Thermocold
THE AIRVOLUTION

Installation, use and maintenance manual

DOMINO EXR C 215-P/450-P

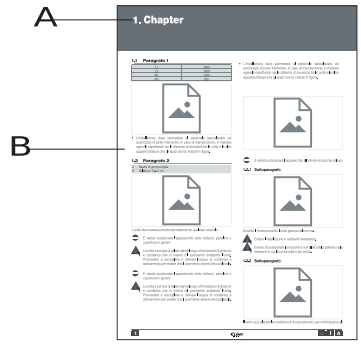
A CLASS ENERGY EFFICIENCY AIR COOLED REVERSIBLE HEAT PUMPS FOR HIGH TEMPERATURE HOT WATER PRODUCTION WITH AXIAL FANS, SCROLL COMPRESSORS AND PLATE EXCHANGER.

Cooling capacity: 51-157 kW
Heating capacity: 56-182 kW

TABLE OF CONTENTS

1 GENERAL

1.1 Document information



A Chapter
B Sequence of paragraphs

The manual is divided into chapters as follows:
- General;
- Shipment;
- Installation;
- Water connections;
- Electrical connections:
- Commissioning;
- Control panel;
- Maintenance.

The preliminary precautions must be read before performing any of the following operations.

This document uses the following definitions:
- Danger zones: any area inside and/or near the machine in which the presence of an exposed person constitutes a risk to his/her own health and safety.
- Exposed person: any person who is entirely or partially in a danger zone.
- Operator/Maintenance Technician: the person/s assigned to operate, adjust, service, repair or move the machine.

1.1.1 Symbols

This publication contains the following symbols:

	Danger	**Draws attention to actions that can cause serious injury if not performed correctly.**
	Prohibited	Draws attention to actions that impose a prohibition.

1.2 Range

DOMINO EXR C 215-P

DOMINO EXR C 218-P

DOMINO EXR C 222-P

DOMINO EXR C 225-P

DOMINO EXR C 430-P

DOMINO EXR C 437-P

DOMINO EXR C 444-P

DOMINO EXR C 450-P

1.2.1 Available versions

DOMINO EXR C	Reversible heat pump

1.3 Accessories

Factory fitted accessories

IM	Automatic circuit breakers
PFC1	Power factor correction condensers (cosφ 0,95)
SL	Unit silencement
EC	EC Inverter fans
ECH	EC Inverter fans with high available static pressure
TX	Coil with pre-coated fins
SI	Inertial tank
PS	Single circulating pump
PSI	Inverter single circulating pump
PD	Double circulating pump
PDI	Inverter double circulating pump
GS	Single circulating pump gasket for glycol >30%
GD	Double circulating pump gaskets for glycol >30%
FO	Antifreeze heater for tank and pipes
FG	Antifreeze heater for single pump and pipes
FM	Antifreeze heater for double pump and pipes
FUM	Antifreeze heater for tank, single pump and pipes
FDM	Antifreeze heater for tank, double pump and pipes
SS	Soft start
IS	Modbus RTU protocol, RS485 serial interface
GDS	Leak detector

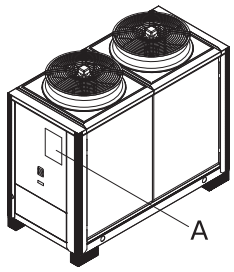
Loose accessories

V3D	3-Way valve for domestic hot water production
CR	Remote control panel
RP	Coils protection metallic guards
AG	Rubber shock absorbers
AM	Spring shock absorbers

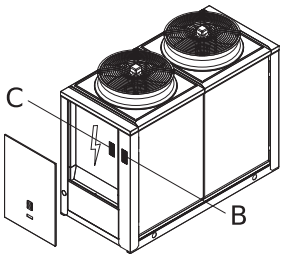
1.4 Compliance

The device complies with the following standards:
Machinery Directive 2006/42/CE
PED Directive 2014/68/EU
Electromagnetic Compatibility Directive 2014/30/UE
LVD Directive: 2014/35/UE

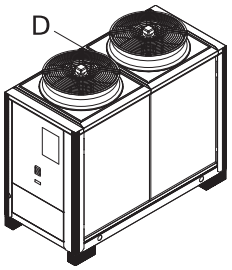
1.5 Machine identification



A Packaging plate



B Frame feature plate
C Electrical board feature plate



D Refrigerant safety valves vent connection.

The equipment can be identified from:
Packaging plate.
- It shows the identification data of the equipment.

Frame feature plate.
- Affixed on the machine, it shows the technical and performance data of the equipment.

Electrical board feature plate.
- Affixed on the panel from which the electrical board is accessed, it shows the electrical data of the equipment.

If it is lost or deteriorated, request a duplicate from Technical Support.

⚠ The loss of the label may compromise CE compliance.

⚠ Tampering with, removal and deterioration of the identification plates complicate any installation, maintenance and spare part request.

1.6 Intended use

This unit is designed to cool water (potentially added with inhibited ethylene glycol) that circulates in a closed circuit.
The heat pump units can cool or heat the water circuit, depending on the selected operating cycle.
The heat recovery units can act as a sub-product, heating the water that circulates in a second closed circuit.
The hot or cold air produced by the machine, may be used for air conditioning systems or industrial processes.

⚠ Any other use of the machine is forbidden.

⚠ Do not use flammable products near the machine.

⚠ Do not use substances that can form explosive mixtures close to the machine.

⚠ Do not use the machine where there are problems of environmental impact.

1.7 General precautions

These units must be installed by a qualified company that at the end of the work provides the operator with a declaration of conformity with the regulations in force and the instructions provided by the manufacturer in this document.
These units must comply with their intended use in line with their performance characteristics.
Wear suitable and accident prevention clothing and equipment during installation and/or maintenance. The manufacturer declines any liability for non-compliance with safety and accident prevention regulations in force.
All unit installation, connection, start-up and shut-down operations must only be implemented by qualified and authorised personnel.
Comply with the laws in force in the country where the machine is installed, concerning the use and disposal of the packaging, the products used for cleaning and maintenance and for the management when the unit life cycle is complete.
Any repairs or maintenance must be performed by the technical support of the manufacturer or by qualified personnel, in accordance with this publication.
Preferably use original spare parts when replacing components.
If the refrigerant should leak, ventilate the room. The liquid refrigerant produces toxic gas when exposed to a flame.
In the case of a malfunction or spill of liquid or gas refrigerant, set the main switch to "off" and close the shut-off valves. Promptly call technical support or professional personnel. Do not intervene personally on the unit.
If the outside temperature can drop below zero, there is a freezing hazard and the system must be drained or anti-freeze must be added.
Based on CE Standard no. 842/2006 on certain fluorinated greenhouse gases, it is mandatory to indicate the total amount of refrigerant in the installed system. This information is present in the technical plate found in the outdoor unit. This unit contains fluorinated greenhouse gas covered by the Kyoto Protocol.
Maintenance and disposal must be carried out only by qualified personnel.
This unit contains flammable gas.
Read with attention the prescriptions on residual risks indicated in the use and maintenance manual.

1.8 Basic safety rules

Using products that require electricity and water require some basic safety rules to be complied with, such as:

- It is prohibited to operate the unit before having disconnecting it from the power supply by setting the main switch to "off".
- It is prohibited to modify the safety devices or the settings without authorisation and instructions from the manufacturer of the unit.
- It is prohibited to pull, detach or twist the electrical cables coming from the unit, even if it is disconnected from the power supply.
- It is strictly prohibited to touch any moving parts, stand between them or introduce pointed objects through the grids.
- It is prohibited to use gas and water pipes to earth the unit.
- It is prohibited to touch the unit when barefoot or with wet or damp parts of the body.
- It is prohibited to stand on the unit, sit down on it and/or lean any type of object against it.
- It is prohibited to dispose of and leave the packaging material in the reach of children as it can be a potential source of danger.
- It is prohibited for children or unassisted disabled persons to use the unit.
- It is forbidden to release R454C into the atmosphere: R454C is a fluorinated greenhouse gas, recalled in the Protocol of Kyoto, with a Global Warming Potential (GWP)= 146.

1.9 Residual risk

Description

The description of the residual risk considers the following elements:
the type of dangers those working around the machine are subject to;
a description of main risks;
who could be exposed to such risks;
what are the main safety measures adopted to reduce the risk of injury.

The guidelines for the prevention of accidents reported below, with reference to the relative areas of residual risk, must be integrated with all the general instructions of this chapter and with the accident prevention regulations in force in the destination country of the system.

Residual risk near the machine

Electrocution, if the electrical connection and earthing of the machine are not carried out correctly.
Cuts or abrasions due to the presence of sharp edges.
Suction of substances in the installation site and subsequent dispersion in the environment.
Projection of any object that may fall on the fan blades.
Leakage of water (in case of a fault).
Formation of condensation water and ice in the area in front of the machine during the heating operation of the heat pump machines.
Micro-climate alteration (during operation).
Noise emission (during operation). The sound pressure levels of the individual units are listed in the technical booklet.
Oil leaks (due to a fault).
Refrigerant gas leak (due to a fault).

⚠ Refrigerant gas is a greenhouse gas effect substance. Vapours are heavier than air and they can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid can cause freezing.

Measures to be adopted if refrigerant gas leaks

Product type:
- - R454C (Opteon™ XL20)

It is a mixture of:
-21,5% -HFO R1234yf Difluoromethane (N. CAS754-12-1) (N. CE468-710-7)
- 78,5% - HFO R1234yf Tetrafluoropropene (N. CAS754-12-1) (N. CE468-710-7)

The refrigerant contains fluorinated greenhouse gases and therefore covered by the Protocol of Kyoto.
The global warming potential (GWP) is 146.

The refrigerant, containing fluorinated gases, has an Ozone Depletion Potential ODP=0 and therefore it is excluded from the Protocol of Montreal.
The refrigerant is classified as an A2L "weakly flammable fluid" according to all international fluid classification criteria (ASRHAE 34 / UL2182 / ISO817).

	R454C
LFL% Vol	7
LFL kg/m3	0.268
Relative density	steam 3.2
	liquid 0.99
Molar Mass (kg/kmole)	90.776
Range coefficient (specific heat ratio)	L: 1,647; V1,273 (@21°C)
Steam density (kg/m3) (@21°C; 1,01325bar)	3.83
Liquid volume mass (kg/m3)	1058,7 (@21°C)
Specific heat at ambient temperature cls (J/kg*k)	Cpl: 1514; Cpv:1104,1 (@21°C)
	Cvl: 919, Cvv: 867,3 (@21°C)
gas diffusion coefficients cd (m2/h)	1
vaporisation latent heat clv (J/kg)	169,7*10^3(@21°C)
Boiling temperature (°C)	-45.9
Flammability temperature (°C)	405
Ignition temperature (°C)	405
UEL %	15
Electric construction group	II
Temperature class	T2

Dangers detection, refrigerant safety sheet

(for full information please consult the safety sheets of refrigerant suppliers)

Mixture classification (EC Regulation No 1272/2008):

- H220: flammable gas, category 1: high flammable gas.

- H280: pressurized gas, liquefied gas containing pressurized gas: it can blow off if heated.

Fluorinated greenhouse gas covered by the Kyoto Protocol HFC-R32.

P210: keep away from heat sources, hot surfaces, sparks, open flames and any other sources of ignition.

No smoking.

P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381: eliminate every possible source of ignition if there is no danger.

P410+P403: protect from solar rays.

Store in a well-ventilated place.

Other dangers

The mixture contains no substance considered as persistent, bioaccumulating or toxic (PBT).

The mixture contains no substance considered as very persistent and very bioaccumulating (vPvB).

Vapours are heavier than air and they can cause suffocation by reducing the oxygen available for breathing.

Rapid evaporation of the liquid can cause freezing.

The inappropriate use or the abuse for intentional inhalation can cause death with no predictive symptoms, as a result of cardiac damages.

Pit can cause cardiac arrhythmia.

Fire safety measures

Extinguishing media

Suitable extinguishing media: use extinguishing systems compatible with the local situation and the surrounding environment.

Use nebulised water, resistant alcohol foam, dry chemical products or carbon dioxide.

- Special dangers caused by the substance or the mixture.

Vapours may form a flammable mixture in contact with air.

Pressure increase.

Strong flame or heat may cause the sudden break of packing.

Dangerous combustion products are: hydrofluoric acid, fluorinated compounds, carbon oxide,

The inhalation of breakdown products may cause health diseases.

- Recommendations for people in charge of fire extinction

Special protection equipment for people in charge of fire extinction: in case of fire, wear the respiratory equipment with independent air intake.

Use individual protection devices.

Use neoprene gloves during after fire cleaning operations.

- Further information: chill the containers/tanks with water spray.

First aid measures

General information:

- in case of unconscious lay the person concerned on the side in a stable position and consult a doctor.
- do not administer anything to an unconscious person.
- In case of irregular breathing or respiratory arrest give artificial respiration.
- In case of disease persistency consult a doctor.
- The rescuer have to equip himself with an individual protection.

Inhalation:

- Remove from the exposure, lay the injured person down, bring to fresh air.
- Set the person concerned in a rest position and keep warm.
- use oxygen or artificial respiration if needed.
- do not administer adrenaline or similar drugs.
- Consult a doctor.

Contact with eyes:

- Rinse thoroughly with water for at least 15 minutes and consult a doctor.

Contact with skin:

- Wash immediately with plenty of lukewarm water.
- Do not use hot water.
- If a freezing occurred ask for medical intervention.
- immediately remove all contaminated clothing

Measures in the event of accidental spillage

Personal precautions:

- Move all personnel to safe areas.
- Vent the area, especially sunken or closed areas where heavy vapours concentration may occur (see also protection measures).
- Use personal protective equipment.

Environmental precautions:

- Intercept the emission.
- It must not be abandoned in the environment in compliance with local and national regulations.

Methods and material for containment and cleaning up:

- The fluid evaporates for this reason the area must be ventilated.
- Avoid open flames and high temperatures.
- Eliminate all ignition sources.

Keep away all heat sources/sparkles/open flames/heated surfaces. No smoking. The fluid is sensible to impact and friction.

In case of abundant leakages the use of an autonomous breathing apparatus is required (SCBA).

Operations with removed panels

Some of the operations and/or tests described below require the removal of the panels to access inside the unit.

There may be hot surfaces (piping, compressor, etc.) or cold (compressor, intake separator, etc.), sharp edges (coil fins) or moving parts (fans) even with the machine stationary.

⚠ The power supply must be disconnected before removing any panel.

⚠ Operations that require the panels to be opened must only be carried out by qualified personnel wearing personal protective equipment.

1.10 User guidelines

Keep this manual together with the wiring diagram in a place that is accessible by the operator.

Take note of the unit identification data so as to provide them to the service centre when required (see the "Machine identification" paragraph).

It is recommended to keep track of the operations carried out on the unit, so as to facilitate any troubleshooting.

In case of a fault or malfunction:

- verify the type of alarm to notify the service centre;
- immediately disable the unit without resetting the alarm;
- contact an authorised service centre;
- request original spare parts.

Request the installer to be trained on:

- switching on/shut-down;
- Shutting down for long periods;
- maintenance;
- what to do/not to do in case of a fault.

1.11 Machine description

1.11.1 Features

Frame.

Self-supporting galvanized steel frame further protected with polyester powder painting. Easy to remove panels allow access to the inside of the unit for maintenance and other necessary operations.

Compressors

Scroll with oil sight glass. They are fitted with internal overheat protection and crankcase heater. They are installed on rubber shock absorbers.

Fans.

Axial fans directly coupled to a three-phase electric motor with external rotor. A safety fan guard is fitted on the air flow discharge. They are also fitted with an electronic proportional

device for continuous and efficient operation of the unit with an outdoor air temperature as low as

-20 °C in cooling and as low as 40 °C when operating with the heat pump. It also allows to reduce

the sound level, especially at night.

Condenser

Made up of finned coils with copper pipes and aluminium fins.

Evaporator

AISI 316 stainless steel braze welded plates type with one or two independent circuits on the refrigerant side and one on the water side. An antifreeze heater is always installed.

Electrical board.

Including:

• wiring designed for supply voltage of 400-3ph-50Hz; auxiliary circuit power supply 230V-1ph+N-50Hz coming from the main power supply; main power switch with safety door lock device; fuses; thermal protection relays on compressors and thermo-contacts for fans;

• machine remote controls:

- remote on/off;
- remote summer/winter switching;
- general alarm signal;
- evaporator pump control when there is an externally supplied electric pump (responsibility of installer);
- auxiliary generator control;
- domestic hot water management controls;
- (feedback) summer/winter signal.

Microprocessor

Microprocessor circuit board controlled from machine panel or by using the remote control panel (CR accessory) for automatic control of the following functions:

- management of electronic expansion valve;
- management of time bands and work parameters with the option of weekly/daily operation programming;
- management of remote set-point via outdoor air temperature (climatic curve);
- adjustment of inlet water temperature to the machine;
- management of circulating pump with pump energy saving function;
- antifreeze protection that engages automatically with machine in stand-by;
- safety time control;
- compressor time control;
- alarms reset;
- management of alarms and operation LEDs;
- alarm cumulative contact for remote warning;
- local or remote cooling/heating cycle switching.

• Visual system with display for:

- running cycle (cooling/heating/domestic hot water production, defrost);
- compressor demand/on (signalled by LED);
- inlet/outlet water temperature;
- temperature set point and differential setting;
- code and display of triggered alarms.

• There are also included inputs/outputs to activate the following advanced functions that can be enabled by the user:

- digital input to manage double remote setpoint (IAS, incompatible with IAV and IAA);
- analogue signals to manage remote setpoint with 0-10V signal (IAV, incompatible with IAS and IAA) or 4-20mA signal (IAA, incompatible with IAS and IAV).
- potential-free contact to control auxiliary generator in integration or replacement in hybrid systems (HYM);
- digital input (via thermostat, not supplied) or analogue input (via sensor, not supplied) for domestic hot water production call and external 3-way valve control (DHW);
- digital input for unit power limit (IDL).

Refrigerant circuit.

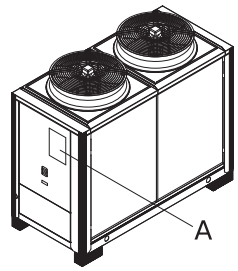
Made of copper pipe, it includes the following components on all models: electronic thermostatic expansion valve; filter drier; liquid and humidity indicator; high pressure switch (with fixed setting); high and low pressure transducers; 4-way reversing valve; suction liquid separator; liquid receiver; check valves.

Water circuit.

It includes: evaporator; temperature probe; antifreeze probe; water differential pressure switch; flow switch; manual air vent; hydraulic 4-way valve for counter flow exchange.

2 SHIPMENT

2.1 Inspection on receipt

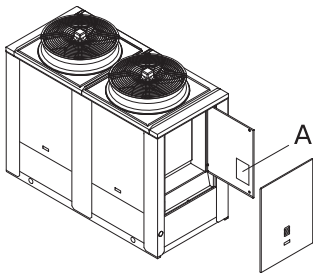


A Packaging plate

Before accepting the delivery, check:
- That the unit has not been damaged during transport.
- That the delivered material is as specified on the shipping document when comparing the data with the package plate 'A'.

In case of damage or faults:
- Immediately take note of the damage on the shipping document and write: "Accepted with reservations for evident loss/damage during transport".
- Submit a complaint by registered mail with return receipt to the carrier and the supplier.

2.2 Position of the equipment



A Pocket for documents

⚠ Keep the documentation in a dry place to prevent deterioration, for at least 10 years for future reference.

⚠ Any accessories that are not factory-fitted are supplied in separate packages, with a relevant instruction sheet.

2.3 Equipment

Installation, operating and maintenance manual;
Wiring diagram;
Refrigerant diagram;
Water diagram;
List of parameters;
Declaration of conformity;
Technical data.

2.4 Storage

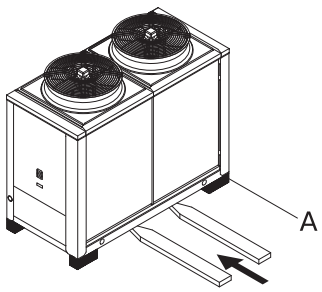
The room temperature in which the units are stored must be between -20 / +50°C.

2.5 Handling

The equipment is designed for two lifting systems according to the length of the machine.

⛔ It is prohibited to use the pipes or other components of the machine as lifting points.

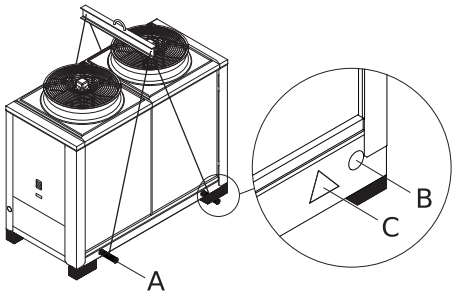
2.5.1 Lifting with forks



A Support

Insert the forks from the side to avoid damaging the panels.
Before placing the machine on the ground remove the wooden supports.

2.5.2 Lifting with a crane



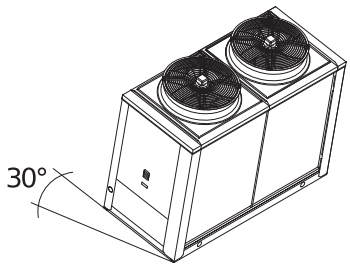
A Bar for lifting (maximum ø 63 mm)
B Hole to insert the lifting bar
C Label for holes enabled for lifting

⚠ It is recommended to use a system to prevent the belts from slipping from the bars during lifting.

⚠ Place spacers and protectors in between prevent damaging the unit.

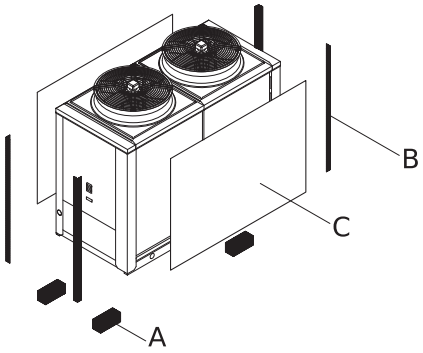
Insert the lifting bars into the arranged holes on the base and indicated by the relative labels.
Lift the unit using suitable belts.

⚠ Make sure that all the equipment used for handling (belts, bars, etc.) are appropriate for the weight of the unit.



⛔ During handling it is prohibited to exceed the maximum inclination allowed, as shown in the figure.

2.6 Unpacking



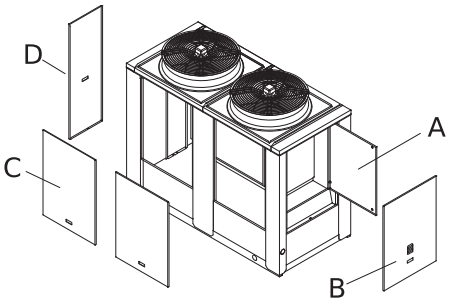
A Wooden support
B Corner protector
C Coil protection

Remove the wooden supports before resting it definitely on the ground.
Remove the clear film that wraps the machine.
Remove the corner protectors.
Remove the coil protectors.

⚠ The machine is supplied without shock absorbers. Install any shock absorbers before resting the machine definitely on the ground.

⚠ Only remove the packaging when set in the place of installation.

2.7 Access to internal parts



A Electrical board door
B Electrical board panel
C Side panel
D Rear panel

Unscrew the fixing screws and remove the panels.
To access the electrical board:
Remove the panels of the electrical board.
Set the disconnecting switch knob to Off.
Open the doors of the electrical board.

2.8 Resting on the ground

The unit must be positioned on a perfectly horizontal surface that is able to withstand its weight.

Positioning must be performed slowly and so that all support points are touching the floor.

3 INSTALLATION

3.1 Installation information

3.1.1 Outdoor installation site features

Aircooled units can be installed only and exclusively outdoor in open air.

The positioning should be done in order to avoid the flow of an accidental refrigerant leak from the unit inside bordering buildings and surrounding places.

In no case the refrigerant accidentally released from the unit must be aspired by aeration channels for the air rechange of air-conditioning and similar equipment placed in the surroundings. Furthermore it must not flow through buildings entrances and/or closed compartments.

Whenever evaluated the risk as non-negligible, it is necessary to provide specific covers to the unit and a natural or forced ventilation must be guaranteed.

Keep attention that in the installation places refrigerant stagnations can occur in basement windows or in sunken parts under the level of the support surface.

In this case the use of gas detectors to signal dangers and forced ventilation systems can be necessary.

The installation area must be confined and forbidden to people not in charge.

The area must be clearly labelled with both the danger of refrigerant flammability and the prohibition to the use of open flames, no smoking prohibition and the use of any device producing sparkles.

Only insiders and authorised personnel, well-trained and informed, are allowed to access to the units.

It is highly recommended that installation area is evaluated by experts for the evaluation of risks connected with the use of flammable substances in compliance with the laws in force in the place of installation and the relevant standards.

3.1.2 Features of the installation area inside service rooms

When the units have to be installed inside a service room, they have to comply with the laws in force in the country of installation.

In case of no laws and legislation follow the guideline defined by the EN 378-2017 legislation, in all its parts.

An analysis of risks based on safety principles for cooling systems should be carried out in respect of the laws in force in the place of installation, the indications of the manufacturer, considering the requirements shown in the refrigerant safety statement and the amount of the refrigerant charge shown in the serial number of the installation. The analysis may indicate that the unit should be installed in a separate and independent engine room. Especially when the fluids used are classified as A2L, an evaluation should be done in compliance with requirements of EN 60079-10-1 for the hazard classification of the area. It could be established from the type of fluid released, the LFL value of the fluid and the ventilation conditions whether there are area classified with risk of explosion or not.

The engine room shall not be accessible to public or layperson. The owner or the person in charge of the conduction of the plant, shall assure the access only to personnel skilled and well-informed on both the maintenance of the systems and cooling plants and on safety procedures in case of emergency.

The engine room should in no case be used as warehouse except for equipment, spare parts and the oil contained in the compressor of the machine installed. It is forbidden to stock refrigerant, flammable or toxic material. These materials should be stored in dedicated places in compliance with the laws in force in the place of installation.

In the engine room it is forbidden to use open flames except for welding and brazing necessary during extraordinary maintenance activities. In these cases a proper ventilation at the control of the refrigerant concentration level into the room should be granted. It is forbidden to leave unattended open flames during extraordinary maintenance steps.

A remote emergency switch shall be foreseen (mushroom head button) outside the engine room near the access door. A similar switch shall be installed in an adequate place inside the engine room. The emergency switch should stop the power supply of the devices installed inside the room, activate the emergency ventilation system and activate an alert system of the state of emergency as a flashing light or a siren.

All piping crossing the perimetral walls of the engine room shall be sealed in order to avoid the refrigerant permeability in the adjacent rooms.

All hot surfaces inside the engine room do not have a surface temperature higher than the minimum temperature between 80% of the autoignition temperature of the fluid (measured in °C) or the autoignition temperature of the refrigerant lowered by 100K.

Refrigerant	Self-ignition temperature	Maximum surface temperature
R454C	405 °C	305°C

The engine room should have doors opening outward, in a sufficient number to guarantee the free exit in case od emergency escape. The door must be sealed (fire door type), self-closing and with antipanic system with opening from inside.

A dedicated engine room shall be foreseen where the refrigerant charge overtakes the practical limit consented for the volume of the local. The access door, which can be opened in both directions, should lead directly to the outside or to an anteroom equipped with self-closing fire door.

The ventilation of engine room should be sufficient both for normal conditions of use and for possible conditions of emergency.

The ventilation normal conditions of use has to comply with the laws and regulations in force in the country of installation.

In case of emergency, the mechanic ventilation shall be activated by one or more detectors placed inside the engine room.

- The mechanic ventilation system should be:

Independent in relation to all other ventilation systems present in the plant;

Activable indifferently from one of the two emergency keys (one placed inside and the other one placed outside the engine room);

- The emergency exhausted air expulsion fan should present the following features:

If completely immersed in the air flow it should be suitable for dangerous areas (i.e.

EN14986) or with the sole vent directly invested by the air flow and the motor separated from the direct flow of the exhausted air.

The fan should be installed in a way to prevent the pressurisation of ductwork of the engine room.

The fan should be installed assuring there is no possibility to release sparks due to the friction of the metallic parts in relative motion between them.

- The air flow of the emergency mechanic ventilation should be at least equal to:

V=0.014 x m^ (2/3)

where:

- V is the air flow in m3/s;

- m is the refrigerant charge in kg of the unit located in the engine room;

- 0,014 is a conversion factor.

- The mechanical ventilation should operate continuously or it should be activated by a safety detector.

The detector of gas leaks shall automatically: activate an alarm, activate the mechanic ventilation and stop the power supply the devices in operation (the cooling unit and the other connected components of the plant) from the main electrical board located in a safe area.

The detector of gas leaks shall be housed taking into consideration the type of refrigerant and in the part of the engine room where stagnation and maximum concentration can be expected.

The placing of detector of gas leaks should be done based on the air distribution inside the room, the ventilation system and the ducting used. Both the mechanic corruption potential and the contamination of the sensible element have to be evaluated.

At least one leak detector should be installed in each engine room and it is important to consider if it is located at basement level and the fluid density in relation to the air. if the gas is heavier than the air, the detector shall be placed at the bottom, on the contrary if it is lighter than the air, it has to be placed at the top.

The detector shall be continuously monitored and maintained in the respect of manufacturer's indications. In case of detector breakdown, it is necessary the activation of the safety procedure as if a refrigerant leak would be detected.

The detector shall be set to the most critical condition between 30°C and 0°C. The limit set shall be set to the detection of refrigerant concentration equal to 25% of LFL. The detector shall be continuously activated for levels higher than the set value.

Refrigerant	LFL	Maximum settable limit
R454C	0.268 kg/m3	0.067 kg/m3

All electrical devices (and not only the refrigerant unit) should be selected and suitable to be installed in the areas identified by the analysis of risks. The following items shall be considered as suitable: conventional electrical devices, which can be supplied until the detector maximum limit of intervention at 25% of LFL; devices which must be supplied regardless the detector intervention should be considered suitable only if suitable for installation in dangerous area.

The engine room or the special engine room should always be clearly marked on the entrance door. Some instructions should also be indicated:

- No admission for unauthorised persons;
- The access is allowed only to insiders and authorised people ;
- Smoking and use or get close with open flames is forbidden;
- Warnings should declare that in emergency case only authorised and people well-trained on emergency procedures could decide to enter in the engine room;
- All warnings, prohibitions and systems non-authorised uses should be explicated.

The person in charge of the management of the installation and/or the user should keep the registry and system book up to date.

The detector inserted in the machines is used only and exclusively to detect leaks inside the machine. It is not usable to the safeguard of the installation.

3.1.3 Ventilation degree to completely declassify the installation area

In cases when it is necessary to completely declassify the machine, it is necessary to foreseen a mechanic ventilation with an proper air flow and able to keep a constant flow speed inside the technical room.

Hereafter are indicated the values of flow and speed to assure inside the technical room; these values, respected by the installer/user, and made from studies carried out by Thermocold in compliance with the EN 60079-10-1 and the guide lines CEI 31-35, do not relieve the installer/user to carry out his own classification study in compliance with the laws and regulations in force in the place of installation. Specific air flow for engine room m^3 0.1 $m^3/(s\ m^3)$.

Air speed to be kept uniform in the ambient 0.15 m/s.

For example for a engine room of 100 m^3 the air flow of mechanic ventilation should be at least 10 m^3/s and the air speed should be kept at a value of 0.15 m/s.

If these conditions were missing, the safety systems shall block the whole system by interrupting the power supply from the main electrical board placed in a safe zone.

3.1.4 Safety valves drain ducting

The safety valves of the unit shall be ducted outwards so that in case of intervention they can release the flammable fluid outwards in a safe and ventilated area.

The connection shall be done with a copper piping with a diameter at least similar to that of the valve's threaded discharge connection.

The piping shall be sustained and its weight shall not deform it.

The drain shall be protected with a grid in order to prevent the entrance of bugs, birds, dirt and it shall also be periodically checked and cleaned.

The valve drain shall be positioned so that to avoid in any case the recirculation of the fluid released inside the technical compartment or inside other compartments or buildings in the surroundings.

In the external point, where the valve drain is conveyed in case of release for an accidental intervention, is generated a zone classified as Type 1 Zone with a reversed cone-shape with a maximum height and diameter as indicated and placed as shown in the figure:

H= 7.8 m

D= 6 m

In watercooled units the safety valves are factory ducted furnishing a single connection to each circuit.

The place where the safety valves drain is present is signalled by a specific label of danger.

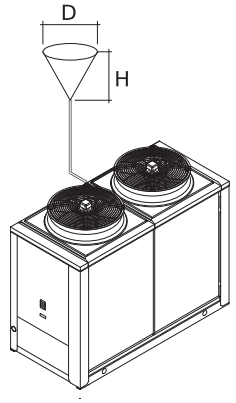
The installer/user is required to prolong the pipeline of the drain leading the drain point into a safe point as for example the one indicated in the picture.
The ducting pipeline shall have at least a diameter equal to that of the connection on the machine.

3.1.5 Ducting dimensioning criteria

The ducting connection should be carried out starting from the valve drain diameter and it should never present a diameter reduction.
The guide is provided with the following table to establish the maximum length of the ducting in relation to the diameter.

	Ducting line diameter	
Outlet valve diameter	28 mm	35 mm
28 mm	Max. length 8 m	Max. length = 15 m
35 mm	-	Max. length = 10 m

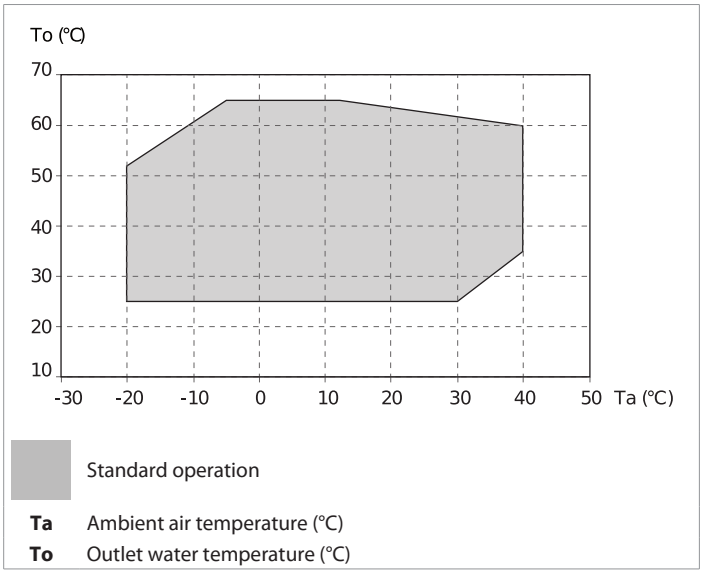
Calculation example: the unit to be installed features a 28 mm connection.
Case A) the distance for valve ducting is 5 m, the diameter of the ducting pipe shall be 28 mm.
Case B) the distance for ducting is 10 m, the diameter of the ducting pipe shall be 35 mm.



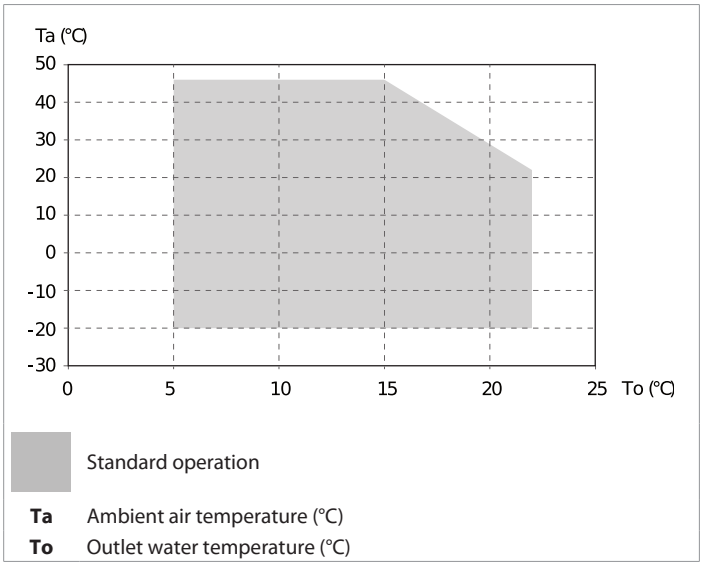
3.2 Work fields

The work fields are indicative, near the operating range limits the units may choke the cooling capacity.
Check the actual capacity by using the capacity tables or the selection software.

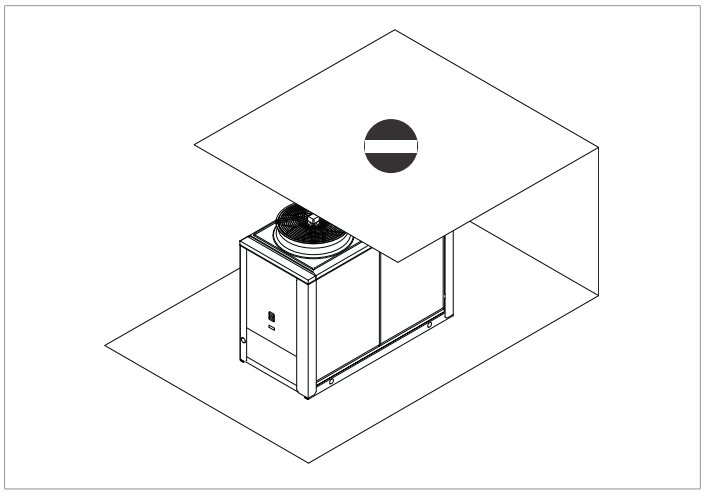
Operating mode: heating



Operating mode: cooling



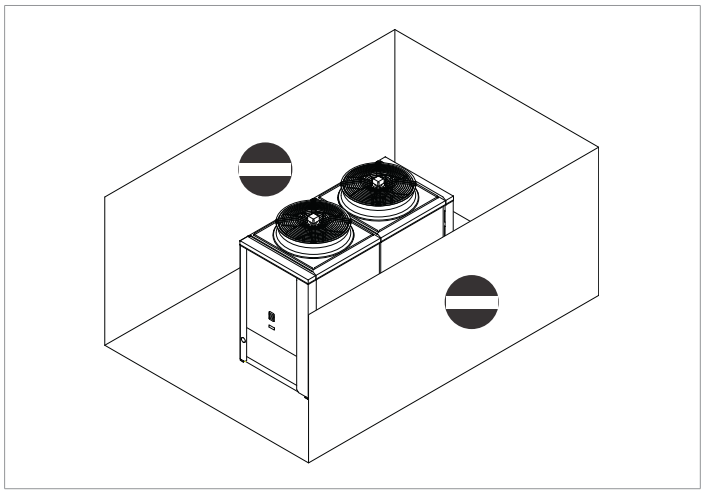
3.3 Unit location



The unit should be positioned far from any obstacle.

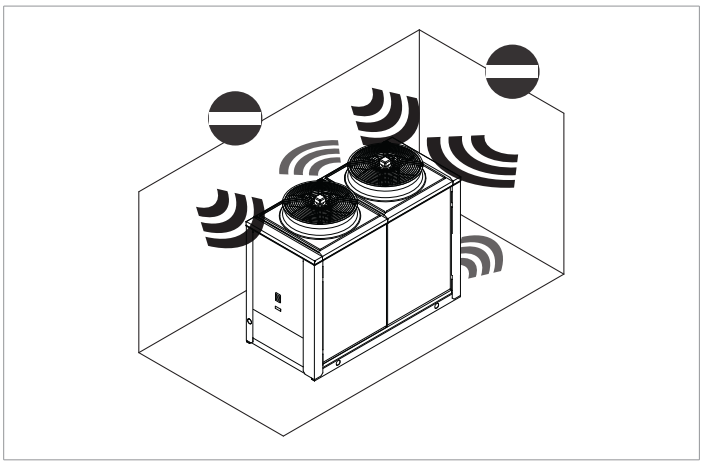
It is prohibited to place the unit under a roof, canopy or any covering in general.

The heat pump units allow ice and condensation to form that pours on to the floor in front of the unit. Collect and drain the condensation and defrost water to prevent the floor from becoming slippery.



It is prohibited to place the unit inside basement windows.

3.3.1 Noise

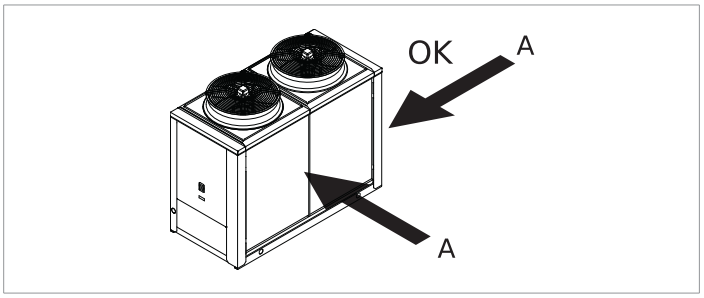


During operation, the unit generates noise.

Avoid installation in reverberant environments.

Avoid placing the machine with the side of the coil in the direction where the noise level is more critical.

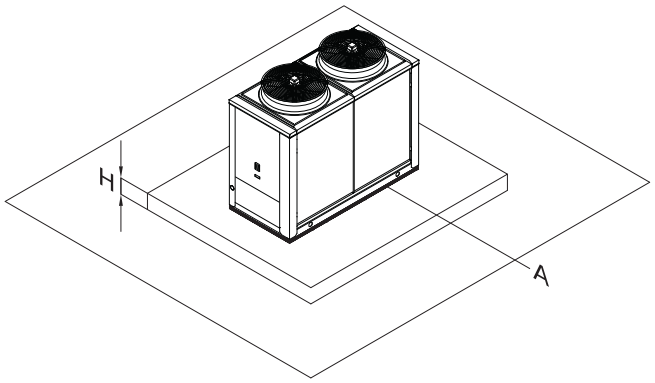
3.3.2 Windy areas (Resting on the ground)



The wind may alter the operating conditions. Place the unit with the long side parallel to the prevailing wind direction in order to minimise the effects.

Avoid placing it with the coil perpendicular to the direction of the main wind.

3.3.3 Resting on the ground



A Rigid rubber band
H Slab of 10-15 cm

Place the unit on a perfectly level support surface.
Place a rigid rubber band between the base of the machine and the support surface.

⚠ Verify that the support surface withstands the weight of the unit.

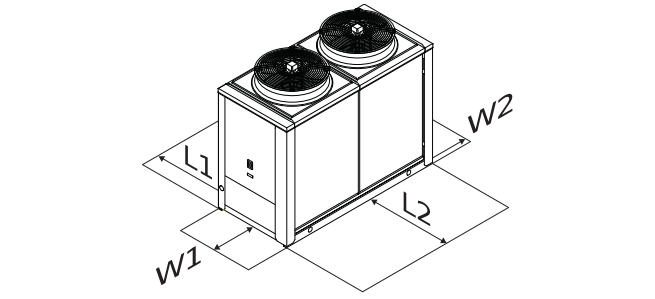
⚠ Provide a supporting slab of proportional dimensions with the unit if resting on unstable ground.

⚠ The slab must be horizontal and able to withstand approximately 200% of the operating weight of the machine.

⚠ If necessary, use shock absorbers (rubber or spring).

⚠ A drain for the water produced by coils defrosting must be implemented for the WP units.

3.4 Verifying clearances (clearance area)



L1 800
L2 1800
W1 800
W2 300

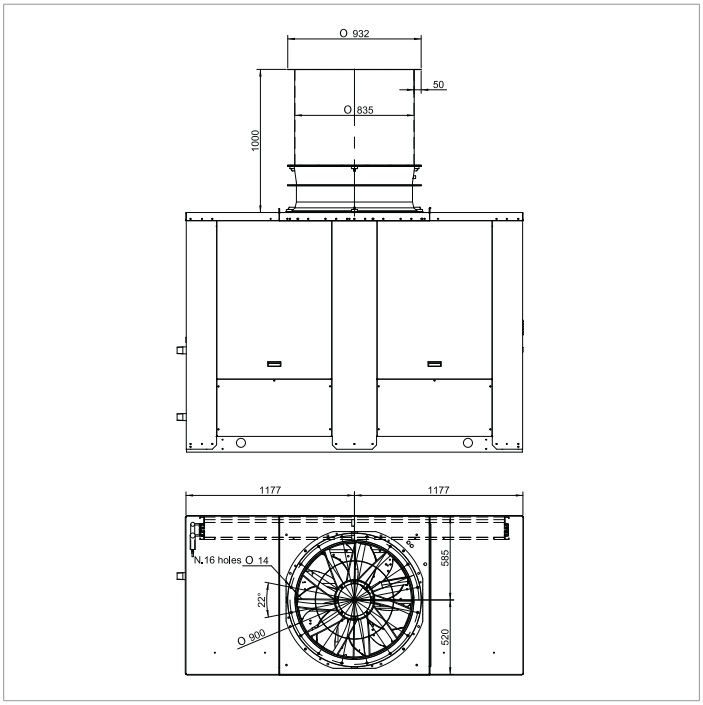
Installation, in addition to the indicated spaces, must enable access to the authorised personnel for maintenance operations and must take into account the safety distances from any other equipment installed near the machine.

3.5 Installation with ECH inverter high pressure fans (accessory ECH)

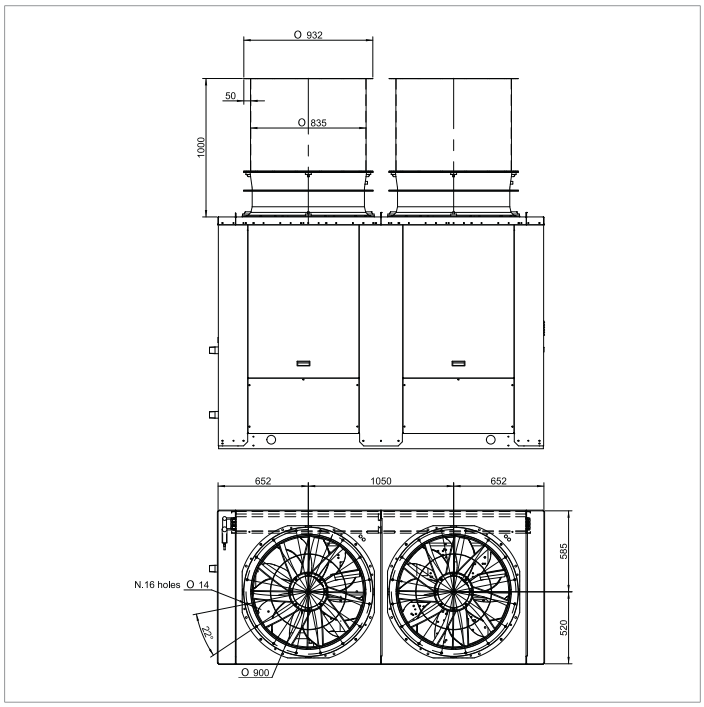
The units equipped with electronic fan and special mouthpiece (ECH accessory) can be ducted keeping the pressure drop of the duct within the limits of the useful head shown in the table below.

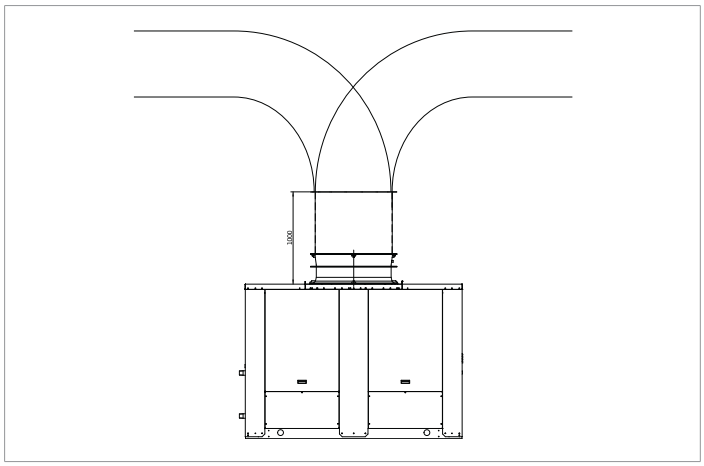
	Available static pressure
ECH	60-110 Pa (2kW motor)

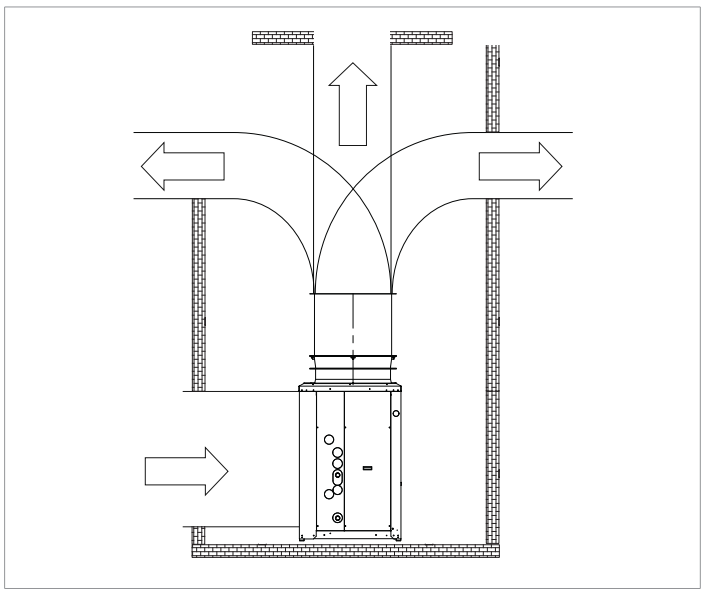
The ducting to be carried out by the installer can be realized by first providing a cylindrical duct section having at least the dimensions shown in the figure. The fan nozzle is equipped with a perforated flange that allows the cylindrical duct to be fixed by means of bolts.



The rectilinear section of the channel allows the flow to be regularized, reducing pressure drops and noise. From this it's possible continue with the ducting according to the installation needs while respecting the useful head of the fan. This solution is also valid for units with several fans







To ensure correct operation of the unit, it is necessary to avoid that the inlet air does not mix with the outlet air, therefore in addition to expelling the air outside the compartment where the unit is installed,all possible measures must be taken to avoid air circulation

The delivery ducting must have a constant section and greater than or equal to the fan outlet

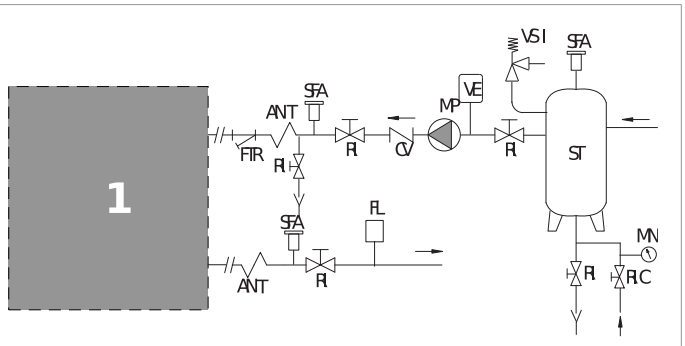
The technical installation compartment of the unit must have an adequate opening towards the outside of the same size as that of the finned coil of the unit to allow the flow of the correct air flow.

The air duct must not burden the unit, the installer must therefore provide adequate external supports to support the ducting.

Warnings

4 WATER CONNECTIONS

4.1 Connection diagram



1	UNIT
ANT	Anti-vibration joint (recommended)
CV	Check valve
FL	Flow switch (recommended)
FTR	Mesh filter (mandatory)
MN	Water gauge
MP	Circulating pump
RI	Shut-off ball valve
RIC	Automatic water filling valve
SFA	Automatic air vent (mandatory)
ST	Inertial tank
VE	Expansion vessel
VSI	Safety valve (mandatory)

⚠ Some of the components in the diagram may already be included in the unit with the hydronic kit. Those not included must be provided by the installer.

⚠ Connection pipes must have a suitable diameter and be supported so as not to impose their weight on the unit.

⚠ If the heat pump is fitted with SI accessory, the circulating pump must be installed with the outlet water suction from the machine

⚠ If the heat pump is fitted with the SI accessory, any DHW and HYM functions must not be enabled

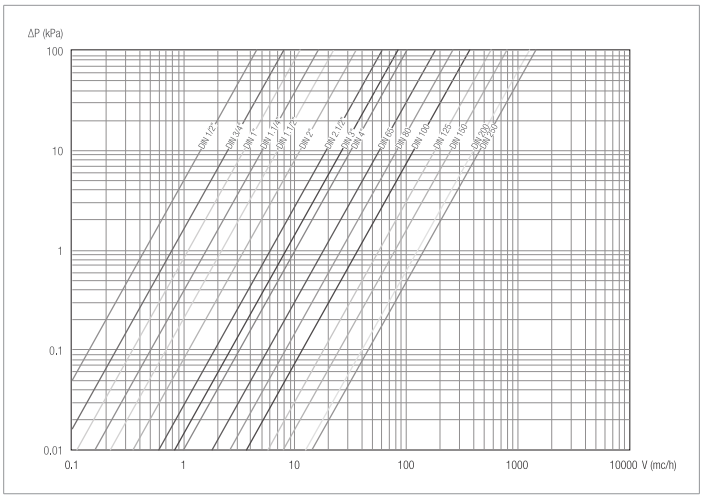
4.1.1 Water filter

Water filters must always be installed on the machine inlet side.
Square mesh filters must be installed with:

- maximum side of 0,8 mm up to diameter DN80
- maximum side of 1,6 mm up to diameter DN150

The dimensions and the pressure drops must be adapted to the installation.

⚠ Filters must be clean periodically.



ΔP	Pressure drops in kPa
V	Water flow rate in mc/h

4.2 Position of connections

The position of the water connections and the inlet and outlet direction is indicated by the labels on the connections.

4.3 Hydraulic data

4.3.1 Water volume

The machine electronic control, to protect the electrical motor, limits hourly start up of the compressor.
This operation creates oscillations of the water temperature in the draw-off point, affecting plant efficiency.
For a correct operation, the water volume must comply with the following formula:

For cooling only version only
M > 9,45 x k x n/N x (Qf – q)

For heat pump version only
M > 9,45 x k x n/N x (Qt – q) + 2,37 x (Qt – q)

M = Minimum water content (l);
k = Factor that takes into account the different water temperature value between the inlet and outlet of the evaporator or condenser;

n = Partition coefficient (n=1 unit up to 4 compressors; n=2 units with more than 4 compressors);

N = N. compressors;

Qf = Cooling capacity (kW);

Qt = Heating capacity (kW);

q = Permanent thermal load in the system (kW), (q=0 if the value is unknown).

ΔT (K)	K
3	1
4	1
5	1
6	1.05
7	1.1
8	1.15
9	1.2
10	1.25

⚠ For the process application a 50% higher water content is recommended to stabilize the outlet temperature (1.5 x M calculated with the previous formulas).

If the water volume in the circuit does not reach what is indicated, installing a new inertial storage tanks shall be required.

Storage size shall be calculated so that with its volume, added to the water quantity inside the circuit, the value indicated in the formula is reached.

4.3.2 Water features

Water features are important for the proper operation of the machine and for its lifetime.

Extreme water hardness leads to the formation of limestone in exchangers reducing their performance.

The table shows some water parameters to be observed for proper operation of the machine.

Content		Concentration mg/l or ppm	Material	
			AISI 316L	Copper
pH		<6	2	2
		6-7.5	2	2
		7.5-9	1	1
		>9	1	2
Alkalinity	HCO3	- <70	1	2
		70-300	1	1
		>300	1	2
Sulphate	SO42-	<70	1	1
		70-300	1	3
		>300	1	3
Alcalinità/Solfato	HCO3-/SO42-	>1	1	1
		<1	1	3
Electrical conductivity	µS/cm	<10	1	2
		10-500	1	1
		>500	1	2
Ammonium	NH4	<2	1	1
		2-20	1	2
		>20	1	3
Free chlorine	Cl2	<1	1	1
		1-5	3	1
		>5	3	3
Hydrogen Sulphide	H2S	<0.05	1	1
		>0.05	1	3
Free Carbon Dioxide	CO2	<5	1	1
		5-20	1	2
		>20	1	3
Nitrate	NO3	<100	1	1
		>100	1	2
Iron	Fe	<0.2	1	1
		>0.2	1	2
Aluminium	AL	<0.2	1	1
		>0.2	1	2
Manganese	MN	<0.1	1	1
		>0.1	1	2

1 - Good corrosion resistance.

2 - If different factors of this type are present, corrosion can occur.

3 - Use not recommended.

4.3.3 Protection against freezing

If you do not wish to drain the system during periods where the machine is not used, the water may freeze, or if the system must operate with temperatures less than 5°C, ethylene glycol must be mixed with the water.

Adding glycol changes the physical characteristics of the water and the performance of the machine.

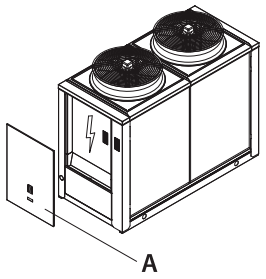
The table indicates the multiplicative factors to calculate the performance change based on the percentage of glycol used.

% G	10	20	30	40	50
Tc	-4.5	-9.5	-15.5	-21.5	-32.5
CQ	0.975	0.953	0.931	0.914	0.882
CP	0.998	0.995	0.99	0.985	0.975
CG	1.01	1.04	1.08	1.14	1.2
CP	1.05	1.13	1.21	1.26	1.32

% G = Glycol percentage
Tc = Water freezing temperature (°C)
CQ = Cooling capacity correction factor
CP = Electrical power absorbed correction factor
CG = Water flow correction factor
Cp = Pressure drops correction factor

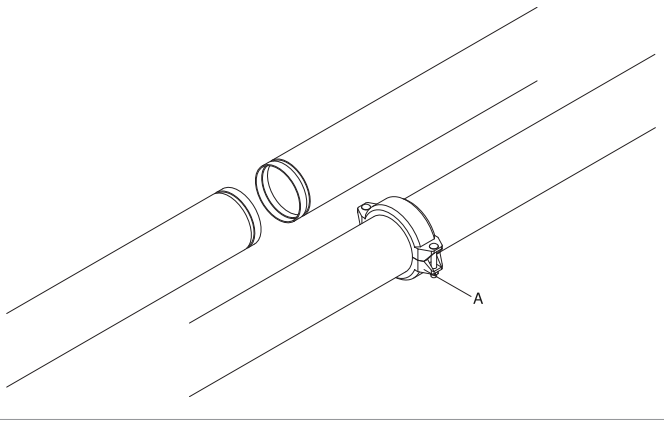
4.4 Connection to the system

4.4.1 Models without hydronic kit



A Rear panel

In these models, the connections are positioned inside the unit.
Remove the inspection panels.
Remove the protection caps from the connections.
Connect the pipes to the connections.



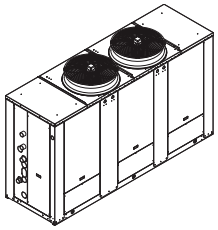
For threaded connections:
Fasten by holding a part in order o tighten the other part.
It is recommended to seal with hemp and green paste.

For Victaulic connections:
Secure by using the appropriate coupling system (not supplied).

⚠ Provide shut-off valves and anti-vibration joints on the connection pipes.

⚠ During the hydraulic connection operations, never operate with free flames near or inside the unit.

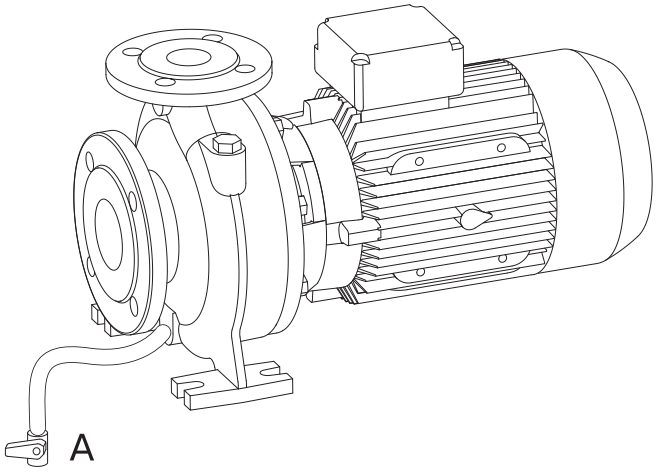
4.4.2 Models with hydronic kit



In these models, the connections are positioned outside the unit.
Remove the protection caps from the connections.
Connect the pipes to the connections.

For threaded connections:
Fasten by holding a part in order o tighten the other part.
It is recommended to seal with hemp and green paste.
For Victaulic connections:
Secure by using the appropriate coupling system (not supplied).

4.5 System fill-up



A Pump drainage shut-off valve

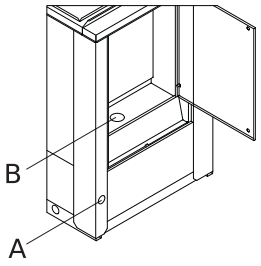
Before performing any operation, make sure the main switch is off.
If the hydronic kit is installed, make sure the pump drainage shut-off valve (A) is closed.
Make sure that the drain valves are closed and the air vent valves are open.
Open the shut-off valves of the water system.
Start filling.
When the water begins to leak from the vent valves, close them and bring the water pressure to the value required by the system (1 - 1.5 bar). Keep in mind that safety valve calibration is 6 bar.
When the water pressure has stabilised (read the pressure gauges installed on the upper side), close the fill-up valve and check the tightness of the various joints.

⚠ It is advisable to periodically check the pressure in the water circuits to prevent malfunctions.

⚠ The water circuits must always be topped-up with the pumps off.

5 ELECTRICAL CONNECTIONS

5.1 Machine connection



A Pre-cut for front inlet
B Hole for bottom inlet

The unit is provided with holes for the power cables inlet. There is a pre-cut hole on the structure and a hole on the base for any input from below.
Remove the pre-cut.
Insert the cables from the outside, guiding them towards the electrical board.

⚠ Avoid direct contact with non-insulated copper pipes and with the compressor.

⚠ It is forbidden to enter the device with electrical cables in positions not specifically required in this booklet.

To set up the electrical connections:
Unscrew the fixing screws.
Remove the external panels.
Set the main switch to 0.
Turn the two fixing screws 1/4 of a turn and open the board doors.
Use the hole for the main power cable and the hole for the cables of other external connections.
Make the connections as shown in the wiring diagram.
Once the electrical connections are completed, secure the cables by using the cable glands, close the doors of the electrical panel and reassemble the external panels by screwing the fixing screws.

⚠ Before connecting the remote ON-OFF switch, remove the jumper from the relative clamps.

5.2 Connections of the accessories

5.2.1 Flow switch

The chiller must only operate in the presence of water flow.

The flow switch is standard supplied in the units.The differential pressure switch (if not already present) must be connected as shown in the wiring diagram.

5.2.2 Circulating pump

The circulating pump must always be connected to the control unit as indicated in the wiring diagram. The pump must be started before the chiller is started and stopped after the chiller is stopped (recommended minimum delay: 60 seconds).

5.2.3 External consents

If you wish to enable or disable the unit remotely, connect the external consent to the contacts listed in the wiring diagram.

⚠ Avoid placing the control cables in the same duct as the power cables. Always use a suitable shielded cable.

⚠ The connection cables must have a minimum cross section of 1.5 mm^2.

6 COMMISSIONING

6.1 Preliminary inspections

6.1.1 Electrical

Verify that the voltage on terminals L1, L2 and L3 is that shown on the plate of the unit (tolerance allowed) ±5%, which can be checked with a tester. If voltage changes occur frequently, please contact our technical department to choose suitable protections.
Verify the complete tightness of the fuse holder caps.
Verify that the crankcase heaters (if applicable) are powered correctly: to check whether the heaters are working properly, check that the bottom of the compressor is at a temperature of 10 to 15 °C higher than the ambient temperature.
Power and check the correct direction of rotation for the three-phase version, which should be clockwise looking at the motor from the fan side. Otherwise, invert any two of the phase conductors.

6.1.2 Hydraulic

Make sure that the water circuit has been previously cleaned: it is recommended to wash the water circuit via by-passing the unit and then check the cleanliness of the system filter.
The machines are shipped with open vents and drains, which must be closed during installation when filling the water circuit. Labels indicate their positions.
In models with a hydronic kit, the water drain cap of the pump has been removed, in order to drain the water contained in it and to avoid freezing problems during the winter season. The cap is inside the envelope containing all documents of the unit.
Make sure that the hydraulic system has been bled, thereby eliminating any residual air. The operation must be performed by loading gradually and opening the venting devices set up by the installer in the upper part of the system.
If you are using glycol water you can move the antifreeze set-point.
The value must be equal to the value of the freezing temperature of the fluid plus 6K.

6.1.3 Cooling

Make sure that the pressure gauges (when present) indicate an adequate pressure. Pressure gauges can be fitted with shut-off valves. They should only be opened when necessary and once readings are taken, they must be closed again.
Check that there is no refrigerant leak, possibly using a leak detector.

6.2 First start-up or restart after long inactivity

6.2.1 Start-up

Activate the machine according to that described in the relative command section.

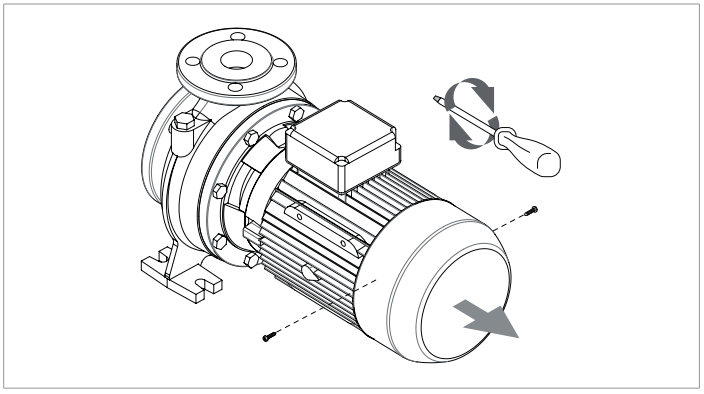
6.2.1.1 Checks during operation

Check that the machine does not generate abnormal noise or excessive vibrations.
After a few hours of operation verify that the crown of the liquid and humidity indicator indicates a dry circuit.
Verify that the machine operates within the optimum working range.
Verify that there is no excessive presence of bubbles in the liquid indicator. If there are this indicates low refrigerant.
A few minutes after the compressors are started, during the summer mode cycle, make sure that the condensing temperature is 18±4K higher than the air temperature entering the condenser and that the average evaporating temperature is approximately 5K lower than the water temperature leaving the utility exchanger.
Verify that the overheating temperature of the refrigerant is between 5 and 7K. To verify:
- Measure the temperature with a contact thermometer placed on the intake pipe of the condenser .
- Read the temperature indicated on the pressure gauge connected to the inlet.
- The difference between these temperatures provides the overheating value.

Verify that the subcooling temperature of the refrigerant is between 4 and 8K. To verify:
- Measure the temperature with a contact thermometer placed on the outlet pipe from the condenser.
- Read the temperature indicated on a pressure gauge connected to the liquid outlet of the condenser.
- The difference between these temperatures provides the subcooling value.

⚠ The tests referred to above can be performed using the pressure gauges supplied with the unit (accessories). Once the checks are complete, close the shut-off valves of the pressure gauges.

6.2.2 Pump release procedure



Before starting the pump, check that the moving parts rotate freely.
To release the pump:

Remove the fan cover from the seat of the rear motor cover.
Use a screwdriver on the present slot on the motor shaft from the fan side.
In case of blockage, turn the screwdriver by tapping it lightly with a hammer.
When the operations are completed, reassemble the components in reverse order.

6.3 Shut-down

6.3.1 Temporary shut-down

Disable the machine according to that described in the relative command section.

⚠ Do not disconnect the power supply by acting on the disconnecting switch on board the machine or the main switch of the system. If no voltage is present, the crankcase heaters and any anti-freeze heaters cannot work, thereby, posing a risk of freezing.

6.3.2 Shut-down for long periods

Not using the unit for a long period of time requires the following operations to be performed:
Disable the unit in any mode of operation it may be, from the control panel.
Set the remote switch to "OFF" (if present) after having turned off the unit.
Disable the internal terminal units by setting the switch of each unit to "off".
Set the main switch of the system to ''off''.
Close the water valves.

⚠ If, during the period of inactivity the temperature drops below zero, the system must be fully empties or topped up with antifreeze liquid.

6.4 Flow rate calibration

Once the pump has started, verify that the fluid flow rate of the utilities is within the expected values for the unit.

To verify:
Use pressure gauges set before and after the circulating pump to measure the pressure difference.
Verify that the pressure difference measured is equal to the pressure drop in the system, including the heat exchanger.

To correct:
Turn the valve installed downstream of the pump to increase or decrease the pressure difference.
Mark the position of each valve to reposition it in the same position after closing for maintenance operations.

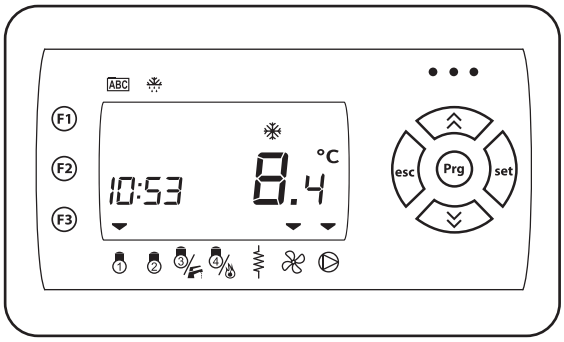
If there are no pressure gauges:
Verify the temperature difference between the utility fluid input and output when the unit is operating regularly (all compressors on).
The difference in water temperature between input and output must be between 4° and 6°C:
- If it is below 4°C, the water flow rate is too high: slightly close the discharge valve of the pump.
- If it is more than 6°C, verify the pressure drops in the water circuit.

⚠ For units equipped with two pumps, you will have to repeat the calibration for each pump.

7 CONTROL PANEL

7.1 User interface

7.1.1 Control panel

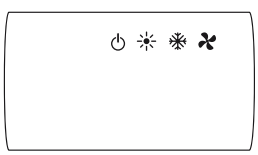


The control panel enables all machine functions to be performed, to display its operation and any alarms which may be triggered.

7.1.2 Display

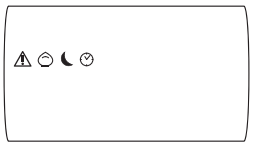
From the control panel display is possible to see the quantities of set values and, via icons, the machine operation.

From the main screen it is possible to visualize the time and the water temperature.

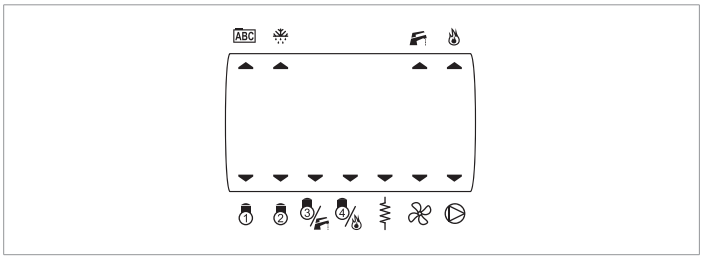


From these icons it is possible to see if the machine is in Stand-by and if it is operating in heating (sun symbol) or cooling (snowflake symbol) mode.

Operation icons shall be steady or flashing.
Steady: if the order was defined from the digital inlet.
Flashing: if the order was defined from the keys of the control panel.

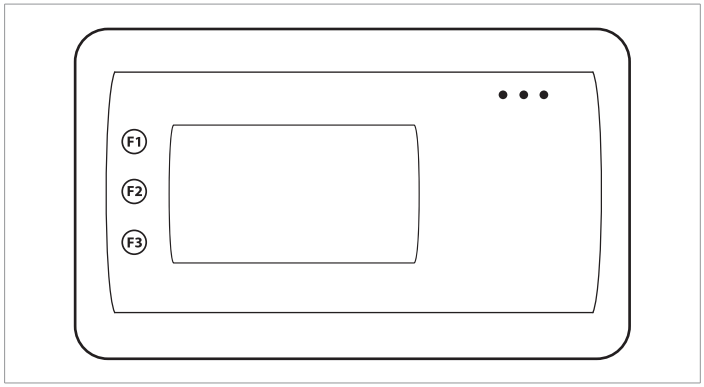


From these icons it is possible to see if the alarm is intervened in the operation of the machine, if it is operating in energy save mode or if an operating frame was set.



Through the start- up of the arrow keys in correspondence of LEDs on the control panel, it is possible to see how many compressors are working, if the primary exchanger heaters, the exchanger fan and the circulating pump are active. In the upper part of the panel, the arrow keys indicate the active manual defrosting or if there are operations in progress in the programming menu.

7.1.3 Function keys

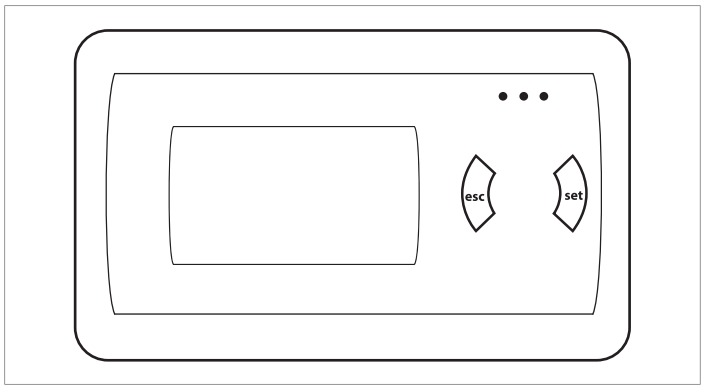


On the control panel there are three function keys:

F1: with press and hold key you can activate the manual defrosting (if there are the activation conditions: heat pump operation and sufficient pressure).

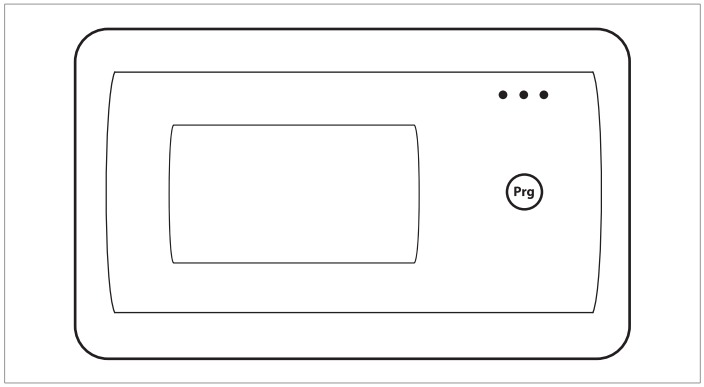
F2: with press and hold key you can change the operation mode.

F3: with press and hold key you can turn the machine on and off.

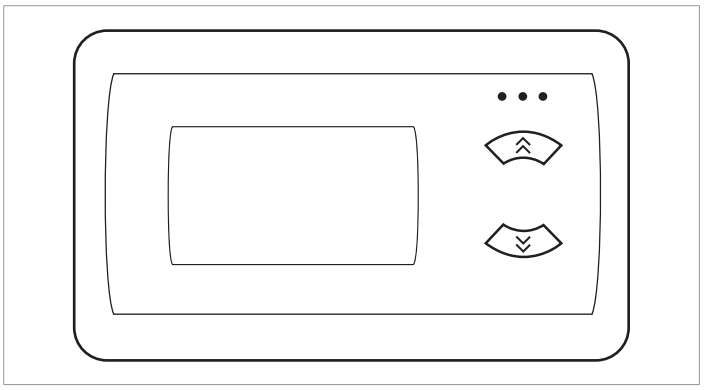


With the SET key you can enter the status menu or set an set value.

With the ESC key you can return to the previous menu or exit from the selection menu.



With the PRG key you can enter in the selection menu.



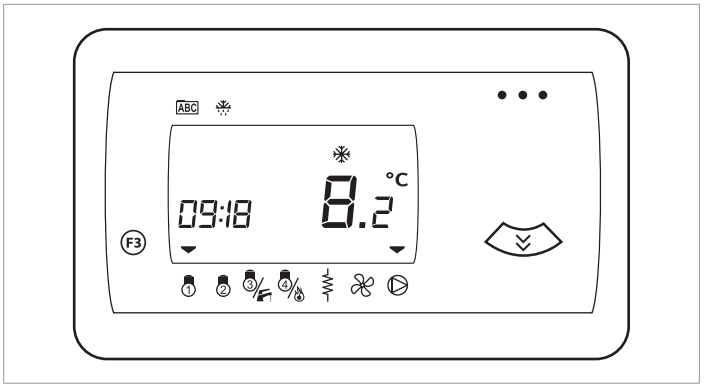
With the UP key you can move around in the menu to increase the values you wish to modify. With press and hold key you can activate the manual defrosting.

With the DOWN key you can move around in the menu to decrease the values you wish to modify.

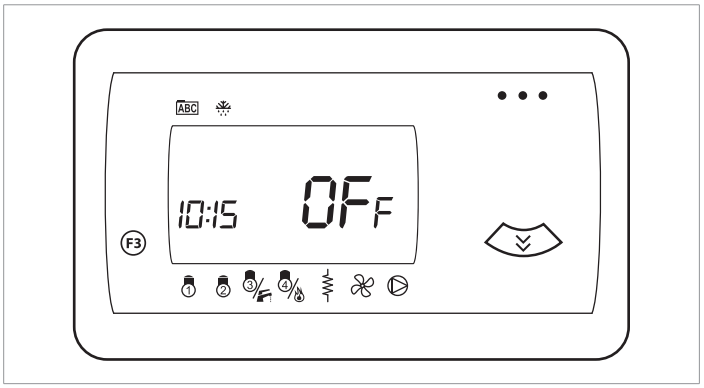
With press and hold key you can turn the machine on and off.

7.2 Switch on and off

The unit can be switched on or off from the control panel.



With press and hold F3 key or DOWN key you can switch from ON state to OFF state and vice versa.

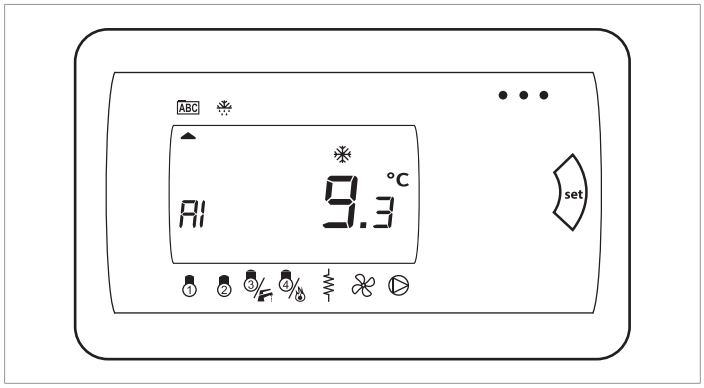


7.3 Settings

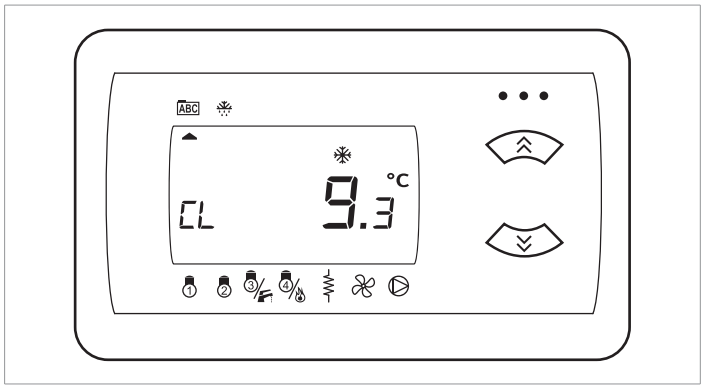
7.3.1 Date and time

The control panel features a clock and calendar which allows the management of the alarm history and the planning of operating ranges.

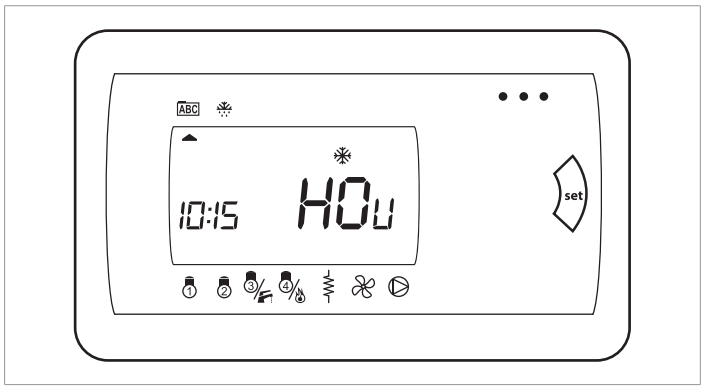
Date and time setting on the control board



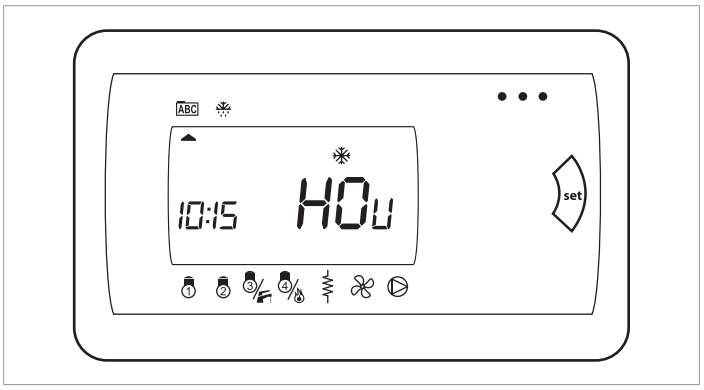
Press the SET key to access to the setting menu.



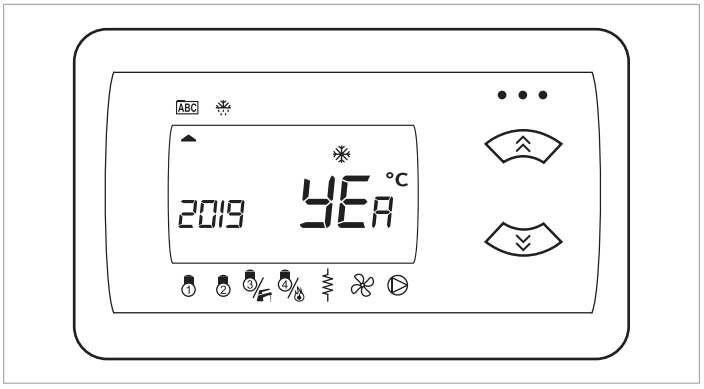
Use UP and DOWN keys to scroll the menu until CL label.



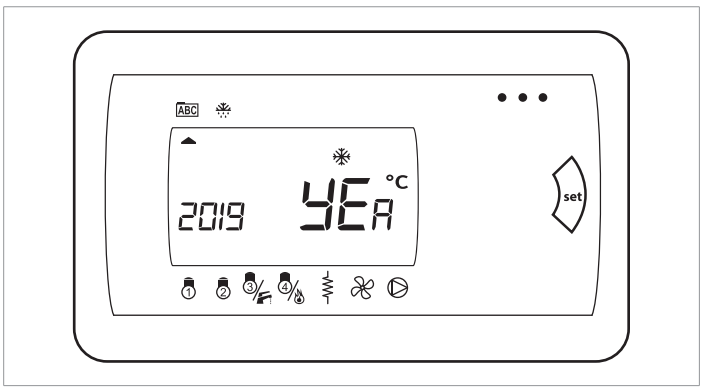
Press the SET key to access to the menu.



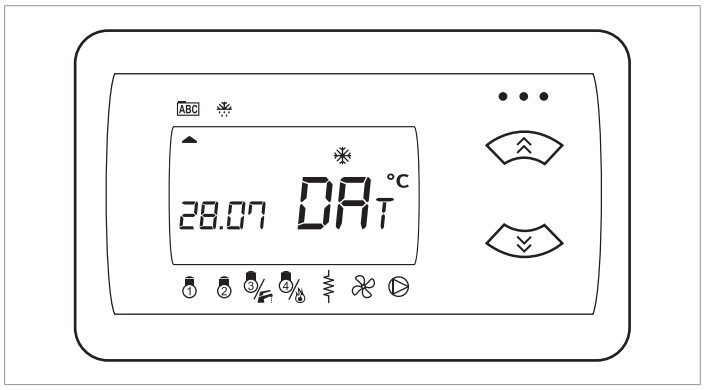
With press and hold SET key you can enter in the parameter to modify.
The value will start to flash on the display.



Use UP and DOWN keys to select the value to modify among date, year and time.

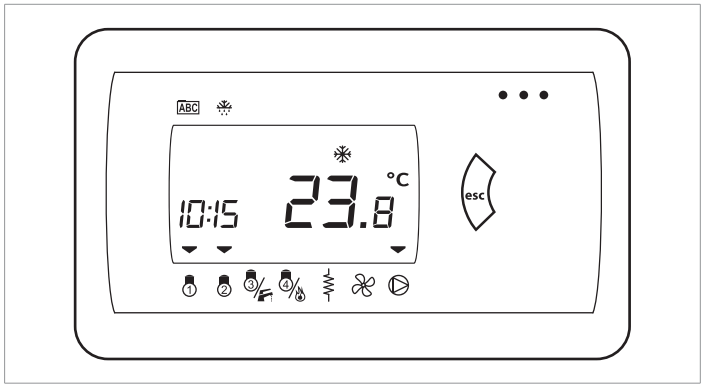


Once chose to value to modify, press again the SET key.



Use UP and DOWN keys to modify the value and press the SET key to save the value set.

Repeat the operation to modify date/year and hour parameters.



Press the ESC key to come back to the main menu and to exit from setting menu.

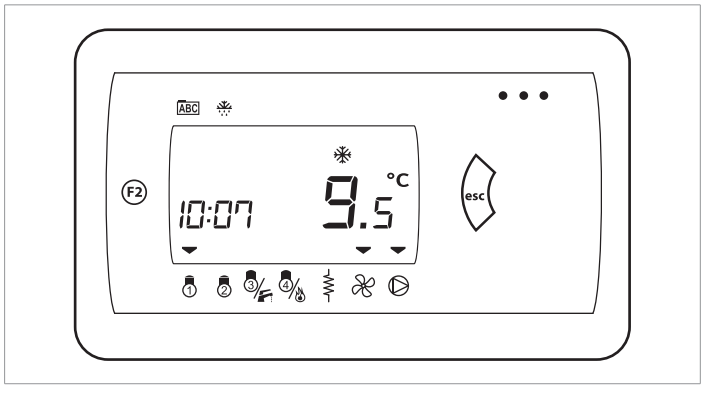
The control panel will display the main screen.

7.3.2 Operating mode change

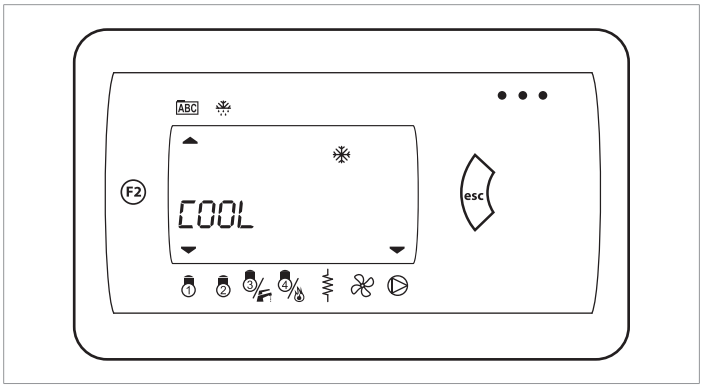
The machine operating mode can be changed from the control panel.

The selectable modes are: Stand-by (Stby), heating (HEAT), cooling (COOL), domestic hot water DHW (AS).

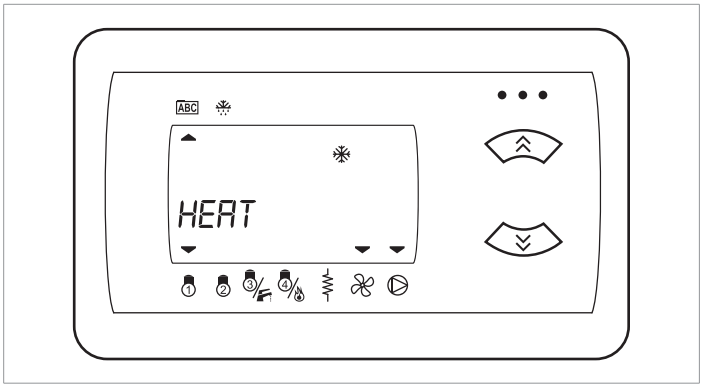
By holding down the ESC or F2 key, it is possible to change the operating mode of the unit. The ESC and F2 keys work with digital commands disabled.



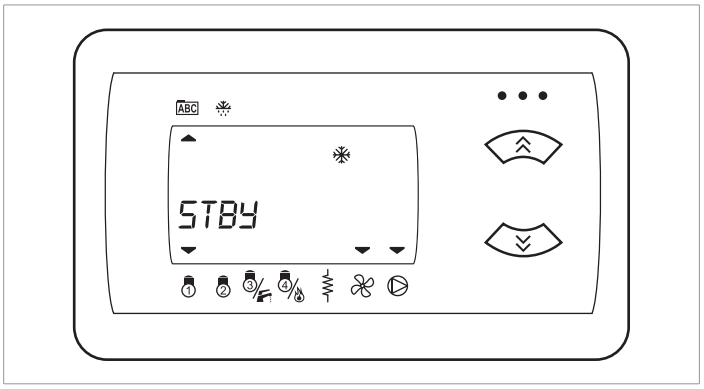
The display shows the machine operation mode.



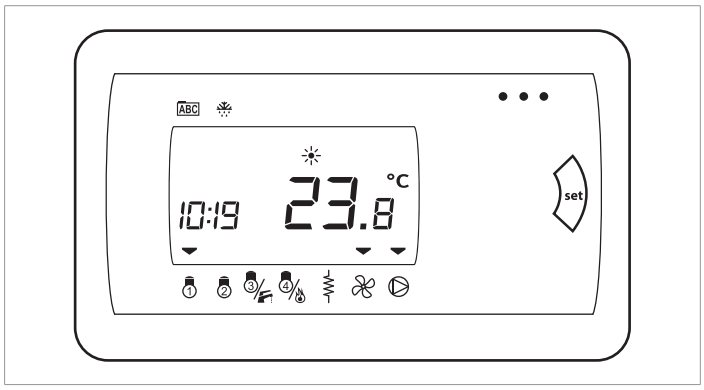
Use UP and DOWN keys to modify the operation mode.



Select the desired operation mode.

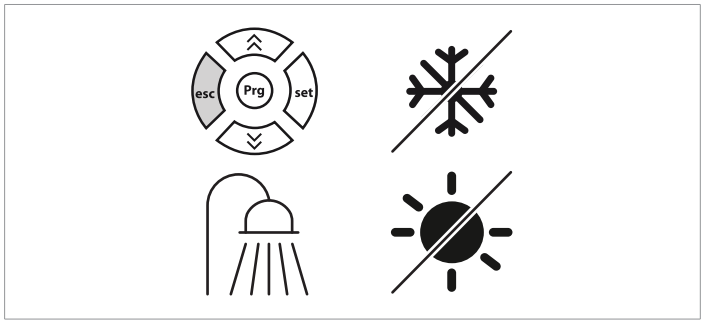


Select the desired operation mode and press the SET key to confirm.



The control panel will display the main screen.

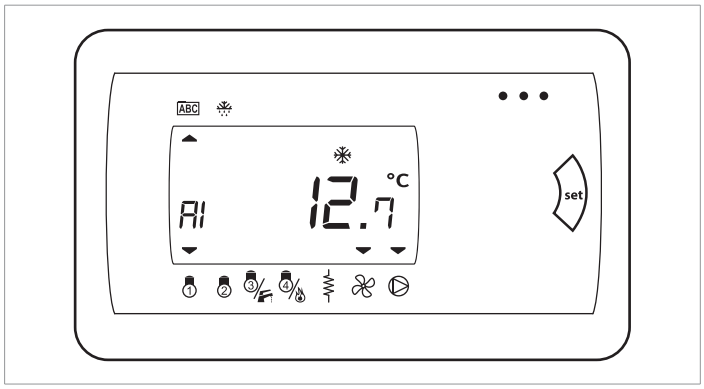
⚠ AS mode selection from "esc" key: by selecting the AS mode the unit can only satisfy domestic hot water requirements. With this condition activated, the unit does not satisfy COOL and HEAT system requirements.



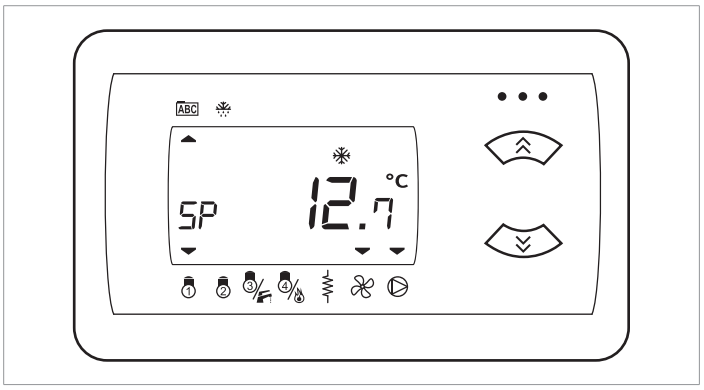
7.3.3 Set-point

The desired temperature can be set from the control panel.

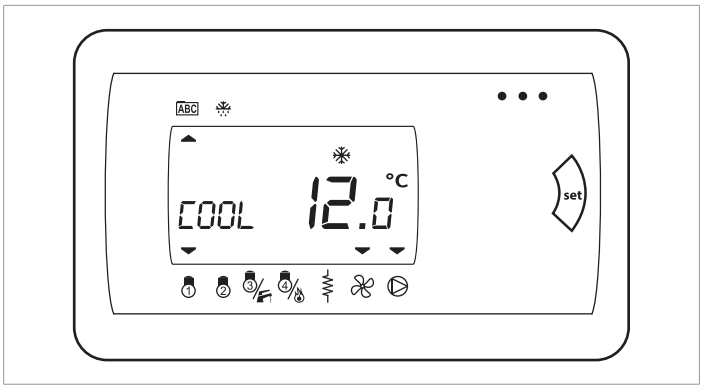
Press the SET key to access to the menu.



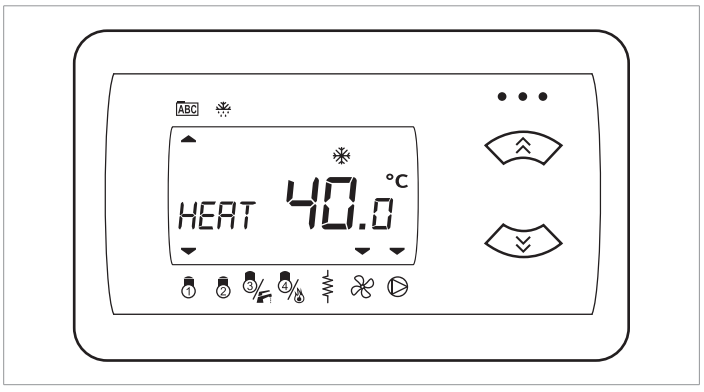
By using UP and DOWN keys select SP label.



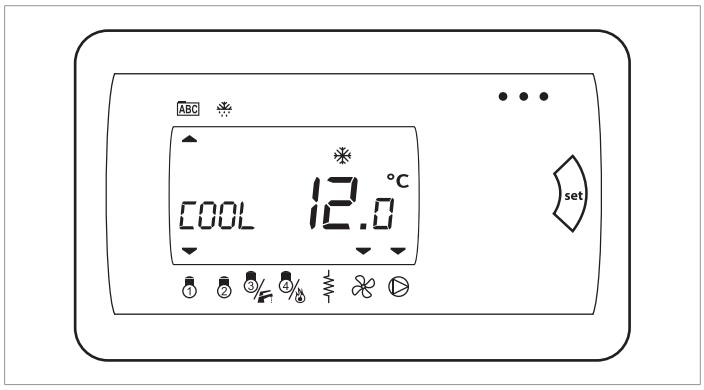
Press the SET key to access to Set-point menu.



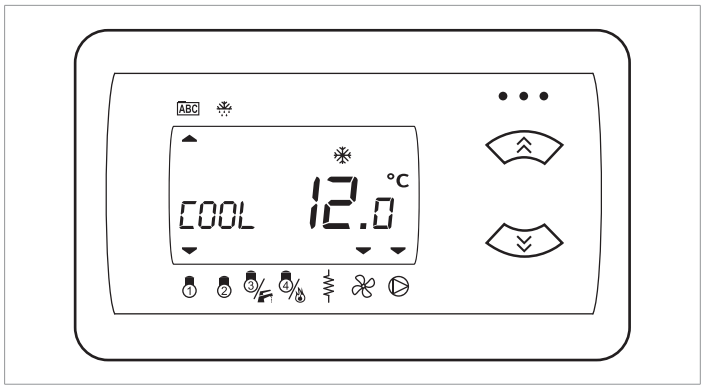
Using the UP and DOWN keys it is possible to choose the Set-point to be modified (HEAT, COOL, AS).



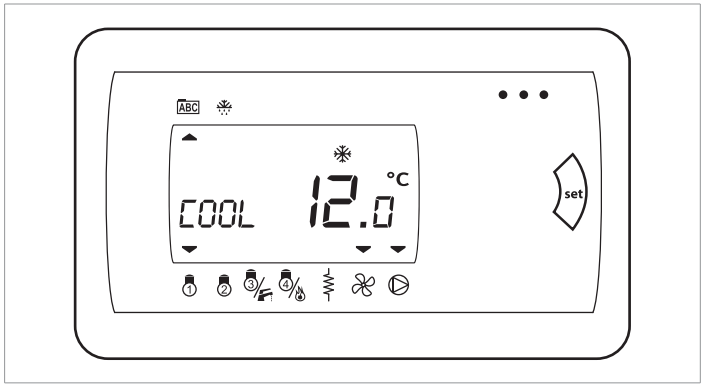
Once selected the set-point to modify, press the SET key.



By using UP and DOWN keys it is possible to select the desired value.



Press the SET key to confirm the set value.



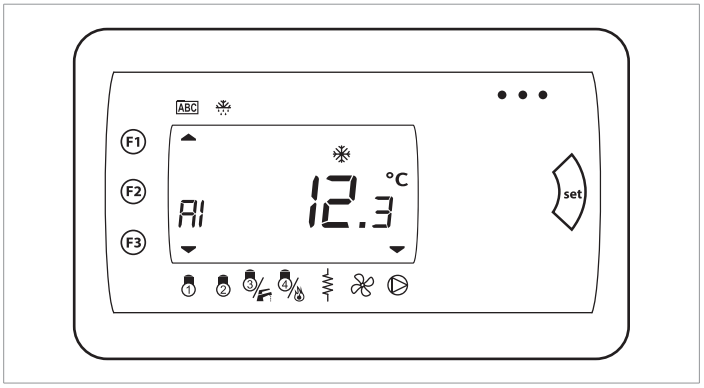
7.4 Unit Status

From the control panel it is possible to view the I / O and the status of the machine.

The acronym of the I/O follow the following rules:
Consult the wiring diagram to check which cards are installed on the unit.

	Analogue input	Analogue output	Digital input	Digital output
Standard card SB1	AILx	AOLx	DILx	DOLx
Expansion SE1	AIEx	AOEx	DIEx	DOEx
Driver EEV 1 A5	1AIx	1AOx	1DIx	1DOx
Driver EEV 2 A6	2AIx	2AOx	2DIx	2DOx

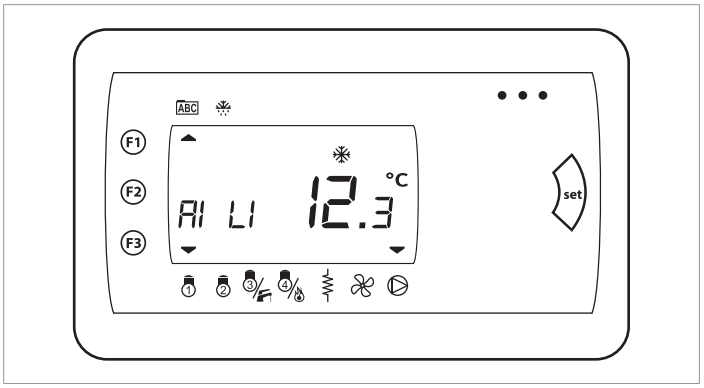
To access the menu, press the SET key.



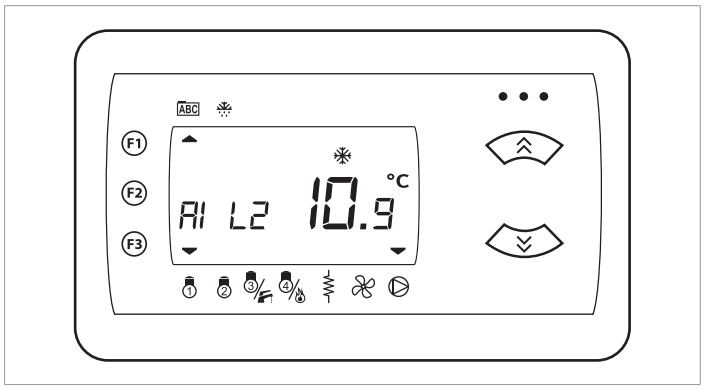
On the display AI label (analogue inlets)appears.

In each label it is possible to press the SET key to view the variables.

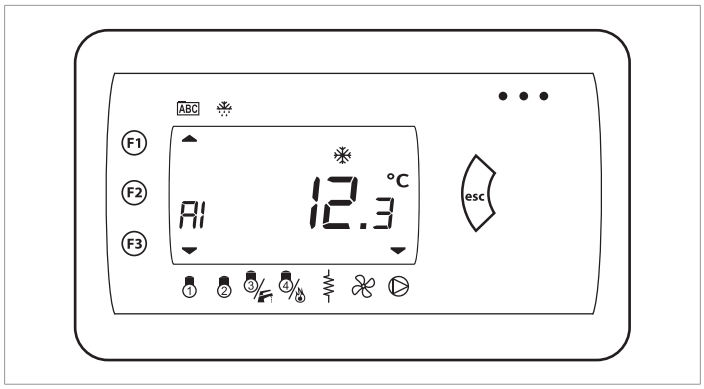
Here are some examples:



In each label it is possible to scroll all parameters by using UP and DOWN keys.

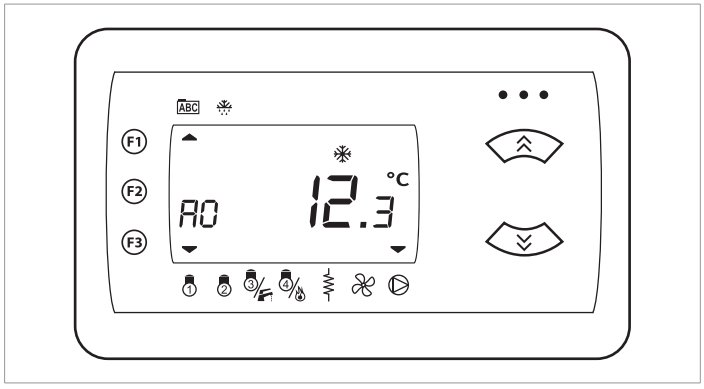


Press the ESC key to return to the main menu.

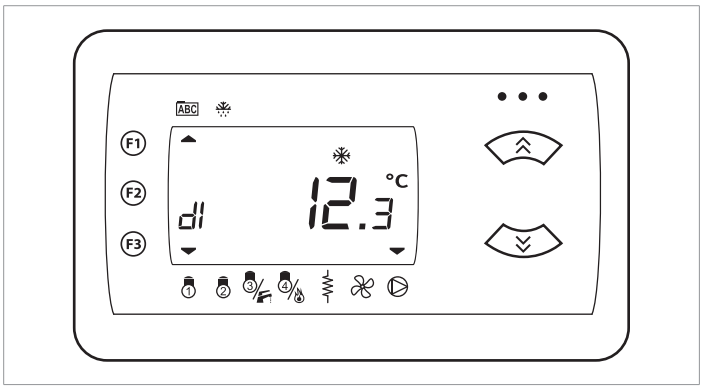


By using UP and DOWN keys it is possible to visualize different status and values of the machine.

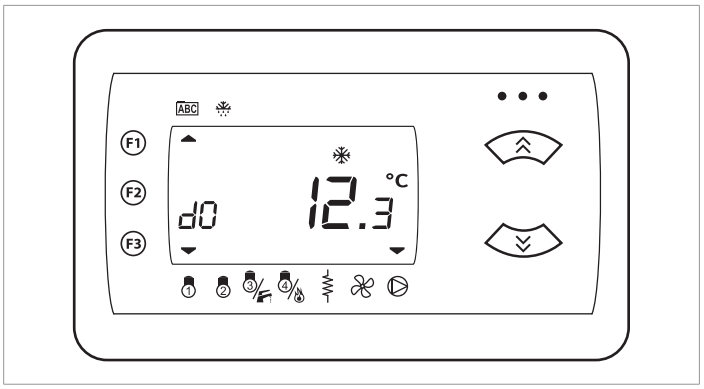
AO (analogue outlets).



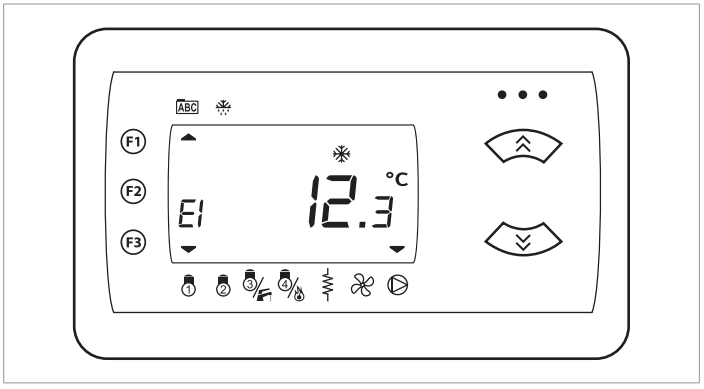
DI (digital inlets).

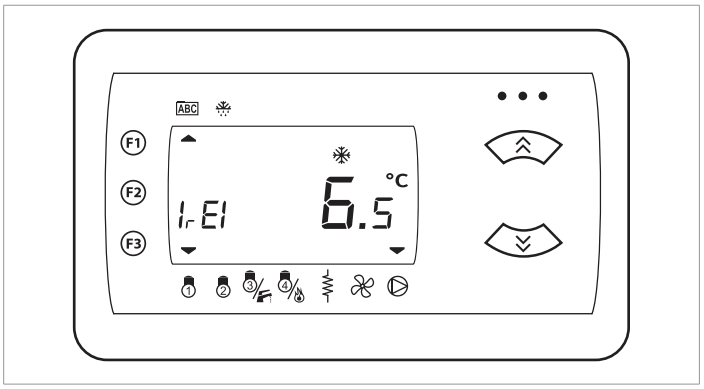


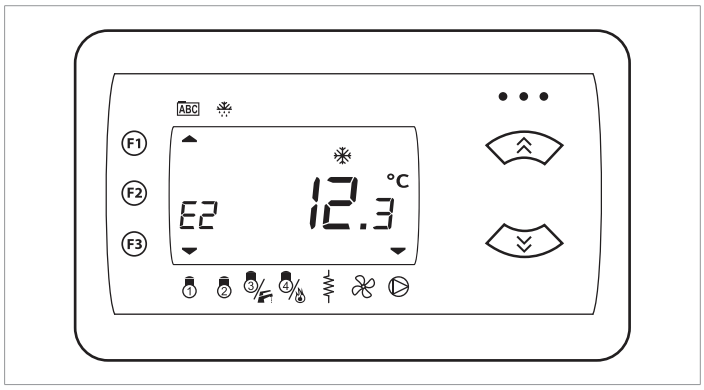
DO (digital outlets).

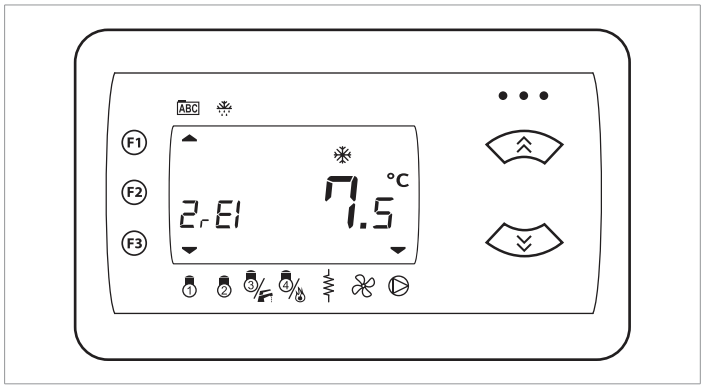


E1 / E2 (electronic expansion valve driver and related readings).

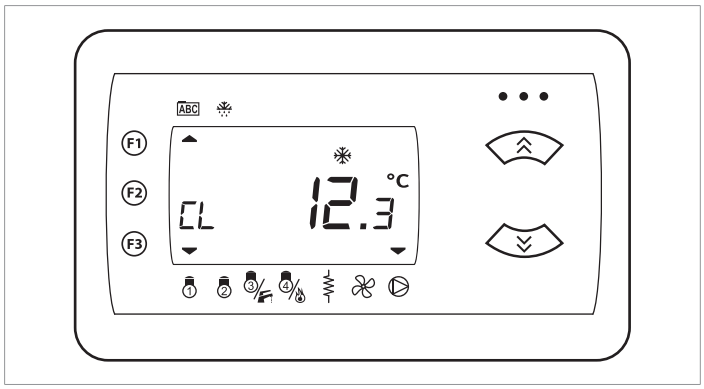




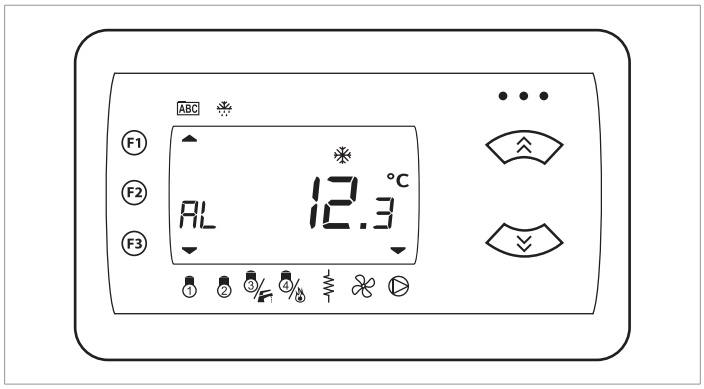




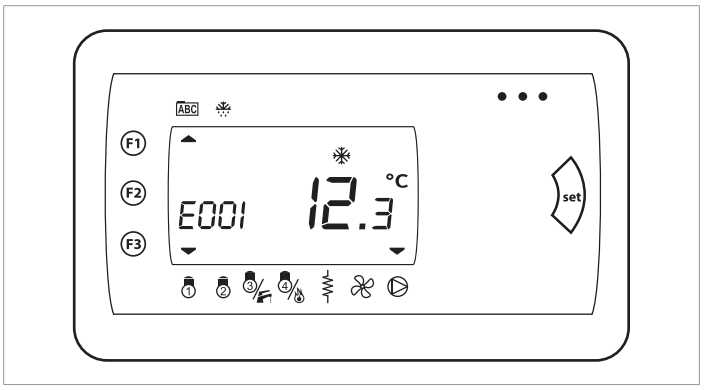
CL (clock).



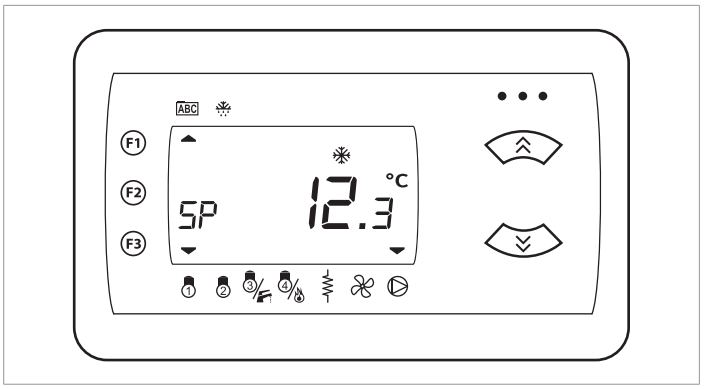
AL (active alarms)



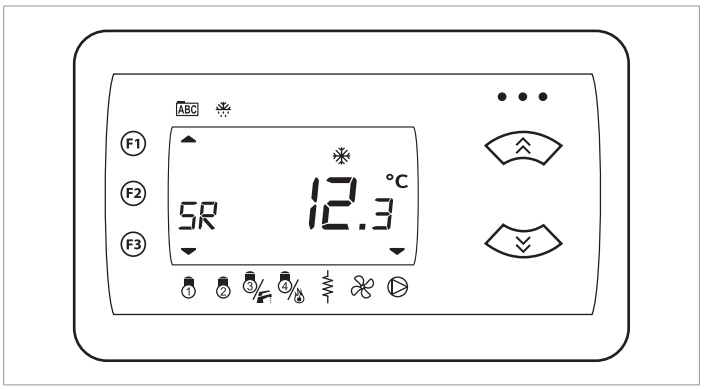
Pressing "set"



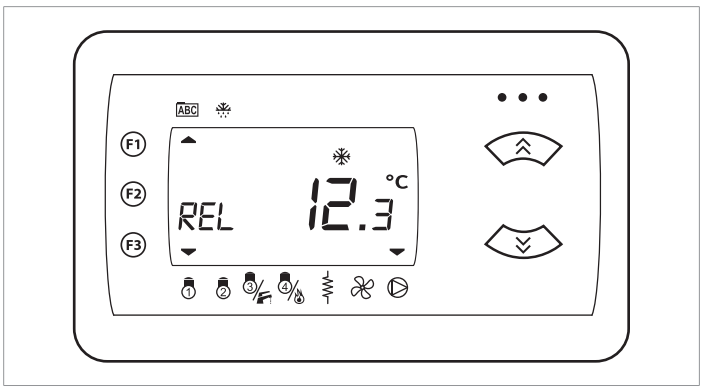
SP (selected Set-point).



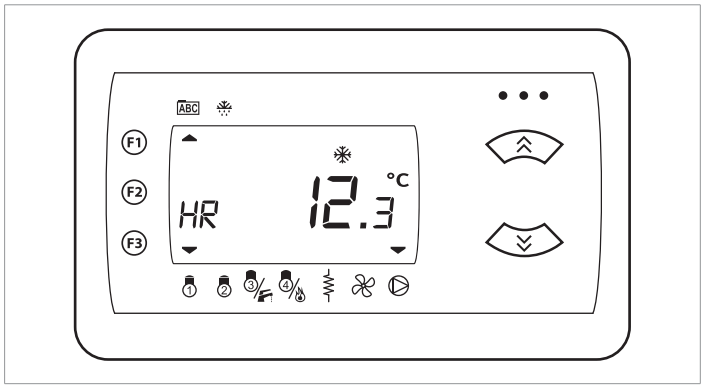
SR (real Set-point).



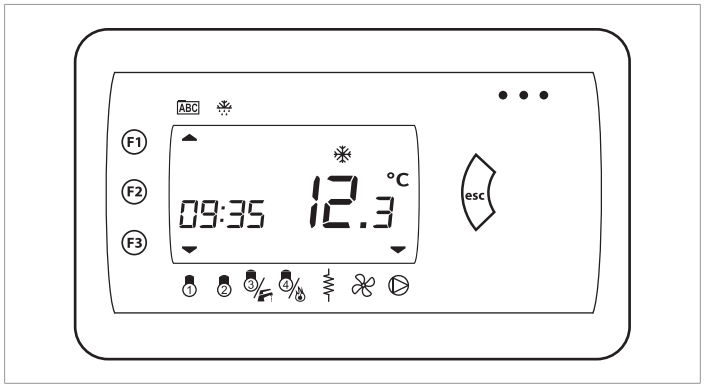
REL (firmware review).



HR (tens of compressors and pumps working hours).

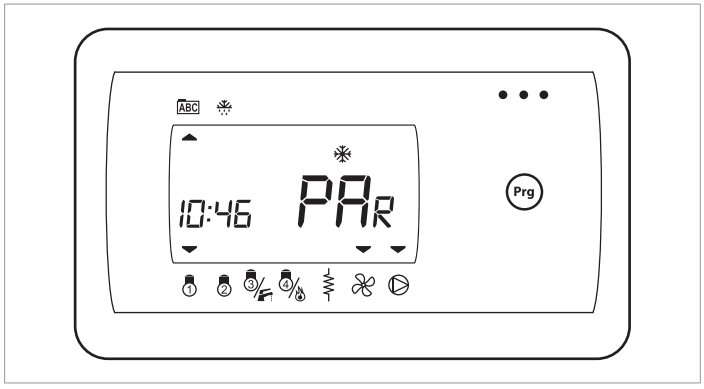


Press the ESC key to return to the main screen.



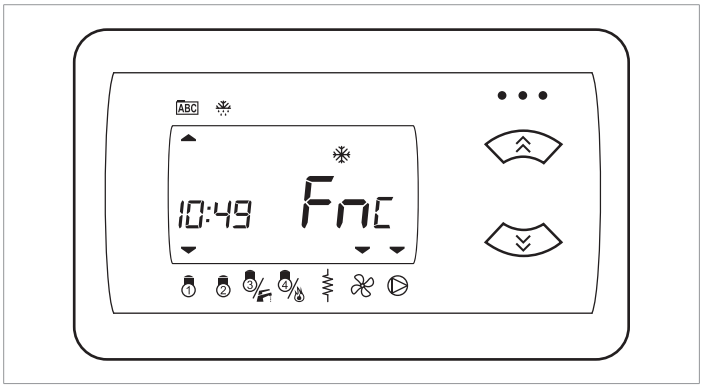
7.5 Planning

From control panel it is possible to access to planning menu by pressing the PRG key.



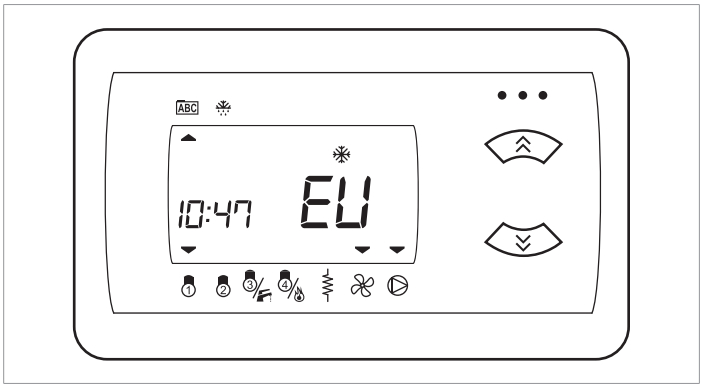
The parameters menu contains the list of editable parameters of the machine.

Press the SET key to access to menu, press the ESC key to exit.
Using UP and DOWN keys it is possible to select the following menu.



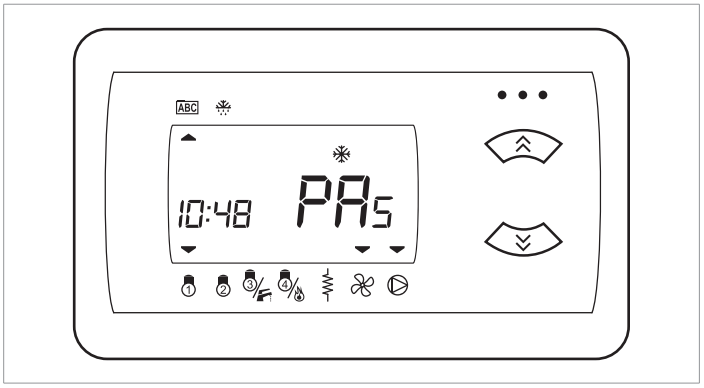
The functions menu allows to execute some manual actions on the machine.

Press the SET key to access to menu, press the ESC key to exit.
Using UP and DOWN keys it is possible to select the following menu.



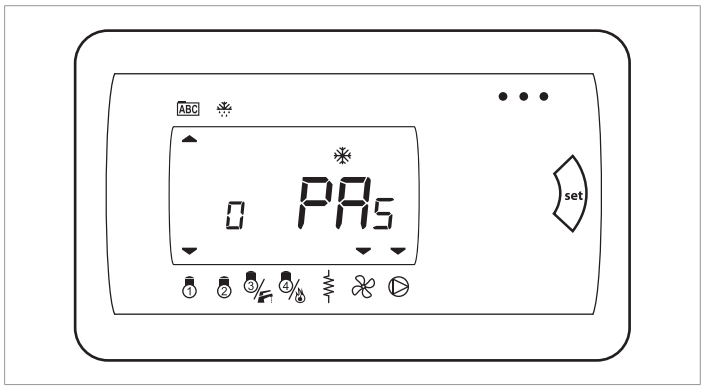
The EU menu allows to view the events that have occurred on the machine: alarm codes, time / date of intervention, time / date of reset and type of reset.

Press the SET key to access to menu, press the ESC key to exit.
Using UP and DOWN keys it is possible to select the following menu.

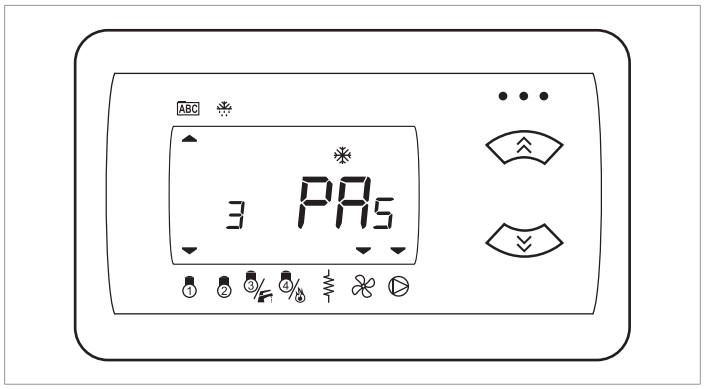


The password menu allows the entrance to the protected area of the control panel.

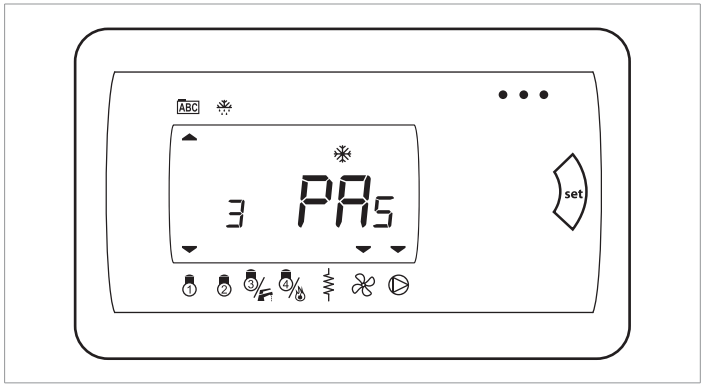
Press SET to enter the password.



Using UP and DOWN keys it is possible to insert the password.



Press the SET key to confirm the password inserted.



The control panel will visualise the previous screen and the password-protected parameters will be visible and editable.

7.6 Enable advanced functions

7.6.1 MODIFICATION OF THE SET-POINT

It is possible to adjust the set point value through one of the following ways:

From digital input IAS.
From current signal IAA.
From voltage signal IAV.
From the external temperature probe with Climatic Curve function IAT.
None of these functions are enabled by default.

The IAS, IAA and IAV functions are associated to a single analogue input (see HARDWARE table) and therefore are one alternative to the other.

All the calibrations are algebraically added to the cold set point TR10 and the hot set point TR20.

The calibrations defined by IAS, IAA and IAV are added to the calibration of the climatic curve if enabled at the same time.

By accessing the SP and Sr menus (set point and real set) from the display, it is possible to check the set point values entered by the parameter and those assumed following the calibration.

⚠ If the set point TR20 is set to 60°C, no functions that further increase the set point must be enabled, the actual set point value Sr must therefore not exceed 60°C.

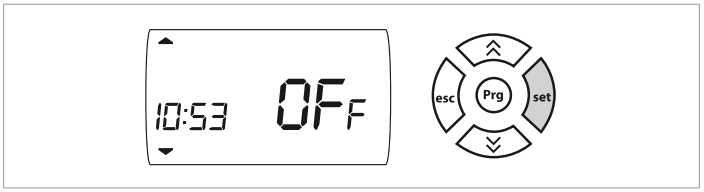
Hardware

Input	**AIL4 analogue input on the SB1 main board.**

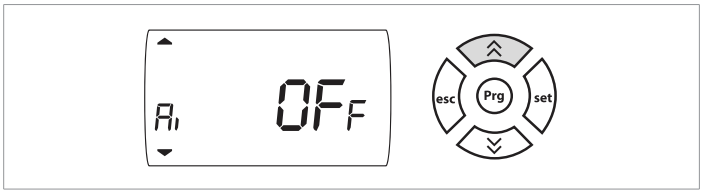
Set point checks from display

It is possible to view the standard set points (i.e. set by the respective parameters TR10, TR20) by accessing the SP menu:

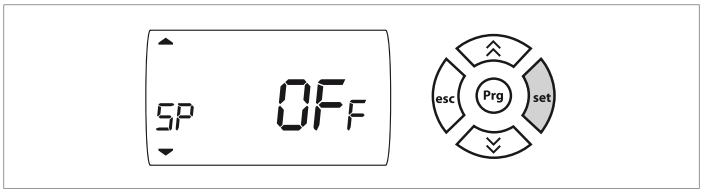
a: Enter the set menu.



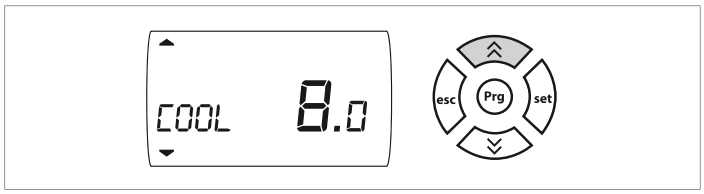
b: Identify the SP submenu.



c: Enter the SP submenu.



d: Display the actual COOL set point.

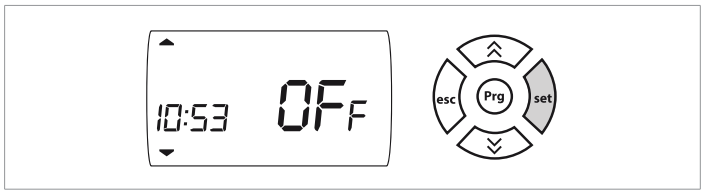


e: Display the actual HEAT set point.

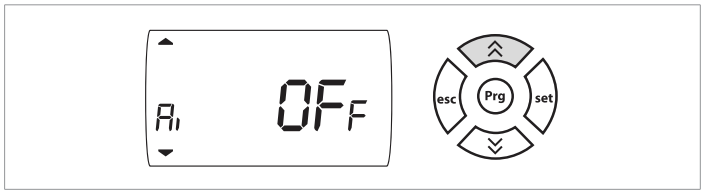
Notes: domestic hot water set point (AS) and anti-legionella set point (AL) are also listed.

It is possible to check on the display the modified / adjusted set point value which we will call the real set point value (menu Sr):

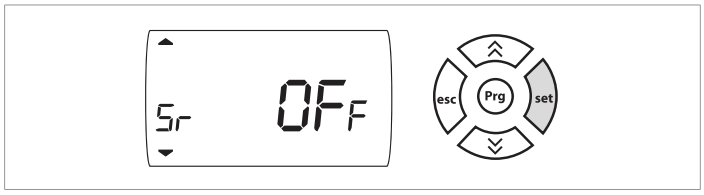
f: Enter the set menu



g: Identify the submenu Sr



h: Enter the submenu Sr



i: Display the actual COOL set point

j: Display the actual HEAT set point.

7.6.1.1 IAS - Fixed setting of the Set Point enabled by DI (double Set Point)

The IAS function allows to modify / adjust the standard set point (entered by parameter) by means of a constant value that can be modified by parameter.

The hysteresis value will be added or subtracted as the status of the associated digital input changes.

We define the real set point as the sum between the standard set point and the hysteresis value:

COOL: TR10 + (±TR15)
HEAT: TR20 + (±TR25)

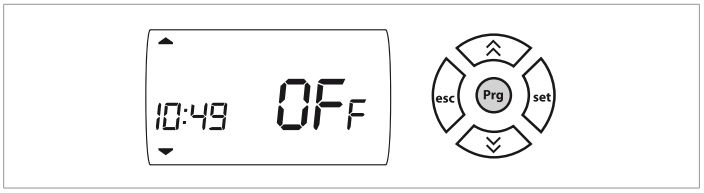
This function does not modify the DHW set point, parameter AS01.

Description
Abbreviation: IAS
The IAS command from digital input is NOT configured in the factory.
The free contact IAS must be connected to the relative terminals (check the wiring diagram).
The wiring inside the panel is already prepared.
It is necessary, during the installation phase, to adequately configure the analogue input that will act as a digital input (see procedure below).

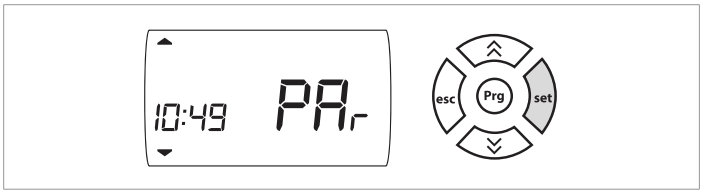
Example for changing parameters

Access and identify the parameter to be modified:

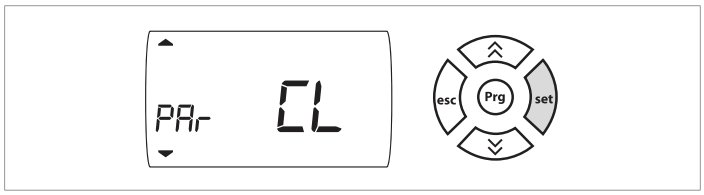
a: Enter programming.



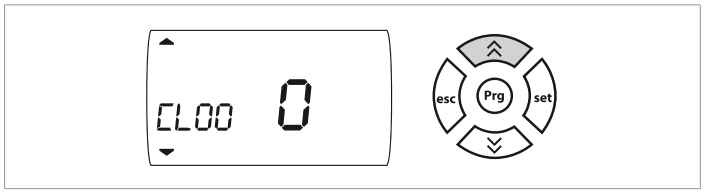
b: Enter the Parameters menu



c: Enter the CL submenu.

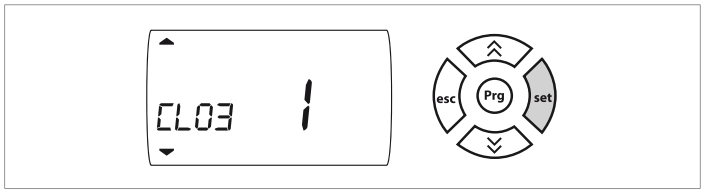


d: Identify the parameter.

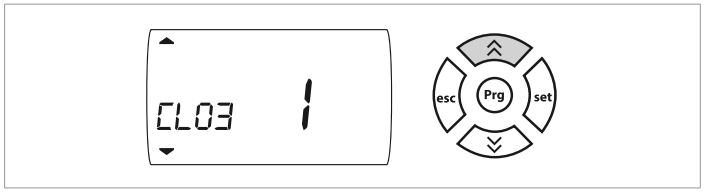


Change the parameter with the new value

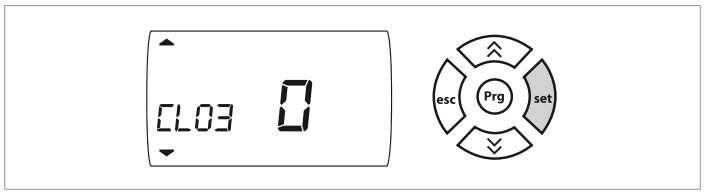
a: Enter parameter modification.



b: Enter the new value.

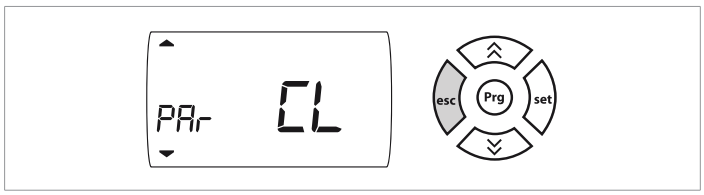


c: Confirm the entered value.

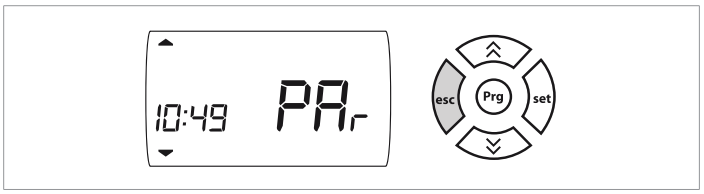


Exit the programming phase

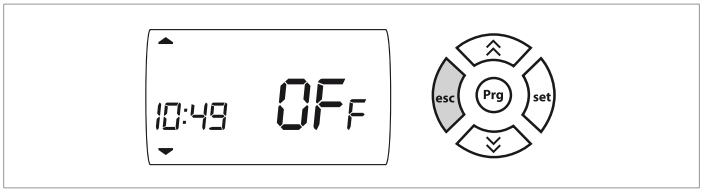
a: Return to the submenu level.



b: Return to the menu level.



c: Return to the main screen.



List of parameters to be modified

Referring to the procedure indicated above, modify the following parameters:

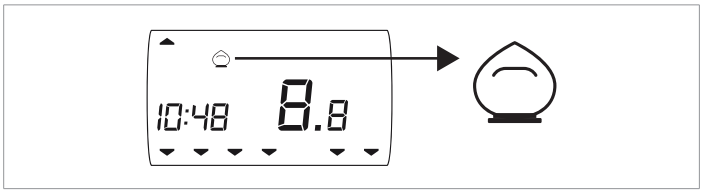
Parameter	Description	Default		value for IAS
CL03	AIL4 input type	0	→	1
CL12	Full scale value	10.0	→	10.0
CL13	Start of scale value	0.0	→	0.0

Associate input to function:

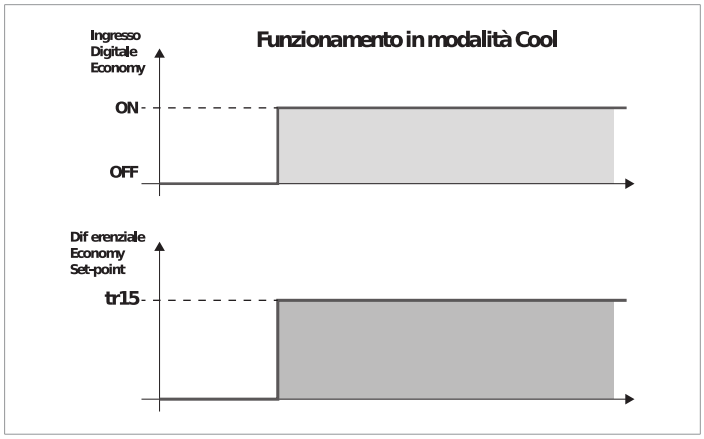
Parameter	Description	Default		value for IAS
CL33	AIL4 input configuration if analogue	0	→	0
CL53	AIL4 input configuration if digital	0	→	-22

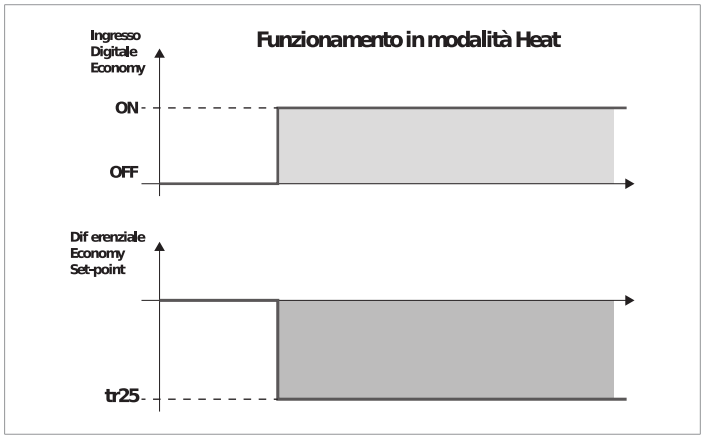
Setting the calibration:
dS00 = 0
TR15 = 5 summer calibration value
TR25 = -5 winter calibration value

Notes
Change the parameters with the unit off.
The indicated parameters are always visible.
Restart the controller following parameter changes.
The IAS function is enabled when the consent is closed.
With the IAS function enabled, the piggy bank icon is active on the main screen.



Example of calibration via digital input





Warning

Make sure that the set values never violate the conditions below:

- In COOL the algebraic sum TR10 + (± TR15) is never lower than 7 ° C.
- In HEAT algebraic sum TR20 + (± TR25) never exceeds 60 ° C.

7.6.1.2 IAA - Variable setting of the Set Point through 4-20mA signal

The IAA function allows you to modify / adjust the standard set point (entered by parameter) by means of a modulating value defined by the 4-20mA analogue signal.

We define the real set point as the sum between the standard set point and the read value:

- COOL: TR10 + (± IAA)
- HEAT: TR20 + (± IAA)

This function does not modify the DHW set point, parameter AS01.

Description

Initials: IAA

The IAA function is NOT configured at the factory

The IAA signal must be connected to the relative terminals (check the wiring diagram).

The wiring inside the panel is already prepared.

It is necessary, during the installation phase, to configure the analogue input.

Example for changing parameters

Parameter modification procedure: see what is reported in paragraph 7.6.1.1

List of parameters to be modified

Referring to the procedure indicated above, modify the following parameters:

Parameter	Description	Default		Value for IAA
CL03	AIL4 input type	0	→	3
CL12	Full scale value	10.0	→	20.0
CL13	Start of scale value	0.0	→	4.0

Associate input to function:

Parameter	Description	Default		Value for IAA
CL33	AIL4 input configuration if analogue	0	→	25
CL53	AIL4 input configuration if digital	0	→	0

Setting the offset / modulation:

dS00 = 0

dS03 = -5

dS04 = 5

Notes

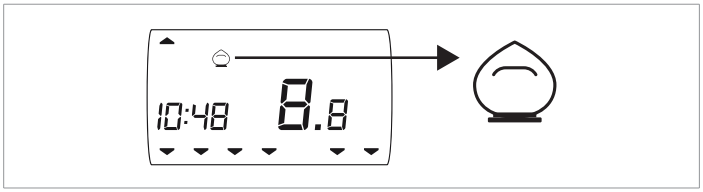
Change the parameters with the unit off.

The indicated parameters are always visible.

Restart the controller following parameter changes.

The IAA function is enabled with IAA value> 0mA.

With the IAA function enabled, the piggy bank icon is active on the main screen.



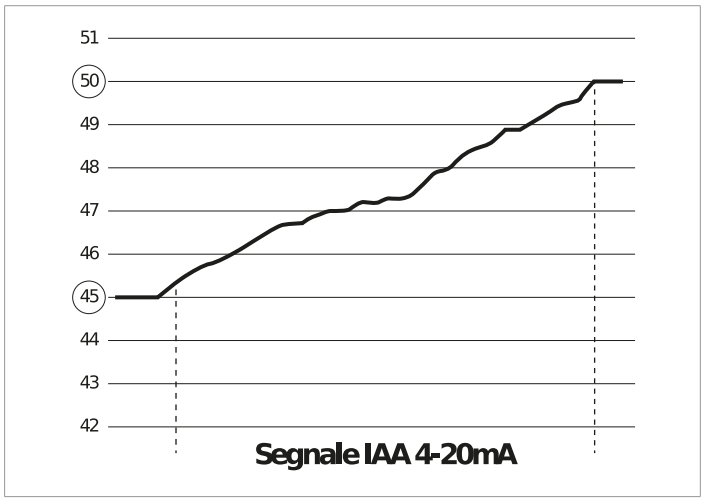
Example of unbalancing via 4-20mA signal

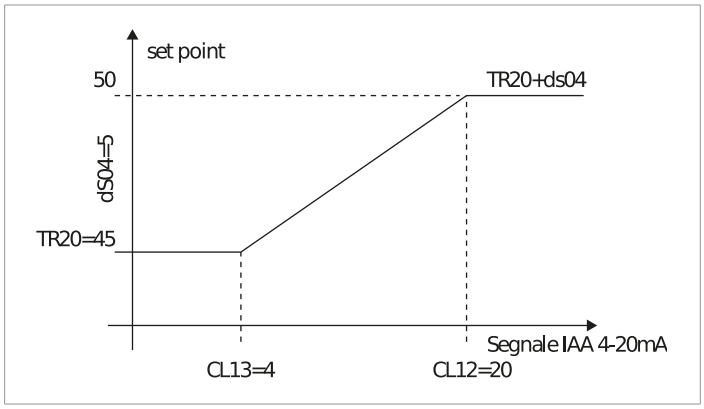
Winter operation

The calibration of the set point during summer operation is based on the set point TR10 and parameter dS03.

increases the HEAT set point of the heat pump

With dS04 = 5 and TR20.





Summer operation

The calibration of the set point during summer operation is based on the set point TR10 and parameter dS03.

For example: with set point TR10 = 7 and dS03 = 5, the real set point of the unit increases as the IAA signal increases in a defined range between 7 ° C and 12 ° C.

Warning

Make sure that the set values never violate the conditions below:

- In HEAT the algebraic sum TR20 + (+ dS04) never exceeds 60 ° C.

7.6.1.3 IAV - Variable setting of the Set Point through 0-10V signal

The IAV function allows you to modify / adjust the standard set point (entered by parameter) by means of a modulating value defined by the 0-10V analogue signal.

We define the real set point as the sum between the standard set point and the read value:

- COOL: TR10 + (± IAV)
- HEAT: TR20 + (± IAV)

This function does not modify the DHW set point, parameter AS01.

Description

Abbreviation: IAV

The IAV function is NOT configured at the factory

The clean IAV signal must be connected to the relative terminals (check the wiring diagram).

The wiring inside the panel is already prepared.

It is necessary, during the installation phase, to configure the analogue input.

Example for changing parameters

Parameter modification procedure: see what is reported in paragraph 7.6.1.1

List of parameters to be modified

Referring to the procedure indicated above, modify the following parameters:

Analog input configuration (check unit map):

Parameter	Description	Default		Value for IAV
CL03	AIL4 input type	0	→	4
CL12	Full scale value	10.0	→	10.0
CL13	Start of scale value	0.0	→	0.0

Associate input to function:

Parameter	Description	Default		Value for IAV
CL33	AIL4 input configuration if analogue	0	→	25
CL53	AIL4 input configuration if digital	0	→	0

Setting the offset / modulation:

- dS00 = 0
- dS03 = -5
- dS04 = 5

Notes

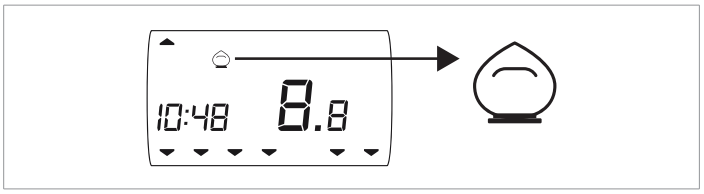
Change the parameters with the unit off.

The indicated parameters are always visible.

Restart the controller following parameter changes.

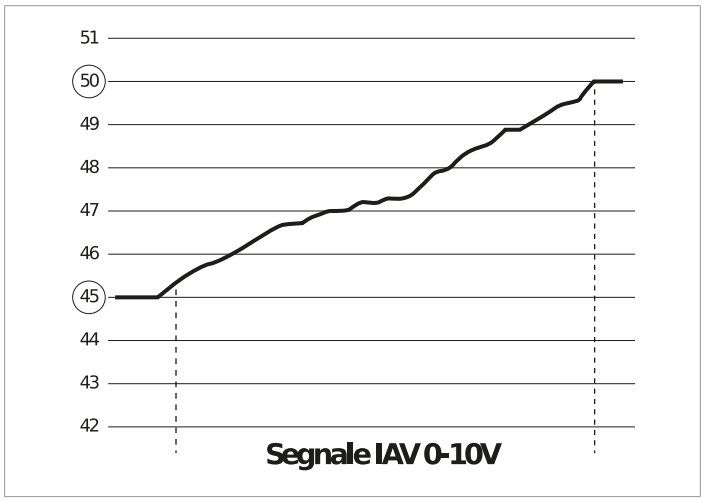
The IAV function is enabled with IAV value> 0V.

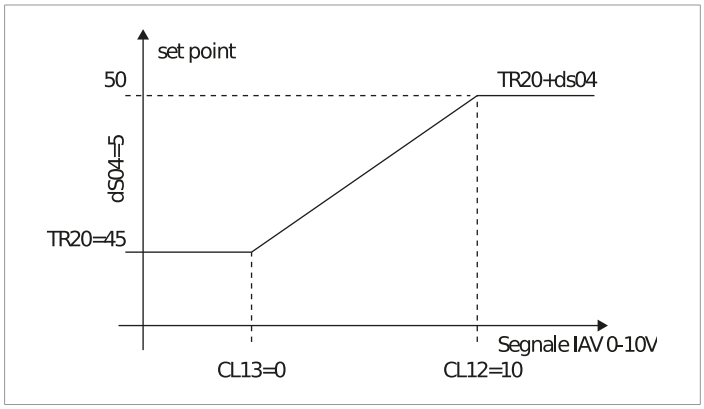
With the IAV function enabled, the piggy bank icon is active on the main screen.



Example of calibration via 0-10V signal

Winter operation: as the 0-10V signal increases increases the set point of the heat pump





Summer operation: The unsetting of the set point during summer operation is based on the set point TR10 and parameter dS03.

For example: with set point TR10 = 7 and dS03 = 5, the real set point of the unit increases as the IAV signal increases in a defined range between 7 ° C and 12 ° C.

7.6.1.4 IAT Climatic Curve - Variable setting of the Set Point through External Temperature

The Climatic Curve function allows you to modify / adjust the standard set point (entered by parameter) by reading the external temperature read by a dedicated probe.

We define the real set point as the sum between the standard set point and the read value:

- COOL: TR10 + (± Climate Curve)
- HEAT: TR20 + (± Climatic Curve)

This function does not modify the DHW set point, parameter AS01.

The climatic curve function is based on the external temperature probe and must be enabled by parameter dS00.

The calibrations defined by IAS, IAA and IAV are added to the calibration of the climatic curve if enabled at the same time.

By accessing the SP and Sr menus (set point and real set) from the display, it is possible to check the set point values entered by the parameter and those assumed following the calibration.

⚠ If the set point TR20 is set to 60°C, no functions that further increase the set point must be enabled, the actual set point value Sr must therefore not exceed 60°C.

Description

Abbreviation: IAT

The Climate Curve function is NOT configured at the factory.

The probe for reading the external temperature is already electrically connected and fixed to the unit's carpentry.

The wiring inside the panel is already prepared.

It is necessary, during the installation phase, to enable the Climatic Curve function with dS00 = 1.

Example for changing parameters

Parameter modification procedure see what reported in 7.6.1.1

⚠ Check that the sum TR20 + dS04 never exceeds 60 ° C.

⚠ Verify that the algebraic sum TR 10 - D503 is not <7 C °

It is possible to check the value of the external probe and the real set point on the display by accessing the Sr. menu.

Examples of calibration by external temperature

Summer operation:

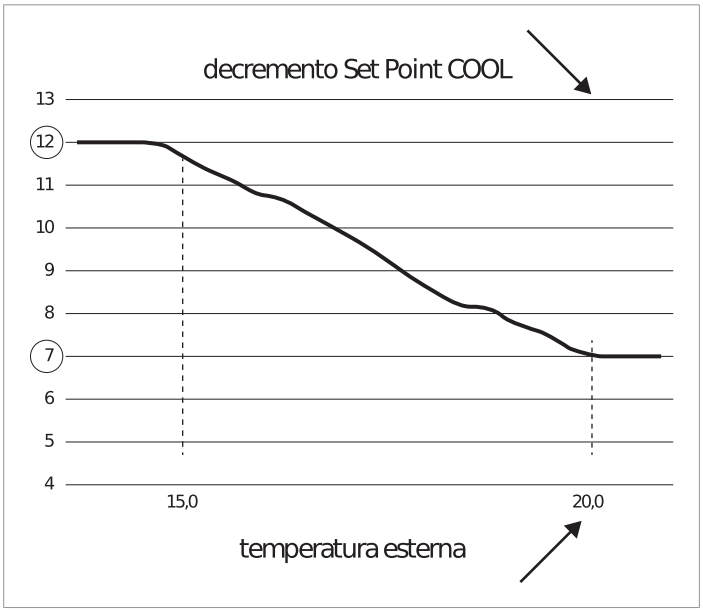
as the outside temperature increases, the summer set point decreases, an example is given below:

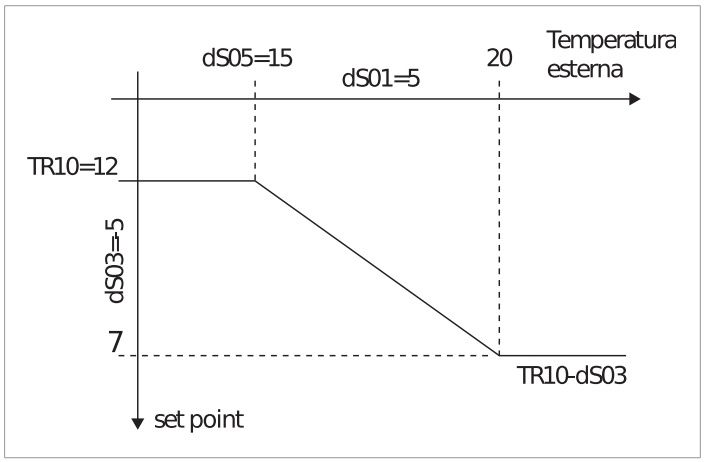
dS00= 1

dS01= 5

dS03= -5

dS05= 15





Winter operation:

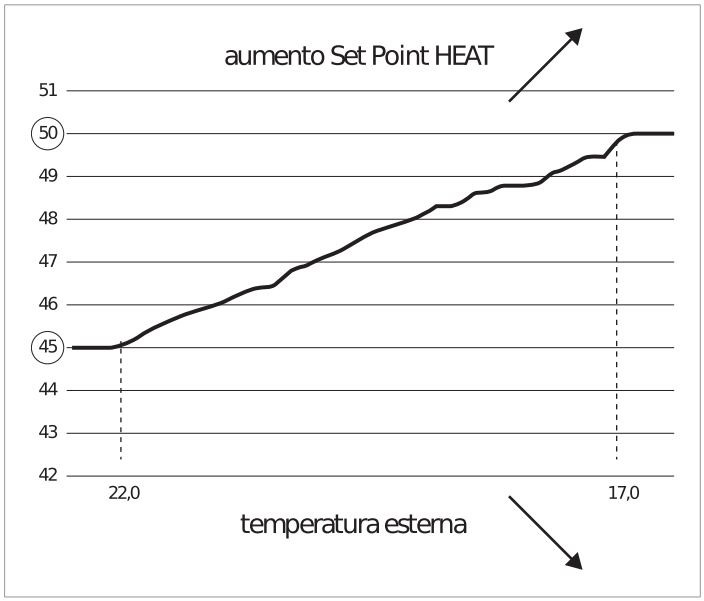
as the external temperature decreases, the winter set-point increases, an example is given below:

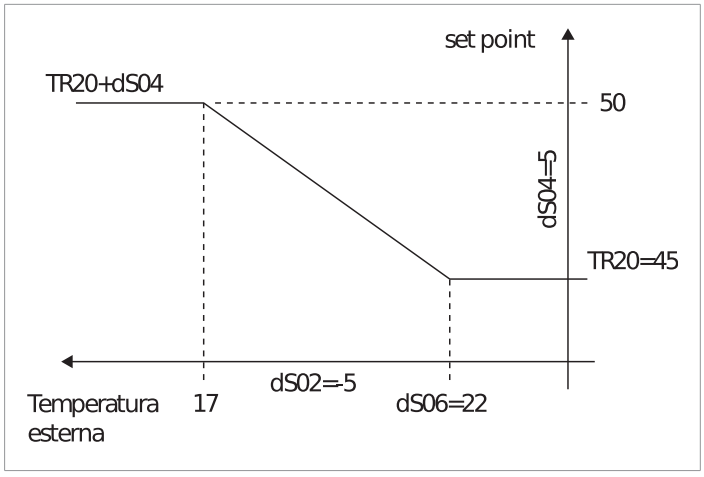
dS00= 1

dS02= -5

dS04 = 5

dS06= 22





7.6.2 IDL - UNIT POWER LIMITATION

The IDL function allows to halve the availability of the configured power or steps, thus reducing the energy consumption / noise level of the unit.

The power limit is always equal to 50% and is not a modifiable value.

Hardware

Input	**Digital input 1DI1 on Driver EEV 1 A5.**

Description

Abbreviation: ecIDL

The IDL command from digital input is not configured at the factory.

Connect the clean IDL contact to the relative terminals (check the wiring diagram).

The wiring inside the panel is already prepared.

Example for changing parameters

Parameter modification procedure: see what is reported in paragraph 7.6.1.1

List of parameters to be modified

Referring to the procedure indicated above, modify the parameter involved in enabling the function:

Parameter	Description	Default		Value for IDL
1r40	Configuration of digital input 1DI1	0	→	21

Notes

Change the parameters with the unit off.

The indicated parameters are always visible.

Restart the controller following parameter changes.

The IDL function is enabled when the consent is closed.

7.6.3 DHW - DOMESTIC HOT WATER

7.6.3.1 Description

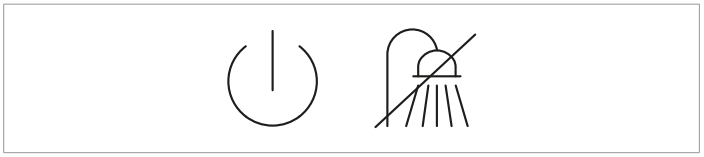
The DHW option is an operating mode that has as its objective the production of hot water for the DHW circuit.

The beginning and the end of the thermoregulation in DHW are subordinated to the external call chosen between the two described below.

The call condition for DHW operation is a digital input or a temperature probe.

Operation in DHW alternates with system mode (HEAT or COOL) and always has priority net of operating times that we will define later.

During operation in DHW, the thermoregulation set point is changed and a valve that we define as DHWV is activated.



⚠ The STANDBY command has priority over the DHW call, this means that with the unit in STANDBY the DHW function is not active.

⚠ The DHW function cannot be enabled if the heat pump is fitted with an on board storage tank (SI accessory). This is to avoid the pouring of cold water into the domestic hot water circuit during summer operation.

7.6.3.2 Consents for DHW qualification

During the installation phase, it is possible to choose the call mode of the DHW function by configuring either an on-off consent or a temperature probe.

⚠ The on-off consent and the temperature probe cannot coexist.

7.6.3.2.1 Option 1: enabling via on-off consent

This configuration requires the installation of a thermostat on the DHW storage.

The consent of the thermostat will make the call of the DHW function.

⚠ The thermostat is not supplied.

Electric connections

Connection of the on-off consent: refer to the wiring diagram and identify the terminals marked 'ecDHW'.

Connection of the DHWV valve: consult the wiring diagram and identify the terminals with the code "fcDHW".

Configuration and enabling of on-off consent

Parameter	Description	Default		Value for on-off DHW
CL04	AIL5 input type	0	→	1
CL34	AIL5 input configuration if analogue	0	→	0
CL54	AIL5 input configuration if digital	0	→	-28*

* you can set +28 to change polarity

DHWV valve configuration and enabling

Parameter	Description	Default		Value for DHWV
CL80	AOL1 output configuration if analogue	0	→	0
CL96	AOL1 output configuration if digital	0	→	9

Enable DHW function

Parameter	Description	Default		SET
AS00	Enable DHW function	0	→	1

Notes

To carry out the modification procedure, refer to the paragraph "Procedure for modifying parameters".

7.6.3.2.2 Option 2: enabling via temperature probe

This configuration provides for the installation of a temperature probe on the DHW storage.

The temperature read will allow the heat pump to make calls to the DHW function.

⚠ The probe is not supplied.

Electric connections

Probe connection: consult the wiring diagram and identify the terminals with the code "stDHW".

Connection of the DHWV valve: consult the wiring diagram and identify the terminals with the code "fcDHW".

Temperature probe configuration and enabling

DHWV valve configuration and enabling

Parameter	Description	Default		Value for DHWV
CL80	AOL1 output configuration if analogue	0	→	0
CL96	AOL1 output configuration if digital	0	→	9

Enable DHW function

Parameter	Description	Default		SET
AS00	Enable DHW function	0	→	1

Notes

To carry out the modification procedure, refer to the paragraph "Procedure for modifying parameters".

7.6.3.2.3 Operation

Operation via on-off consent.

The DHW option is activated when the DHW call contact is closed.

The DHW option is activated only if it has been inactive for the AS10 minimum time in the system.

The DHW option ends when the DHW contact is open.

The DHW option always ends if the maximum operating time in DHW is exhausted (time defined by parameter AS09 Maximum time in DHW).

Operation via temperature probe

The DHW option is activated when the DHW temperature probe reads a lower value AS01-AS04 (respectively set point value and relative hysteresis).

The DHW option is activated only if it has been inactive for the AS10 minimum time in the system.

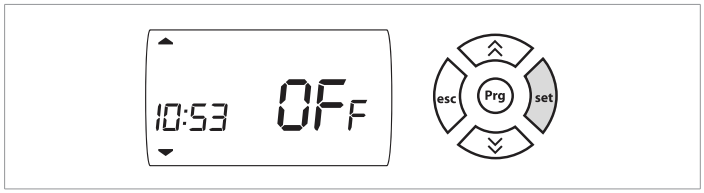
The DHW option ends when the DHW temperature probe reads a value greater than AS01 (default 55 ° C).

The DHW option always ends if the maximum operating time in DHW is exhausted (time defined by parameter AS09 Maximum time in DHW).

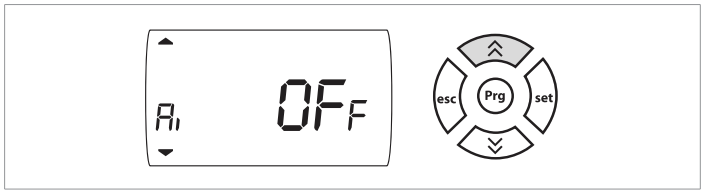
Thermoregulation
The power required is based on the temperatures read on board the heat pump.
When the DHW thermoregulation set point is reached, the compressor is switched off, but the function still remains active (the output from the DHW function is always bound to the previously described consents).

Checks during DHW operation
During operation in DHW, the status of the DHWV valve can be checked from the DO menu:

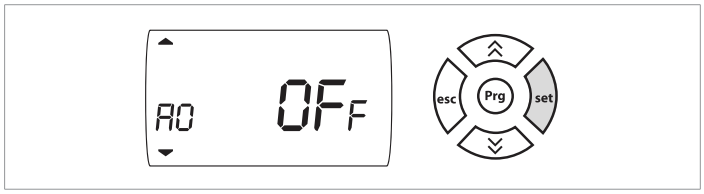
a. Enter the set menu.



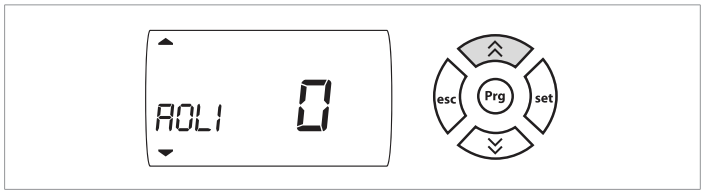
b. Identify the dO submenu.



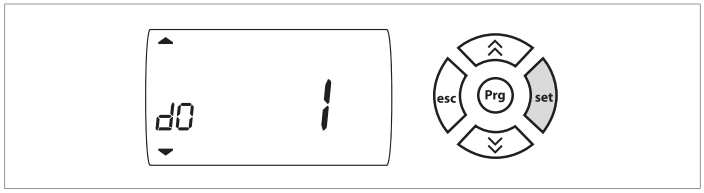
c. Enter the AO submenu.



d. Identify the AOL1 output.

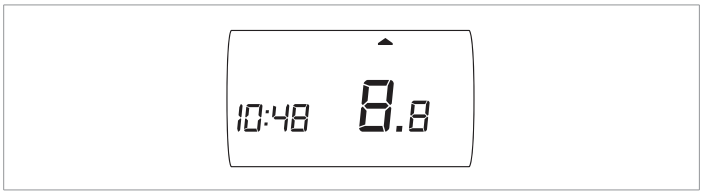


e. Check the status of the DHWV dO.



Defrost in DHW
The DHW defrost function is managed regularly.
During the installation phase, it is possible to define the position of the DHWV during defrosting in order to convey the flow to the domestic hot water or to the system.

Display
- The DHW LED is steady on when the DHW Valve output is active.
- The DHW LED is flashing
- when the thermoregulation temperature is reached, but the DHW call is still active
- when we are waiting for the exhaustion of the AS10 break
- The DHW led is off in the other cases (no DHW call present)



7.6.4 HYM - HYBRID SYSTEM

7.6.4.1 Description

The heat pump (pdc) is able to manage a boiler as an auxiliary heat source.
The checks of the working conditions determine the intervention of the boiler which will act as a source of integration or replacement.

	**Integrated system**	**The boiler works at the same time as the heat pump.**
	Alternating system	The boiler replaces the heat pump.

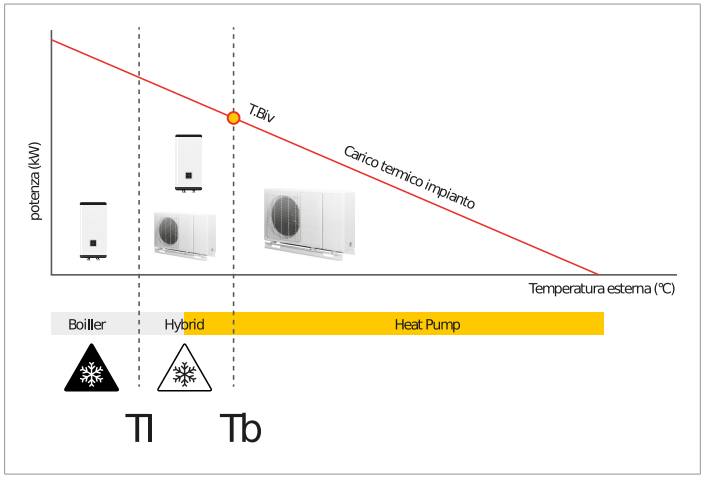
The heat pump checks the outside air and water temperature before and during operation in hybrid mode.

	**STE probe**	**It is the probe that checks the outside air temperature.**
	ST1 probe	It is the probe that checks the water temperature.

It is possible to set 2 operating thresholds:

	**Threshold Tb**	**Bivalent temperature: when the external air temperature reaches a value lower than the Tb temperature, the boiler is activated in integration with the heat pump.**	
	TI threshold	Limit temperature: when the external air temperature reaches a value lower than the TI1 temperature, the heat pump is switched off and replaced by the boiler.	

Graph summarizing the behaviour described above:



TI = 2 ° C; Tb = 7 ° C

Notes

- The consents to the heat pump and to the boiler are controlled by the regulator installed on the heat pump.
- The call to the boiler is made after checking the water temperature read by the ST1 probe
- With the circulation pump off, the boiler will never be switched on.
- The boiler will not be switched on automatically in the event of a heat pump alarm.
- During alternation operation, the hydraulic pump of the heat pump remains on.
- Turning off the heat pump will cause the heat pump itself and the boiler to turn off.
- The integration and alternation systems work both in HEAT mode and in DHW mode.
- The boiler call remains active in the event of a defrost request.
- When the HEAT or DHW set point is reached, all active heat generators are switched off. The shutdown for satisfied set point occurs both in integration and in replacement.

7.6.4.2 Electric connections

Connection of the consent to the boiler: consult the wiring diagram and identify the terminals with the code "fcKC"

7.6.4.3 Parameter configuration

Enabling the integration function and configuring the Tb threshold:

Parameter	Description	Default		SET
br00	Enabling the integration function.	0	→	1
br01	Bivalent temperature threshold Tb (integration) [° C]	7.0	→	*

* enter the desired value if different from the one proposed

Enabling the alternation function and configuring the TI threshold:

Parameter	Description	Default		SET
HP00	Enabling the alternation function.	0	→	1
HP01	Limit temperature threshold TI (integration) [° C]	2.0	→	*

* enter the desired value if different from the one proposed

Configuration of the electrical consent fcKC:

Parameter	Description	Default		SET
1r91	Configuration of output 1DO2 for boiler consent fcKC	0	→	30

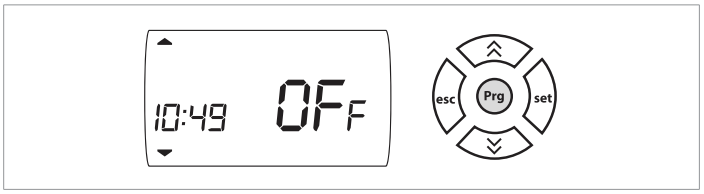
Notes

- To change the parameters, refer to the procedure below.
- The indicated parameters are always visible at the USER level.

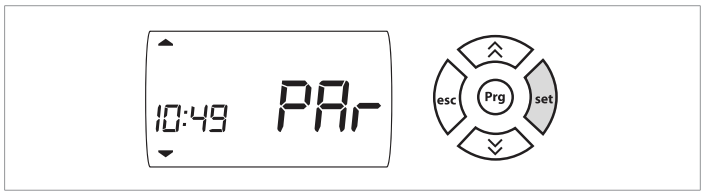
Procedure for changing parameters

Access the submenu and identify the parameter to be modified:

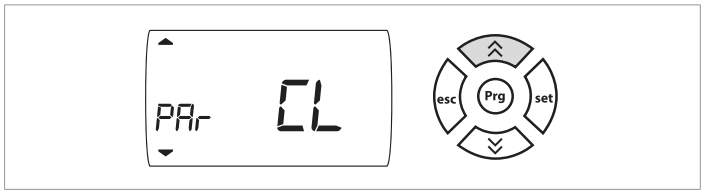
a. Enter the Programming menu.



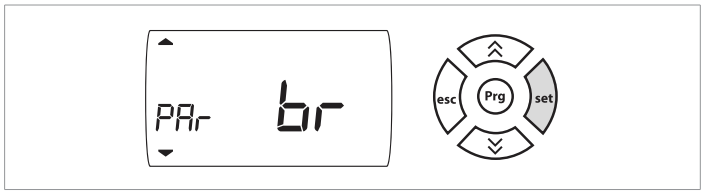
b. Enter the Parameters menu.



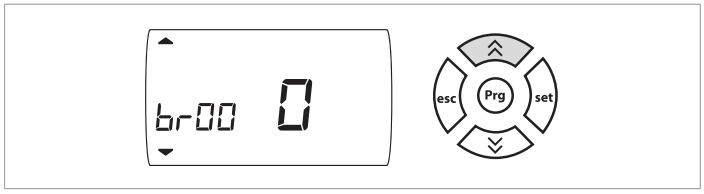
c. Scroll through the submenus.



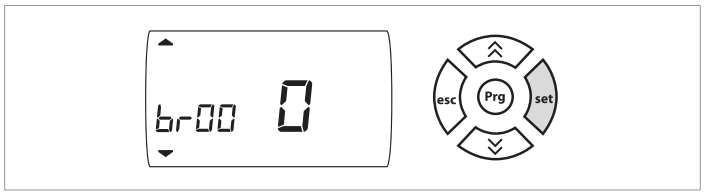
d. Enter the submenu br.



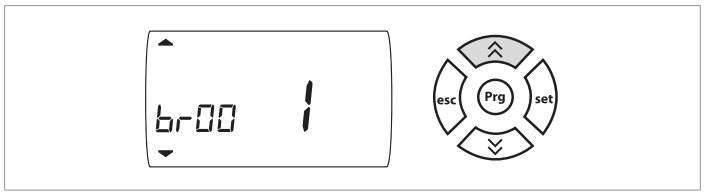
e. Identify the parameter to be changed.



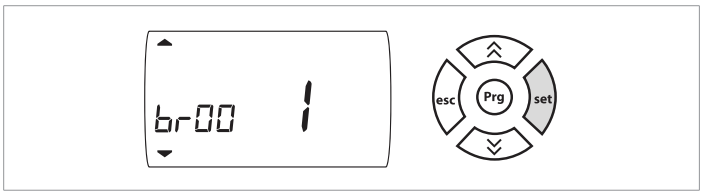
Change the parameter with the new value.
a. Access the parameter modification.



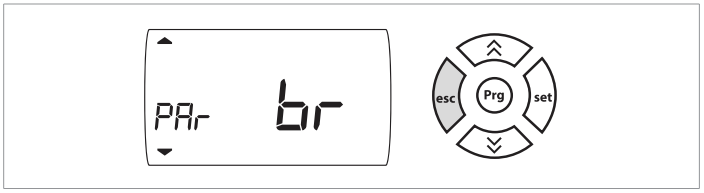
b. Enter the new value.



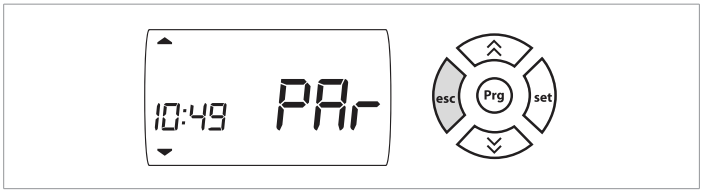
c. Confirm the entered value.



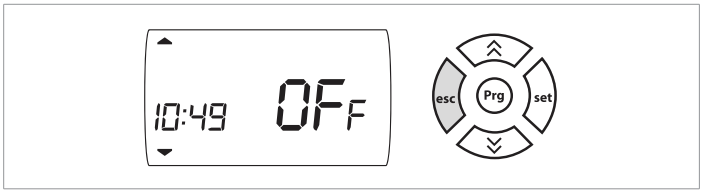
Exit the programming phase.
a. Return to submenu level.



b. Go back to the menu level.



c. Go back to the main screen.



Notes

Change the parameters with the unit off.

The indicated parameters are always visible.

Restart the controller following the changes in the parameters (by disconnecting the voltage and re-supplying the board).

7.6.5 SUMMARY OF "ADVANCED FUNCTIONS" HARDWARE CONFIGURATION TABLES

IAS - AIL4

Set point calibration with digital input

Parameter	Description	Default		value for IAS
CL03	AIL4 input type	0	→	1
CL12	Full scale value	10.0	→	10.0
CL13	Start of scale value	0.0	→	0.0

Parameter	Description	Default		value for IAS
CL33	AIL4 input configuration if analogue	0	→	0

Parameter	Description	Default		value for IAS
CL53	AIL4 input configuration if digital	0	→	-22

IAA - AIL4
Set point offset with 4-20mA

Parameter	Description	Default		Value for IAA
CL03	AIL4 input type	0	→	3
CL12	Full scale value	10.0	→	20.0
CL13	Start of scale value	0.0	→	4.0

Parameter	Description	Default		Value for IAA
CL33	AIL4 input configuration if analogue	0	→	25
CL53	AIL4 input configuration if digital	0	→	0

IAV - AIL4
Set point offset with 0-10V

Parameter	Description	Default		Value for IAV
CL03	AIL4 input type	0	→	4
CL12	Full scale value	10.0	→	10.0
CL13	Start of scale value	0.0	→	0.0

Parameter	Description	Default		Value for IAV
CL33	AIL4 input configuration if analogue	0	→	25
CL53	AIL4 input configuration if digital	0	→	0

IDL - 1DI1
Demand Limit

Parameter	Description	Default		Value for IDL
1r40	Configuration of digital input 1DI1	0	→	21

ecDHW - AIL5
DHW consent with on-off

Parameter	Description	Default		Value for on-off DHW
CL04	AIL5 input type	0	→	1
CL34	AIL5 input configuration if analogue	0	→	0
CL54	AIL5 input configuration if digital	0	→	-28*

* you can set +28 to change polarity

stDHW - AIL5
DHW consent with probe

Parameter	Description	Default		Value for DHW probe
CL04	AIL5 input type	0	→	2
CL34	AIL5 input configuration if analogue	0	→	11
CL54	AIL5 input configuration if digital	0	→	0

DHWV - AOL1
DHW Valve

Parameter	Description	Default		Value for DHWV
CL80	AOL1 output configuration if analogue	0	→	0
CL96	AOL1 output configuration if digital	0	→	9

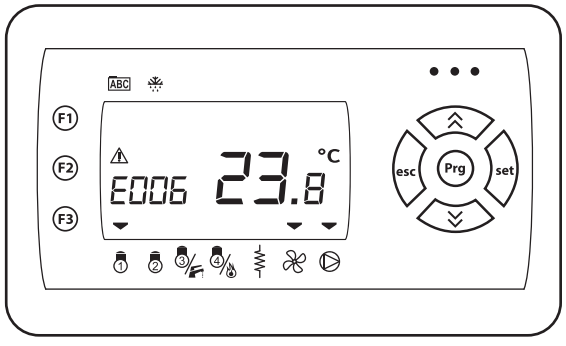
fcKC - 1DO2
Consent boiler

Parameter	Description	Default		SET
1r91	Configuration of output 1DO2 for boiler consent fcKC	0	→	30

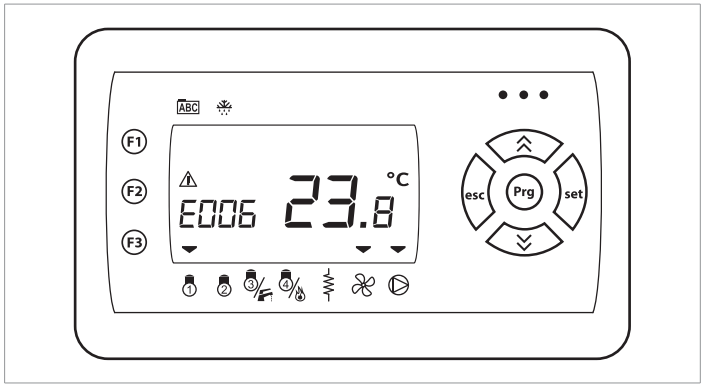
7.7 Alarms

7.7.1 Alarm presence

In case of poorly functioning of the machine, the ALARM signal and the intervened alarm code appear on the display.
At the same time as an alarm is triggered, the fcGA contact (general alarm) is enabled.
The contact is restored following the reset of the alarm or pressing a key on the display.



7.7.2 Alarms reset

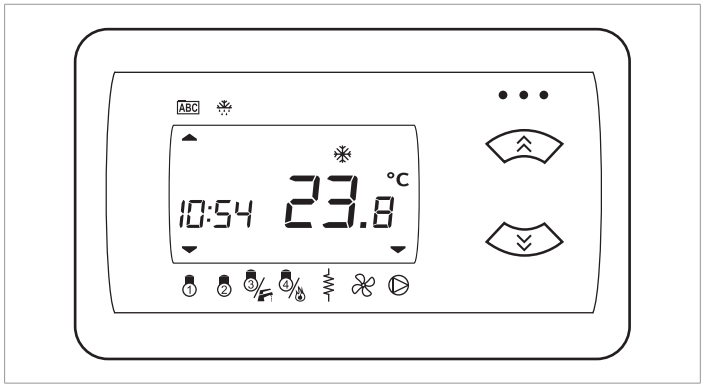


During the unit operation two types of alarm can intervene: with automatic reset or with manual reset.

In presence of an alarm with automatic reset, the return to regular operation conditions will be automatic at the stop of the causes of its intervention.

The alarm signal and the intervened alarm code will disappear from the display.

In presence of an alarm with manual reset, the return to regular operation conditions occurs through pressing simultaneously UP and DOWN keys and only if the stop of the causes of its intervention.

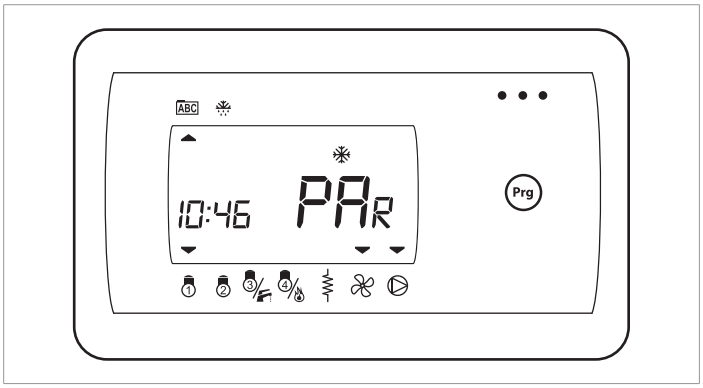


The alarm signal and the intervened alarm code will disappear from the display.

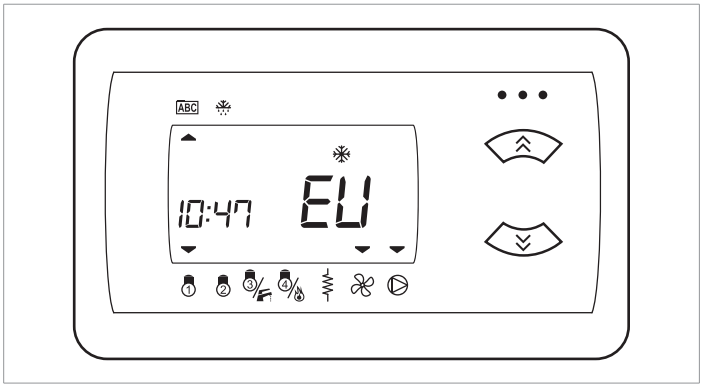
7.7.3 Alarms history

From control panel it is possible to visualise the history of intervened alarms during the machine operation.

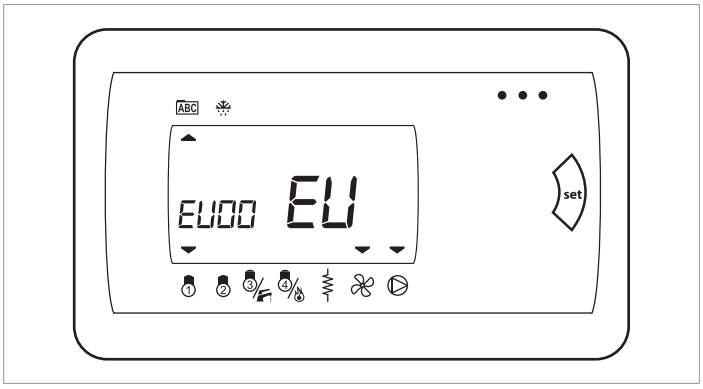
Press the PRG key to return to the main screen.



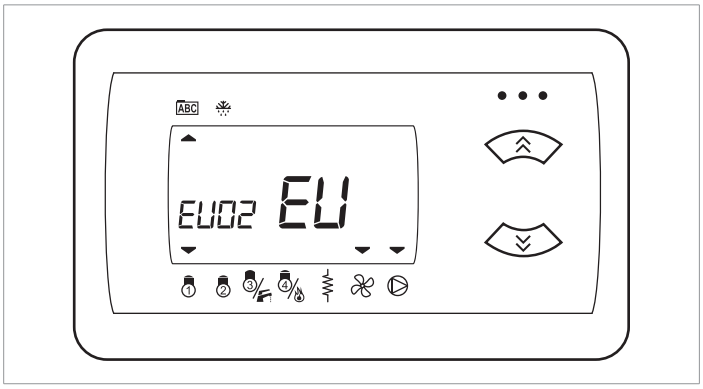
Use UP and DOWN keys to select the EU menu.



Press the SET key to enter the menu containing the list of intervened alarms.



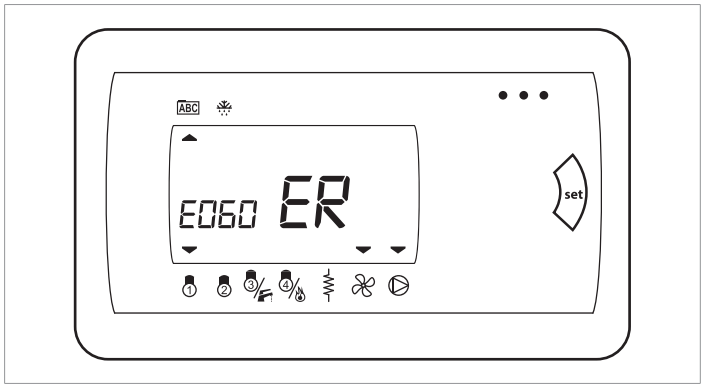
Use UP and DOWN keys to select the alarm of whom you wish to visualize all information.



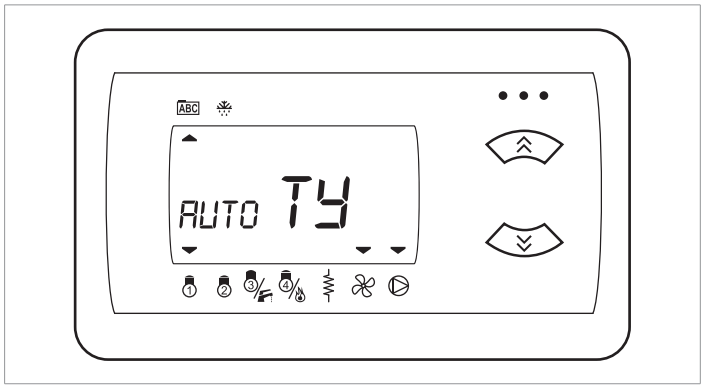
Once selected the alarm, press the SET key to enter in the information list.

Use UP and DOWN keys to scroll all information about the selected alarm.

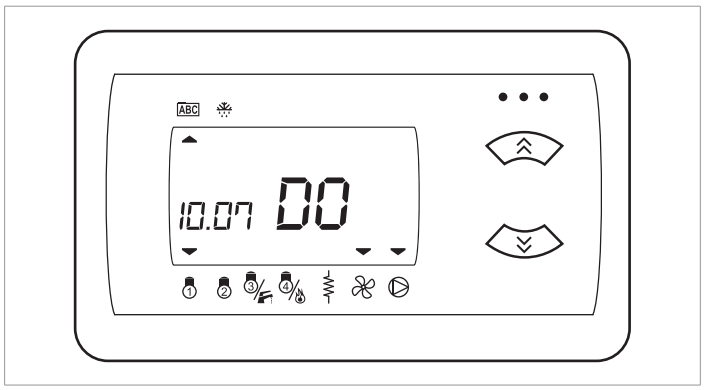
ER: indicates the code of intervened alarm.



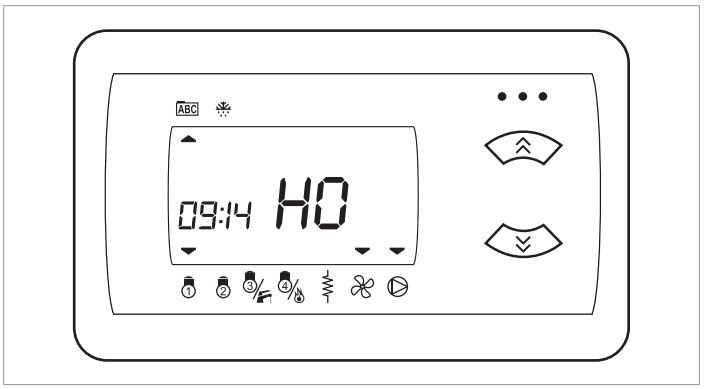
TY: indicates if the intervened alarm is with manual or automatic reset.



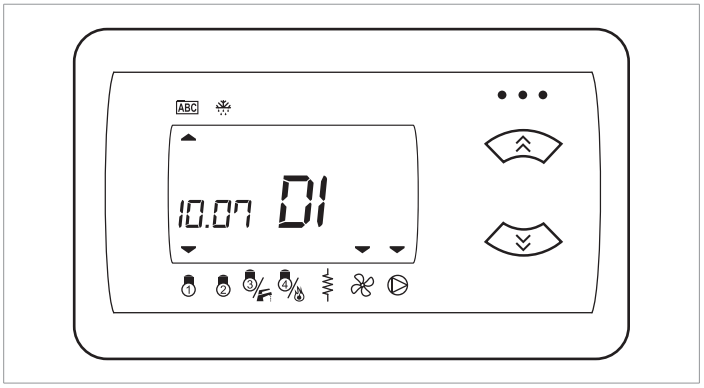
DO: indicates the date when it was rearmed or if the alarm is still active (- - : - -).



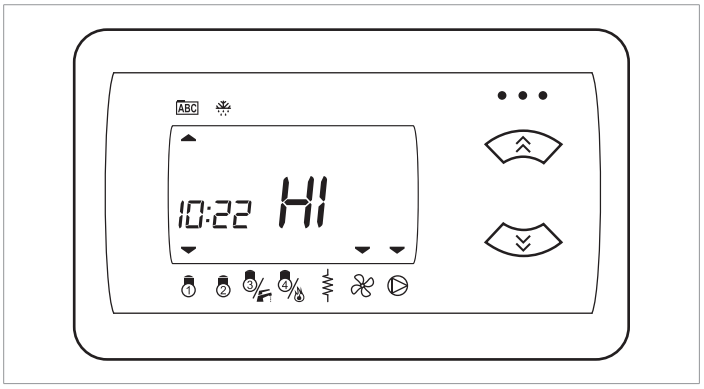
HO: indicates the time when it was rearmed or if the alarm is still active (- - : - -).



DI: indicates the date when the alarm intervened.



HI: indicates the time when an alarm intervened.



Press the ESC key to come back to the previous menu or to come back to the main screen.

7.7.4 Alarm charts

From alarm charts it is possible to identify the anomaly on the unit.

Alarm code	Alarm name
E000	Gas leak alarm
E001	High pressure (digital) circuit 1
E002	High pressure (digital) circuit 2
E003	High pressure (analogue) circuit 1
E004	High pressure (analogue) circuit 2
E005	Low pressure (digital)
E007	Low pressure (analogue) circuit 1

Alarm code	Alarm name
E008	Low pressure (analogue) circuit 2
E009	Unloaded machine
E010	Thermal overload protection compressor 1
E011	Thermal overload protection compressor 2
E012	Thermal overload protection compressor 3
E013	Thermal overload protection compressor 4
E015	Oil switch compressor 1
E016	Oil switch compressor 2
E017	Oil switch compressor 3
E018	Oil switch compressor 4
E020	Primary circuit flow switch
E021	Thermal protection pump 1 primary circuit
E022	Thermal protection pump 2 primary circuit
E025	Open circuit flow switch
E026	Open circuit pump thermal protection
E030	Primary circuit antifreeze
E031	Open circuit antifreeze
E032	Vacuum circuit 1
E033	Vacuum circuit 2
E035	High temperature
E040	Fans thermal overload protection of the primary exchanger
E041	Fans thermal overload protection of the disposable exchange of circuit 1
E042	Fans thermal overload protection of the disposable exchange of circuit 2
E045	Faulty clock error
E046	Clock needs adjusting error
E047	LAN communication error
E048	Anti-legionella
E050	Thermal protection electrical heaters 1 primary exchanger
E051	Thermal protection electrical heaters 2 primary exchanger
E056	Auxiliary outlet thermal protection
E060	Broken water or air temperature probe at the primary exchanger inlet
E061	Broken water or air temperature probe at the primary exchanger outlet of 1 and/or 2 circuit
E062	Broken temperature sensor of the non-returnable exchanger of 1 and/or 2 circuit
E063	Faulty open exchanger inlet water temperature probe
E064	Faulty open exchanger outlet water temperature probe
E065	Faulty indoor room temperature sensor
E066	Faulty DHW temperature probe
E067	Faulty display sensor (temperature and/or pressure)
E068	Faulty external temperature sensor
E069	Broken circuit 1 high pressure inlet, and/or broken circuit 2 high pressure inlet
E070	Broken circuit 1 low pressure inlet, and/or broken circuit 2 low pressure inlet
E071	Faulty discharge temperature sensor compressor 1
E073	Broken dynamic set-point inlet
E074	Broken primary exchanger pressure of circuit 1, and/or broken primary exchanger pressure of circuit 2
E075	Broken disposable exchanger pressure of circuit 1, and/or broken disposable exchanger pressure of circuit 3
E080	Configuration Error
E081	Reporting of compressors exceeding hour operation (*)
E085	Reporting of exceeding hour operation of the primary circuit pump (*)
E086	Reporting of exceeding hour operation of the disposable circuit pump (*)
E090	Reporting of registrations exceedance

8 MAINTENANCE

8.1 Maintenance

Regular maintenance is essential to maintain the efficiency of the unit in terms of operation and energy.

The maintenance schedule that the Service or the refrigerator technician has observed, with, involves the following operations and checks.

8.2 Weekly checks

Regular maintenance is essential to maintain the efficiency of the unit in terms of operation and energy.

The maintenance schedule that the Service or the refrigerator technician has observed, with, involves the following operations and checks.

8.2.1 Routine maintenance

The routine maintenance operations are the cleaning and control of machine components or parts that may compromise its operation, safety or efficiency.

These operations must be performed by qualified personnel and enabled to work on this type of products.

All maintenance operations must be performed with the machine off and electrically isolated, paying particular attention to the safety instructions and laws in force in the country of operation.

The machine can be restarted after completing the routine maintenance operations, checking its proper operation.

8.2.2 Extraordinary maintenance

The extraordinary maintenance operations are the replacement and the repair of machine components or parts that compromise its operation, safety or efficiency.

These operations must be performed by qualified personnel and enabled to work on this type of products.

All maintenance operations must be performed with the machine off and electrically isolated, paying particular attention to the safety instructions and laws in force in the country of operation.

After completing the repair and replacement operations, the machine can be restarted following the first start-up instructions, verifying its proper operation.

8.3 Monthly checks

Verify the tightness of the terminals inside the electrical board and in the terminal board of the compressors. Check the mobile and fixed contacts of the remote switches and replace them if deteriorated.
Verify the complete tightness of the fuse holder caps.
Verify the proper refrigerant charge in the circuit through the liquid and humidity indicator.
Check that the compressor is not leaking oil.
Verify that the fan of the electrical board (if applicable) works properly.
Verify that there are no abnormal vibrations of the compressor.
Verify that the power consumption of the compressor falls within the plate limits.
Verify that the temperatures and pressures of the compressor fall within those indicated for proper operation.
Check that the water circuit does not leak water.
Vent the hydraulic system.
Check any compressors crankcase heaters.
Clean the metal filters in the hydraulic pipes.
Clean the finned coil (and the relative metal filters, if applicable), using a jet of compressed air, aimed in the opposite direction of the air flow. If the filters are particularly clogged, use a water jet.
Verify that the noise emission of the machine is regular.
Check that any antifreeze heaters are working properly.
Verify that the following safety devices work properly:
- High pressure switch;
- Low pressure switch;
- Compressor protection module;
- Water flow switch;
- Defrost sensor;
- Check the correct reading of the temperature and pressure sensor.

Check the following operating factors:
- Subcooling and superheating of the refrigerant;
- No bubbles on the liquid indicator;
- Refrigerant leaks near the joints;
- Proper closure of the solenoid valve (if applicable);
- The temperature difference of the liquid used for utilities between inlet and outlet.

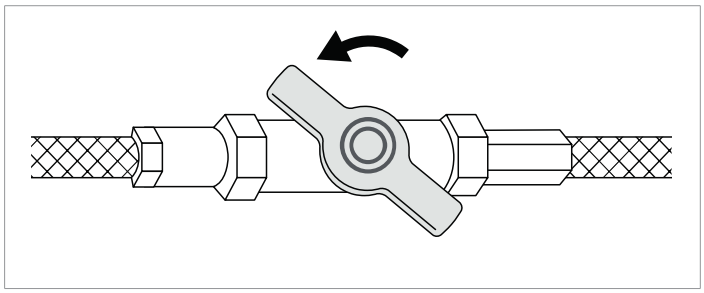
8.4 Annual checks

Proceed with the verification of the fastening, balancing and general conditions of the fans.
Verify the colour of the liquid and humidity indicator; if the colour indicates a wet circuit, the filter must be replaced.
Check the condition of the paint: any scratches should be touched up to prevent corrosion.
Verify the cleanliness of the heat exchanger on the air side.
Verify the cleanliness of the metal guard filter on water circuit.

8.5 Water circuit

8.5.1 Water circuit load

Before starting to load, set the main switch of the system to "off".
Open the rear inspection panel of the chiller.
Verify that the drain cocks of the chiller and the system are closed.
Open all the vent valves of the chiller, the system and the relative terminals.



Open the shut-off devices of the system.
Start filling by slowly opening the system water fill-up valve outside the unit.
When water begins to leak from the air vents, close them and continue filling until the expected system pressure value is reached.

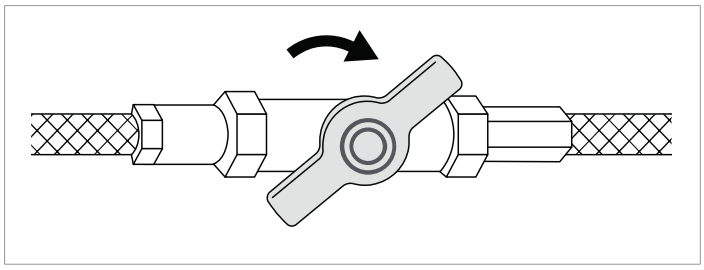
⚠ Verify the hydraulic tightness of the joints.

⚠ It is advisable to repeat this operation after the unit has been operating for a few hours and regularly check the system pressure. Top-ups must be carried out with the machine off (pump OFF).

⚠ The system must be filled to a pressure range between 1 and 2 bar.

8.5.2 Draining of the water circuit

Before starting to load, set the main switch of the system to "off".
Open the rear inspection panel of the chiller.
Verify that the drain cocks of the chiller and the system are closed.
Open all the vent valves of the chiller, the system and the relative terminals.



Before starting to load, set the main switch of the system to "off".
Before starting to empty, set the main switch of the system to "off".
Open the rear inspection panel of the chiller.
Verify that the system water load/top-up valve is closed.

⚠ If the system is supplemented with anti-freeze liquid, this should not be drained freely because of pollution. It must be collected and possibly reused.

8.5.3 Exchanger cleaning

The material not trapped by the filters, the water hardness or the high concentration of low freezing point solutions may dirty the water exchangers, reducing the efficiency of the heat exchange.

By using a differential pressure gauge it is possible to check the pressure loss between exchanger inlet and outlet.

If, from an inspection, it is found that the pressure values compromise regular operation or reduce machine efficiency, cleaning the exchanger will be required.

The exchangers must be cleaned with the machine off and by personnel authorised and trained for this type of operation.

The exchangers must be cleaned by using the specific pressure sockets and with specific detergents. At the end of the cleaning operation the exchangers must be appropriately rinsed to prevent detergent from circulating in the system.

At the end of the operation the water system must be reloaded and vented before restarting.

8.6 Refrigerant circuit

8.6.1 Cooling circuit repair

⚠ These operations should be carried out only by qualified personnel, using standard techniques typical of cooling systems that use halogen fluids such as refrigerants.

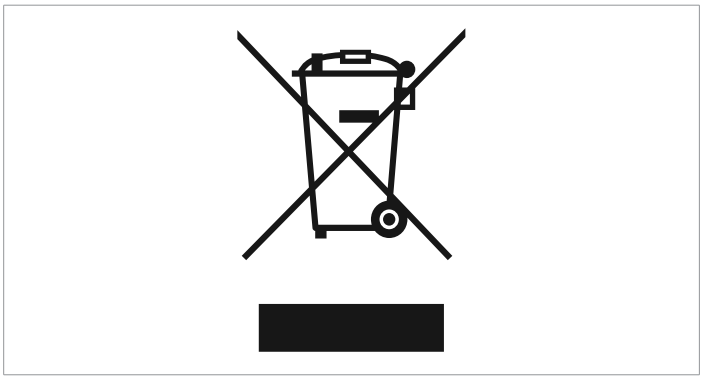
8.6.2 Refrigerant top up

They should be carried out only after having identified and repaired the leaking points.

⛔ No more than two top ups are permitted. If an additional top-up is required, the cooling circuit must be emptied completely and filled with virgin refrigerant.

8.7 Decommissioning and disposing

This product falls within the field of application of Directive 2012/19/EU on the management of waste electric and electronic equipment (WEEE).



⚠ These types of products may contain substances that are potentially harmful to human health and the environment and cannot be disposed of as household waste.

When the machine needs to be replaced or dismantled it must be disposed of according to local regulations on sorted waste, otherwise you must contact your local dealer for information on free pick-up.

Thermocold - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit thermocold.it.
Thermocold has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

70026 Modugno – Bari
Via dei Ciclamini, 25 – Z.I.
Tel. 080/5312623
Internet: http://www.thermocold.it
E-Mail: info@thermocold.it

Cod. DOMINO EXR C MIUM-EN 12-24-REV00

We are committed to using environmentally conscious print practices.

Thermocold® THE AIRVOLUTION