



Warning this manual contains the exclusive instructions for use for professionally qualified installers, in compliance with the laws in force.

The manufacturer will not be held liable in the case of damage to people, animals or property due to the failure to observe the instructions contained in the manuals supplied.

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Instructions on how to correctly dispose of the product.

At the end of its life, this appliance must not be disposed of as mixed municipal waste.

It is mandatory to separate this type of waste so that the materials making up the appliance can be recycled and reused. Contact authorised operators for disposal of this type of appliance. Incorrect management of waste and its disposal has potential negative effects on the environment and on human health. The symbol on the appliance represents the prohibition of disposing of the product as mixed municipal waste.

The company **IMMERGAS S.p.A.**, with registered office in via Cisa Ligure 95 42041 Brescello (RE), declares that the design, manufacturing and after-sales assistance processes comply with the requirements of standard **UNI EN ISO 9001:2015**.

For further details on the product CE marking, request a copy of the Declaration of Conformity from the manufacturer, specifying the appliance model and the language of the country.

The manufacturer declines all liability due to printing or transcription errors, reserving the right to make any modifications to its technical and commercial documents without forewarning.



CASING-RELATED INFORMATION

1 CASING-RELATED INFORMATION

1.1 OUTDOOR UNIT

1.1.1 OUTDOOR UNIT HANDLING



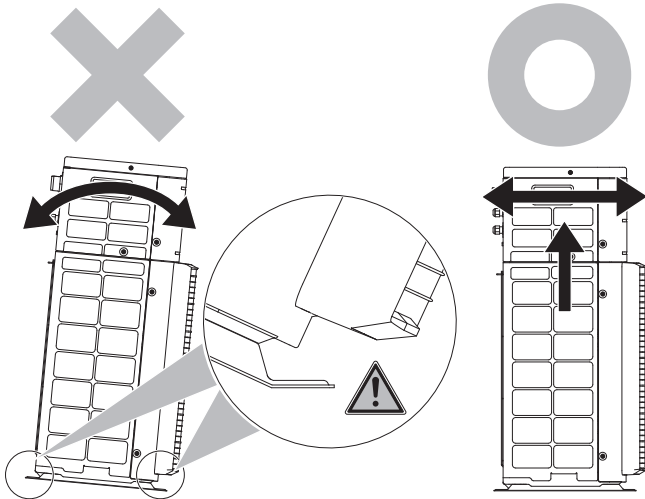
ATTENTION

To prevent damage or injuries, **DO NOT** touch the air inlet nozzle or the aluminium fins of the unit.

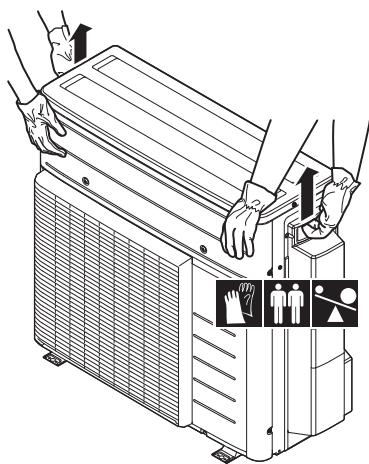


NOTE

To prevent damaging the mount feet, **NEVER** tilt the unit sideways in any way:

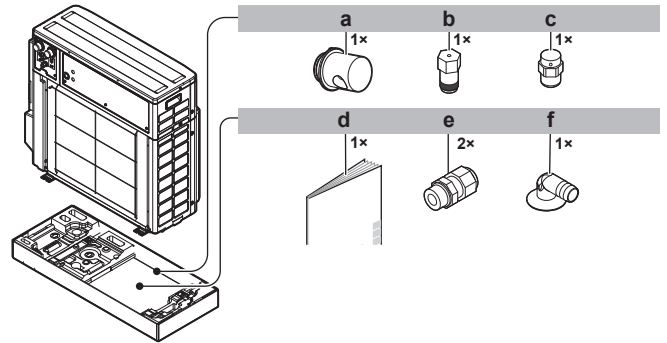


Slowly transport the unit as shown:



1.1.2 REMOVAL OF ACCESSORIES FROM THE OUTDOOR UNIT

- 1) Lift the outdoor unit. See "1.1.1, Outdoor unit handling".
- 2) Remove the accessories at the bottom of the unit.



KEY:

a = Part of the connection (with O-ring) of the antifreeze protection valve inside the outdoor unit

b = Antifreeze protection valve (inside the outdoor unit)

c = Vacuum switch (outside the outdoor unit)

d = Installation manual of the outdoor unit

e = Cable clamp

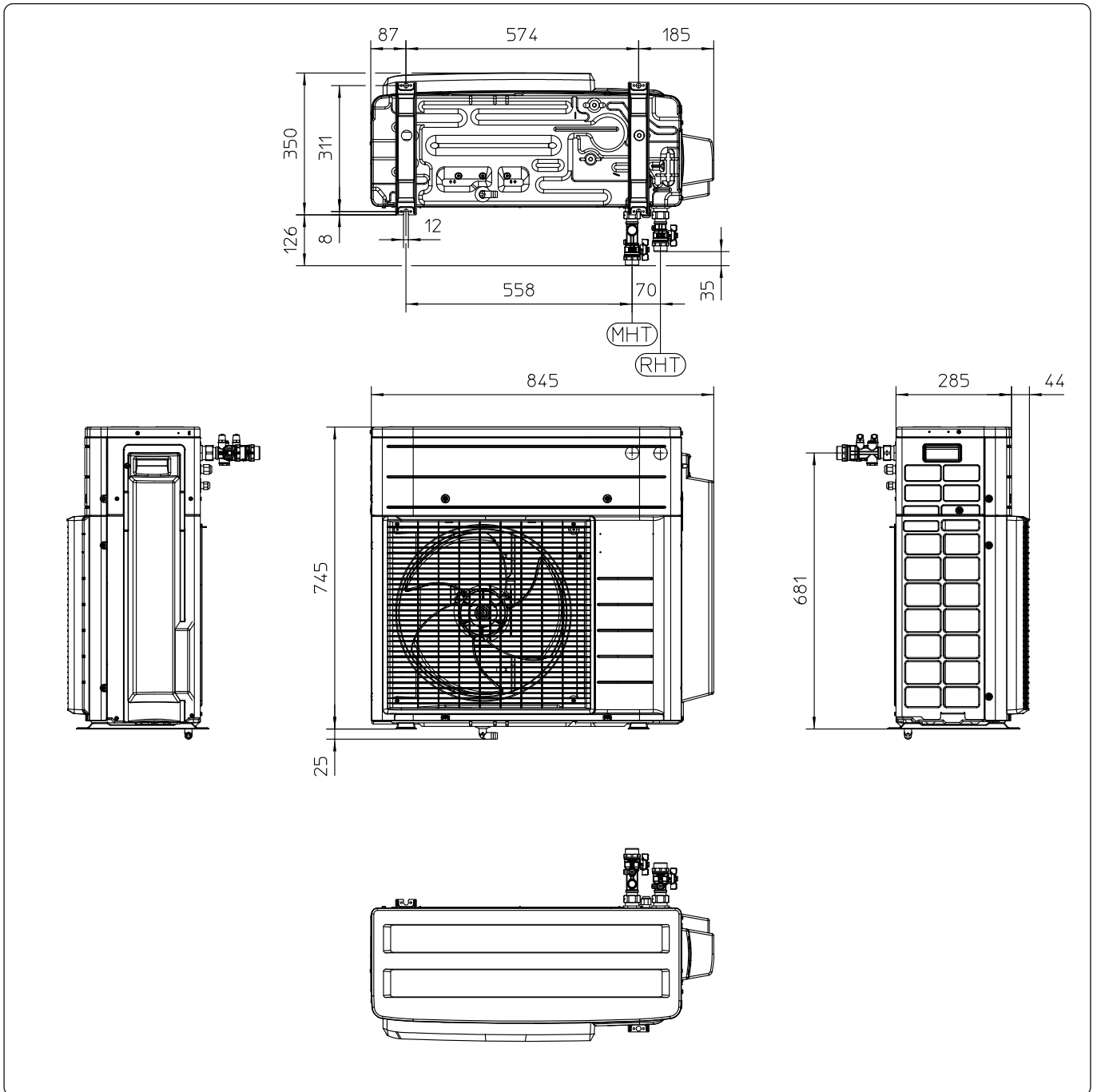
f = Drain fitting



NOTE

The shut-off valves, the control panel and the vibration-dampening feet are located inside the accessory unit, inside the indoor unit packaging.

1.2 MAIN DIMENSIONS.



KEY:
 RHT (G1") = Return to heat pump
 MHT (G1") = Flow from heat pump

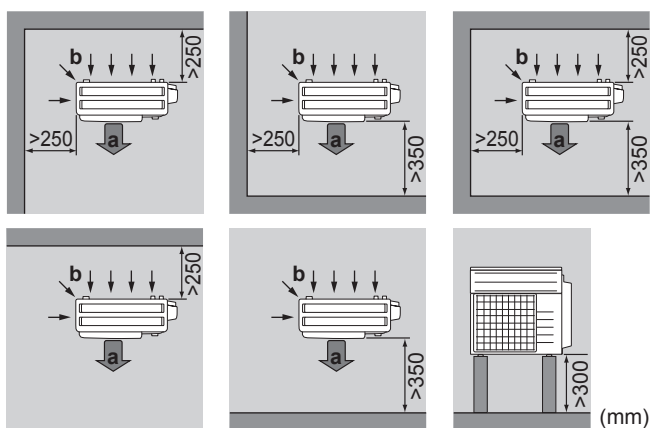


2 PREPARATION

2.1 PREPARING THE INSTALLATION SITE

2.1.1 REQUIREMENTS OF THE OUTDOOR UNIT INSTALLATION SITE

Keep the following space guidelines in mind:



KEY:
a = Air outlet
b = Air inlet



NOTE
The height of the wall on the outlet side of the outdoor unit **MUST BE** ≤ 1200 mm.

The outdoor unit is only designed for outdoor installation and for the following room temperatures:

Room central heating operation	-15~25°C
Production of Domestic Hot Water	-15~35°C

- Do not install the unit in places with a danger of leakage of flammable gas (e.g. thinners or petrol), carbon fibre or flammable dust.
- Do not install in places where corrosive gases (e.g. sulphuric acid) are produced.
- Do not install where there are machines that emit electromagnetic waves. The electromagnetic waves could disturb the control system and cause appliance failure.
- The appliance is not intended to be used in potentially explosive atmospheres.
- Do not install near sources of heat.
- Do not install the unit or parts of it on stairs, landings or other elements constituting escape routes, thereby obstructing the free passage.
- The unit must be positioned in such a way as to avoid refrigerant leaking in homes or otherwise endangering people, animals, objects and property. In the event of a leak, the refrigerant must not be able to flow into vents, doors, hatches, drains or other openings.
- Bear in mind that the refrigerant that escapes from the appliance in the event of a leak has a higher density than air and can accumulate at the bottom of the installation site. Refrigerant stagnation can create a fire or explosion hazard. In case of possible refrigerant stagnation, follow the safety measures of legislation in force and of local technical standards. For units installed outdoors in a place where the release of refrigerant may stagnate, follow the guidelines of legislation in force

- and of local technical standards.
- Do not position in basement windows or similar environments.
- Avoid obstacles or barriers that cause recirculation of exhaust air.

Special requirements for R32

The outdoor unit contains the internal coolant circuit (R32), but NO local coolant pipe or coolant charging is required. The total coolant charge in the system is ≤ 1.842 kg, therefore, the system is NOT subject to any requirement in relation to the installation site. However, keep the following requirements and precautions in mind:



- WARNING**
- **DO NOT** puncture or burn.
 - **DO NOT** use tools to accelerate the defrosting process or to clean the equipment, other than those recommended by the manufacturer.
 - Keep in mind that the R32 coolant is odourless.
 - The refrigerant gas leak check must be carried out in accordance with the relevant legislation. This job must be carried out by certified personnel only.



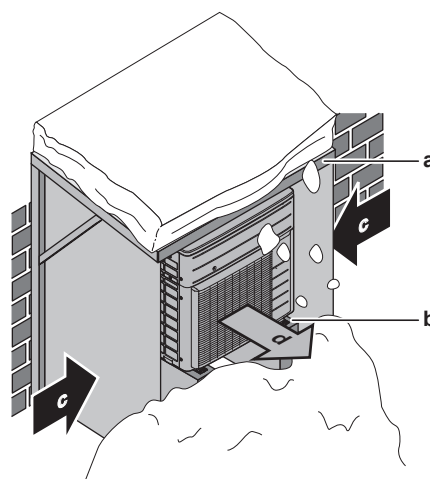
- WARNING**
- The appliance must be stored in such a way as to avoid mechanical damage, in a well ventilated environment and with no ignition sources in continuous operation (for example: open flames, gas appliance in operation or electric heater in operation).



- WARNING**
- Make sure that the installation, maintenance and repair are carried out in compliance with the Immergas instructions and local regulations in force and that they are only performed by qualified personnel.

2.1.2 ADDITIONAL REQUIREMENTS OF THE OUTDOOR UNIT INSTALLATION SITE IN COLD CLIMATES

Protect the outdoor unit from snow falls and make sure that the outdoor unit is NEVER buried under snow.



KEY:
a = Snow cover or shelter
b = Pedestal
c = Prevailing wind direction
d = Air outlet

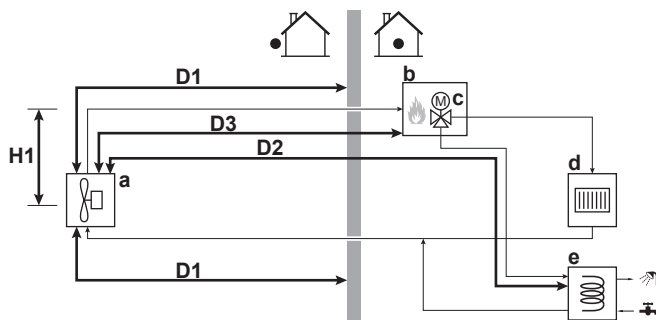
However, provide a space of at least 300 mm under the unit. In ad-

dition, make sure that the unit is positioned at least 100 mm above the maximum height that fallen snow is expected to reach. For more information, consult “3.2 Assembling the outdoor unit”.

In areas subject to heavy snowfalls, it is very important to choose an installation site where snow CANNOT reach the unit. If blowing lateral snowfalls are possible, make sure that the heat exchanger coil CANNOT be covered by snow. If necessary, install a snow cover or shelter and a pedestal.

2.2 PREPARING THE HYDRAULIC PIPES

2.2.1 PERMITTED PIPE LENGTH AND HEIGHT DIFFERENCE



KEY:

a = Outdoor unit

b = Indoor unit

c = 3-way valve

d = Room central heating circuit

e = External storage tank unit (if applicable)

Which?		Distance
H1	Maximum height difference between outdoor unit and indoor unit	It depends on the expansion vessel present in the indoor unit

—	Maximum total length of the water pipe (internal section+external section)	To be calculated according to the head available to the system (see Victrix Hybrid and Victrix Hybrid Plus instruction manuals)
D1	Maximum length of the external section of the water pipe (to prevent freezing the water pipe)	30 m (but limited to D2 when the external storage tank unit is installed)
D2	Maximum distances between the outdoor unit and the external storage tank unit (if applicable)	10 m
D3	Maximum distance between outdoor unit and indoor unit	To be calculated according to the head available to the system (see Victrix Hybrid and Victrix Hybrid Plus instruction manuals)

2.2.2 WATER VOLUME AND FLOW RATE - MINIMUM CONTENTS.

Minimum water volume

Check that the total water volume in the system, EXCLUDING the water volume inside the outdoor unit, is at least 20 litres.

Minimum flow rate

Ensure minimum flow rate, so that the outdoor unit does not go into high pressure error (1021). For the flow rate guidelines, see the tables in “2.2.1 Permitted pipe length and height difference”.

2.3 PREPARING THE WIRING

2.3.1 ELECTRICAL CONNECTIONS FOR EXTERNAL AND INTERNAL ACTUATORS



NOTE

The cables used for the electrical connections inside the connection compartment must be able to withstand a maximum temperature of 90°C.

Outdoor unit connections:

Item	Description	Wires	Maximum operating current
Power supply			
1	Outdoor unit power supply	2+GND	(a)
Control panel			



PREPARATION

2	Control panel	2	(b)
Optional equipment			
3	Anti-freeze resistance kit	2	(c)

- (a) See the information plate on the outdoor unit.
- (b) Cable section from 0.75 mm² to 1.25 mm² ; maximum length: 200 m.
- (c) See kit instructions



NOTE
Other technical specifications of the various connections can be found inside the outdoor unit.

Indoor unit connections.



NOTE
Other technical specifications of the various connections can be found inside the instruction manual of the hybrid heat pump.

3 INSTALLATION

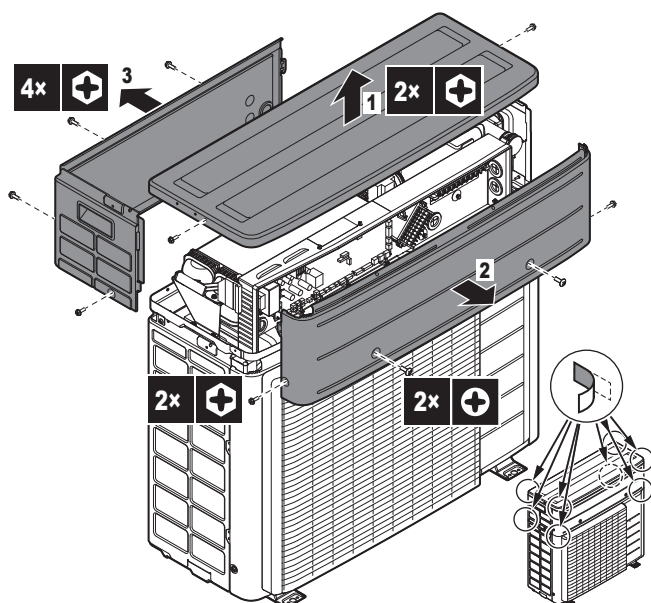
3.1 OPENING THE OUTDOOR UNIT



DANGER: RISK OF ELECTRIC SHOCK



DANGER: RISK OF BURNS



- 1) Open the upper panel.
- 2) Open the front plate.
- 3) If necessary, remove the rear plate. For example, this is necessary in the following cases:
 - When the antifreeze protection valve is installed inside the outdoor unit.
 - When the anti-freeze resistance kit is installed.

3.2 ASSEMBLING THE OUTDOOR UNIT

3.2.1 INSTALLATION STRUCTURE

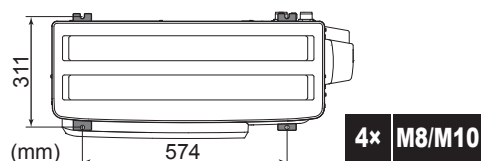
This section shows different installation structures. For all, use 4 series of M8 or M10 anchor bolts, nuts and washers. However, provide a space of at least 300 mm from the ground. In addition, make sure that the unit is positioned at least 100 mm above the maximum height that fallen snow is expected to reach.



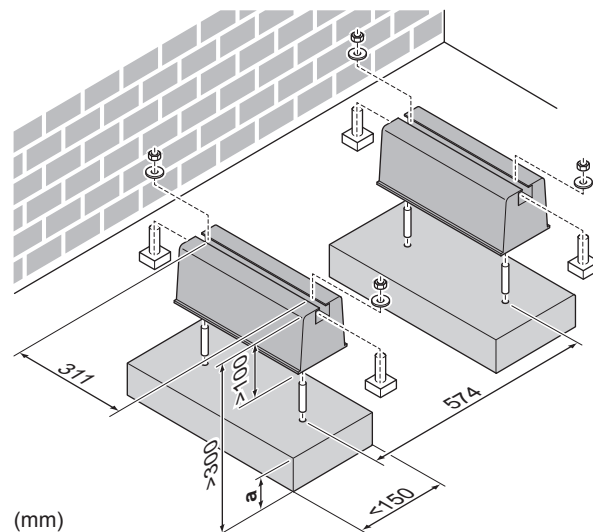
INFORMATION

The maximum height of the top protruding part of the bolts is 15 mm.

Anchor points



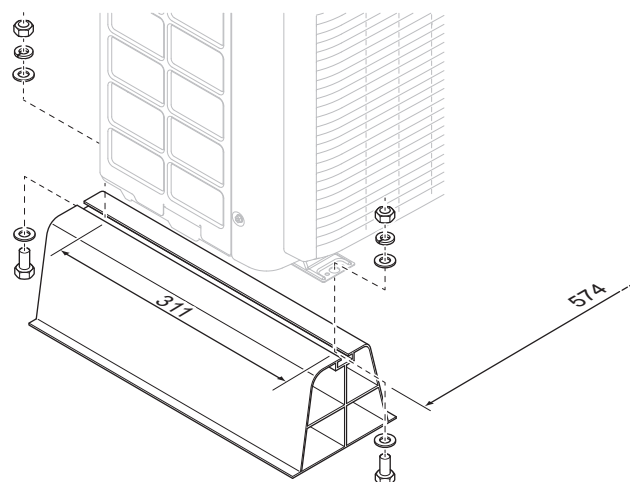
Option 1: on assembly feet "flexible with strut"



KEY:

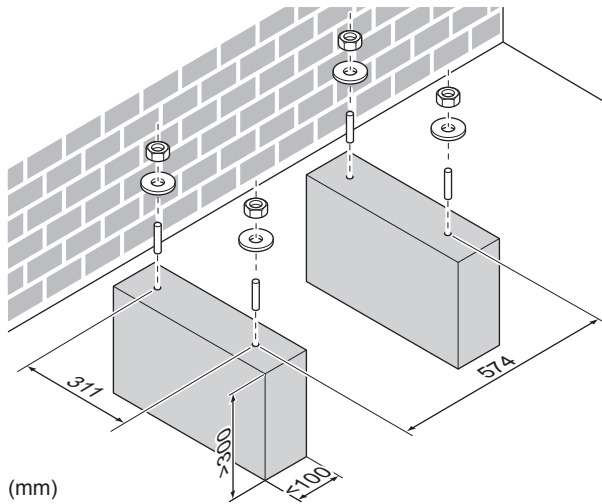
a = Maximum height reached by the fallen snow

Option 2: on plastic assembly feet

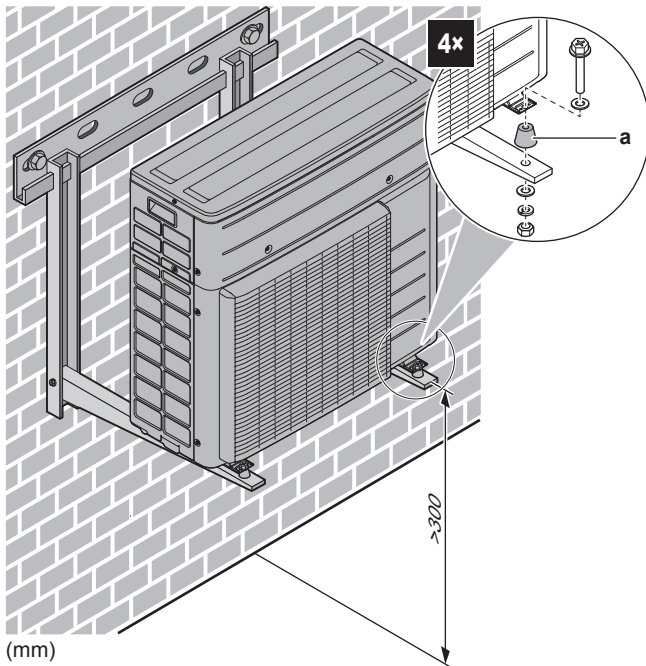


INSTALLATION

Option 3: on a pedestal (insert the vibration-dampening feet present in the indoor unit packaging)

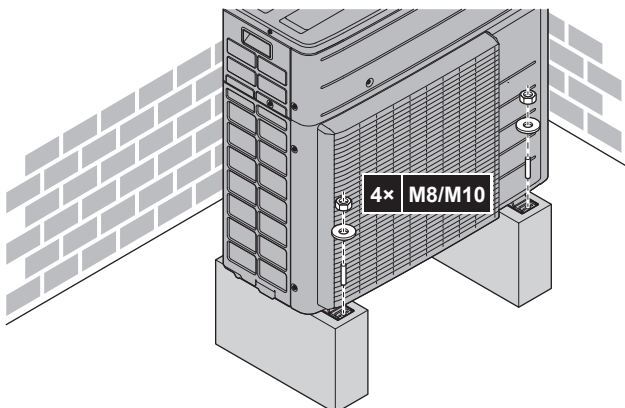


Option 4: on wall brackets (optional)



KEY:
a = Vibration-dampening rubber (supplied inside the kit)

3.2.2 INSTALLING THE OUTDOOR UNIT



3.2.3 CONDENSATE DRAIN

Make sure that the condensate water can be properly evacuated.



NOTE

If the unit is installed in cold climates:

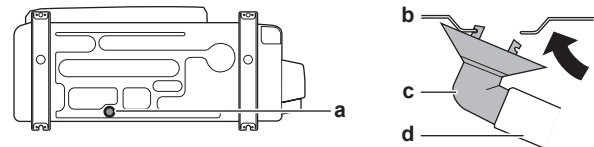
- Take adequate countermeasures so that the evacuated condensate CANNOT freeze.
- DO NOT USE the drain fitting and the drain hose in the outdoor unit, since the water drain may freeze, decreasing the central heating capacity.



NOTE

Provide a space of at least 300 mm under the unit. In addition, make sure that the unit is positioned at least 100 mm above the height that fallen snow is expected to reach.

Use the drain plug and the drain hose for drainage, except in cold climates.



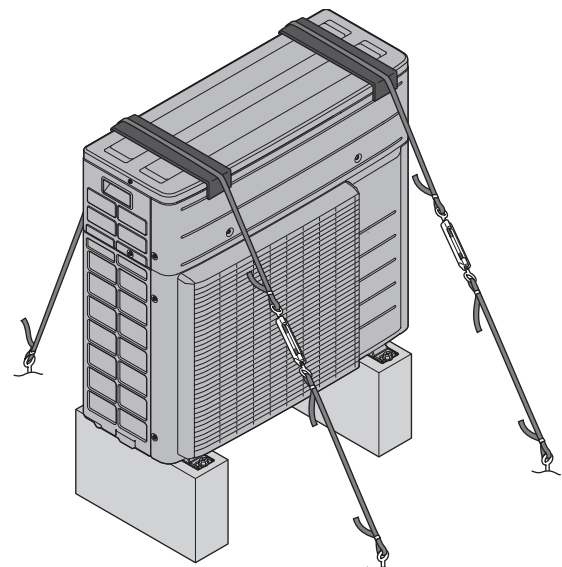
KEY:

- a = Drain hole
- b = Lower frame
- c = Drain fitting (supplied as standard)
- d = Flexible hose (obtain locally)

3.2.4 FALL PREVENTION OF THE OUTDOOR UNIT

Take the following measures should the unit be installed in places where strong wind could tilt it:

- 1) Prepare 2 cables as indicated in the following illustration (obtain locally).
- 2) Arrange the 2 cables above the outdoor unit.
- 3) Insert a rubber sheet between the cables and the outdoor unit to prevent the cables scratching the paint (obtain locally).
- 4) Fix the ends of the cable and tighten them.



3.3 CONNECTING THE WATER PIPE

3.3.1 WATER PIPE CONNECTIONS



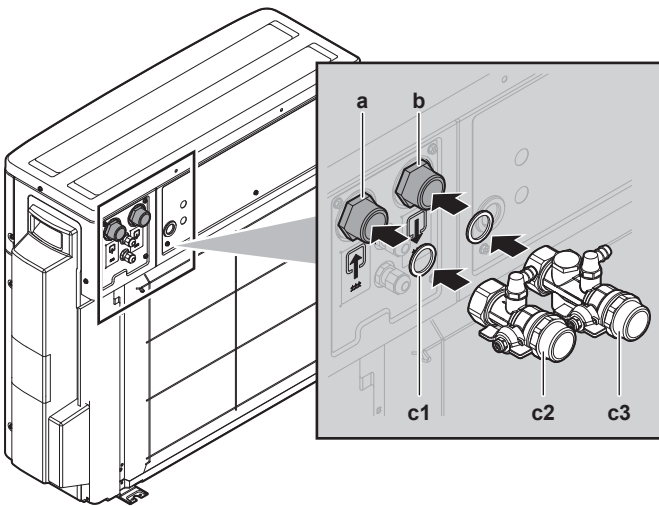
NOTE

DO NOT use excessive force to connect the pipes. Deforming the pipes can cause defects in the unit. Make sure that the tightening torque DOES NOT exceed 30 N•m.



NOTE

Shut-off valve with integrated vent. It is recommended to connect the shut-off valves present inside the accessory unit in the indoor unit packaging, to facilitate assistance and maintenance. When shut-off valves are not installed, it is necessary to install valves with integrated air vent on the flow from heat pump (MHT) and on the return to heat pump (RHT).



KEY:

- a = RHT (G1") Return to heat pump
- b = MHT (G1") Flow from heat pump
- c1 = Flat gaskets
- c2 = Shut-off valve
- c3 = Shut-off valve with integrated connection of the vacuum switch (if applicable).

- 1) Connect the shut-off valves by inserting flat gaskets and position them with the vent facing up.
- 2) Connect the site pipes on the shut-off valves.

3.3.2 SAFETY VALVE DRAIN

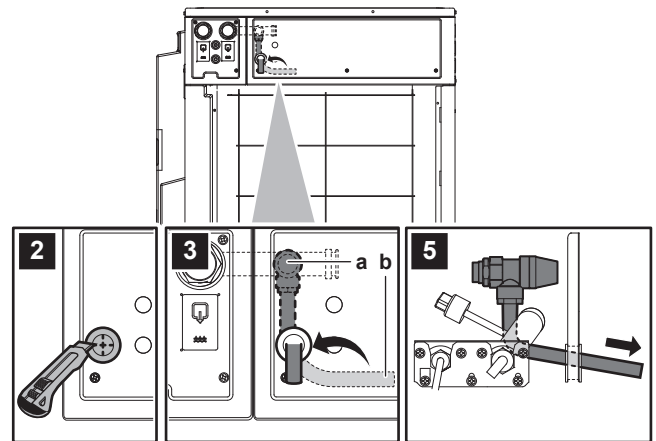


NOTE

In the event of overpressure, the system will release part of the liquid through the safety valve. The safety valve of the outdoor unit is designed to open at 3 bar. The safety valve drain must always be duly conveyed to a draining funnel. Consequently, in the event of valve intervention, the discharged liquid will end up in the sewer system.

If fluid containing glycol was added to the system circuit, make sure it is recovered and disposed of in accordance with standard EN 1717.

However, check that the flexible hose of the safety valve is ALWAYS free to discharge the pressure.



KEY:

- a = Pressure discharge valve
- b = Flexible hose (discharge)(obtain locally)

- 1) Open the upper plate, the front plate and the rear plate. See "3.1. Opening the outdoor unit".
- 2) Make a cross cut in the rubber gasket on the rear plate.
- 3) Route the flexible hose through the gasket.
- 4) Close the rear plate.
- 5) Pull the flexible hose gently so that it is tilted downwards. This prevents the water from stagnating and/or freezing inside the flexible hose.
- 6) Close the front plate and the upper plate.



INSTALLATION

3.3.3 SYSTEM FILLING



INFORMATION

Air vent valves.

- Manual air vent valves on the shut-off valves.
- Air vent valve inside the indoor unit.
- Manual or automatic air vent valves to be obtained locally.
- When using glycol, automatic air purge valves are NOT allowed.

The indoor unit MUST BE installed before filling the system. For the instructions on filling, refer to the manual of the hybrid heat pump.

3.4 WIRING CONNECTION



DANGER: RISK OF ELECTRIC SHOCK

WARNING

For the power supply cables, ALWAYS use multi-strand cables.



WARNING

Prevent risks due to the accidental resetting of the heat manifold: the current to this appliance MUST NOT be supplied through an external switching device, such as a timer, nor should the appliance be connected to a circuit that is regularly turned ON and OFF by the system.

Connecting the electrical cables to the outdoor unit



NOTE

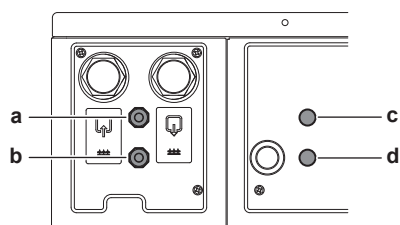
The distance between the 230 VAC power supply cable and the low voltage signal cables must be at least 50 mm.



ATTENTION

DO NOT push or position excessively long cables in the unit.

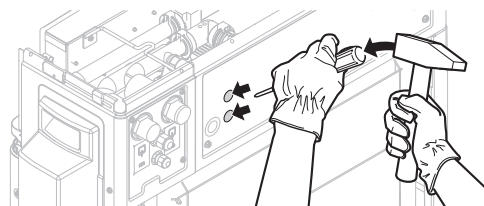
- 1) Open the upper plate and the front plate. See "4.1. Opening the outdoor unit".
- 2) Insert the wiring on the back of the unit:



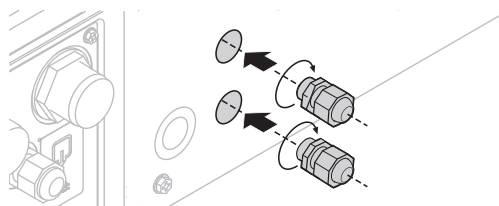
KEY:

a~d = See below

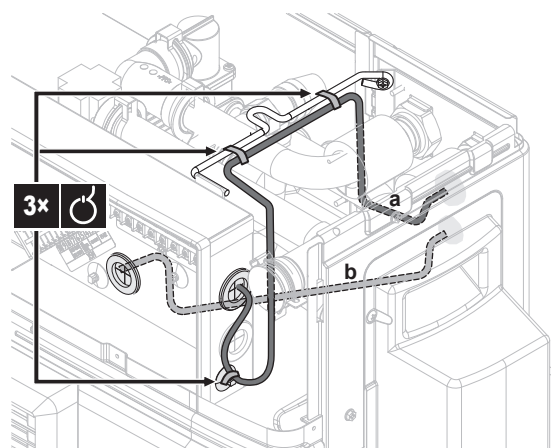
- 3) If cables are inserted through the blind holes c and d:
 - Open the blind holes using a hammer and screwdriver.



- Insert the cable glands (supplied as accessories).



- 4) Position the cables inside the unit, towards the electrical panel as follows:



KEY:

a = Main power supply
b = Control panel

- 5) Connect the cables inside the electrical panel to the corresponding terminals.
- 6) After having connected all the cables, close the front plate and upper plate.



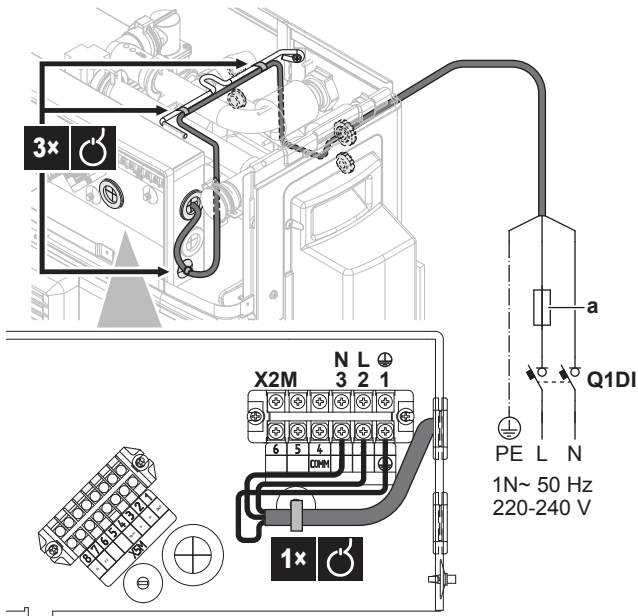
INFORMATION

Anti-freeze resistance kit. For the cable path, see the installation manual of the anti-freeze resistance kit.



Connecting the main power supply

1) Connect the main power supply to the appropriate terminals, as shown in the following figure.



KEY:

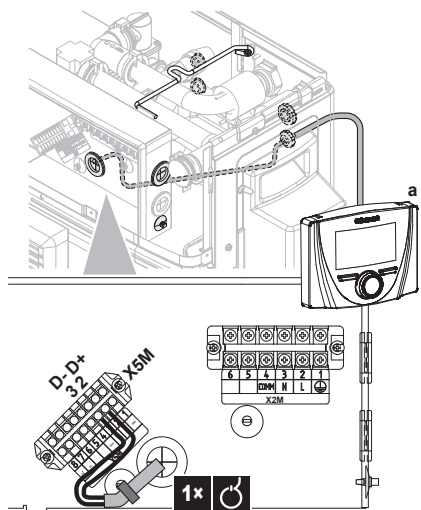
a = Recommended local fuse: 20 A

Q1DI = Differential switch

2) Fix the cable to the appropriate supports using the clamps.

Control panel connection

Connect the cable from the control panel to the outdoor unit. Fix the cable to the appropriate supports using the clamps.



4 ANTIFREEZE PROTECTION

4.1 HYDRAULIC CIRCUIT PROTECTION FROM FREEZING - GLYCOL AND ANTI-FREEZE PROTECTION VALVES

Freezing may damage the system. To prevent freezing of the hydraulic components, the software is equipped with special antifreeze protection functions, which include the activation of the pump of the indoor unit in case of low temperatures.

However, if the conditions specified in the antifreeze protection paragraph in the hybrid pump manual are missing (such as, for example, power supply failure), these functions cannot ensure protection.

Perform one of the following actions to protect the hydraulic circuit from freezing:

- Add glycol to water. The glycol lowers the freezing point of water. For the indoor unit, consult the operating range contained in the technical data table included in the instruction manual of the hybrid heat pump and the relative antifreeze protection paragraph.

- Install the standard supplied antifreeze protection valves. The antifreeze protection valves drain the water from the system before it freezes. For the indoor unit, consult the operating range contained in the technical data table included in the instruction manual of the hybrid heat pump and the relative antifreeze protection paragraph.



NOTE

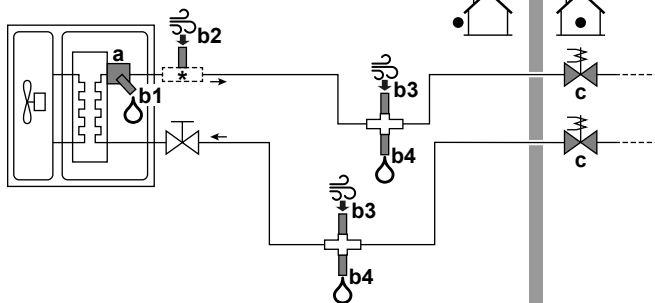
DO NOT install the antifreeze protection valves when adding glycol to water. Possible consequence: Glycol leakage from the antifreeze protection valves.

Anti-freeze protection with glycol

For the antifreeze protection with glycol, please refer to the hybrid heat pump manual.

Antifreeze protection with antifreeze protection valves

If no glycol was added to water, antifreeze protection valves can be used to drain the water from the system before it freezes. To do this, install the following parts:

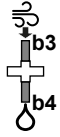


KEY:

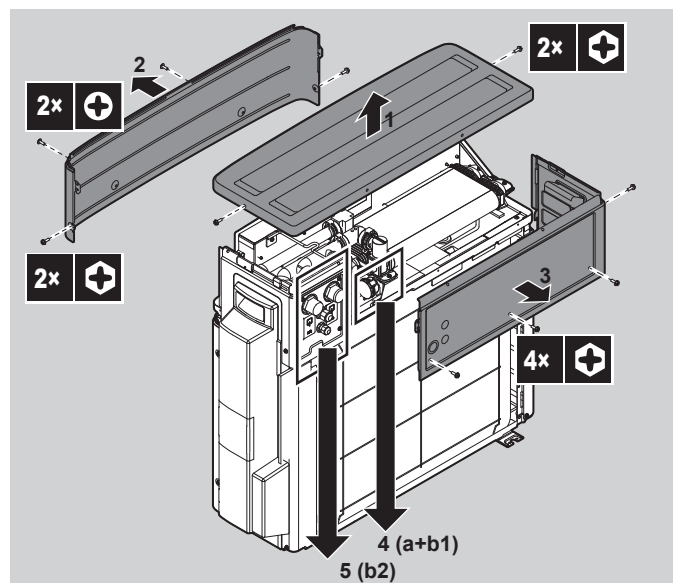
a+b1+b2 = Outdoor unit protection (*: there are 2 ways of connecting b2; see below).

b3+b4 = Local pipe protection

c = Water isolation inside the home in the event of a power failure.

Part	Description
a+b1+b2	(Mandatory – supplied as standard). a Part of the connection for b1 . b1 Antifreeze protection valve (for water drainage). b2 Vacuum switch (facing up for air supply). These components are necessary to protect the indoor pipe to the outdoor unit from freezing. Note: These components DO NOT protect the local pipes from freezing.
b3+b4	(Obtain locally). The installer is responsible for protecting the local pipes from freezing. One solution is to install the antifreeze protection valves in all the lowest points of the local pipes. By doing this, the antifreeze protection valves must always be installed in pairs:  b3 antifreeze protection valve (facing up for water supply) b4 Antifreeze protection valve (facing up for water drainage).
c	c Normally closed valves (Recommended - obtain locally). The normally closed valves prevent all water coming from the system from being drained when the antifreeze protection valves are opened. <ul style="list-style-type: none"> - In the event of a power failure: the normally closed valves close and isolate the water inside the home. If the antifreeze protection valves open, only the water outside the home is drained. - In other circumstances (for example if a pump breaks): the normally closed valves remain open. If the antifreeze protection valves open, the water inside the home is also drained.

To connect a+b1+b2



KEY:

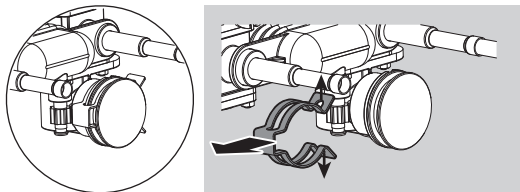
a = Part of the connection for **b1**

b1 = Antifreeze protection valve (for water drainage)

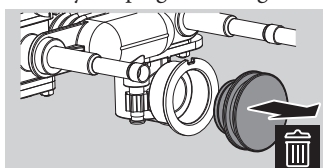
b2 = Vacuum switch (facing up for air supply)



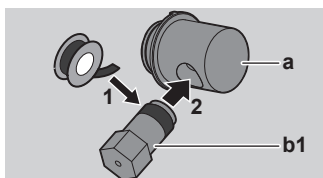
- 1) Open the upper panel.
 - 2) Open the front plate.
 - 3) Open the rear plate.
 - 4) Connect a+b1 as follows:
- Remove the clip.



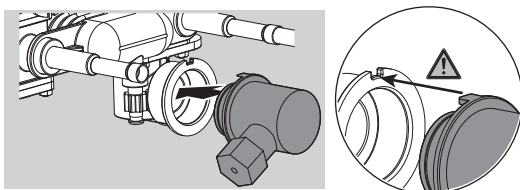
- Remove and throw away the plug with the gasket.



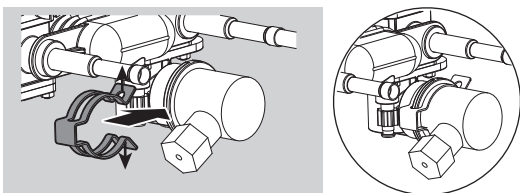
- Mount the antifreeze protection valve (b1) to the connection part (a) with a thread sealant.



- Mount the connection part to the outdoor unit.



- Mount the clip.



- Close the rear plate, the front plate and the upper panel.

- 5) To connect b2, proceed as follows (2 possibilities):



NOTE

Vacuum switch (b2). To perform proper drainage through the antifreeze protection valve inside the outdoor unit, the Vacuum switch must be installed correctly:

- Directly on the water outlet of the unit, without any valve or local pipe in between.
- Facing up to suck the air.

<p>Option 1</p>	<p>Use the shut-off valves with integrated connection for switch (supplied as standard).</p>
<p>Option 2</p>	<p>With the T-joint (obtain locally) + shut-off valve (obtain locally).</p>

4.2 ANTI-FREEZE RESISTANCE KIT (OPTIONAL)

The optional anti-freeze resistance kit can be installed to prevent freezing of the bottom plate. It may be necessary in some circumstances.

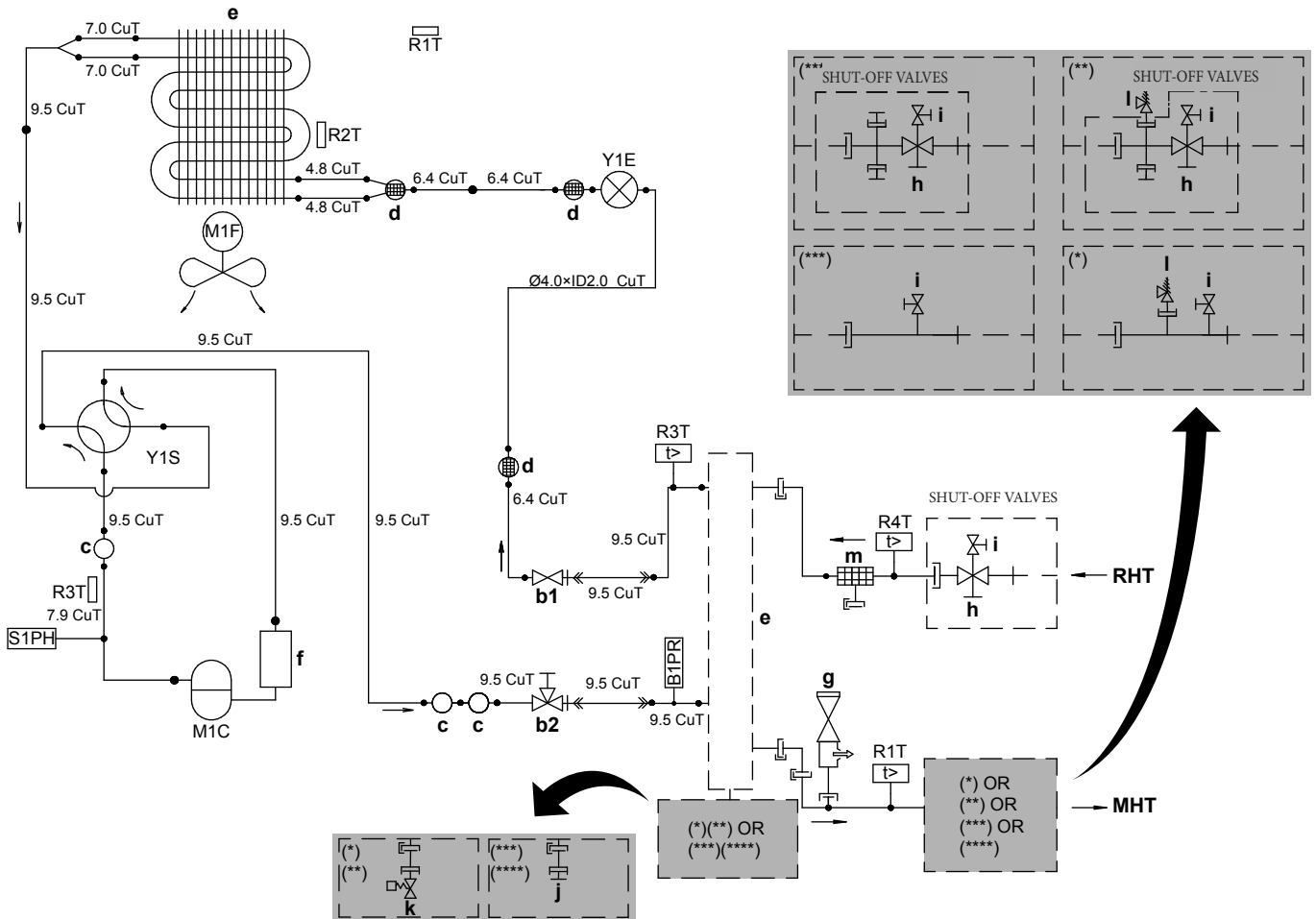
Anti-freeze resistance kit

- It prevents freezing of the bottom plate.
- It is necessary in areas with room temperature <math>< -5^{\circ}\text{C}</math> and high relative humidity for at least 3 consecutive days.
- For the installation instructions, see the installation manual of the anti-freeze resistance kit.



5 OPERATING DIAGRAMS.

5.1 FUNCTIONAL LAYOUT

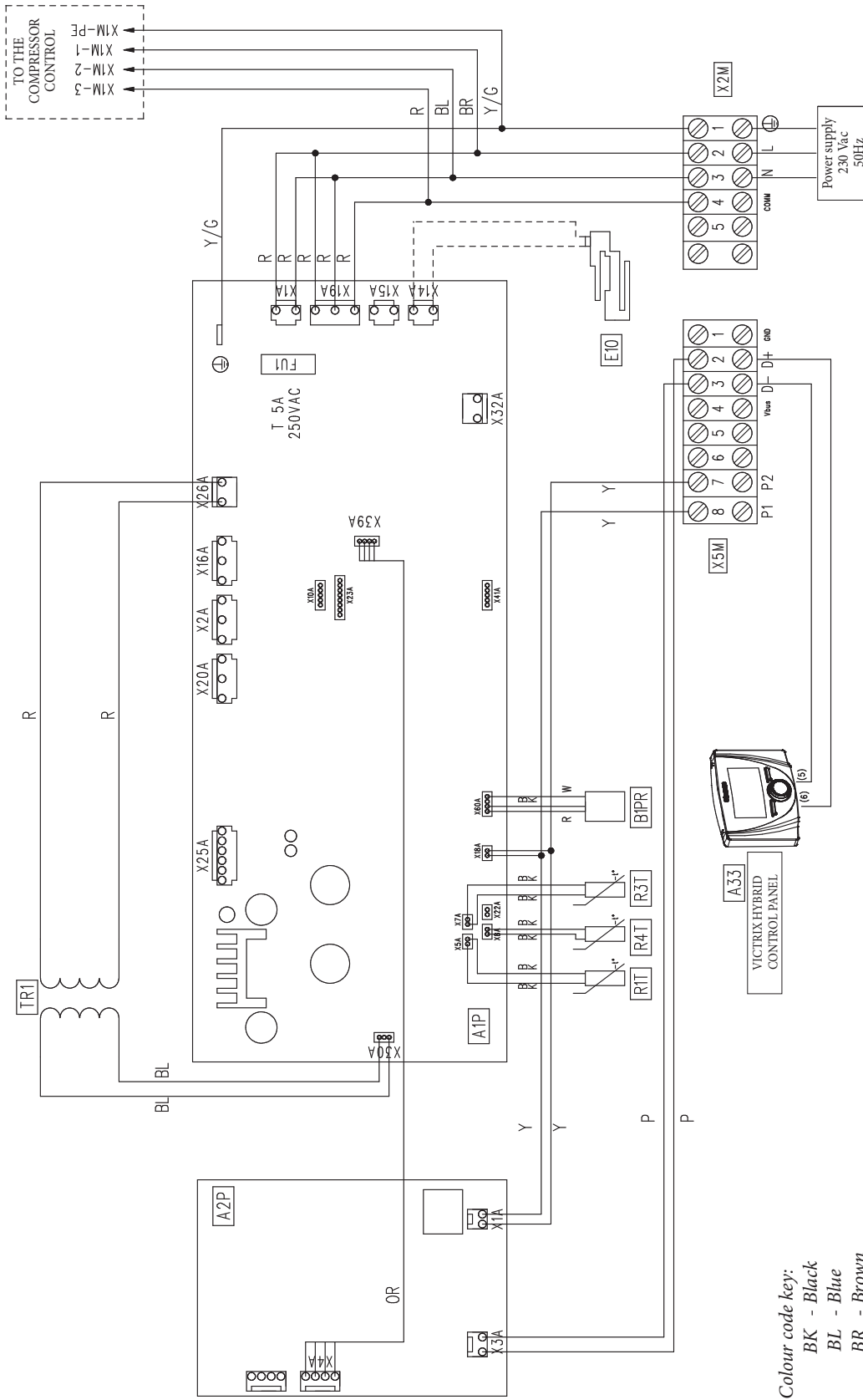


Key:

- (*) - In the event of glycol-free water (without standard supplied shut-off valves)
- (**) - In the event of glycol-free water + standard supplied shut-off valves
- (***) - In the event of water with glycol (without standard supplied shut-off valves)
- (****) - In the event of water with glycol + standard supplied shut-off valves
- RHT - Return to heat pump
- MHT - Flow from heat pump
- b1 - Stop valve (cooling liquid)
- b2 - Stop valve with service opening (coolant gas)
- c - Silencer
- d - Silencer with filter
- e - Heat exchanger
- f - Storage tank
- g - Safety valve
- h - Cut-off valve
- i - Air purge
- j - Cap
- k - Antifreeze protection valve

- l - Vacuum switch
- m - Filter
- B1PR - Coolant pressure sensor
- Shut-off valve - Standard supplied shut-off valves
- M1C - Compressor motor
- M1F - Fan motor
- R1T - External probe
- R1T (t>) - Water outlet probe
- R2T - Evaporator probe
- R3T - Compressor outlet probe
- R3T (t>) - Liquid phase probe
- R4T (t>) - Water inlet probe
- S1PH - High pressure switch
- Y1E - Electronic expansion valve
- Y1S - Four way reversal
- |— - Screw connection
- >>— - Flared connection
- |— - Quick release connector
- - Brazed connection

5.2 WIRING DIAGRAMS



Colour code key:

- BK - Black
- BL - Blue
- BR - Brown
- G - Green
- GY - Grey
- G/Y - Yellow/Green
- OR - Orange
- P - Purple
- PK - Pink
- R - Red
- W - White
- Y - Yellow
- W/BK - White/Black

Key:

- A1P - Hydro main P.C.B.
- A2P - ModBus P.C.B.
- A33 - Victrix Hybrid control panel
- BIPR - Coolant pressure sensor
- E10 - Adhesive heating resistance (antifreeze)
- R1T (t>) - Water outlet probe
- R3T (t>) - Liquid phase probe
- R4T - Water inlet probe
- TR1 - Transformer

6 INFORMATION ON MAINTENANCE.

Checks in the area.

Before starting work on systems containing flammable refrigerants, safety checks must be performed to guarantee that the risk of ignition is reduced to a minimum. Before performing repairs on chilling systems, follow the precautions below.

Work procedure.

The jobs must be carried out according to a consolidated safety procedure to reduce the risk of refrigerant or flammable vapour leaks during work to a minimum.

Work area.

All maintenance personnel and anyone else working in the involved area must be instructed as to the nature of the work carried out. Avoid working in confined spaces. The area in the immediate vicinity of the work field must be appropriately delimited. Make sure that there are safety conditions within the area to prevent the risk of refrigerant leaks.

Refrigerant leak check.

The area must be checked with an adequate refrigerant detector before and during the jobs, to guarantee that the technician is aware of the presence of potentially flammable atmospheres. Make sure that the leak detector is suitable to be used with flammable refrigerants, namely without electric discharges, appropriately sealed or inherently safe.

Presence of a fire extinguisher.

If hot work needs to be done on the chilling system or on related parts, adequate firefighting devices must be available. Check that there is a dry fire extinguisher or a CO₂ fire extinguisher adjacent to the recharge area.

No source of ignition.

No one carrying out work in relation to a chilling system that entails exposure of pipes that contain or have contained flammable refrigerant must use sources of ignition implicating the risk of fire or explosion. All possible sources of ignition, including cigarette smoke, must be kept sufficiently far from the place of installation, repair, removal and disposal, during which the flammable refrigerant could be released into the surrounding area. Before starting the work, the area around the appliance must be monitored to make sure there are no flammability hazards or ignition risks. "NO SMOKING" signs must be applied.

Ventilated area.

Make sure that the area is outdoors or appropriately ventilated before intervening inside the appliance or performing hot work. A certain ventilation level must also be guaranteed while carrying out the work. Ventilation must safely release the dispersed refrigerant and preferably eject it into the outside atmosphere.

Checks on the chilling equipment.

When replacing electric components, these must be suitable for the purpose for which they are used and comply with the correct specifications. The manufacturer's guidelines for maintenance and service must be complied with that all times. Should any doubts arise, contact the Authorised Immergas Technical Service for assistance. The following controls must be applied to appliances that use flammable refrigerants:

- Illegible markings or writings must be corrected.
- Chilling lines or refrigeration components must be installed in a position where they are unlikely to be exposed to any substance that can corrode components containing refrigerants, unless the components themselves are made of materials inherently resistant to corrosion or

have been adequately protected against corrosion.

Checks on electrical devices.

Repair and maintenance operations on electric components must include preventive safety checks and inspection procedures of the components. If a fault occurs that could jeopardise safety, the circuit must not be powered until the issue has been resolved in a satisfactory way. If it is not possible to immediately eliminate the fault, but the system needs to keep running, a temporary solution must be found. This must be communicated to the owner of the equipment so that all parties are informed thereof.

The initial safety checks include making sure:

- that the capacitors are discharged: this is essential to avoid the possibility of electrical discharges;
- that there are no live components or cables during charging, recovery or purging of the circuit;
- that there is continuity in the earth connection.

Wiring.

Check that wiring is not subject to wear, corrosion, excessive pressure, vibrations, sharp edges or other adverse environmental effects. The check must also take into consideration the consequences of aging or of continuous vibrations coming from sources such as compressors or fans.

Detection of flammable refrigerants.

Under no circumstances must potential sources of ignition be used to look for or detect refrigerant leaks. Halide torches (or any other detector that uses naked flames) must not be used.

Leak detection methods.

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants. Electronic leak detectors must be used to detect flammable refrigerants, but their sensitivity might not be adequate or require recalibration. (The detection device must be calibrated in an area free of refrigerants). Make sure that the detector is not a potential source of ignition and that it is suitable for the refrigerant. The leak detection appliance must be set at an LFL percentage of the refrigerant and calibrated for the refrigerant used; the appropriate percentage of gas is confirmed (25% at maximum). Leak detection fluids can be used with the majority of refrigerants, but detergents containing chlorine must not be used as this element can react with the refrigerant and corrode the copper pipes. If there is a suspected leak, all naked flames must be removed or put out.

Removal and discharge.

When intervening on the refrigerant circuit to perform repairs or for any other purpose, conventional procedures must be followed. It will be important to abide by consolidated practice as flammability is a very important factor to be taken into consideration. The following procedure must be complied with:

- Remove the refrigerant;
- Purge the circuit with inert gas;
- Discharge;
- Purge again with inert gas;
- Restore the circuit by cutting or performing a brazing intervention.

The refrigerant charge must be recovered in appropriate recovery cylinders. The circuit must be washed with nitrogen to remove impurities from the appliance. This process might need to be repeated several times.

Compressed air or oxygen must not be used for this activity.

Make sure that the vent of the vacuum pump is not exposed to triggering sources and that there is ventilation.



Charging procedure.

In addition to conventional charging procedures, the following requirements must be complied with:

- Make sure that different refrigerant contaminations do not occur when using recharging equipment. The tubes or pipes must be as short as possible to minimise the amount of refrigerant therein;
- The cylinders must be upright;
- Make sure that the chilling system is earthed before charging the system with refrigerant;
- Label the circuit when the charge is complete (unless this has already been done);
- Pay the utmost attention not to overfill the chilling circuit;
- Before recharging the circuit, it must undergo a pressurised leak test with nitrogen.

Deactivation.

Before performing this operation, the technician must have extensive knowledge of the appliance and all its details. It is good practice that the refrigerant be recovered correctly. Before performing the job, an oil and refrigerant sample must be taken if an analysis is required before recovering the refrigerant. The power supply must be available before starting the work.

- a) Become acquainted with the appliance and its operation.
- b) Disconnect the electric power to the appliance.
- c) Before starting the procedure, proceed as follows:
 - Check, where necessary, the availability of mechanical equipment to handle the refrigerant cylinders.
 - Check that personal protective equipment is available and used correctly.
 - Make sure that the recovery operation is supervised at all times by a skilled person.
 - Check that the equipment and the recovery cylinders comply with current regulations.
 - d) Empty the chilling circuit by means of the specific service ports.
 - e) If it is not possible to discharge the circuit by means of the specific service ports, make a “manifold” so that the refrigerant can be removed from other points of the system.
 - f) Make sure that the cylinder is placed on the scale before proceeding with recovery.
 - g) Start the recovery machine and follow the instructions given by the manufacturer.
 - h) Do not overfill the cylinders. (Do not exceed 80% of the charge volume of the liquid).
 - i) Do not exceed the maximum working pressure of the cylinder, not even temporarily.
 - j) When the cylinders have been filled to the maximum capacity and the intervention has been completed, make sure that these and the equipment are immediately removed from the area and that all shut-off valves on the equipment are closed.
 - k) The recovered refrigerant cannot be recharged into another chilling system unless it has been recycled or regenerated.

Labelling.

The appliance must be labelled with an indication that it has been decommissioned and the refrigerant emptied. The label must be dated and signed. Make sure that there are labels on the appliance indicating that it contains flammable refrigerant.

Recovery.

When refrigerant is removed from a system, both for maintenance operations and deactivation, good practice is recommended to remove the refrigerant correctly.

When the refrigerant is transferred to cylinders, make sure that only adequate cylinders for recovery of refrigerant are used.

Make sure that a proportionate number of cylinders is available for storage of the total charge of the system. All the cylinders to be used are specifically dedicated for the recovered refrigerant and labelled accordingly (namely they are specific cylinders for refrigerant recovery). The cylinders must have a pressure relief valve and relative shut-off cocks in good working conditions.

The recovery cylinders must be empty and, if possible, cooled before the recovery operation.

The recovery equipment must be in good working order with relative instructions close at hand and it must also be suitable for the recovery of flammable refrigerants. Lastly, a series of calibrated scales must be available and in good working order.

The flexible hoses must be complete with shut-off valves without leaks and in good conditions. Before using the recovery instrument, check that it is in satisfactory operating conditions, that maintenance has been performed correctly and all the associated electric components have been sealed to avoid an accidental ignition in case of a refrigerant leak. Contact the manufacturer in case of doubts.

The recovered refrigerant must be treated according to local legislation in the appropriate recovery cylinder and the relative waste transfer note must be drafted. Do not mix refrigerants in recovery units and above all not inside the cylinders.

Should it be necessary to remove compressors or oil for compressors, make sure that they have been emptied sufficiently to guarantee that no flammable refrigerant remains inside the lubricant. To speed up this operation, only electrical heating should be used on the body of the compressor. When oil is discharged from a system, the operation must be performed safely.











This instruction booklet is
made of ecological paper.

