.6).



Number	Description	Number	Description
1	Modulating 3-way valve	4	Analogue output signal 0-10 V
2	Circulating pump	5	Relay output
3	Outlet temperature probe	6	NTC Analogue input

Figure 5.13. Wiring diagram for connecting the circulating pump and the modulating 3-way valve of the 2nd zone.

6 Start Up

To carry out the start-up of the heat pump, follow these steps in the order listed.

1. Fill the heating/cooling indoor circuit by following the directions in section 6.1 .
2. Fill the built in circuit coil in the DHW tank as described in section 6.2.
3. Fill the DHW tank by following the directions in section 6.3 .
4. Fill the brine circuit by following the directions in section 6.4 .
5. Fill the heat pump circuit by following the directions in section 6.5 .
6. Inspect the installation, perform the initial start-up of the equipment and verify proper operation (see section 6.6).

6.1 Filling the heating/cooling circuit

DANGER!

- During the filling of the heating/cooling indoor circuit, be especially careful not to get water on the electrical cabinet, because it may cause personal injury from electric shock and/or cause equipment malfunction.

NOTE

- Do not add anti-corrosion additives or antifreeze to the heating/cooling system fluid, as this may damage the seals or other components and cause leaking.
- Before filling the heating/cooling circuit, complete the electrical installation, so that the climate control circuit pump can be used.

To fill the heating/cooling indoor circuit use water only. Before starting the heat pump, make sure the air in the cooling circuit has been completely purged, its pressure is suitable and there are no leaks in the circuit.

To facilitate filling the heating circuit start the heating pump. To do so, access SERVICE MENU -> INSTALLER CONF. -> MANUAL CONF. -> HEATING PUMP -> STATUS, Change the value to ON.

To completely drain the heating circuit, use the heat pump drain valve at the lowest point of the circuit, just below the heating circulator pump (see section 3.4).

6.2 Filling the built-in DHW tank coil circuit

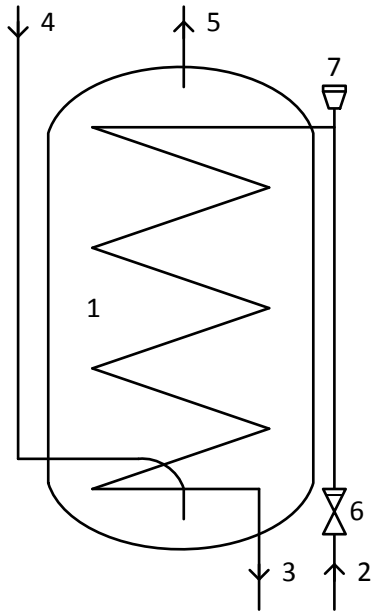
DANGER!

- During the filling of the DHW circuit, be especially careful not to get water on the electrical cabinet, because it may cause personal injury from electric shock and/or cause equipment malfunction.

NOTE

- Do not add anti-corrosion additives or antifreeze to hot water tank coil circuit. It could damage the seals or other components and cause leaking.

The coil circuit built into the hot water tank is connected to the heating circuit. Therefore, filling this circuit is simultaneous with the heating circuit. To do this, open the automatic air vent located at the entrance of the coil at the top of the tank (see **Figure 6.1**) during the heating circuit load to ensure complete removal of air.



Number	Description	Number	Description
1	DHW tank	5	DHW outlet
2	DHW coil inlet	6	Check valve
3	DHW coil outlet	7	DHW circuit automatic air vent
4	Cold water inlet		

Figure 6.1. Filling the DHW coil circuit

In ecoGEO C1 and C2 models, draining the tank coil circuit is done together with the heating circuit using the drain valve located under the heating pump (see section 3.4).

To empty the tank coil circuit in ecoGEO C3 models, use valve directly below the DHW circulation pump (see section 3.4).

6.3 Filling the DHW tank

DANGER!

- During the filling of the DHW tank, be especially careful not to get water on the electrical cabinet, because it may cause personal injury from electric shock and/or cause equipment malfunction.

To fill the hot water tank, follow these steps.

1. Open the valve located in the mains water inlet pipe.
2. Open one or more hot water taps in the dwelling to fully purge the air in the tank.

To empty the DHW tank, the heat pump has a drain valve on the bottom of the tank (see section 3.4).

6.4 Connecting the brine circuit

DANGER!

- During the filling of the brine circuit, be especially careful not to get antifreeze mix on the electrical panel, because it may cause personal injury from electric shock and/or cause equipment malfunction.

NOTE

- Before filling the brine circuit, complete the electrical installation, so that the brine pump can be used.
- Check local regulations before using any antifreeze mixture.

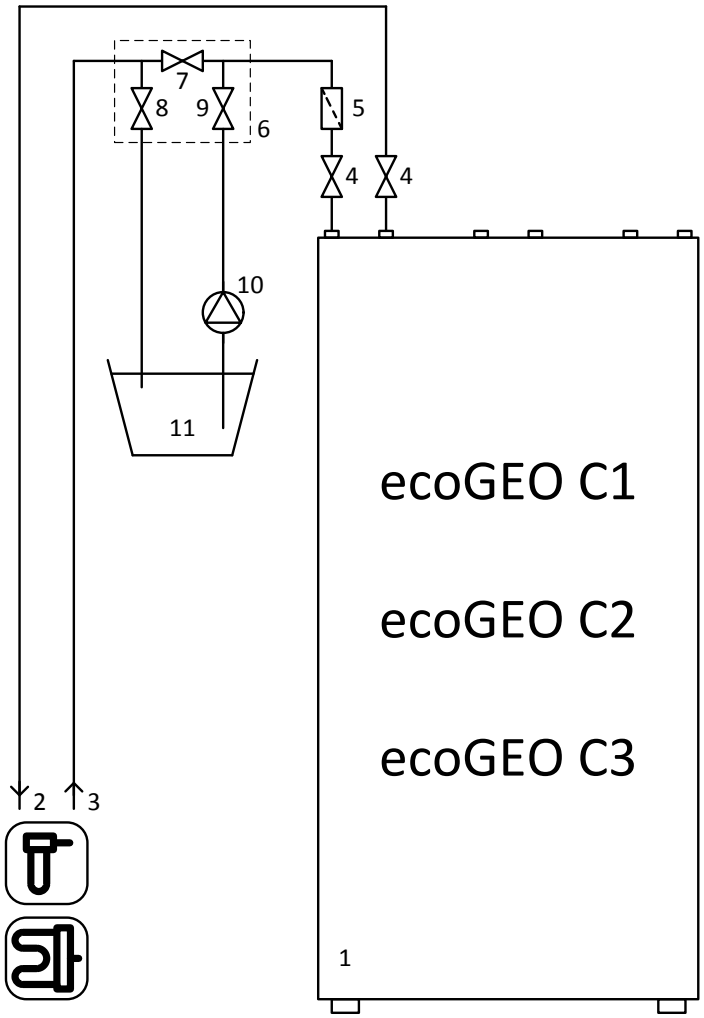
The intake system temperature may drop below 0°C, so a mixture of water antifreeze with a freezing point around -17 ± 2°C should be used. We recommend using propylene glycol antifreeze (max. 33% by volume) or ethylene glycol (max. 30% by volume) with corrosion inhibitor.

The estimated volume of the antifreeze mixture needed to fill the return circuit must take into account the following.

- Heat pump (pipes + heat exchangers + expansion vessel), 5 l.
- Brine tube per lineal metre of pipe. We do not recommend using pipes with diameters less than those in **Table 6.1** because the high speeds of circulation of the liquid can cause noise and corrosion problems.

Type of piping	Inner diameter (mm)	Volume (l/m)
PEM DN 40	36.0	1
PEM DN 32	28.0	0.6
Copper 28	25.6	0.5

Table 6.1. Volume calculation per lineal metre of pipe.



Number	Description	Number	Description
1	Heat pump	7	Filling valve A
2	Brine outlet	8	Filling valve B
3	Brine inlet	9	Filling valve C
4	Shut-off valve	10	External filling pump
5	Particle filter	11	External antifreeze mixture tank
6	Brine filling fitting		

Figure 6.2. Filling the brine circuit

Filling the brine circuit should be done by an external filling pump, as indicated in diagram **Figure 6.2** by following these steps.

1. Prepare the antifreeze mixture in suitable proportions in the external tank (11).
2. Connect the discharge of the filling pump (10) to filling valve C (9).
3. Connect a transparent hose from filling valve B (8) to the external antifreeze tank, so that its end is immersed.

4. Close filling valve A (7).
5. Open filling valves B and C.
6. Activate the external filling pump to fill the circuit.
7. Activate in manual mode the brine circuit pump (SERVICE MENU -> INSTALLER CONF. -> MANUAL CONF. -> BRINE PUMP -> STATUS, change the value to ON) to facilitate the circulation of the antifreeze mixture through the circuit.
8. Keep the external filling pump and the brine pump running until no air bubbles are seen through the hose that returns to the antifreeze mixture tank.
9. Deactivate in manual mode the brine circuit pump (SERVICE MENU -> INSTALLER CONF. -> MANUAL CONF. -> BRINE PUMP -> STATUS, Change the value to OFF).
10. Open filling valve A while maintaining the external filling pump connected to remove air contained between filling valves B and C.
11. Close filling valve B and pressurize the brine circuit until the service pressure is achieved by the filling pump.
12. Close the filling valve C.
13. Disconnect the external filling pump and the remaining filling components.

To completely drain the brine circuit, use the heat pump drain valve at the lowest point of the circuit, just below the circulating pump (see section 3.4).

6.5 Configuring the system

Before starting the heat pump it must be configured to work with the heating system used and its main operating parameters defined. We recommend following the steps, outlined below.

1. Activate the heat pump front panel. Wait until the initial screen is displayed while the program is loading. Then, simultaneously press ***[Esc]*** and ***[Prg]*** on the front panel.
2. Once inside the service menu, select CHANGE LANGUAGE. Then access the language screen, where you can change the language on the front panel of your heat pump. Press ***[Esc]*** to return to the SERVICE menu.
3. Then select the INSTALLER CONF. option. Enter the service password (PW1).
4. Select OPERATING SCHEME to choose the type of installation in which the heat pump is fitted and the compressor speed (see sections 8.7 and 8.8). Press ***[Esc]*** to return to INSTALLER CONF. menu.
5. Select the CLIMATE CONTROL menu. Several screens show the design parameters of the installation, and here they can be selected.
6. In DESIGN PARAMETERS 1 set the indoor and outdoor design temperatures.
7. In DESIGN PARAMETERS 2 adjust the heating outlet temperature at the outdoor design temperature for the main zone. If you have selected Scheme 4, also modify the temperature of zone 2.
8. In DESIGN PARAMETERS 3 choose the radiation system. If you have selected Scheme 4, do the same for zone 2.
9. In DESIGN PARAMETERS 4 set the type of building insulation from good, average and bad.
10. In DESIGN PARAMETERS 5 set the value of the heating curve gradient for the main zone (Scheme 3) and 2^{nd} zone (scheme 4).

11. Only if indoor th-Tune terminals are installed go to TH-TUNE and enable the th-Tune option. Set values of 1 and 2 for the indoor terminal address of the main and secondary zones, respectively. This second zone only exists if you have selected Scheme 4. We recommend not changing the default values that appear on the screen in "BMS SETTINGS" (**Figure 4.7**). Press ***[Esc]*** to return to menu INSTALLER CONF.
12. Only if conventional relay type thermostats are installed Go to MANUAL CONF. In the digital inputs display, enable the THERMOSTAT IMPUT DI1 and choose the operating logic, NO or NC (normally open or normally closed). If you choose the NC option, the input entered in contacts 38 and 39 (see section 8.3) so the pump is activated must be an open circuit. If the NO option is chosen, the input required for the activation of the pump is a closed circuit. For ecoGEO C3 models, the same thermostat can be used to control active heating and cooling. To do so, when choosing, you must take into account the heat pump logic to produce heating or cooling, respectively.
13. Go to PROBE CONF. In this menu, you can make corrections to the values measured by the temperature probes. These are factory calibrated and we only recommend correcting the value of the outdoor probe if using a long cable. Press ***[Esc]*** to return to menu INSTALLER CONF.
14. We recommend changing the password once the computer settings are complete to prevent users accessing those menus for use by the installer. Once modified, write it down and keep it handy for future maintenance work. Select the CHANGE PASSWORD and change it.

Parameter	System	Recommended Value	Comments
Indoor design temperature	-	(21-23) ºC	Regulation of Thermal Installations in Buildings
Outdoor design temperature[1]	-	-	UNE 1000012001
Heating outlet design temperature	Low temperature radiators	50 ºC.	Technical Committee CEN / TC 228
	Fancoils / Convectors	45 ºC.	
	Underfloor heating	35 ºC.	
Heating curve gradient	-	1	-

[1] Minimum environmental temperature for operating the installation. It is based on the place where the installation is located.

Table 6.2. Recommended values for the parameters of climate control.

6.6 Final inspection and commissioning of the installation

NOTE

- The initial start-up should only be done after verifying that the heating/cooling, brine and DHW circuits have been filled and purged properly. Damage may cause equipment malfunction.
- Note that if during start up any alarm is triggered, it may be due to faulty circuit purging.
- ecoGEO heat pumps have a program for drying the floors when underfloor heating is installed (see section).

Before initial start-up, check the following points to ensure that they have been completed successfully.

1. Inspect heating, brine and DHW circuits.
   - The heating/cooling indoor system was performed according to **Figure 5.2**, including all components.
   - The DHW system was performed according to **Figure 5.3**, including all components.
   - The brine system was performed according to **Figure 5.5**, including all components.
   - The inlet and outlet pipes from the different circuits have been properly insulated.
   - The heating/cooling and brine circuits have been filled, purged and pressurized properly.
   - The installation has been inspected for leakage of fluids.

2. Inspect the wiring.
   - The installation of the heat pump power supply is done according to **Figure 5.7** .
   - The electric installation includes an external switch that shuts off all circuits (phase and neutral).
   - The indoor terminals have been correctly positioned and installed.
   - The outdoor temperature probe has been correctly positioned and installed.
   - The buffer tank temperature probe has been installed correctly (only in systems with intermediate buffer tank).
   - The external circulating pump has been installed correctly (only installations with two outlet temperature levels controlled by the heat pump).

3. Start the heat pump and inspect any abnormal noises.
   - Check the equipment for abnormal noises that indicate possible damage to any of its components during transport and installation. Check the heat pump in all modes of operation (production of heating, active/free cooling and DHW) to ensure that there is no abnormal noise.
   - Also inspect any abnormal noises elsewhere in the installation.

7 Identifying problems and troubleshooting.

7.1 Alarms Lists

There are a number of parameters that the heat pump monitors at all times to check the equipment is working properly. If any of these parameters is not within the standard value range, an alarm is activated to inform the user that the heat pump is malfunctioning. If an alarm is activated, the **[Alarm]** button on the front panel lights up red and if you press the button, you can access the alarm menu (see section 4.5 , Menu 1.8).

Alarm N°	MESSAGE
1	High discharge pressure
2	Low suction pressure
3	Low brine system pressure
4	Low heating system pressure
5	High discharge temperature
6	High inverter temperature
7	Low brine outlet temperature
8	Low brine inlet temperature
9	High heating outlet temperature
10	Temperature probe fault (the defective probe is shown on screen)
11	Pressure transducer fault (the defective transducer is shown on screen)
12	Failure of a indoo th -Tune terminal (the defective terminal is shown on screen)
13	Temperature reading failure of a indoor th -Tune terminal (the defective terminal is shown on screen)
14	Humidity reading failure of a indoor th -Tune terminal (the defective terminal is shown on screen)
	Internal clock failure of a indoor th -Tune terminal (the defective terminal is shown on screen)
15	Incorrect superheat

Table 7.1. List of alarms and messages displayed on the front panel.

7.2 Comfort problems

The following list shows some of the common comfort-related problems that can be found and their possible causes and remedies.

Symptom	Possible Cause	Remedy
DHW temperature too low	Occasional high demand for DHW	Wait a few hours and then check if the DHW temperature has increased
	DHW temperature set too low	Increase the temperature of DHW setpoint (see USER MENU -> DHW-> DHW-> Change setpoint value)
	Heat pump is faulty	Contact the service centre
Indoor temperature too high or low	Occasional high demand for heating	Wait a few hours and then check the indoor temperature
	Defective heating/cooling curve	Set the heating/cooling curve properly (see USER MENU -> Heating -> HEATING 2 -> Raise/Lower the heating curve)
	The operating program (WINTER/SUMMER) is incorrect	Select the correct operating program or select the AUTO mode (see USER MENU -> ON / OFF -> ON / OFF ecoGEO 1 -> Change program to AUTO)
	Indoor temperature setting is too high / low	Set up the indoor ambient temperature in the th -Tune terminal or the front panel of the heat pump
	Heat pump is faulty	Contact the service centre
The heat pump does not start up	The minimum time between heat pump start-ups has not elapsed (20 minutes)	Wait 20 minutes and check if the heat pump has started up
	Alarms are active	Clear active alarms (see ALARM MENU -> ALARM RESET -> Reset alarms Change to Yes)
	There are no active alarms that can be disabled	Contact the service centre
	The power circuit breaker on the electrical cabinet of the heat pump has tripped	Reset the power circuit breaker on the electrical cabinet of the heat pump
	The control circuit breaker on the electrical cabinet of the heat pump has tripped	Reset the control circuit breaker on the electrical cabinet of the heat pump
	The power supply circuit breaker on the electrical cabinet of the heat pump has tripped	Reset the power supply circuit breaker on the electrical cabinet of the heat pump.
	Heat pump is faulty	Contact the service centre

Table 7.2. Identifying problems and troubleshooting.

8 Technical Specifications

8.1 Technical data table

ecoGEO C Geothermal Pumps TECHNICAL DATA		Unit	ecoGEO C1		ecoGEO C2		ecoGEO C3	
			3-12	5-22	3-12	5-22	3-12	5-22
Application	Heating and DHW	-	•	•	•	•	•	•
	Integrated DHW tank 170 l	-	•	•	•	•	•	•
	Active cooling	-					•	•
	Integrated free cooling	-			•	•		
Refrigerant	Type	-	R410A	R410A	R410A	R410A	R410A	R410A
Components	Compressor	-	Scroll with Copeland inverter					
	Expansion valve	-	Carel Electronic					
	Heat exchangers	-	Alfa Laval Plates					
	Circulation pumps	-	Wilo high efficiency variable speed					
	DHW tank with coil	-	Stainless steel tank and coil					
	Built-in expansion vessel (12 l).	-	Heating and brine circuits					
Electrical Data	Voltage	-	230 V / 50 Hz, 1/N/PE~					
	Magnetothermal protection	A	32	40	32	40	32	40
Efficiency	heating output[1]	kW	3-15	5-26	3-15	5-26	3-15	5-26
	heating output[2]	kW	3-14	5-23.5	3-14	5-23.5	3-14	5-23.5
	Power consumption[2]	kW	0.7-3.2	1.4-5.5	0.7-3.2	1.4-5.5	0.7-3.2	1.4-5.5
	COP[2]	-	4.6-5	4.6-5	4.6-5	4.6-5	4.6-5	4.6-5
	EER[2]	-	6.1-6.9	6.1-6.9	6.1-6.9	6.1-6.9	6.1-6.9	6.1-6.9
	Active cooling output[3]	kW	--	--	--	--	4-16.3	6.9-30
	Free cooling output	kW	--	--	6	6	--	--
Refrigerant Circuit	Refrigerant charge	kg	1.35	1.7	1.35	1.7	1.5	2.0
	Maximum working pressure	Bar	42	42	42	42	42	42
	Compressor oil	-	POE	POE	POE	POE	POE	POE
	Compressor oil charge	kg	2	2.5	2	2.5	2	2.5
Heating Circuit	Maximum/minimum temp.	ºC	60/20					
	Maximum working pressure	Bar	3					
	Flow rate	l/h	1200 - 4500					
Brine Circuit	Maximum/minimum temp.	ºC	20/-10					
	Maximum working pressure	Bar	3					
	Flow rate	l/h	1200 - 4500					
	Recommended antifreeze[4]	-	propylene glycol / water freezing point -17 ± 2 ° C					
DHW	DHW tank volume	l	170	170	170	170	170	170
	Maximum working pressure	Bar	8	8	8	8	8	8
	Maximum temperature (without support)	ºC	50	50	50	50	50	50
	Maximum temperature (with support)	ºC	75	75	75	75	75	75
Soundproofing	Noise emission level	dB	42	45	42	45	42	45
Dimensions	H x W x D	mm	1800 x 600 x 700					
Weight	unladen weight (without assembly)	kg	260	270	260	270	260	270

1) According to EN 14511, 5/2 - 30/35 º C (including circulation pumps). Provisional=pending qualification.

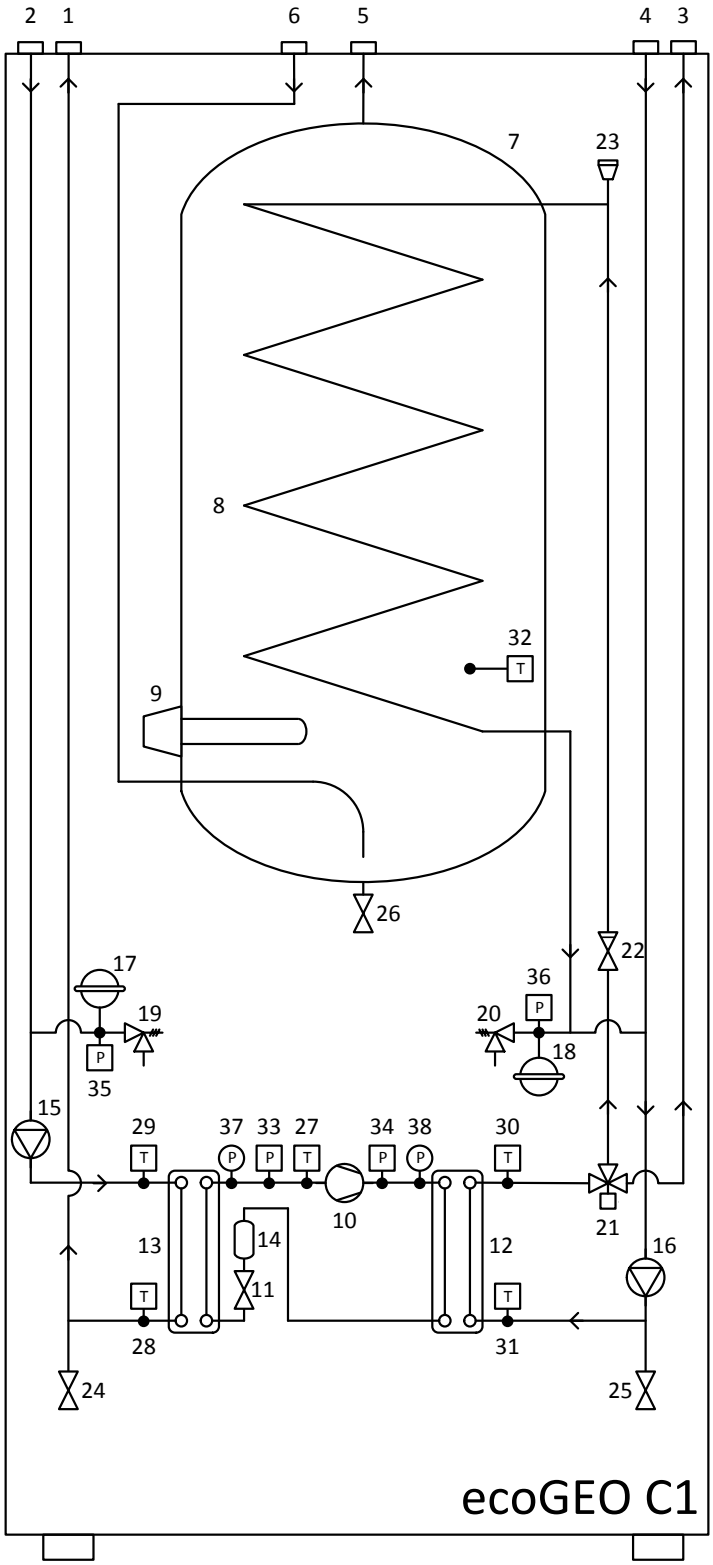
2) According to EN 14511, 0/-3 - 30/35 º C (including circulation pumps). Provisional=pending qualification.

3) According to EN 14511, 7/12 - 30/35 º C (including circulation pumps). Provisional=pending qualification.

4) Always consult regional regulations before using antifreeze.

8.2 Internal diagrams of the heat pump

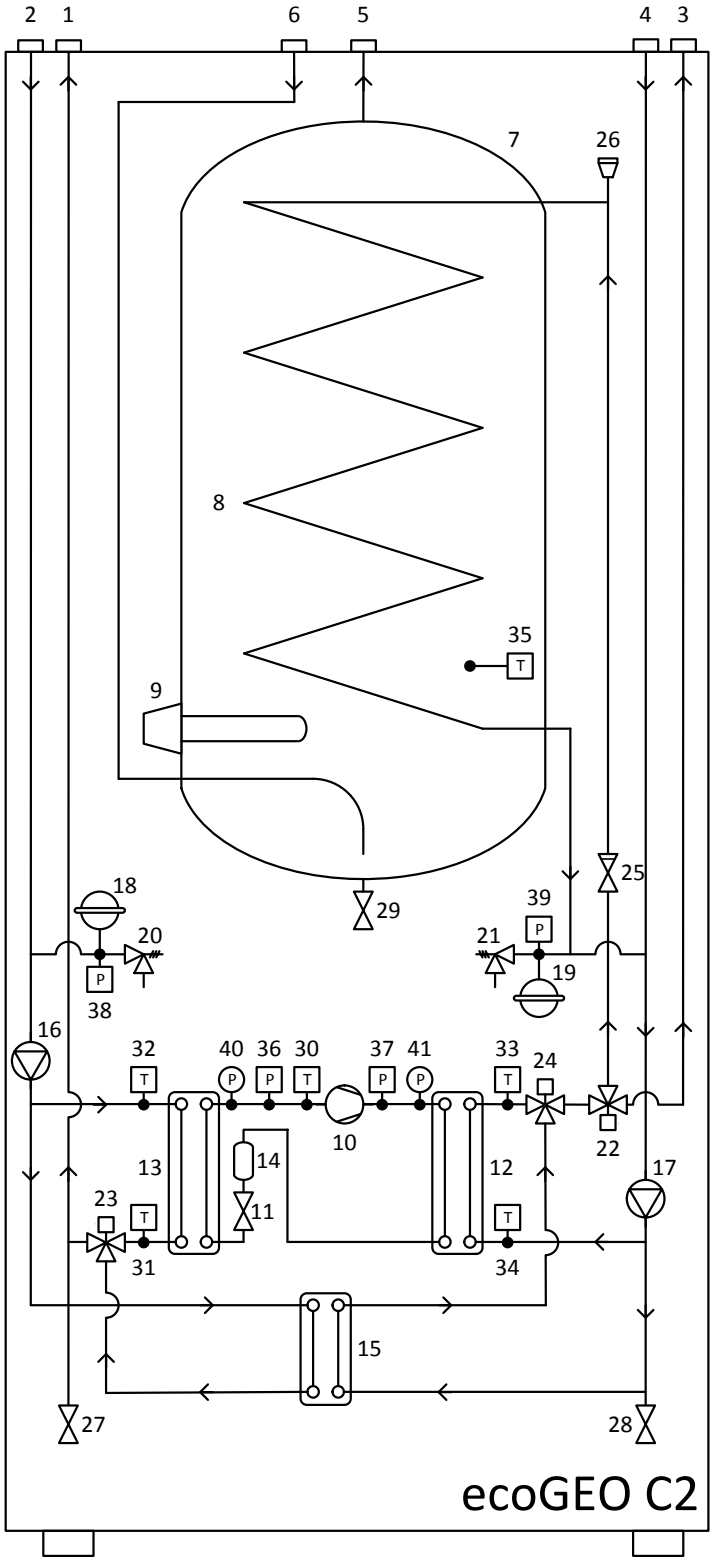
ecoGEO C1



Position

1. Brine outlet, (G1'' F)
2. Brine inlet, (G1'' F)
3. Heating outlet, (G1'' F)
4. Heating inlet, (G1'' F)
5. DHW outlet, (G1'' F)
6. Cold water inlet (G1'' F)
7. DHW tank
8. DHW circuit coil
9. Electric heater (legionella protection)
10. Inverter compressor
11. Electronic expansion valve
12. Condenser
13. Evaporator
14. Combi filter dryer
15. Brine pump
16. Heating pump
17. Brine expansion vessel
18. Heating expansion vessel
19. Brine safety valve
20. Heating safety valve
21. 3-way valve, heating/DHW
22. DHW circuit check valve
23. DHW circuit automatic Air vent
24. Brine circuit drain valve
25. Heating circuit drain valve
26. DHW tank drain valve
27. Compressor suction temp. probe
28. Brine outlet temp. probe
29. Brine inlet temp. probe
30. Heating outlet temp. probe
31. Heating inlet temp. probe
32. DHW tank temp. probe
33. Low pressure transducer
34. High pressure transducer
35. Brine circuit pressure transducer
36. Heating circuit pressure transducer
37. Low pressure switch
38. High pressure switch

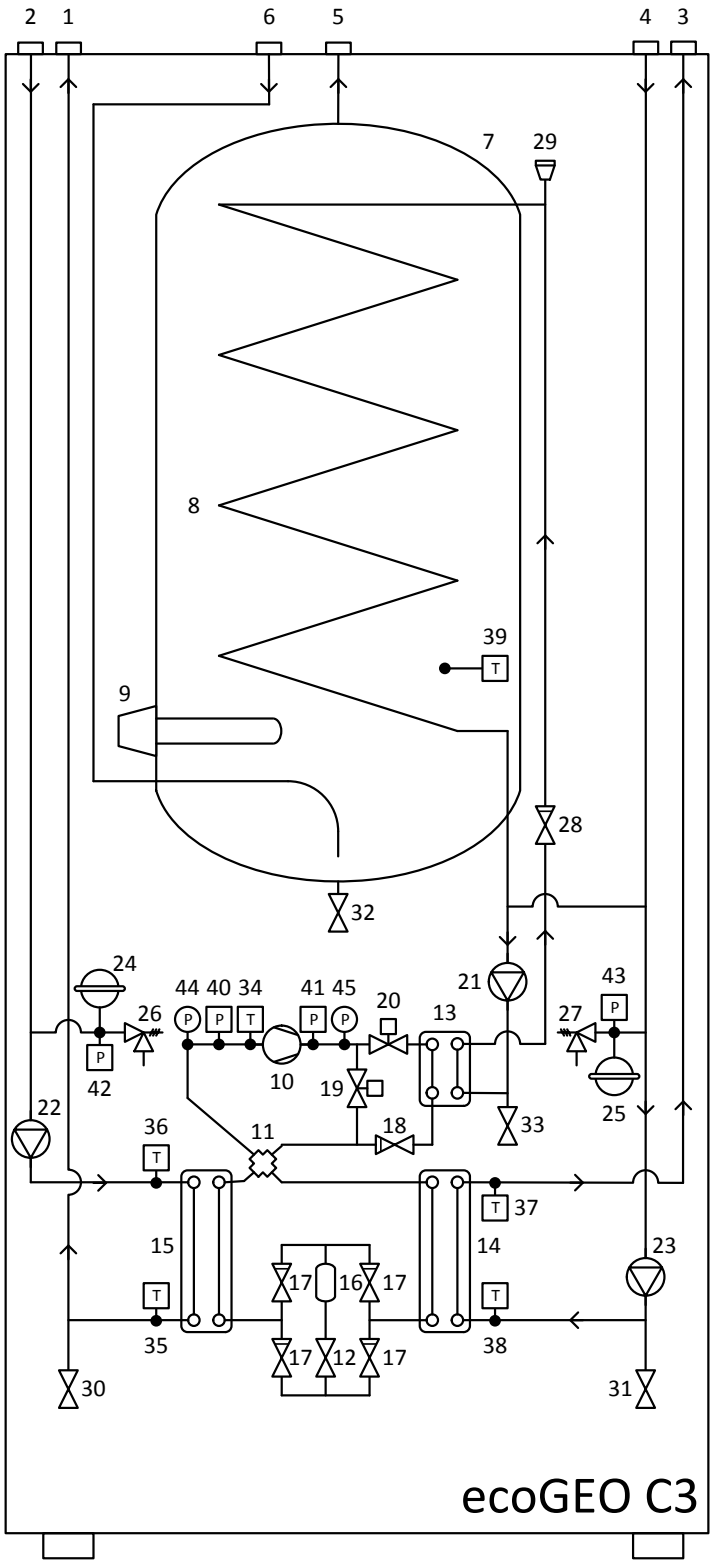
ecoGEO C2



Position

1. Brine outlet, (G1'' F)
2. Brine inlet, (G1'' F)
3. Heating/cooling outlet, (G1'' F)
4. Heating/cooling inlet, (G1'' F)
5. DHW outlet, (G1'' F)
6. Cold water inlet, (G1'' F)
7. DHW tank
8. DHW circuit coil
9. Electric heater (legionella protection)
10. Inverter compressor
11. Electronic expansion valve
12. Condenser
13. Evaporator
14. Combi filter dryer
15. Free cooling heat exchanger
16. Brine pump
17. Heating/cooling pump
18. Brine expansion vessel
19. Heating/cooling expansion vessel
20. Brine safety valve
21. Heating/cooling safety valve
22. 3-way valve, Heating/DHW
23. 3-way valve, brine side free cooling
24. 3-way valve, indoor side free cooling
25. DHW circuit check valve
26. DHW circuit automatic Air vent
27. Brine drain valve
28. Heating/cooling drain valve
29. DHW tank drain valve
30. Compressor suction temp. probe
31. Brine outlet temp. probe
32. Brine inlet temp. probe
33. Heating/cooling outlet temp. probe
34. Heating/cooling temp. probe
35. DHW tank temp. probe
36. Low pressure transducer
37. High pressure transducer
38. Brine pressure transducer
39. Heating/cooling pressure transducer
40. Low pressure switch
41. High pressure switch

ecoGEO C3

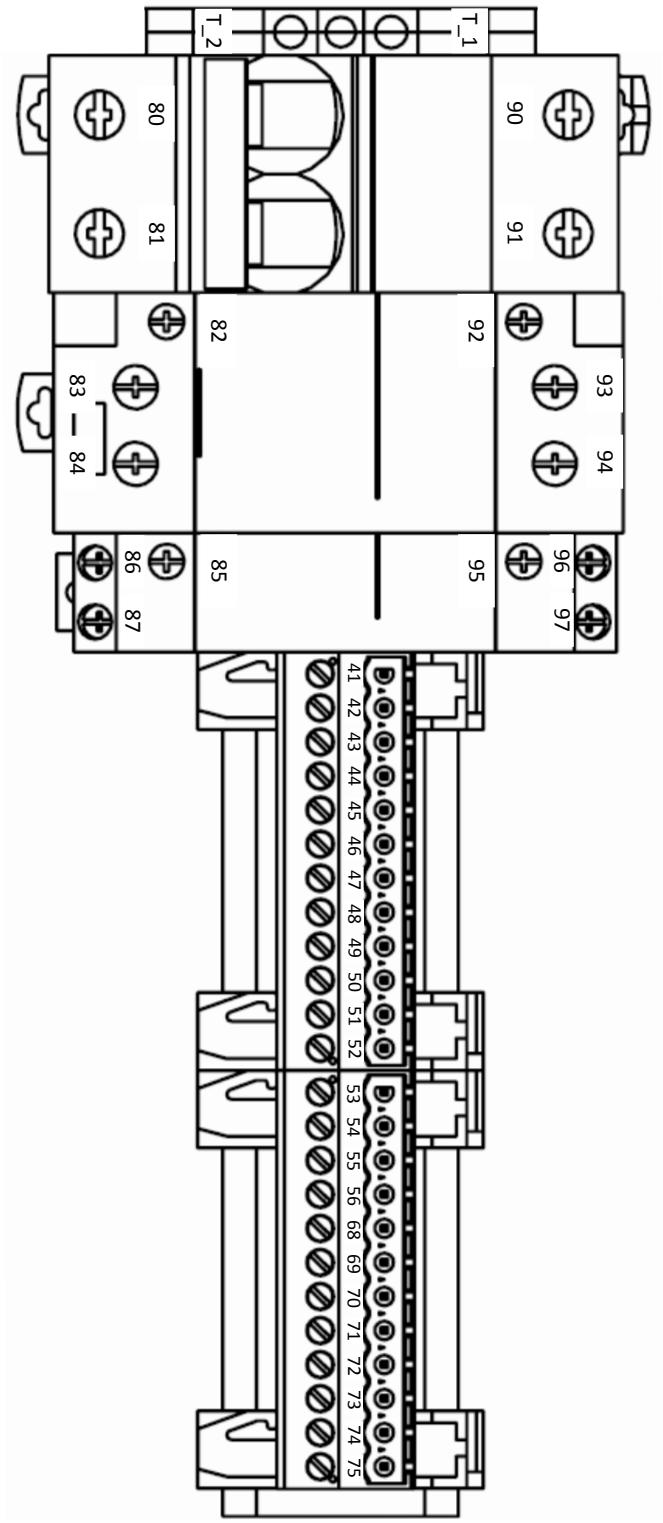


Position

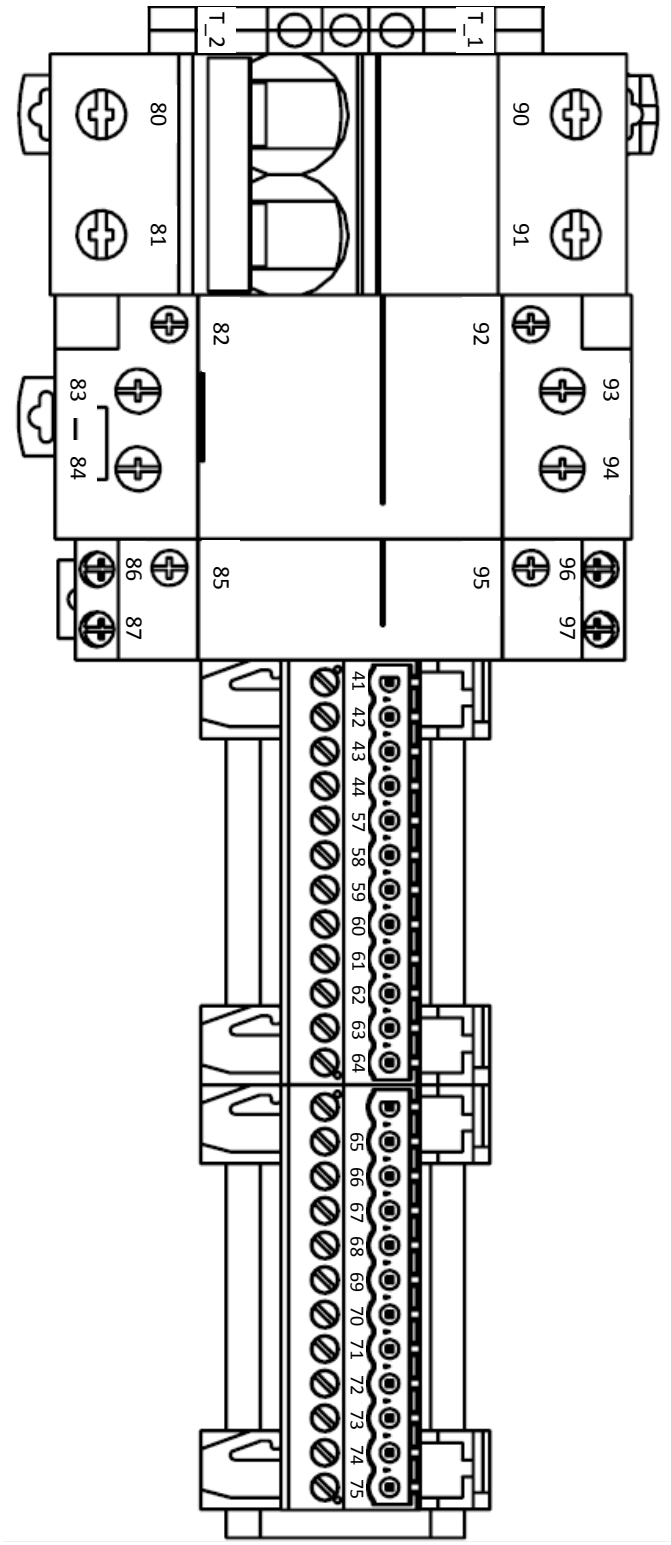
1. Brine outlet, (G1'' F)
2. Brine inlet, (G1'' F)
3. Heating/cooling outlet, (G1'' F)
4. Heating/cooling inlet, (G1'' F)
5. DHW outlet, (G1'' F)
6. Cold water inlet, (G1'' F)
7. DHW tank
8. DHW circuit coil
9. Electric heater (legionella protection)
10. Inverter compressor
11. 4-way reversing valve
12. Electronic expansion valve
13. DHW desuperheater
14. Condenser/Evaporator
15. Evaporator/Condenser
16. Combi filter dryer
17. Reverse cycling check valves
18. DHW desuperheater check valve
19. Heating/cooling solenoid valve
20. DHW desuperheater solenoid valve
21. DHW circuit pump
22. Brine pump
23. Heating/cooling pump
24. Brine expansion vessel
25. Heating/cooling expansion vessel
26. Brine safety valve
27. Heating/cooling safety valve
28. DHW circuit check valve
29. DHW circuit automatic Air vent
30. Brine drain valve
31. Heating/cooling drain valve
32. DHW tank drain valve
33. DHW circuit drain valve
34. Compressor suction temp. probe
35. Brine outlet temp. probe
36. Brine inlet temp. probe
37. Heating/cooling outlet temp. probe
38. Heating/cooling inlet temp. probe
39. DHW tank probe
40. Low pressure transducer
41. High pressure transducer
42. Brine pressure transducer
43. Heating/cooling pressure transducer
44. Low pressure switch
45. High pressure switch

8.3 Location of electrical cabinet connections

Upper terminal block ecoGEO C1 and ecoGEO C2 models

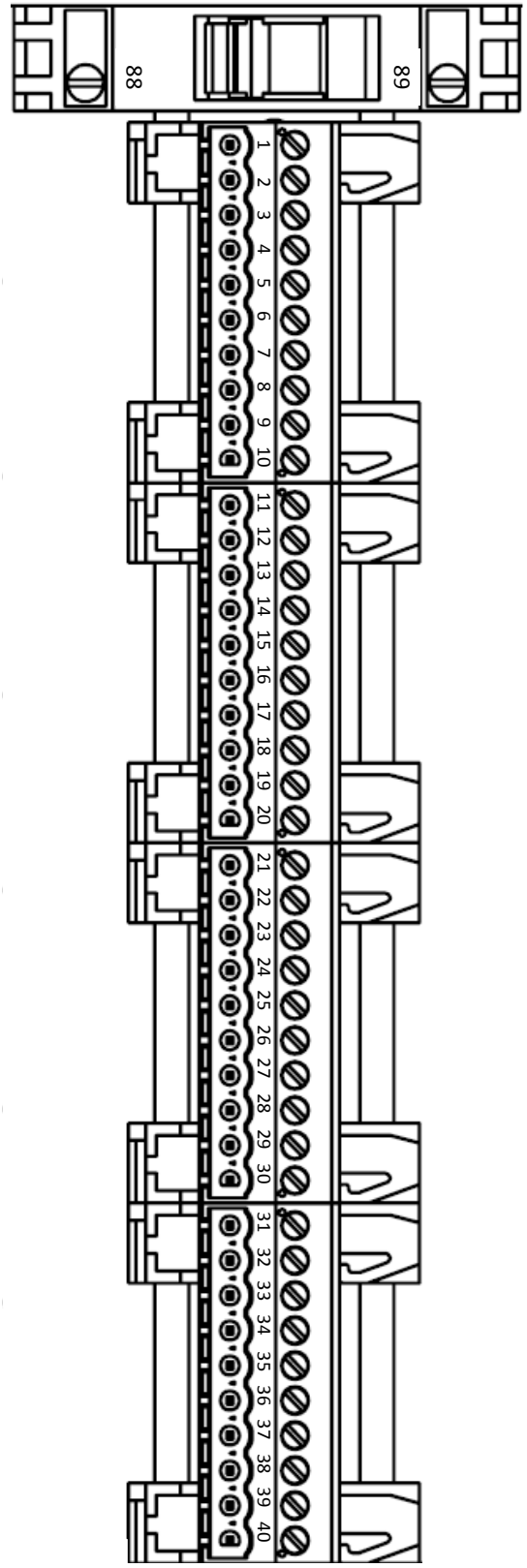


Upper terminal block ecoGEO C3 models



CONNECTIONS ON THE UPPER TERMINAL BLOCK OF THE ELECTRICAL CABINET		
Terminal No.	**Component**	
T_1	Ground	Power supply
90	Neutral	
91	Phase	
93	Inverter / compressor	
94		
96	Electric heater (legionella protection)	
97		
41	High-pressure switch	
42		
43	Low-pressure switch	
44		
45	3-way valve to produce heating / DHW (ecoGEO C1 and C2 only)	
46		
47		
48		
49	3-way valve in free cooling / brine only ecoGEO C2 models)	
50		
51		
52		
53	3-way valve in free cooling /heating (only ecoGEO C2 models)	
54		
55		
56		
57	Cycle inversion valve (only ecoGEO C3 models)	
58		
59	DHW solenoid valve desuperheater (only ecoGEO C3)	
60		
61		
62	DHW pump (only ecoGEO C3)	
63		
64		
65	Heating solenoid valve (only ecoGEO C3)	
66		
67		
68	Brine pump	
69		
70		
71	Heating pump	
72		
73		
74	Alarm	
75		

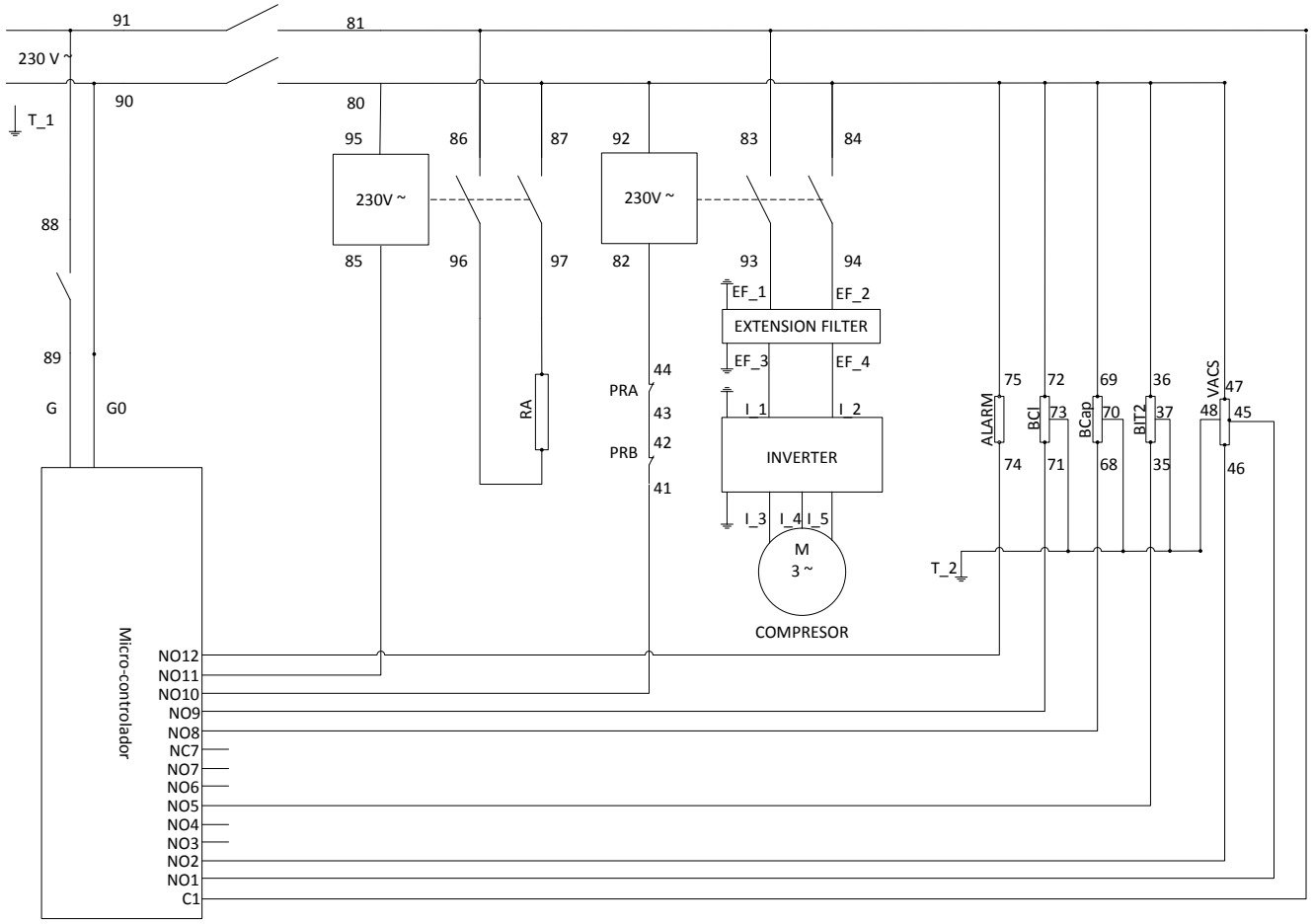
Lower terminal block on ecoGEO C1, ecoGEO C2 AND ecoGEO C3 models



CONNECTIONS ON THE LOWER TERMINAL BLOCK OF THE ELECTRICAL CABINET	
Terminal No.	**Component**
1	NTC Analogue input
2	Brine outlet temp. probe
3	NTC Analogue input
4	Brine inlet temp. probe
5	NTC Analogue input
6	Heating outlet temp. probe
7	NTC Analogue input
8	Heating inlet temp. probe
9	NTC Analogue input
10	Compressor suction temp. probe
11	Analogue ratiometric input 0-5 Vdc
12	Compressor suction pressure transducer
13	
14	Analogue ratiometric input 0-5 Vdc
15	Compressor discharge pressure transducer
16	
17	NTC Analogue input
18	Internal DHW tank temperature probe
19	NTC Analogue input
20	Buffer tank temperature probe or 2nd zone outlet temperature probe
21	NTC Analogue input
22	Outdoor temperature probe
23	Analogue ratiometric input 0-5 Vdc
24	Brine pressure transducer
25	
26	Analogue ratiometric input 0-5 Vdc
27	Heating pressure transducer
28	
29	Analogue output 0-10 Vdc
30	Brine pump regulation
31	Analogue output 0-10 Vdc
32	Heating pump regulation
33	Analogue output 0-10 Vdc
34	Modulating mixing valve regulation zone 2
35	Relay output
36	Modulating mixing valve regulation/pressure valve zone 2
37	
38	Voltage free Digital input
39	Power on / off BC (thermostat control)
40	Not used

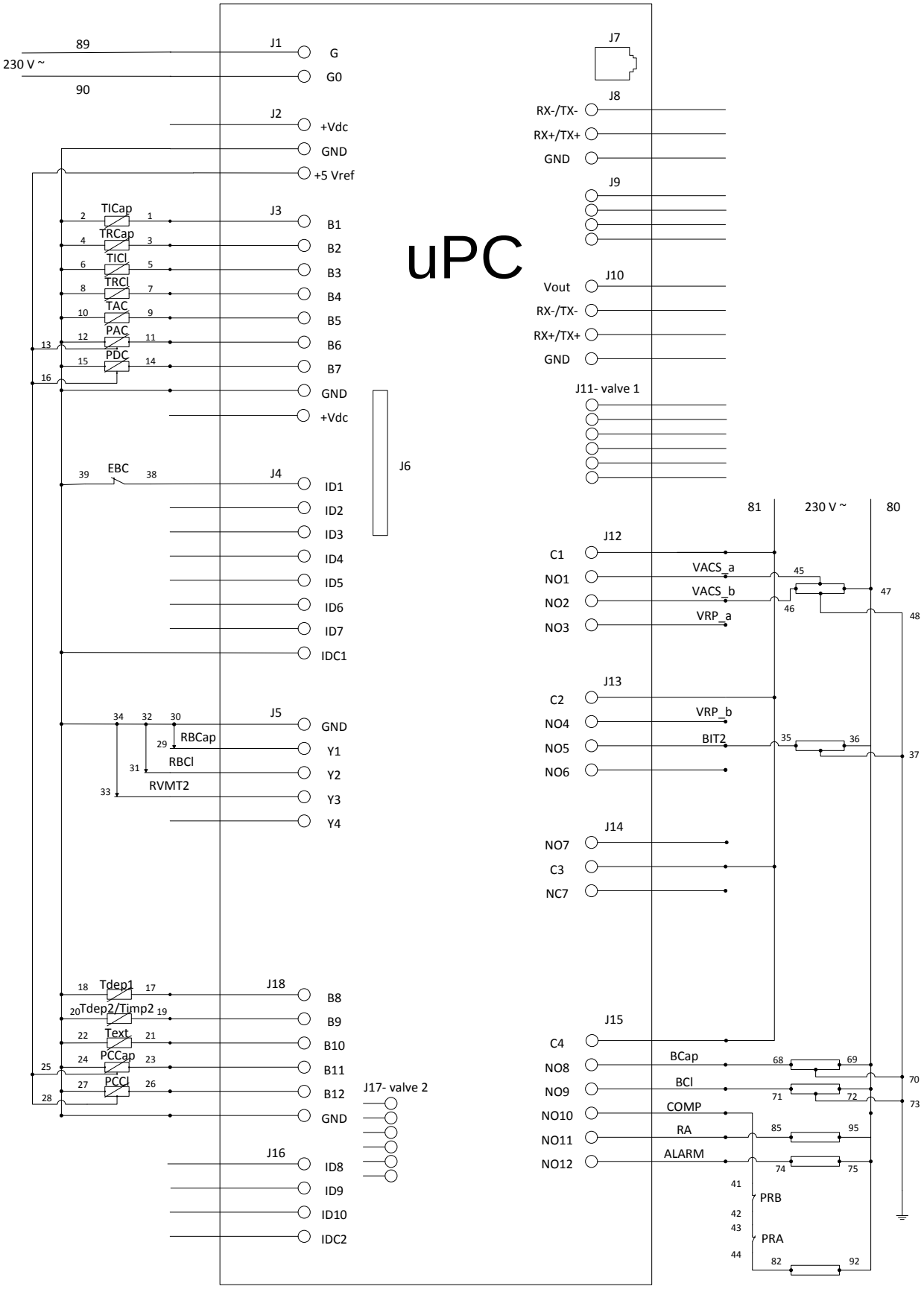
8.4 Wiring diagrams ecoGEO C1

ecoGEO C1 power diagram



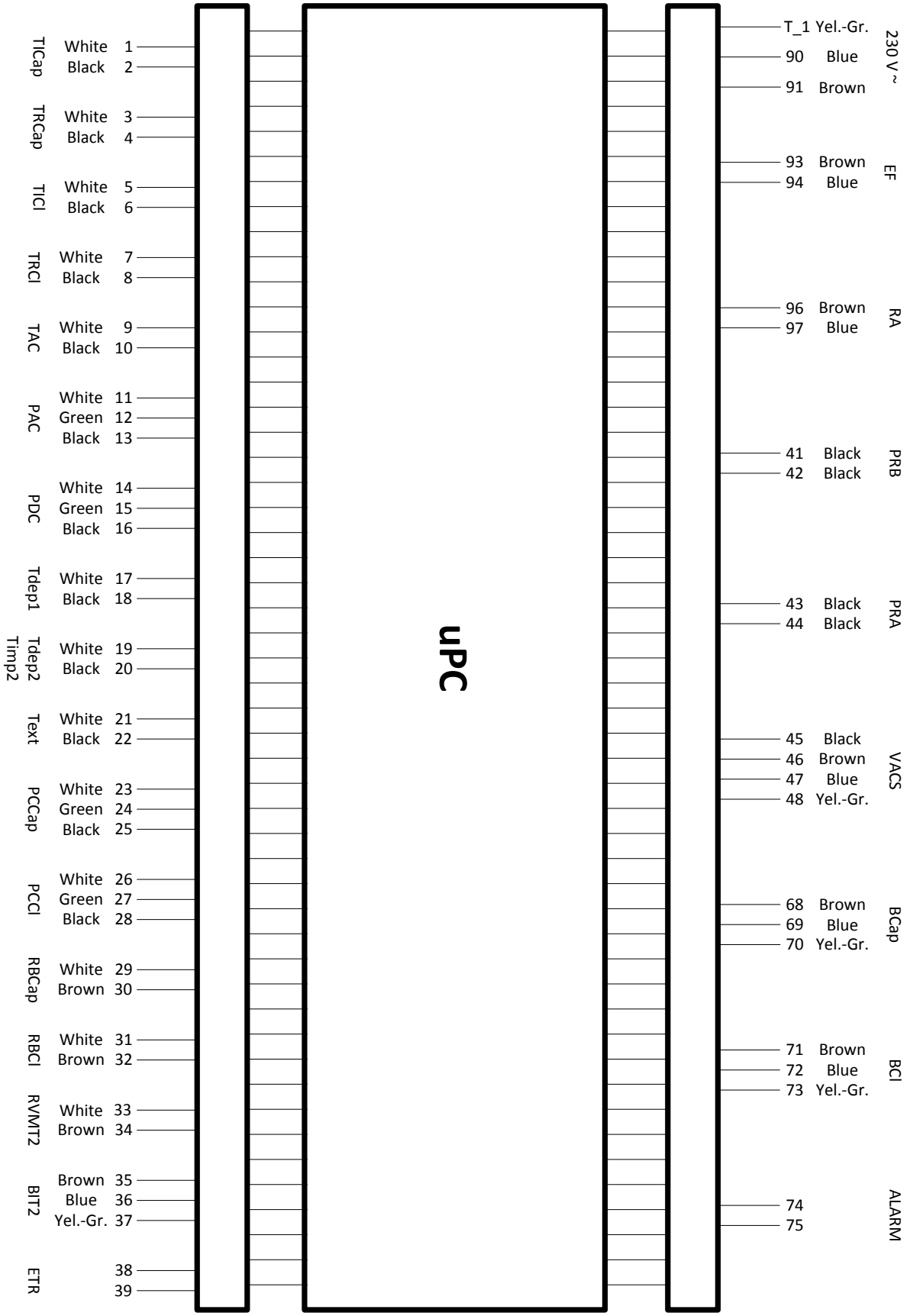
ecoGEO C1 POWER CONNECTIONS	
Nomenclature	**Description**
G	Micro-controller power supply (Phase)
G0	Micro-controller power supply (Neutral)
EF_X	Connection X EMI extension filter
I_X	Connection X Inverter
Digital outputs (to relay)	
VACS_X	DHW Valve, Wire X
BIT2	Circulating pump (2nd zone)
BCap	Brine circuit pump
BCl	Heating circuit pump
ALARM	Alarm
RA	Electric heater (legionella protection)

ecoGEO C1 micro-controller connection diagram



ecoGEO C1 MICRO-CONTROLLER CONNECTIONS	
Nomenclature	**Description**
G	Micro-controller power supply (Phase)
G0	Micro-controller power supply (Neutral)
PRA	High-pressure switch
PRB	Low-pressure switch
Digital Inputs	
EBC	Heat pump on signal
Analogue inputs	
TICap	Brine outlet temp. probe
TRCap	Brine inlet temp. probe
TICl	Heating outlet temp. probe
TRCl	Heating inlet temp. probe
TAC	Compressor suction temp. probe
PAC	Compressor suction pressure transducer
PDC	Compressor discharge pressure transducer
Tdep1	Tank 1 temperature probe (DHW tank)
Tdep2	Tank 2 temperature probe (buffer tank)
Timp2	2nd zone outlet temperature probe
Text	Outdoor temperature probe
PCCap	Brine circuit pressure transducer
PCCl	Heating circuit pressure circuit transducer
Digital outputs (to relay)	
VACS_X	DHW Valve, Wire X
BCap	Brine circuit pump
BCl	Heating circuit pump
BIT2	Circulating pump (2nd zone)
ALARM	Alarm
COMP	Compressor contactor
RA	Electric heater (legionella protection)
EF	EMI Filter extension
Analogue outputs (regulation)	
RBCap	Brine circuit pump regulation
RBCl	Heating circuit regulation
RVMT2	Regulation signal for 3-way modulating valve (2nd zone)

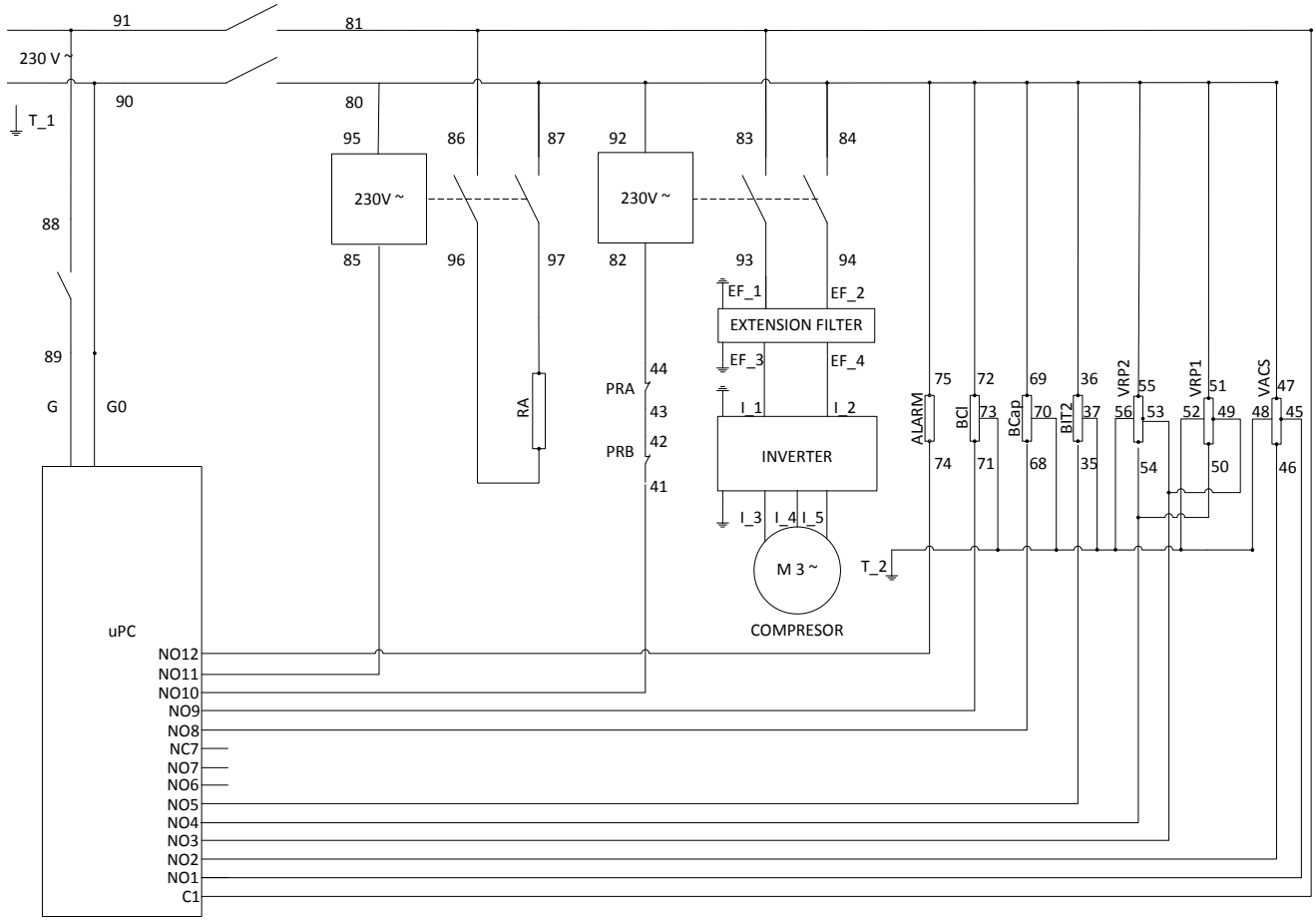
Installation diagrams ecoGEO C1



INSTALLATION CONNECTIONS ecoGEO C1	
Nomenclature	**Description**
L	Heat pump power supply (Phase)
N	Heat pump power supply (Neutral)
T	Heat pump power supply (Ground)
PRA	High-pressure switch
PRB	Low-pressure switch
Digital Inputs	
EBC	Heat pump on signal
Analogue inputs	
TICap	Brine outlet temp. probe
TRCap	Brine inlet temp. probe
TiCl	Heating outlet temp. probe
TRCl	Heating inlet temp. probe
TAC	Compressor suction temp. probe
PAC	Compressor suction pressure transducer
PDC	Compressor discharge pressure transducer
Tdep1	Tank 1 temperature probe (DHW tank)
Tdep2	Tank 2 temperature probe (buffer tank)
Timp2	2nd zone outlet temperature probe
Text	Outdoor temperature probe
PCCap	Brine circuit pressure transducer
PCCl	Heating circuit transducer
Digital outputs (to relay)	
VACS_X	DHW Valve, Wire X
BCap	Brine circuit pump
BCl	Heating circuit pump
BIT2	Circulating pump (2nd zone)
ALARM	Alarm
COMP	Compressor contact
RA	Electric heater (legionella protection)
EF	EMI Filter extension
Analogue outputs (regulation)	
RBCap	Brine circuit pump regulation
RBCl	Heating circuit pump regulation
RVMT2	Regulation signal for 3-way modulating valve (2nd zone)

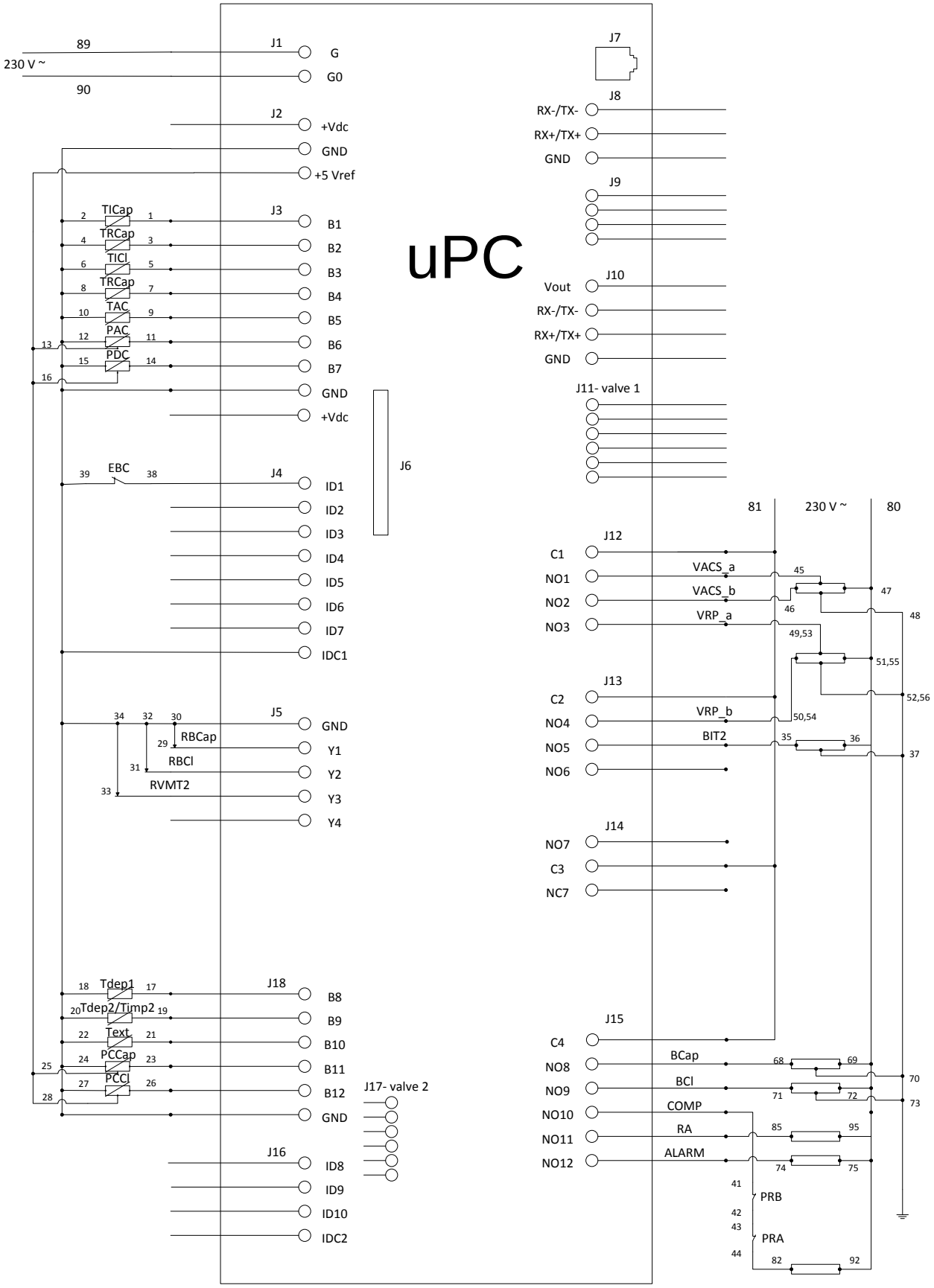
8.5 Wiring diagrams ecoGEO C2

ecoGEO C2 power diagram



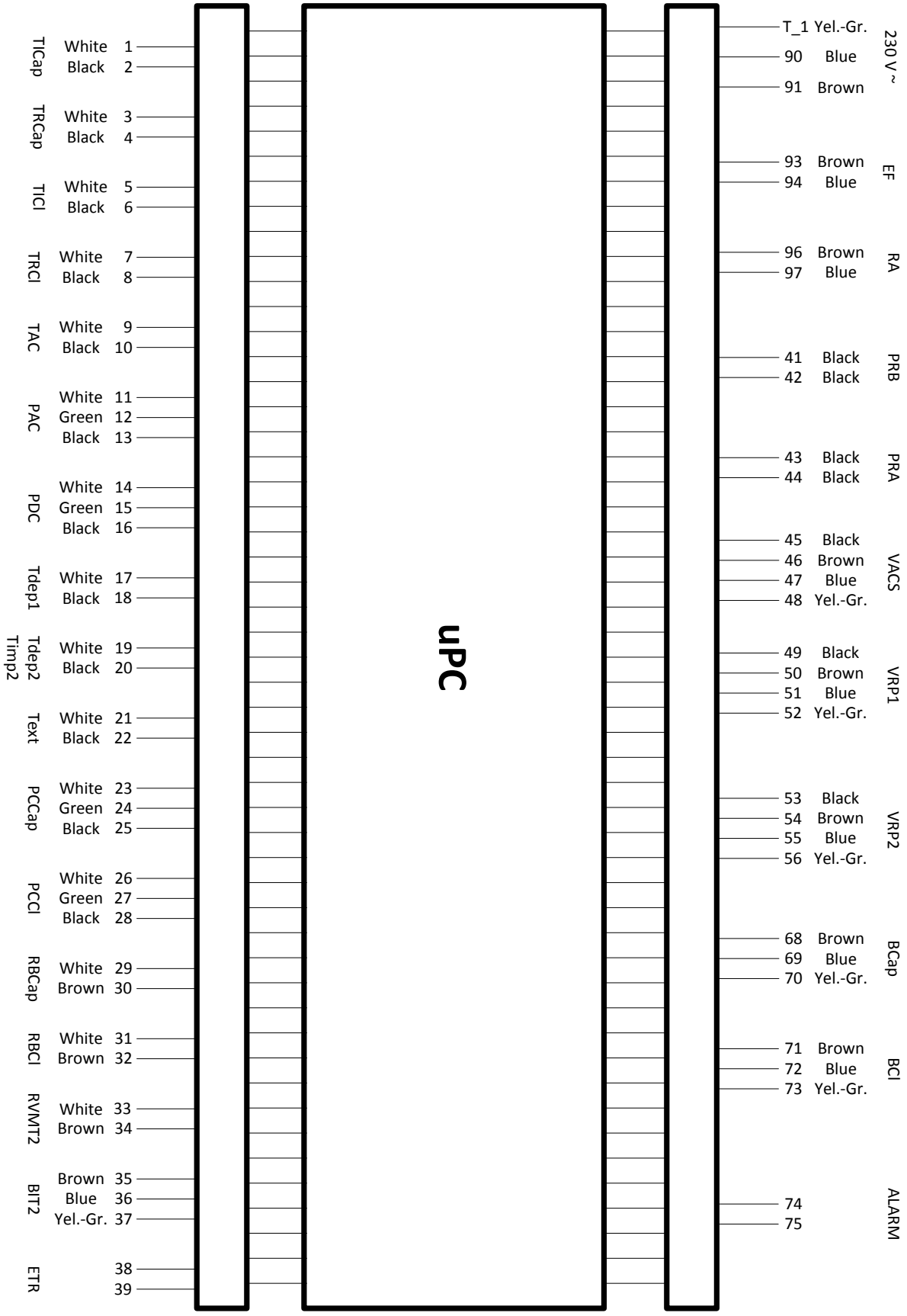
ecoGEO C2 POWER CONNECTIONS	
Nomenclature	**Description**
G	Micro-controller power supply (Phase)
G0	Micro-controller power supply (Neutral)
EF_X	Connection X EMI extension filter
I_X	Connection X Inverter
Digital outputs (to relay)	
VACS_X	DHW Valve, Wire X
VRP1_X	Free cooling valve 1, Wire X
VRP2_X	Free cooling valve 2, Wire X
BIT2	Circulating pump (2nd zone)
BCap	Brine circuit pump
BCl	Heating circuit pump
ALARM	Alarm
RA	Electric heater (legionella protection)

ecoGEO C2 micro-controller connection diagram



ecoGEO C2 MICRO-CONTROLLER CONNECTIONS	
Nomenclature	**Description**
G	Micro-controller power supply (Phase)
G0	Micro-controller power supply (Neutral)
PRA	High-pressure switch
PRB	Low-pressure switch
Digital Inputs	
EBC	Heat pump on signal
Analogue inputs	
TICap	Brine outlet temp. probe
TRCap	Brine inlet temp. probe
TiCl	Heating outlet temp. probe
TRCl	Heating inlet temp. probe
TAC	Compressor suction temp. probe
PAC	Compressor suction pressure transducer
PDC	Compressor discharge pressure transducer
Tdep1	Tank 1 temperature probe (DHW tank)
Tdep2	Tank 2 temperature probe (buffer tank)
Timp2	2nd outlet temperature probe
Text	Outdoor temperature probe
PCCap	Brine circuit pressure transducer
PCCl	Heating circuit pressure transducer
Digital outputs (to relay)	
VACS_X	DHW Valve, Wire X
VRP1_X	Free cooling valve 1, Wire X
VRP2_X	Free cooling valve 2, Wire X
BCap	Brine circuit pump
BCl	Heating circuit pump
BIT2	Circulating pump (2nd zone)
ALARM	Alarm
COMP	Compressor contact
RA	Electric heater (legionella protection)
EF	EMI Filter extension
Analogue outputs (regulation)	
RBCap	Brine circuit pump regulation
RBCl	Heating circuit pump regulation
RVMT2	Regulation signal for 3-way modulating valve (2nd zone)

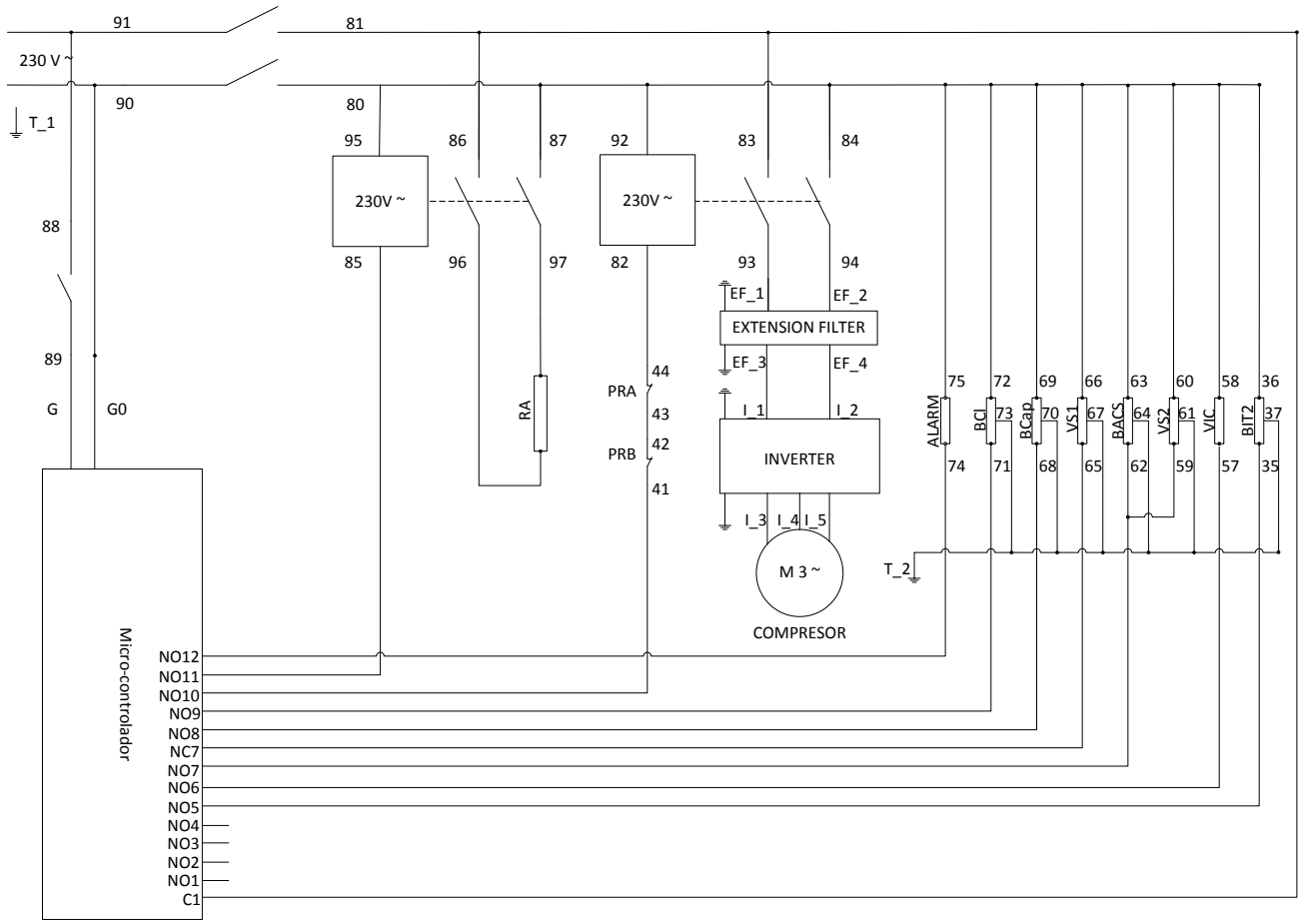
Installation diagrams ecoGEO C2



INSTALLATION CONNECTIONS ecoGEO C2	
Nomenclature	**Description**
L	Heat pump power supply (phase)
N	Heat pump power supply (Neutral)
T	Heat pump power supply (Ground)
PRA	High-pressure switch
PRB	Low-pressure switch
Digital Inputs	
EBC	Heat pump on signal
Analogue inputs	
TICap	Brine outlet temp. probe
TRCap	Brine inlet temp. probe
TiCl	Heating outlet temp. probe
TRCl	Heating inlet temp. probe
TAC	Compressor suction temp. probe
PAC	Compressor suction pressure transducer
PDC	Compressor discharge pressure transducer
Tdep1	Tank 1 temperature probe (DHW tank)
Tdep2	Tank 2 temperature probe (buffer tank)
Timp2	2nd zone temperature probe
Text	Outdoor temperature probe
PCCap	Brine circuit pressure transducer
PCCl	Heating circuit pressure transducer
Digital outputs (to relay)	
VACS_X	DHW Valve, Wire X
VRP1_X	Free cooling valve 1, Wire X
VRP2_X	Free cooling valve 2, Wire X
BCap	Brine circuit pump
BCl	Heating circuit pump
BIT2	Circulating pump (2nd zone)
ALARM	Alarm
COMP	Compressor contact
RA	Electric heater (legionella protection)
EF	EMI Filter extension
Analogue outputs (regulation)	
RBCap	Brine circuit pump regulation
RBCl	Heating circuit pump regulation
RVMT2	Regulation signal for 3-way modulating valve (2nd zone)

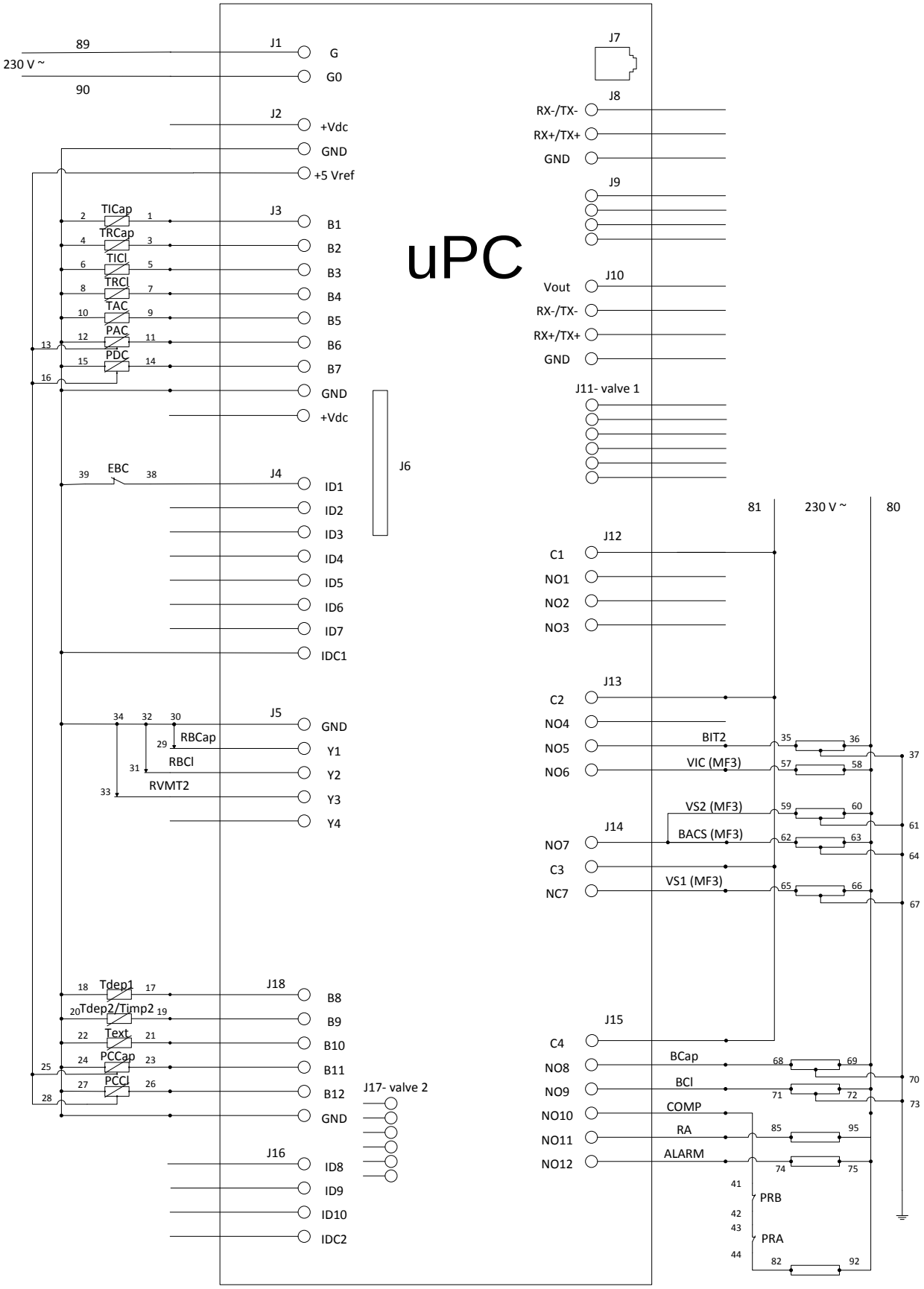
8.6 Wiring diagrams ecoGEO C3

Power diagrams ecoGEO C3



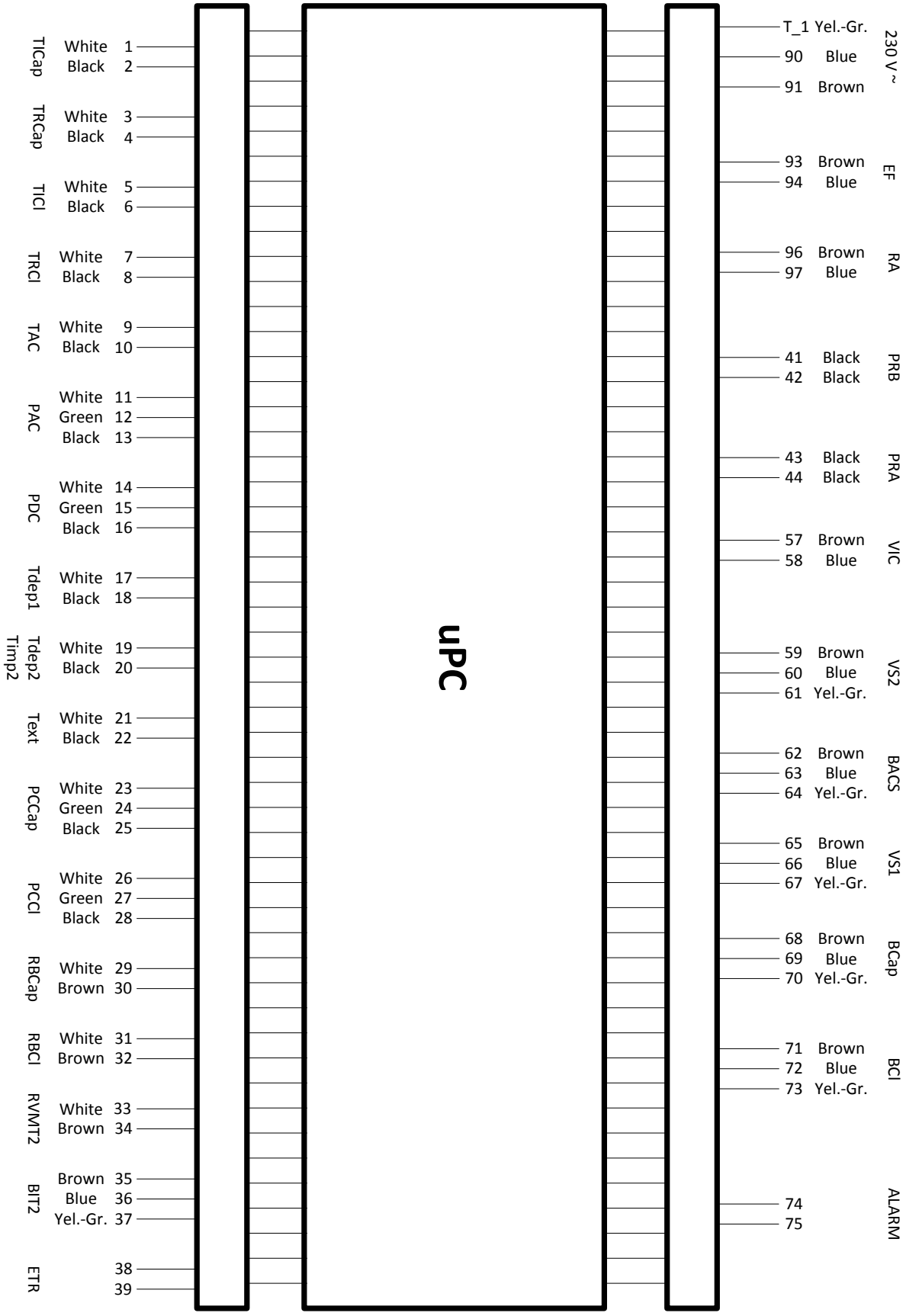
POWER CONNECTIONS ecoGEO C3	
Nomenclature	**Description**
G	Micro-controller power supply (Phase)
G0	Micro-controller power supply (Neutral)
EF_X	Connection X EMI extension filter
I_X	Connection X Inverter
Digital outputs (to relay)	
VIC	Reversing cycle valve
VS1	Solenoid valve 1
VS2	Solenoid valve 2
BIT2	Circulating pump (2nd zone)
BACS	DHW circuit pump
BCap	Brine circuit pump
BCl	Heating circuit pump
ALARM	Alarm
RA	Electric heater (legionella protection)

micro-controller connection diagram ecoGEO C3



MICRO-CONTROLLER CONNECTIONS ecoGEO C3	
Nomenclature	**Description**
G	Micro-controller power supply (Phase)
G0	Micro-controller power supply (Neutral)
PRA	High-pressure switch
PRB	Low-pressure switch
Digital Inputs	
EBC	Heat pump on signal
Analogue inputs	
TICap	Brine outlet temp. probe
TRCap	Brine inlet temp. probe
TiCl	Heating outlet temp. probe
TRCl	Heating inlet temp. probe
TAC	Compressor suction temp. probe
PAC	Compressor suction pressure transducer
PDC	Compressor discharge pressure transducer
Tdep1	Tank 1 temperature probe (DHW tank)
Tdep2	Tank 2 temperature probe (buffer tank)
Timp2	2nd outlet temperature probe
Text	Outdoor temperature probe
PCCap	Brine circuit pressure transducer
PCCl	Heating circuit pressure transducer
Digital outputs (to relay)	
VIC	Reversing cycle valve
VS1	Solenoid valve 1
VS2	Solenoid valve 2
BACS	DHW circuit pump
BCap	Brine circuit pump
BCl	Heating circuit pump
ALARM	Alarm
COMP	Compressor contact
RA	Electric heater (legionella protection)
EF	EMI Filter extension
Analogue outputs (regulation)	
RBCap	Brine circuit pump regulation
RBCl	Heating circuit pump regulation
RVMT2	Regulation Tª2 modulating valve

Installation diagrams ecoGEO C3

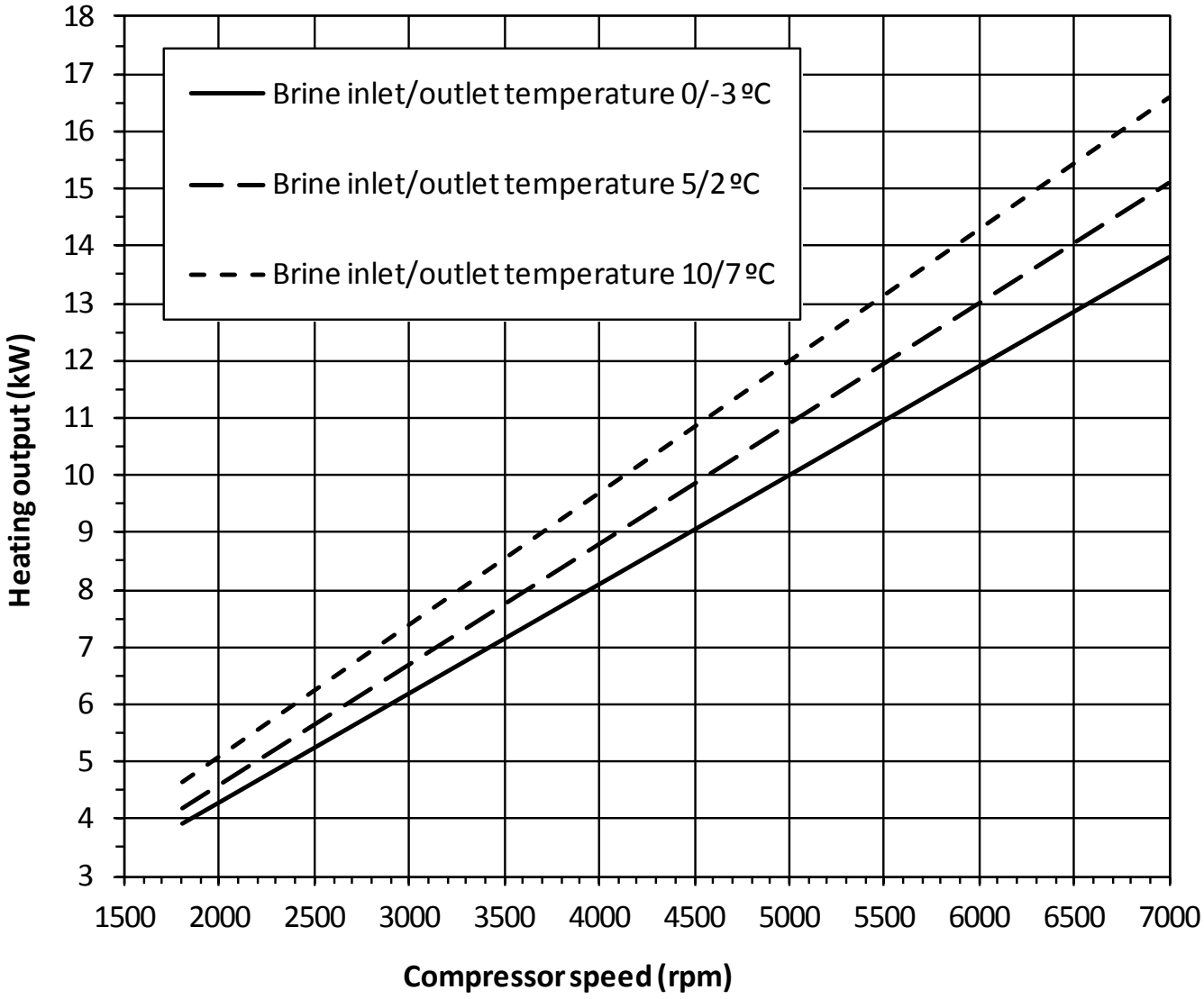


MICRO-CONTROLLER CONNECTIONS ecoGEO C3	
Nomenclature	**Description**
L	Heat pump power supply (phase)
N	Heat pump power supply (Neutral)
T	Heat pump power supply (Ground)
PRA	High-pressure switch
PRB	Low-pressure switch
Digital Inputs	
EBC	Heat pump on signal
Analogue inputs	
TICap	Brine outlet temp. probe
TRCap	Brine inlet temp. probe
TiCl	Heating outlet temp. probe
TRCl	Heating inlet temp. probe
TAC	Compressor suction temp. probe
PAC	Compressor suction pressure transducer
PDC	Compressor discharge pressure transducer
Tdep1	Tank 1 temperature probe (DHW tank)
Tdep2	Tank 2 temperature probe (buffer tank)
Timp2	2nd outlet temperature probe
Text	Outdoor temperature probe
PCCap	Brine circuit pressure transducer
PCCl	Heating circuit pressure transducer
Digital outputs (to relay)	
VIC	Reversing cycle valve
VS1	Solenoid valve 1
VS2	Solenoid valve 2
BACS	DHW circuit pump
BCap	Brine circuit pump
BCl	Heating circuit pump
ALARM	Alarm
COMP	Compressor contact
RA	Electric heater (legionella protection)
EF	EMI Filter extension
Analogue outputs (regulation)	
RBCap	Brine circuit pump regulation
RBCl	Heating circuit pump regulation
RVMT2	Regulation Tª2 modulating valve

8.7 Heating output of the heat pump in relation to the compressor speed

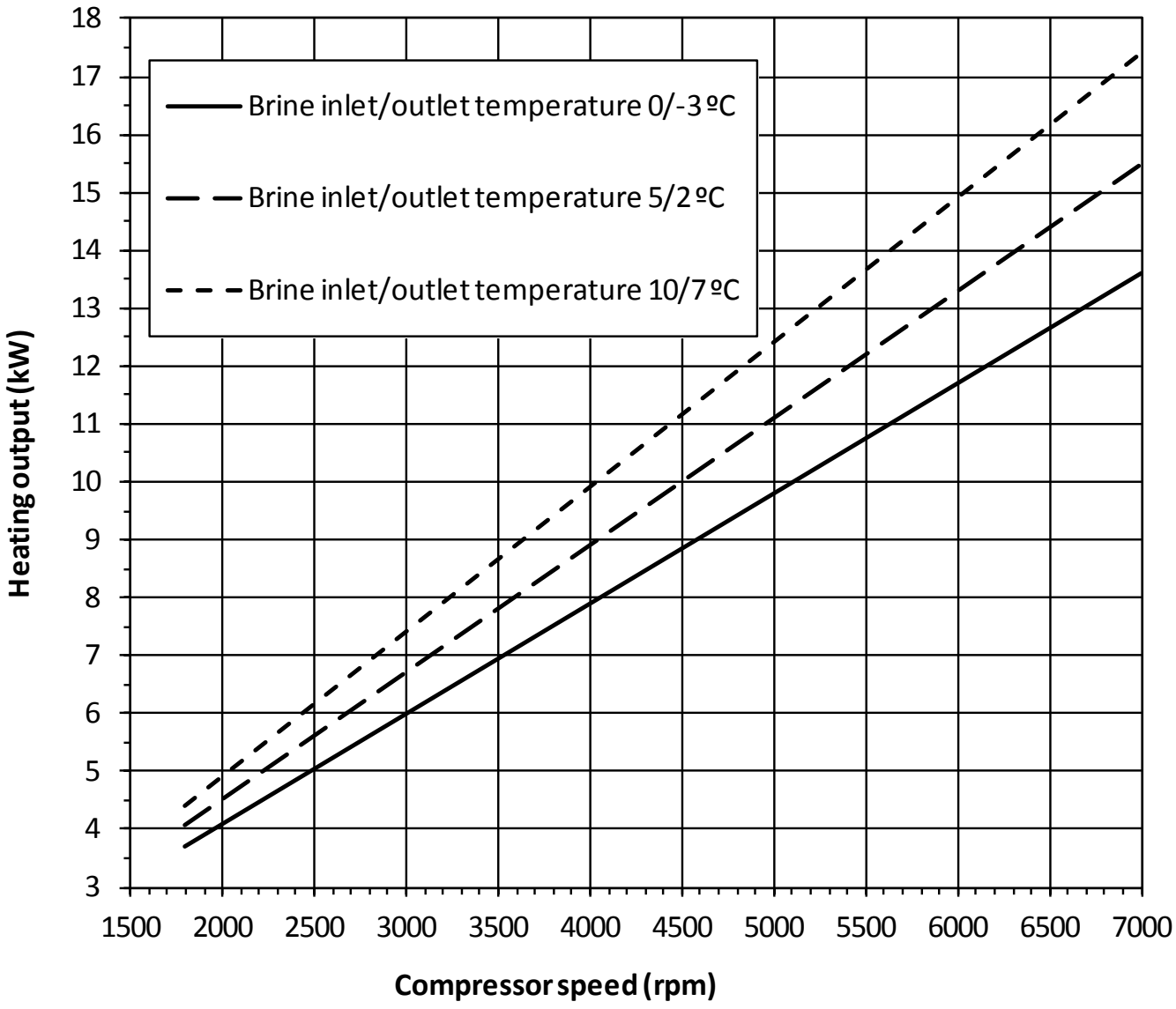
ecoGEO C 3-12 kW models

Heating inlet/outlet temperature of 30/35 ° C



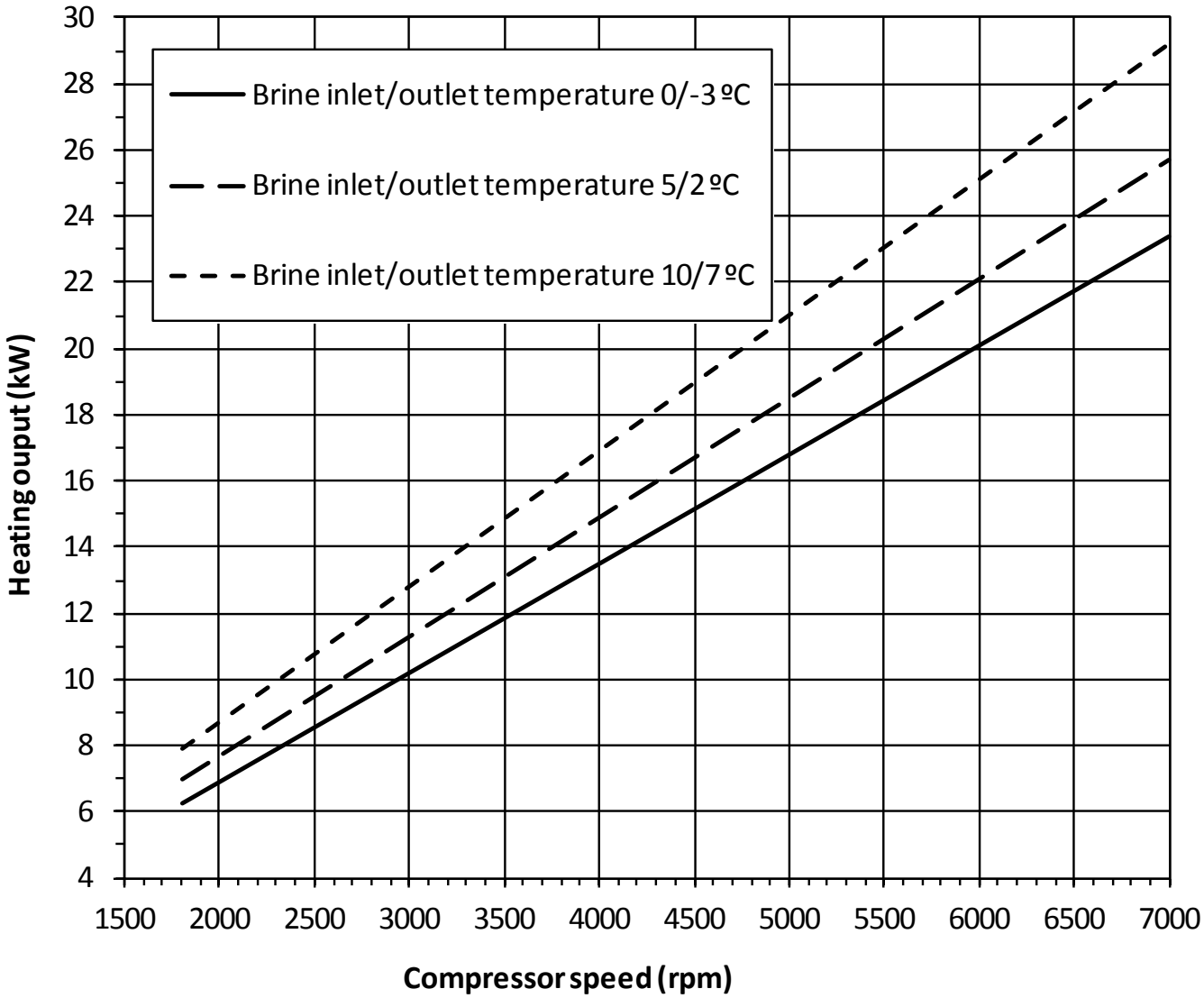
ecoGEO C 3-12 kW models

Heating inlet/outlet temperature of 40/45 °C



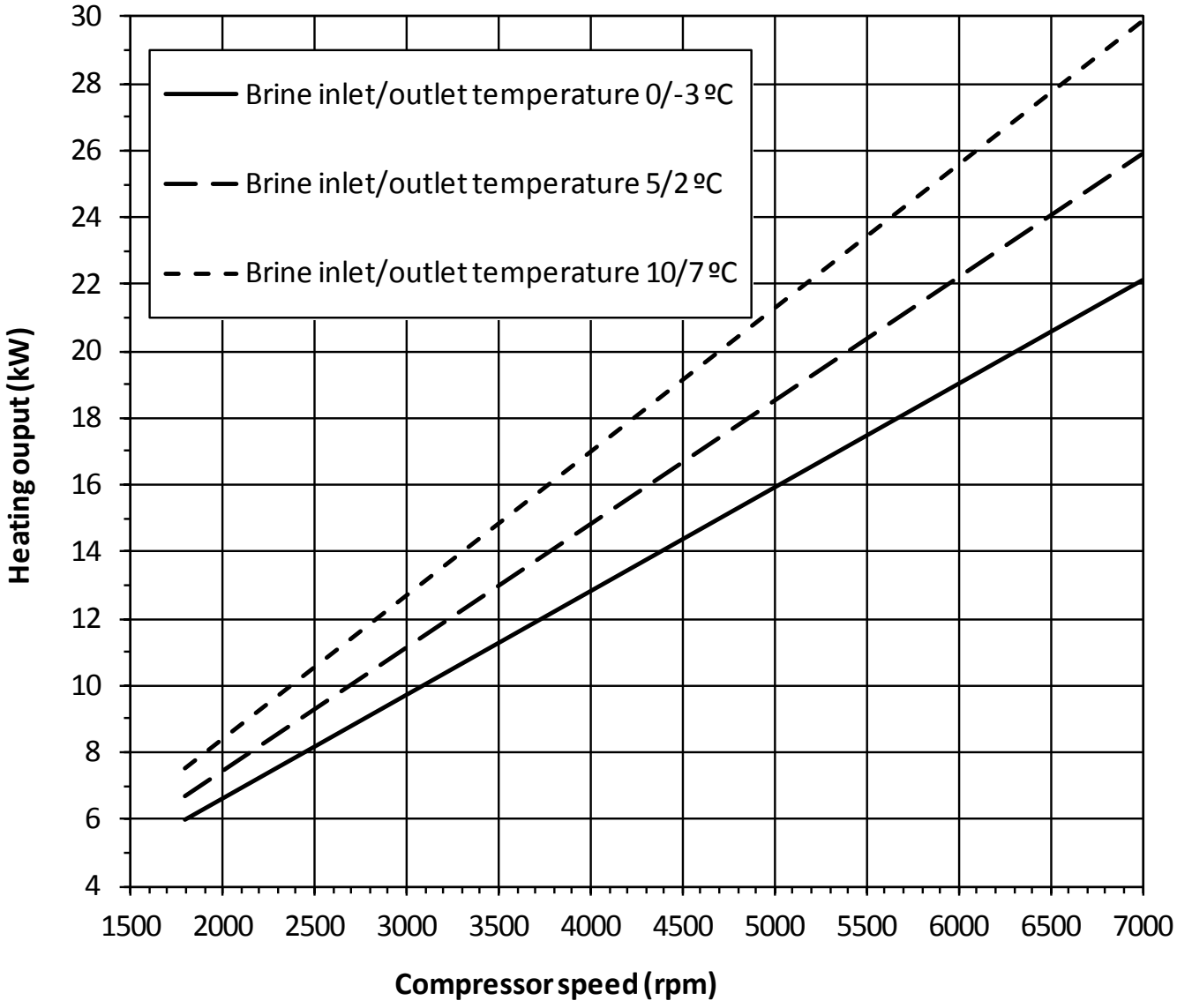
ecoGEO C 5-22 kW models

Heating inlet/outlet temperature of 30/35 ° C



ecoGEO C 5-22 kW models

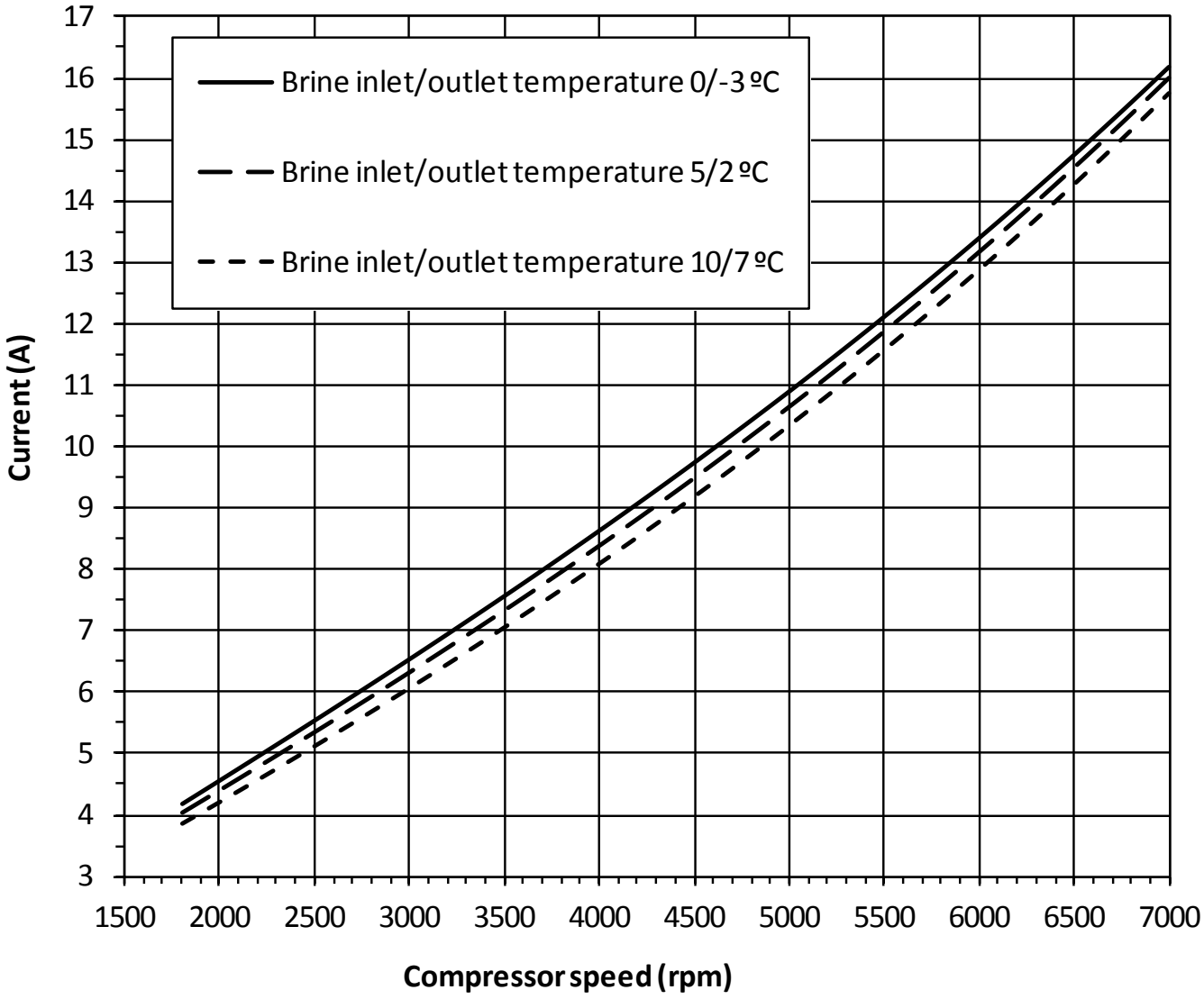
Heating inlet/outlet temperature of 40/45 °C



8.8 Power consumption of the heat pump in relation to the compressor speed

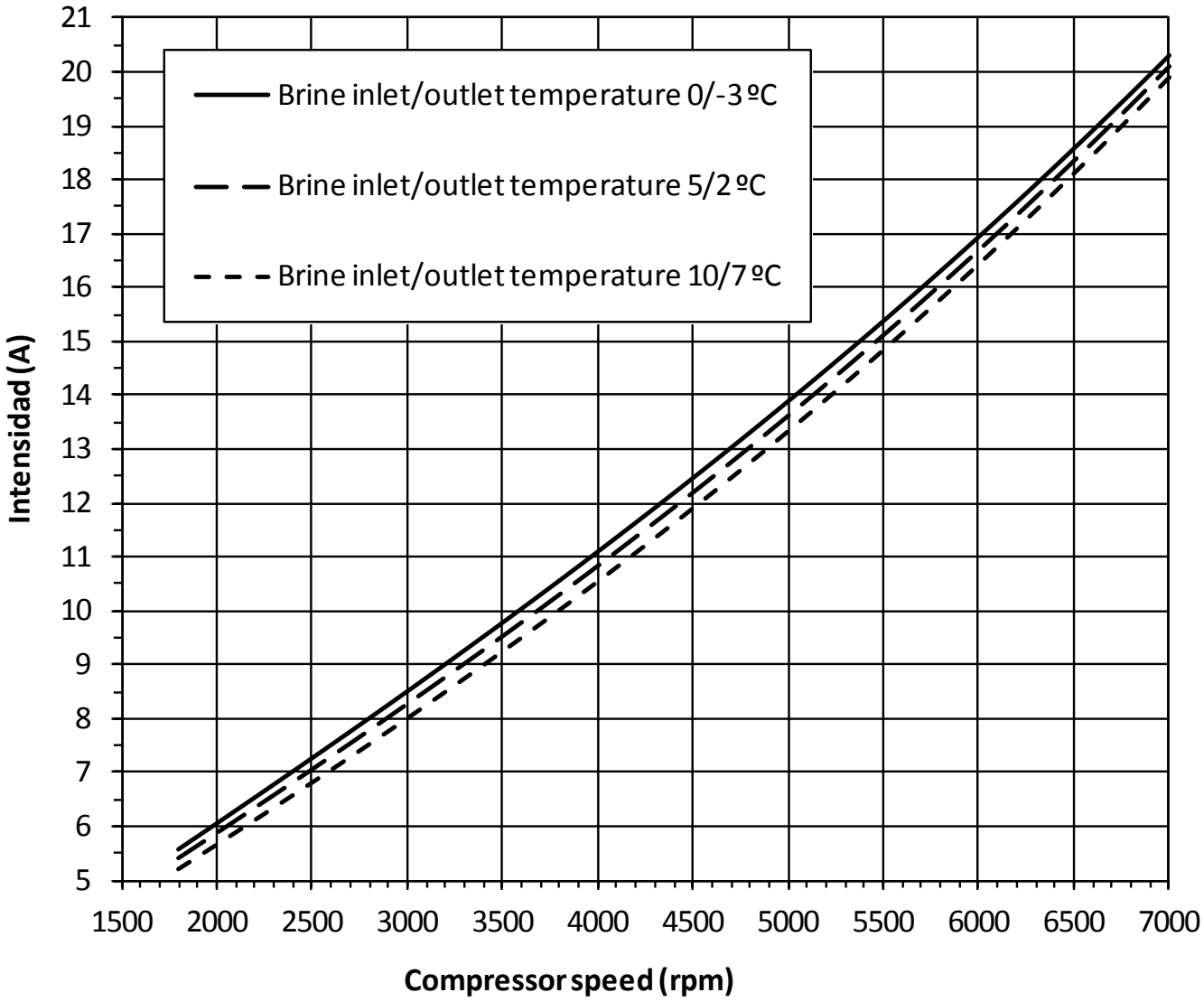
ecoGEO C 3-12 kW models

Heating inlet/outlet temperature of 30/35 °C



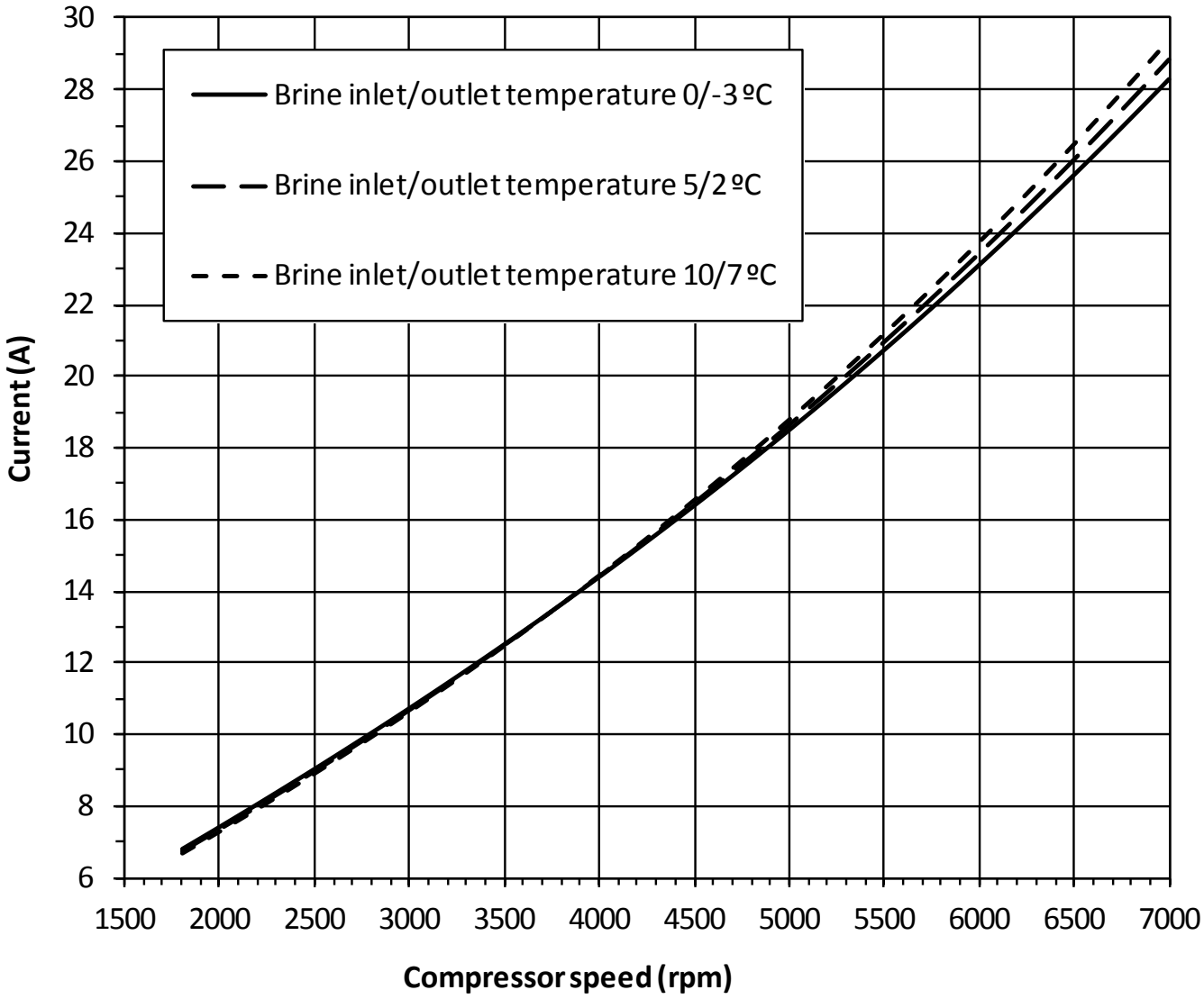
ecoGEO C 3-12 kW models

Heating inlet/outlet temperature of 40/45 °C



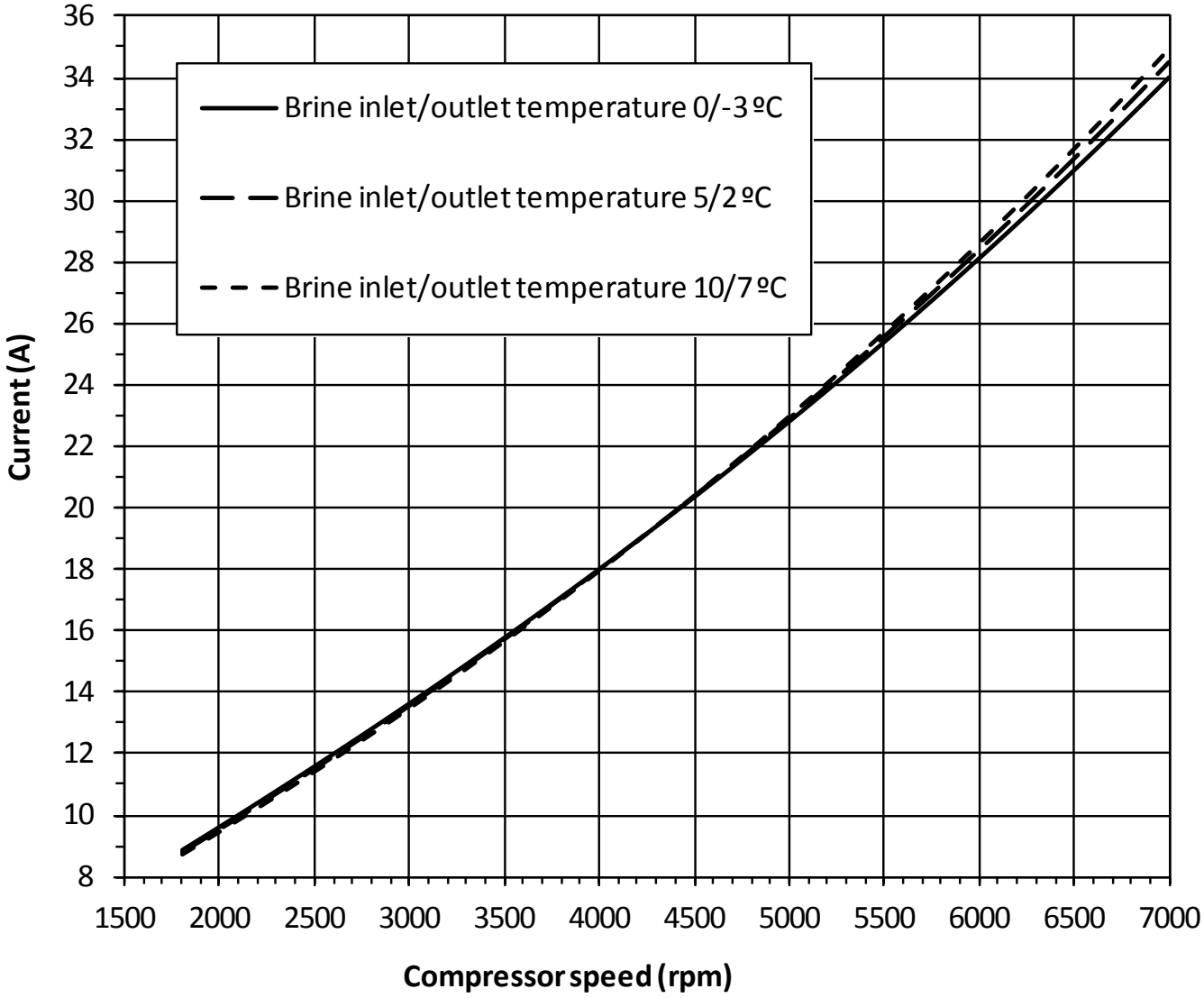
ecoGEO C 5-22 kW models

Heating inlet/outlet temperature of 30/35 °C



ecoGEO C 5-22 kW models

Heating inlet/outlet temperature of 40/45 °C



9 Examples of typical applications

NOTE

- The following examples of installations are only approximate and it may be necessary to install additional components (valves, fasteners, etc..).
- The installation must be designed by qualified personnel, in accordance with applicable local regulations.

ecoGEO heat pumps are designed to provide comprehensive heating/cooling and produce DHW (domestic hot water) all year round, using a simple installation and ensuring the maximum energy efficiency possible.

Maximum Energy Efficiency.

Because of its wide regulatory capacity, ecoGEO heat pumps suit the needs of thermal energy for DHW, heating, or heating/cooling that exist at any time. The compressor with inverter technology and the highly efficient variable speed brine and heating pumps provide optimal flow rate and outlet temperature at all times, so that the heat pump always operates at peak efficiency. Moreover, the inverter control of the heat pump can minimize ecoGEO equipment start/stop cycles, which results in increased energy efficiency.

Simple, economical installation

Capacity and outlet temperature regulation provided by ecoGEO heat pumps considerably simplify the heating/cooling installation. First, in simple facilities may not be necessary to have a buffer tank, even in installations with heating using fan-coils or low temperature radiators. Moreover, ecoGEO heat pumps can provide two different outlet temperatures by simply adding external 3-way modulating valve and a circulating pump, without using additional control systems.

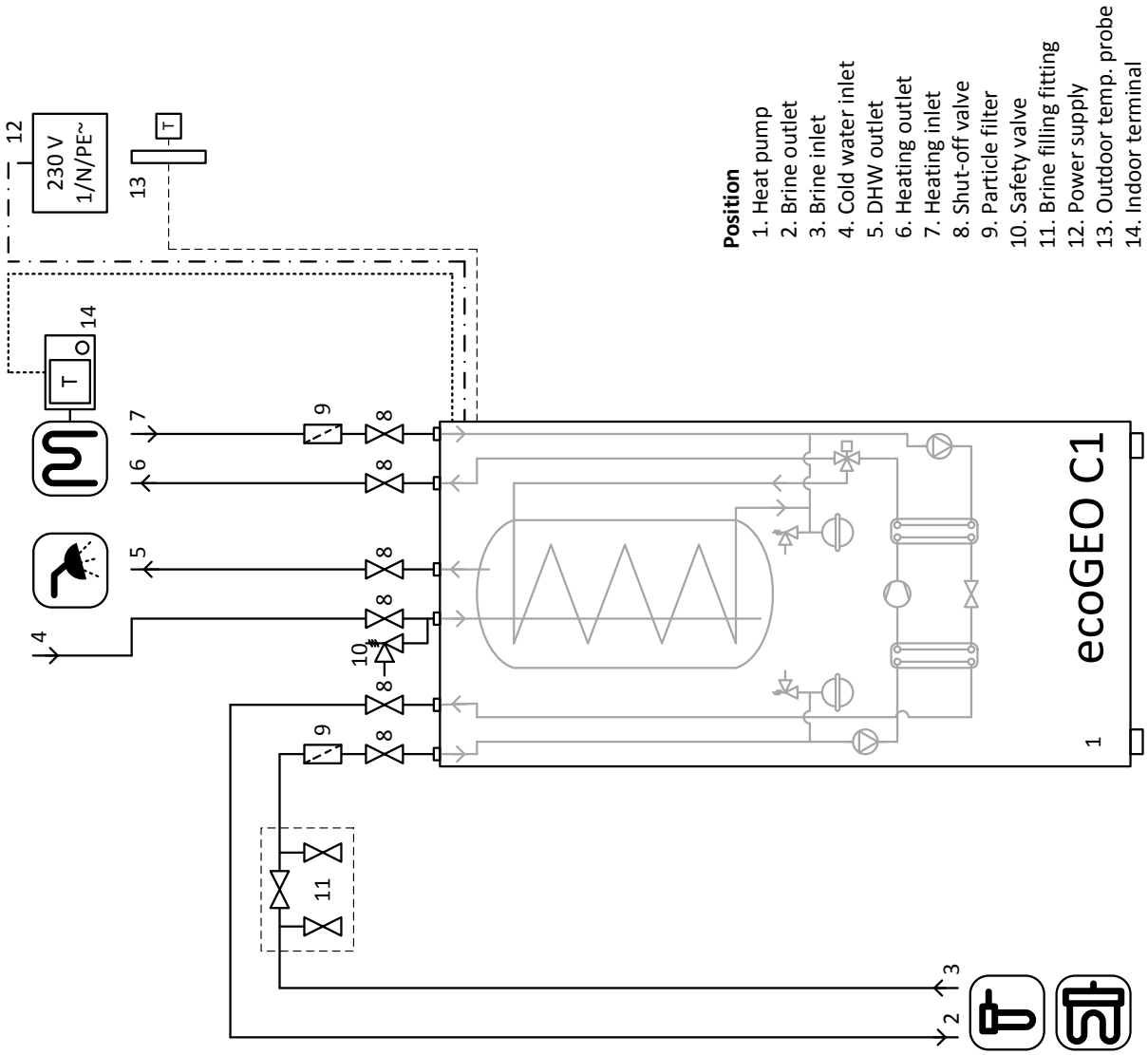
This can simplify installation and reduce cost significantly.

General Installation Recommendations

Geothermal heat pumps in general, and ecoGEO heat pumps in particular, provide maximum performance when used energy in heating installations fitted with low-temperature heat emitters. This means the ideal application is underfloor heating, using a radiant floor surface, as these require low outlet temperatures (around 35°C).

However, ecoGEO heat pumps allow outlet temperatures of up to 55°C, so they can be used in heating with medium temperature emitters such as fancoils, convector heaters or low-temperature radiators. In this type of installations ecoGEO heat pump also ensure maximum efficiency. However, it should be noted that the increased outlet temperature of the heating system increases the energy consumption necessary for heating the water and thus reduces the energy efficiency that can be obtained with the heat pump. Thus, an increase in the outlet temperature from 35ºC to 50ºC means a reduction in energy efficiency of approximately 25%. To mitigate this effect we recommend over-dimensioning the thermal emitters in the heating system to minimize the required outlet temperature and/or increasing the thermal insulation of the building.

9.1 DHW and single area heating with ecoGEO C1



Application

- DHW and heating in houses, small apartment blocks, offices or shops with underfloor heating systems, fan coil units, thermo-convector or low-temperature radiators.

Operation

The heat pump pumps hot water directly to the heating system adapting to your needs. The outlet temperature is adjusted to the type of installation and is optimized with regards to indoor and outdoor temperatures. The flow rate is adjusted to maintain a constant working temperature difference (5°C by default).

When there is a demand for DHW, the heat pump stops the production of heating and sends hot water to the coil in the hot water tank. The temperature and flow rate are controlled to minimize heating time (maximum accumulation temp 50-55°C). Once a week, the electric heater located in the hot water tank is activated to raise the temperature to 70°C to prevent possible outbreaks of legionella in the tank.

Additional control elements

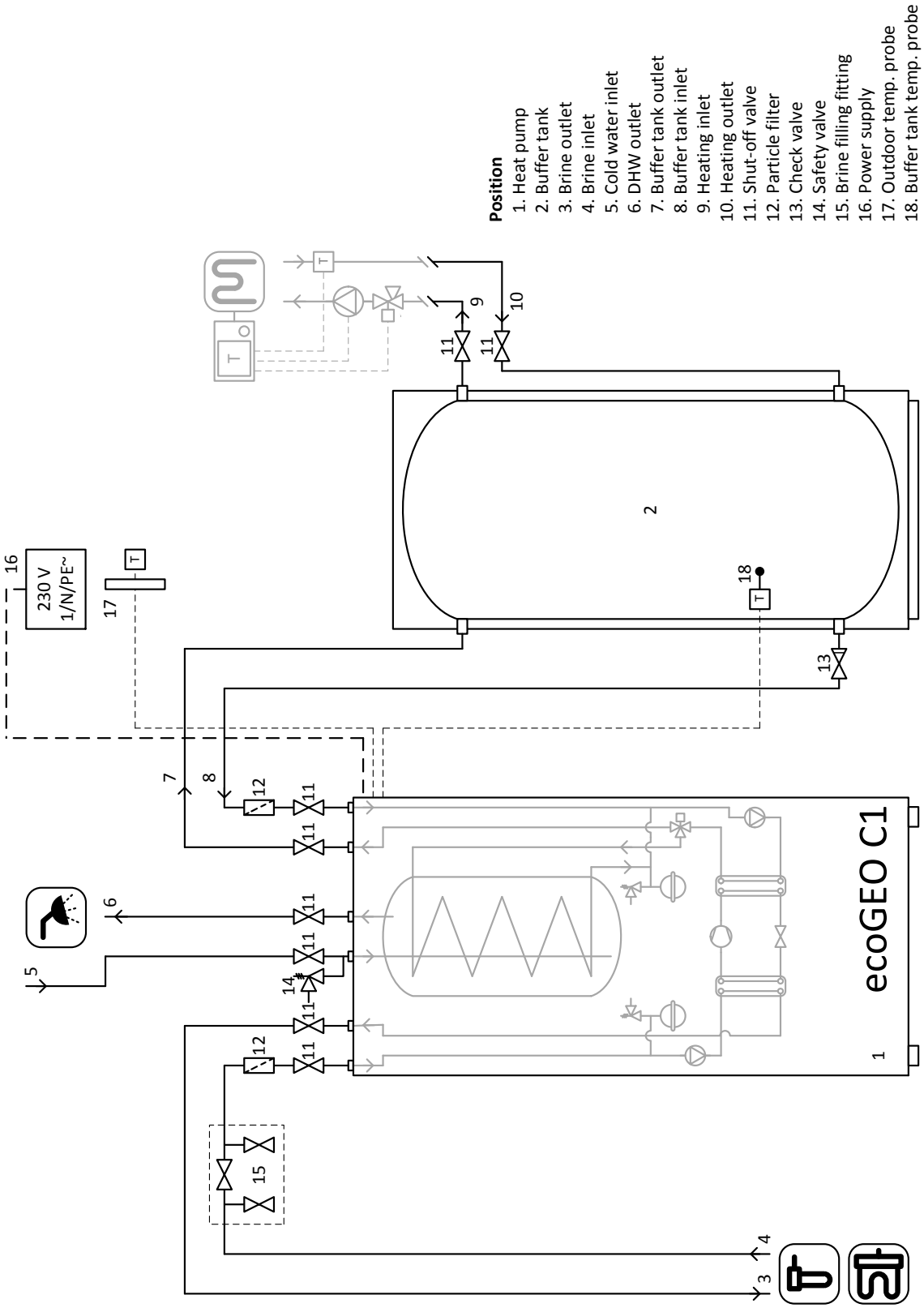
Besides the heat pump control equipment you must install the following components.

- An indoor terminal that registers the temperature, one or more relay type indoor thermostats (see section 5.7).
- An outdoor temperature probe (see section 5.7).

Configuration

1. Enter the SERVICE MENU ***([Prg]*** + ***[Esc])*** -> INSTALLER CONF. (Enter service password PW1) -> OPERATING SCHEME -> 1 ZONE.

9.2 Production of hot water for the buffer tank with ecoGEO C1



Application

- DHW and heating in houses, small apartment blocks, offices or shops with heating systems pumping from an intermediate buffer tank.

Operation

In heating mode, the heat pump drives hot water to the buffer tank. The power supplied by the heat pump is related to the difference between the tank setpoint temperature and the actual temperature of the water in the tank. The flow rate is adjusted to maintain a constant working temperature difference (5°C by default). The outlet temperature is not controlled but is in relation to the return temperature from the hot water tank to the buffer tank.

When there is a demand for DHW, the heat pump stops the production of heating and sends hot water to the coil in the hot water tank. The temperature and flow rate are controlled to minimize heating time (maximum accumulation temp 50-55°C). Once a week, the electric heater located in the hot water tank is activated to raise the temperature to 70°C to prevent possible outbreaks of legionella in the tank.

Additional control elements

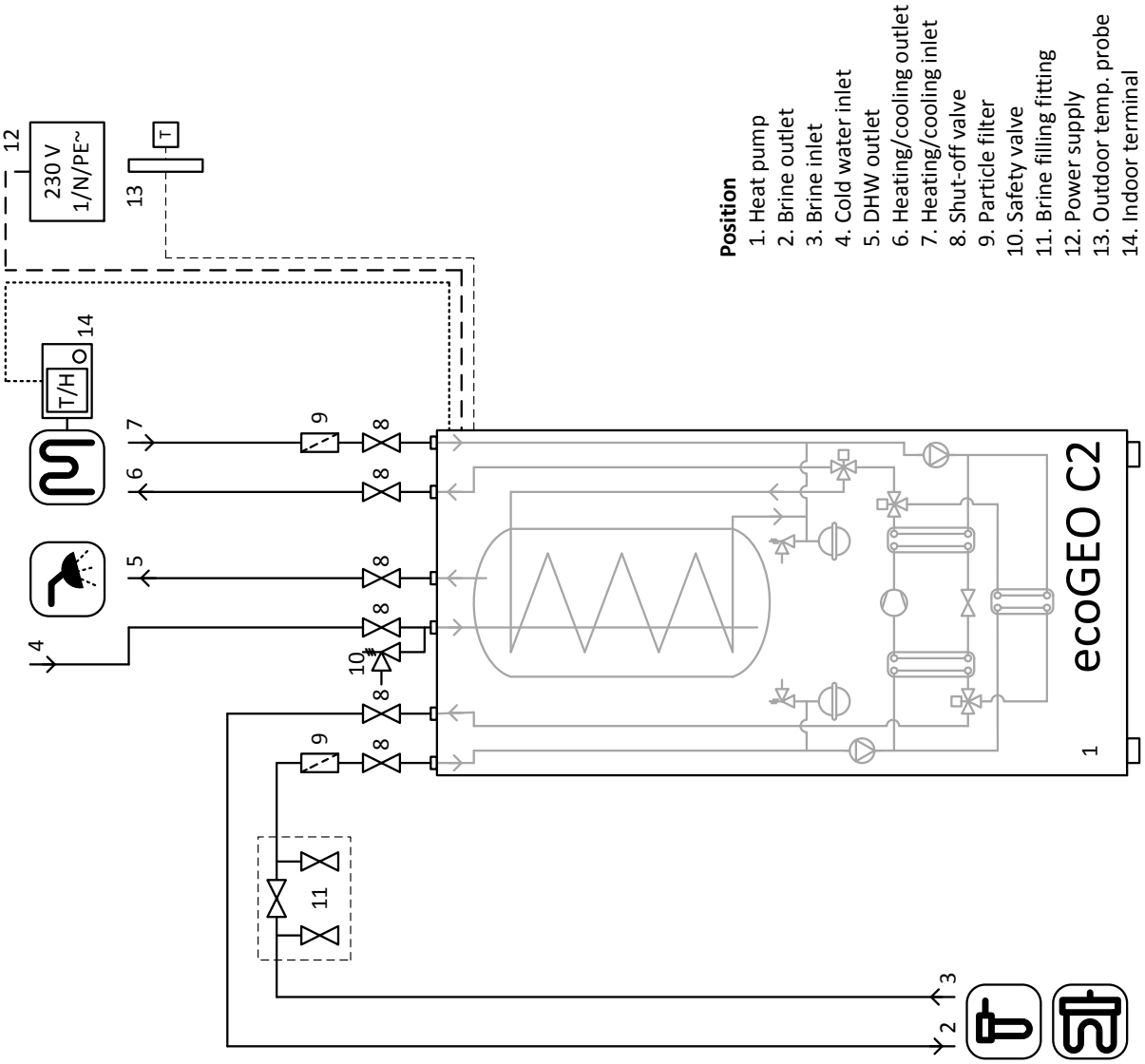
Besides the heat pump control equipment you must install the following components.

- A temperature probe for the buffer tank (see section 5.7).

Configuration

1. Enter the SERVICE MENU ***([Prg]*** + ***[Esc])*** -> INSTALLER CONF. (Enter service password PW1) -> OPERATING SCHEME -> BUFFER TANK.

9.3 DHW and heating and free cooling with single area ecoGEO C2



Application

- DHW, heating and free cooling in houses, small apartment blocks, offices or shops with underfloor heating/cooling systems, fan coil units, or thermo-convectors.

Operation

In heating mode, the heat pump pumps hot water directly to the heating system adapting to your needs. The outlet temperature is adjusted to the type of installation and is optimized with regards to indoor and outdoor temperatures. The flow rate is adjusted to maintain a constant working temperature difference (5°C by default).

In free cooling mode the compressor switches off, the drive pumps remain active and cooling and brine circuits are derived to the free cooling exchanger. Thus, the equipment drives cool water –obtained by heat exchange with the antifreeze mixture from the brine system.

When there is a demand for DHW, the heat pump stops the production of heating or free cooling and sends hot water to the coil in the hot water tank. The temperature and flow rate are controlled to minimize heating time (maximum accumulation temp 50-55°C). Once a week, the electric heater located in the hot water tank is activated to raise the temperature to 70°C to prevent possible outbreaks of legionella in the tank.

Additional control elements

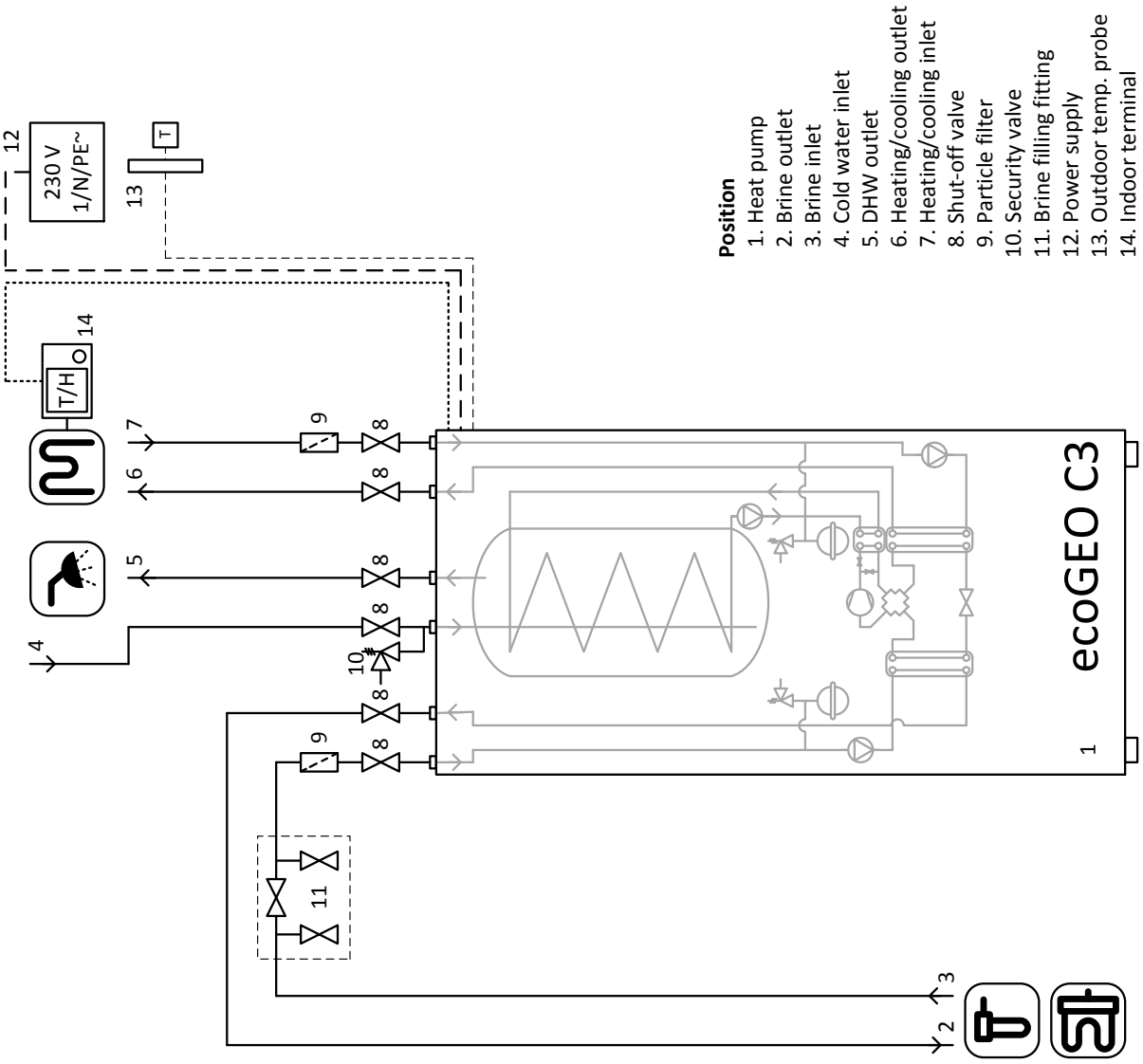
Besides the heat pump control equipment you must install the following components.

- An indoor temperature/humidity terminal (see section 5.7).
- An outdoor temperature probe (see section 5.7).

Configuration

1. Enter the SERVICE MENU ***([Prg]*** + ***[Esc])*** -> INSTALLER CONF. (Enter service password PW1)> OPERATING SCHEME -> 1 ZONE.

9.4 Production of DHW, heating and active cooling by reversing cycle with ecoGEO C3



Application

- DHW, heating and active cooling in houses, small apartment blocks, offices or shops with underfloor heating/cooling systems, fan coil units, for producing heating and cooling. If underfloor system is used, special care must be taken with the outlet temperature control when cooling occurs.

Operation

In heating mode, the heat pump pumps hot water directly to the heating system adapting to your needs. The outlet temperature is adjusted to the type of installation and is optimized with regards to indoor and outdoor temperatures. The flow rate is adjusted to maintain a constant working temperature difference (5°C by default).

In cooling mode the heat pump reverses its operating cycle so cold water is driven to the cooling system. The flow rate and temperature will be optimized for the type of system used and its operating conditions.

When there is a demand for DHW, the CHW system (Closed Hot Water Production System) is activated, which produces DHW and heating/cooling simultaneously (maximum tank temperature 50-55°C). Once a week, the electric heater located in the hot water tank is activated to raise the temperature to 70°C to prevent outbreaks of legionella.

Additional control elements

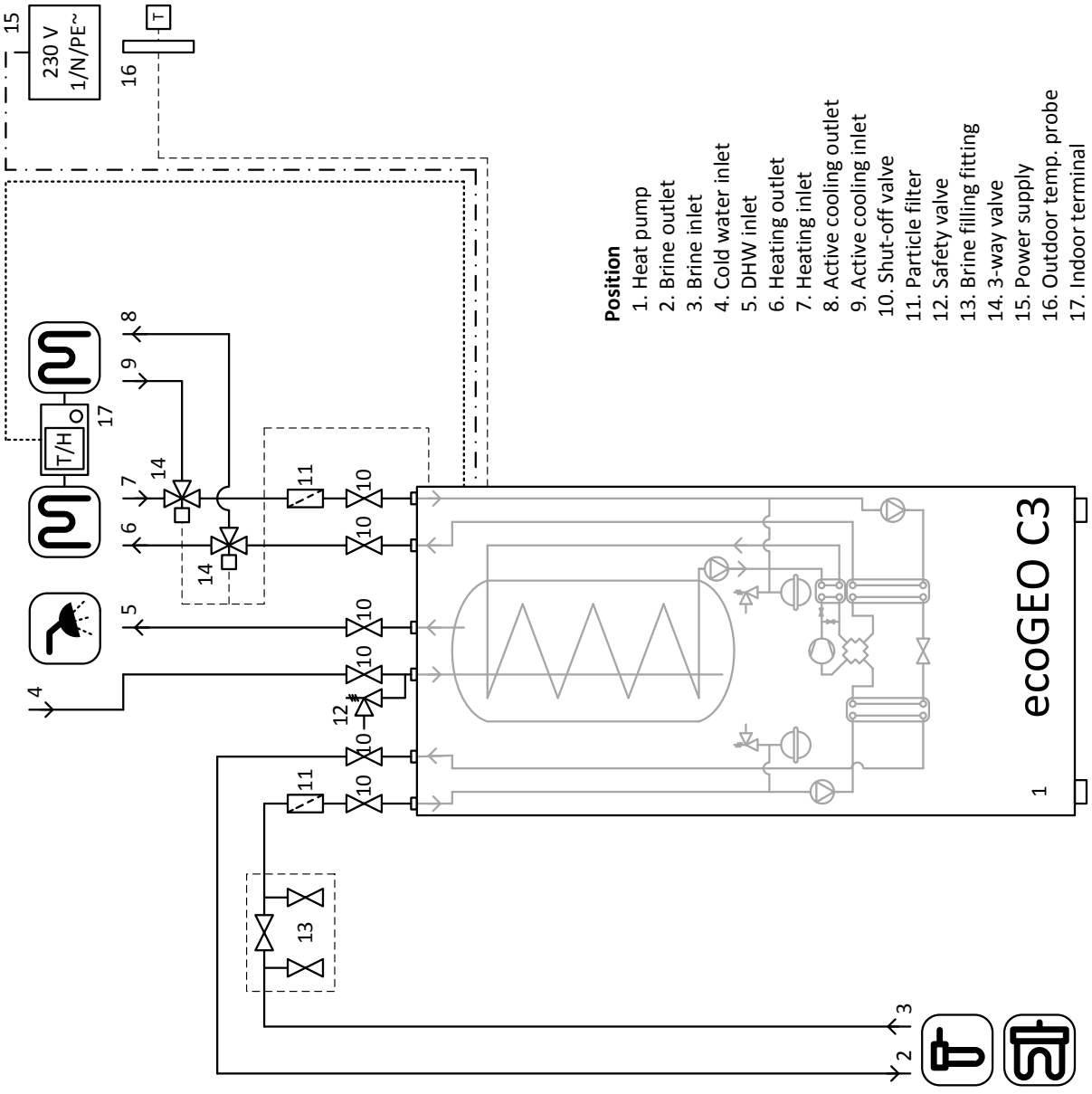
Besides the heat pump control equipment you must install the following components.

- An indoor temperature/humidity terminal (see section 5.7).
- An outdoor temperature probe (see section 5.7).

Configuration

1. Enter the SERVICE MENU ***([Prg]*** + ***[Esc])*** -> INSTALLER CONF. (Enter service password PW1) -> OPERATING SCHEME -> 1 ZONE.

9.5 Production of DHW and heating/cooling by reversing cycle with ecoGEO C3 with separate heating/cooling emission systems



Application

- DHW heating and active cooling in houses and small apartment blocks, offices or business premises with independent heating and cooling systems. For example, facilities that combine underfloor heating and fan coil units for cooling.

Operation

In heating mode, the heat pump pumps hot water directly to the heating system adapting to your needs. The outlet temperature is adjusted to the type of installation and is optimized with regards to indoor and outdoor temperatures. The flow rate is adjusted to maintain a constant working temperature difference (5°C by default).

In cooling mode the heat pump reverses its operating cycle and cold water is driven to the cooling system through external all/nothing zone valves. The outlet temperature is adjusted to the type of system used and is optimized with regards to indoor and outdoor temperatures.

When there is a demand for DHW, the CHW system (Closed Hot Water Production System) is activated, which produces DHW and heating/cooling simultaneously (maximum tank temperature 50-55°C). Once a week, the electric heater located in the hot water tank is activated to raise the temperature to 70°C to prevent outbreaks of legionella.

Additional control elements

Besides the heat pump control equipment you must install the following components.

- An indoor temperature/humidity terminal (see section 5.7).
- An outdoor temperature probe (see section 5.7).

Configuration

1. Enter the SERVICE MENU ***([Prg]*** + ***[Esc])*** -> INSTALLER CONF. (Enter service password PW1) -> OPERATING SCHEME -> 1 ZONE.

10 Guarantee

Biomasa Ecoforestal Villacañas (hereinafter ECOFOREST) guarantees this product for two (2) years from the date of purchase against defects in workmanship and materials. Additionally, the warranty of the compressor and the inverter is extended to 4 (four) years from the date of purchase.

ECOFOREST's liability is limited to providing the equipment, which must be properly installed following the instructions contained in the publications delivered at purchase and in accordance with existing laws.

Installation of the equipment must be performed by authorized personnel, who will accordingly assume full liability for final installation and proper functioning of the product . ECOFOREST will be held harmless if these precautions are not taken. Installations in crowded public places are subject to the specific regulations of each area.

It is essential to conduct a test run of the equipment before considering that installation is complete.

ECOFOREST ensures that all its products are manufactured with optimum quality materials and manufacturing techniques that guarantee greatest efficiency.

If during normal use any defective parts are detected, these parts will be replaced free of charge by the dealer that has made the sale or the dealer responsible for that area.

For products sold abroad product replacement also will be free of charge on our premises, unless there are special agreements with the distributor of our products abroad.

TERMS AND CONDITIONS OF THE GUARANTEE

For the warranty to be considered valid the following conditions must be fulfilled.

- The buyer must submit within 30 (thirty) days from the date of purchase the warranty sheet along with a copy of the invoice or purchase. The seller must endorse the date of purchase and be in possession of a fiscally valid document.
- Installation and commissioning of the equipment must be performed by an authorized technician who considers the technical characteristics of the installation to which the equipment is to be connected are ideal. The aforementioned installation must comply with the instructions in the user and installation manual that comes with the product.
- The equipment must be used as specified in the instructions in the user and installation manual that comes with the product.

The warranty does not cover damage caused by:

- Weathering, chemicals and/or misuse of the product, lack of maintenance, modifications to or tampering with equipment or other causes not derived from the product.
- Unsuitable transport of the product. We recommend a thorough inspection of the goods at the time of receipt and, if you notice any damage to the product, immediately contact the seller and record the

anomalies on the delivery note and include a copy for the carrier. You have 24 (twenty four) hours to file your claim in writing to the dealer and/or carrier.

- We only accept product returns after ECOFOREST has provided previously written approval, the product is in perfect condition and is returned in its original packaging and includes a copy of the delivery note and invoice if any. Transport must be prepaid and a letter accepting these conditions included.
- All those parts subject to wear are excluded from the guarantee, unless they have a manufacturing defect.
- All those components not supplied by ECOFOREST and the configuration required during installation are excluded from the guarantee.
- The masonry and/or plumbing work required for the installation of equipment are excluded from the guarantee.
- This warranty applies only to the buyer and is not transferable.
- Replacement of parts does not extend the warranty.
- ECOFOREST will not be liable for compensation based on equipment inefficiency derived from unsuitable dimensioning of the installation.
- This is the only valid warranty and no one is allowed to present any other in the name of or on behalf of ECOFOREST.
- ECOFOREST will not be liable for any compensation for direct or indirect damages caused by the product or derived from.

The application for assistance must be directed to product retailer.

ECOFOREST reserves the right to make changes in their manuals, warranties and rates without notice.

Any suggestions and / or complaints must be submitted in writing to:

ECOFOREST GEOTERMIA, S.L.

Poligono industrial A pasaxe C/15 - nº22 - parcela 139

36316 - Vincios / Gondomar - Pontevedra (España)

Tel: +34 986 262 184 / +34 986 417 700

Fax: +34 986 262 186

e-mail: Info@ecoforest.es

http://www.ecoforest.es

Information to be Included in the suggestion or complaint:

Name and address of the supplier.

Name, address and telephone number of the installer.

Name, address and telephone number of the purchaser.

Invoice and/or purchase note.

Date of installation and initial operation of the equipment.

Model and serial number of the equipment.

Control, periodic maintenance and inspections stamped by the dealer.

Be sure to clearly explain the reason for your inquiry, providing all the information you consider necessary, to avoid misinterpretation.

Interventions during the warranty period of the equipment provide for repairs at no charge, pursuant to current legislation.

JURISDICTION

Both sides, through the act placing and accepting orders are subject to the jurisdiction of the courts of Vigo, renouncing any other jurisdiction that may apply, even in the case of payments domiciled in another Spanish town or in a different country.