Installer reference guide

CO_2 ZEAS heat recovery connection instruction

LREN8A7Y1B
LREN10A7Y1B
LREN12A7Y1B

Table of contents

1 About this document

Target audience

Authorised installers

Documentation set

This document is part of a documentation set. The complete set consists of:

- **General safety precautions:**
  - Safety instructions that you must read before installing
  - Format: Paper (in the box of the outdoor unit)
- **Installation and operation manual of the outdoor unit:**
  - Installation and operation instructions
  - Format: Paper (in the box of the outdoor unit)
- **Installer and user reference guide of the outdoor unit:**
  - Preparation of the installation, reference data, …
  - Detailed step-by-step instructions and background information for basic and advanced usage
  - Format: Digital files on https://www.daikin.eu. Use the search function 🔍 to find your model.
- **CO2 ZEAS heat recovery connection instruction (this document):**
  - Preparation of the installation, reference data, …
  - Format: Digital files on https://www.daikin.eu. Use the search function 🔍 to find your model.

Latest revisions of the supplied documentation may be available on the regional Daikin website or via your dealer.

The original instructions are written in English. All other languages are translations of the original instructions.

Technical engineering data

- A **subset** of the latest technical data is available on the regional Daikin website (publicly accessible).
- The **full set** of latest technical data is available on the Daikin Business Portal (authentication required).

1.1 About the warranty conditions

The heat recovery connection is entirely field supplied. Therefore, Daikin does not take any responsibility for the materials, layout or installation of the heat recovery connection.

Daikin only provides a warranty for the LREN* unit, on the condition that the connection has been made in compliance with the instructions in this installer reference guide.

1.2 Meaning of warnings and symbols

DANGER

Indicates a situation that results in death or serious injury.

DANGER: RISK OF ELECTROCUTION

Indicates a situation that could result in electrocution.

DANGER: RISK OF BURNING/SCALDING

Indicates a situation that could result in burning/scalding because of extreme hot or cold temperatures.

DANGER: RISK OF EXPLOSION

Indicates a situation that could result in explosion.

WARNING

Indicates a situation that could result in death or serious injury.

WARNING: FLAMMABLE MATERIAL

CAUTION

Indicates a situation that could result in minor or moderate injury.

NOTICE

Indicates a situation that could result in equipment or property damage.

INFORMATION

Indicates useful tips or additional information.

Symbols used on the unit:

Symbol	Explanation
	Before installation, read the installation and operation manual, and the wiring instruction sheet.
	Before performing maintenance and service tasks, read the service manual.
	For more information, see the installer and user reference guide.
	The unit contains rotating parts. Be careful when servicing or inspecting the unit.

Symbols used in the documentation:

Symbol	Explanation
	Indicates a figure title or a reference to it. **Example:** "1–3 Figure title" means "Figure 3 in chapter 1".

Symbol	Explanation
	Indicates a table title or a reference to it. **Example:** "▦ 1–3 Table title" means "Table 3 in chapter 1".

1.3 Installer reference guide at a glance

Chapter	Description
About the documentation	What documentation exists for the installer
General safety precautions	Safety instructions that you must read before installing
Specific installer safety instructions	
About the heat recovery system	Explains the heat recovery system
Application examples	Various installation setups of the heat recovery system
System installation	What to do and know to install the system, including information on how to prepare for an installation
Piping installation	What to do and know to install the piping of the system, including information on how to prepare for an installation
Charging refrigerant	What to do and know to charge refrigerant
Technical data	Specifications of the system
Glossary	Definition of terms

2 General safety precautions

In this chapter

2.1 For the installer

2.1.1 General

If you are NOT sure how to install or operate the unit, contact your dealer.

DANGER: RISK OF BURNING/SCALDING

- Do NOT touch the refrigerant piping, water piping or internal parts during and immediately after operation. It could be too hot or too cold. Give it time to return to normal temperature. If you MUST touch it, wear protective gloves.
- Do NOT touch any accidental leaking refrigerant.

WARNING

Improper installation or attachment of equipment or accessories could result in electrical shock, short-circuit, leaks, fire or other damage to the equipment. ONLY use accessories, optional equipment and spare parts made or approved by Daikin unless otherwise specified.

WARNING

Make sure installation, testing and applied materials comply with applicable legislation (on top of the instructions described in the Daikin documentation).

WARNING

Tear apart and throw away plastic packaging bags so that nobody, especially NOT children, can play with them. **Possible consequence:** suffocation.

WARNING

Provide adequate measures to prevent that the unit can be used as a shelter by small animals. Small animals that make contact with electrical parts can cause malfunctions, smoke or fire.

CAUTION

Wear adequate personal protective equipment (protective gloves, safety glasses,...) when installing, maintaining or servicing the system.

CAUTION

Do NOT touch the air inlet or aluminium fins of the unit.

CAUTION

- Do NOT place any objects or equipment on top of the unit.
- Do NOT sit, climb or stand on the unit.

In accordance with the applicable legislation, it might be necessary to provide a logbook with the product containing at least: information on maintenance, repair work, results of tests, stand-by periods,...

Also, at least, following information MUST be provided at an accessible place at the product:

- Instructions for shutting down the system in case of an emergency
- Name and address of fire department, police and hospital
- Name, address and day and night telephone numbers for obtaining service

In Europe, EN378 provides the necessary guidance for this logbook.

2.1.2 Installation site

- Provide sufficient space around the unit for servicing and air circulation.
- Make sure the installation site withstands the weight and vibration of the unit.
- Make sure the area is well ventilated. Do NOT block any ventilation openings.
- Make sure the unit is level.

Do NOT install the unit in the following places:

- In potentially explosive atmospheres.
- In places where there is machinery that emits electromagnetic waves. Electromagnetic waves may disturb the control system, and cause malfunction of the equipment.
- In places where there is a risk of fire due to the leakage of flammable gases (example: thinner or gasoline), carbon fibre, ignitable dust.
- In places where corrosive gas (example: sulphurous acid gas) is produced. Corrosion of copper pipes or soldered parts may cause the refrigerant to leak.

Instructions for equipment using R744 refrigerant

WARNING

- Do NOT pierce or burn refrigerant cycle parts.
- Be aware that the refrigerant inside the system is odourless.

WARNING

The appliance shall be stored so as to prevent mechanical damage and in a well-ventilated room without continuously operating ignition sources (example: open flames, an operating gas appliance or an operating electric heater) and have a room size as specified below.

WARNING

Make sure installation, servicing, maintenance and repair comply with instructions from Daikin and with applicable legislation and are executed ONLY by authorised persons.

NOTICE

- Take precautions to avoid excessive vibration or pulsation to refrigeration piping.
- Protect the protection devices, piping and fittings as much as possible against adverse environmental effects.
- Provide space for expansion and contraction of long runs of piping.
- Design and install piping in refrigerating systems such as to minimise the likelihood of hydraulic shock damaging the system.
- Mount the indoor equipment and pipes securely and protect them to avoid accidental rupture of equipment or pipes in case of events such as moving furniture or reconstruction activities.

CAUTION

Do NOT use potential sources of ignition in searching for or detection of refrigerant leaks.

NOTICE

- Do NOT re-use joints and copper gaskets which have been used already.
- Joints made in installation between parts of refrigerant system shall be accessible for maintenance purposes.

Installation space requirements

NOTICE

- Protect pipework from physical damage.
- Keep the pipework installation to a minimum.

2.1.3 Refrigerant — in case of R744

See the installation manual or installer reference guide of your application for more information.

NOTICE

Make sure refrigerant piping installation complies with applicable legislation. In Europe, EN378 is the applicable standard.

NOTICE

Make sure the field piping and connections are NOT subjected to stress.

WARNING

During tests, NEVER pressurise the product with a pressure higher than the maximum allowable pressure (as indicated on the nameplate of the unit).

WARNING

Take sufficient precautions in case of refrigerant leakage. If refrigerant gas leaks, ventilate the area immediately. Possible risks:

- Carbon dioxide poisoning
- Asphyxiation

NOTICE

After all the piping has been connected, make sure there is no gas leak. Use nitrogen to perform a gas leak detection.

NOTICE

- To avoid compressor breakdown, do NOT charge more than the specified amount of refrigerant.
- When the refrigerant system is to be opened, refrigerant MUST be treated according to the applicable legislation.

WARNING

Make sure there is no oxygen in the system. Refrigerant may ONLY be charged after performing the leak test and the vacuum drying.

Possible consequence: Self-combustion and explosion of the compressor because of oxygen going into the operating compressor.

CAUTION

A vacuumed system will be under triple point. To avoid solid ice, ALWAYS start charging with R744 in vapour state. When the triple point is reached (5.2 bar absolute pressure or 4.2 bar gauge pressure), you may continue charging with R744 in liquid state.

- In case recharge is required, see the nameplate or the refrigerant charge label of the unit. It states the type of refrigerant and necessary amount.
- Either if the unit is factory charged with refrigerant or the unit is non-charged, you might need to charge additional refrigerant, depending on the pipe sizes and pipe lengths of the system.
- Only use R744 (CO_2) as refrigerant. Other substances may cause explosions and accidents.
- Do NOT charge liquid refrigerant directly to a gas line. Liquid compression could cause compressor operation failure.
- Only use tools exclusively for the refrigerant type used in the system, this to ensure pressure resistance and prevent foreign materials from entering into the system.
- Open refrigerant cylinders slowly.

CAUTION

When the refrigerant charging procedure is done or when pausing, close the valve of the refrigerant tank immediately. If the valve is NOT closed immediately, remaining pressure might charge additional refrigerant. **Possible consequence:** Incorrect refrigerant amount.

3 Specific installer safety instructions

Always observe the following safety instructions and regulations.

General installation requirements

WARNING

Installation shall be done by an installer, the choice of materials and installation shall comply with the applicable legislation. In Europe, EN378 is the applicable standard.

DANGER: RISK OF BURNING/SCALDING

System installation (see "6 System installation" [▸ 15])

DANGER: RISK OF ELECTROCUTION

WARNING

The water installation MUST be carried out by companies and personnel who have the necessary certifications.

The water/glycol circuit must comply with local building codes and all relevant national and European regulations. All components and sealants used in the water/glycol circuit should be able to withstand water pressure and temperature during operation.

Piping installation (see "7 Piping installation" [▸ 19])

WARNING

The field piping method MUST be in accordance with the instructions from this manual. See "7 Piping installation" [▸ 19].

WARNING

If the outdoor unit is already charged with R744 (CO_2) refrigerant, it is necessary to release the CO_2 pressure into the atmosphere, before cutting the pipes.

See "To remove refrigerant using the service ports" in the "Maintenance and service" chapter of the LREN* installer and user reference guide for more information.

Charging refrigerant (see "8 Charging refrigerant" [▸ 25])

WARNING

- ONLY use R744 (CO_2) as refrigerant. Other substances may cause explosions and accidents.
- When installing, charging refrigerant, maintaining or performing service, ALWAYS use personal protective equipment, such as safety shoes, safety gloves and safety glasses.
- If the unit is installed indoors (for example, in a machine room), ALWAYS use a portable CO_2 detector.
- If the front panel is open, ALWAYS beware of the rotating fan. The fan will continue rotating for a while, even after the power switch has been turned off.

CAUTION

A vacuumed system will be under triple point. To avoid solid ice, ALWAYS start charging with R744 in vapour state. When the triple point is reached (5.2 bar absolute pressure or 4.2 bar gauge pressure), you may continue charging with R744 in liquid state.

CAUTION

Do NOT charge liquid refrigerant directly to a gas line. Liquid compression could cause compressor operation failure.

Freeze protection (see "9.2.4 Requirements freeze protection" [▸ 32])

WARNING

Ethylene glycol is toxic.

WARNING

Due to the presence of glycol, corrosion of the system is possible. Uninhibited glycol will turn acidic under the influence of oxygen. This process is accelerated by the presence of copper and high temperatures. The acidic uninhibited glycol attacks metal surfaces and forms galvanic corrosion cells that cause severe damage to the system. Therefore it is important that:

- the water treatment is correctly executed by a qualified water specialist,
- a glycol with corrosion inhibitors is selected to counteract acids formed by the oxidation of glycols,
- no automotive glycol is used because their corrosion inhibitors have a limited lifetime and contain silicates which can foul or plug the system,
- galvanized pipes are NOT used in glycol systems since the presence may lead to the precipitation of certain components in the glycol's corrosion inhibitor.

4 About the heat recovery system

Heat recovery system

The CO_2 ZEAS units (LREN*) are equipped with a heat recovery loop to connect an additional plate heat exchanger.

Heat from compressed hot CO_2 gas can be recovered before this heat is dissipated to the environment in the gas cooler.

The recovered heat can be used to warm up water or other liquid such as glycol, for a range of applications.

Instructions on how to connect the external plate heat exchanger, is discussed further in this manual.

Operating conditions

The amount of heat that can be recovered depends on several factors, such as the non-limited list below:

- Ambient temperature
- Cooling load
- Evaporation temperature
- Water/glycol temperature
- …

5 Application examples

In this chapter

5.1 Overview: Application examples

The purpose of the application examples is to give a glance at the possibilities of the CO_2 ZEAS heat recovery system.

Heat recovery is only available if the CO_2 ZEAS provides a sufficient amount of cooling. Using a domestic hot water tank as a buffer allows the user to have a more constant amount of heat.

This chapter contains application examples for:

- Hydraulic setup with a domestic hot water tank
- Hydraulic setup with a domestic hot water tank and 3-way valve

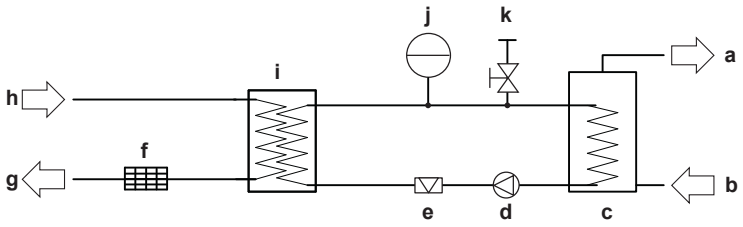
NOTICE

Make sure water quality complies with EU directive 2020/2184, if applicable.

5.2 Hydraulic setup with a domestic hot water tank

In the examples below, a proportional pump control can be added as needed to regulate the PHEX (plate heat exchanger) water/glycol output temperature.

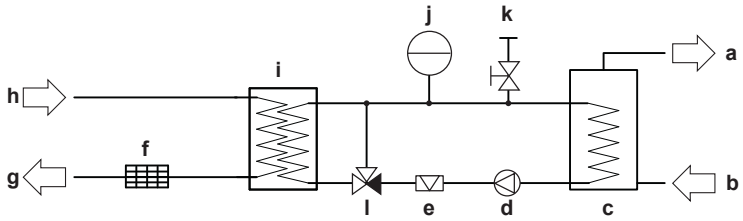
5.2.1 Example setup without 3-way valve



a DHW[1] OUT
b DHW IN
c DHW tank
d Pump
e Glycol filter/strainer
f CO_2 filter
g CO_2 OUT
h CO_2 IN
i PHEX[2]
j Expansion tank
k Air vent

[1] DHW: domestic hot water
[2] PHEX: plate heat exchanger

5.2.2 Example setup with 3-way valve



a DHW[1] OUT
b DHW IN
c DHW tank
d Pump
e Glycol filter/strainer
f CO_2 filter
g CO_2 OUT
h CO_2 IN
i PHEX[2]
j Expansion tank
k Air vent
l 3-way valve

[1] DHW: domestic hot water
[2] PHEX: plate heat exchanger

6 System installation

INFORMATION

The installer is responsible for supplying all components for the heat recovery system on CO_2 side and water/glycol side.

In this chapter

6.1 Preparing the installation site

6.1.1 Installation site requirements of the heat recovery system

For more information about where the heat recovery system is located, see "9.1 Piping diagram: Outdoor unit" [▸ 28].

For more information about the installation requirements, see "9.2 Technical specifications: Heat recovery system" [▸ 29].

Plate heat exchanger

The plate heat exchanger is responsible for the heat exchange from the hot discharge gases to the water/glycol circuit.

INFORMATION

The maximum piping length limit between the plate heat exchanger and the outdoor unit is is 5 m.

The plate heat exchanger must have copper or brass sleeves, so it can be brazed to copper piping (for a design pressure of 120 bar gauge).

Take precautions in case of a plate heat exchanger rupture, as this can cause CO_2 to leak into the water/glycol circuit.

Recommended plate heat exchanger: Alfa Laval AXP27-84.

For an alternative plate heat exchanger, see "9.2.2 Requirements plate heat exchanger" [▸ 30].

Filter

A filter is mandatory.

To protect downstream components from potential debris, a refrigerant filter must be installed in the refrigerant return pipe, between the plate heat exchanger and the gas cooler.

Install the filter as close as possible to the LREN* outdoor unit.

The filter must comply with the following specifications:

Requirements	Value
Design pressure / temperature	120 bar gauge / 110°C
Pipe connections	15.9 mm
Kv value	≥1 (m^3/h)
Mesh opening	≤0.1 mm

Water/glycol circuit

The water/glycol side of the installation is the responsibility of the installer and MUST comply with the following requirements:

- Appropriate anti-freeze measures,
- Appropriate galvanic corrosion measures,
- Appropriate legionella measures,
- Appropriate water quality measures,
- Install a filter/strainer and an air vent.

WARNING

The water installation MUST be carried out by companies and personnel who have the necessary certifications.

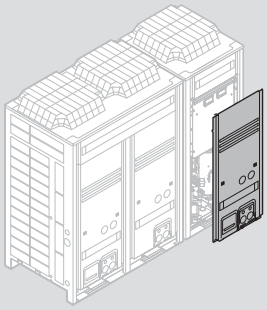
The water/glycol circuit must comply with local building codes and all relevant national and European regulations. All components and sealants used in the water/glycol circuit should be able to withstand water pressure and temperature during operation.

For more information, see "9.2.3 Requirements water/glycol" [▸ 31] and "9.2.4 Requirements freeze protection" [▸ 32].

6.2 Opening and closing the unit

INFORMATION

To install the heat recovery system, only access to the right side of the outdoor unit is required.



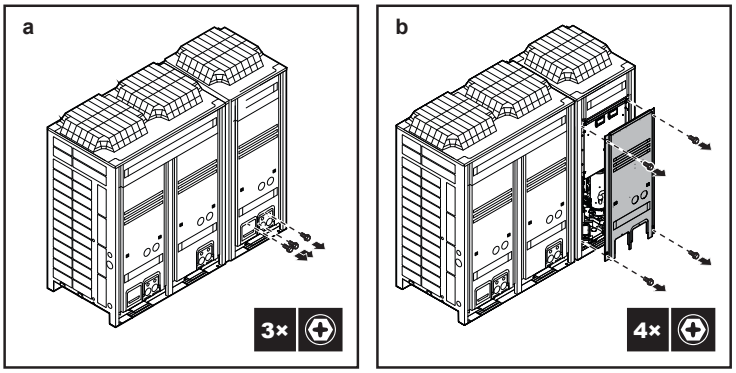
6.2.1 To open the right side of the outdoor unit

DANGER: RISK OF BURNING/SCALDING

DANGER: RISK OF ELECTROCUTION

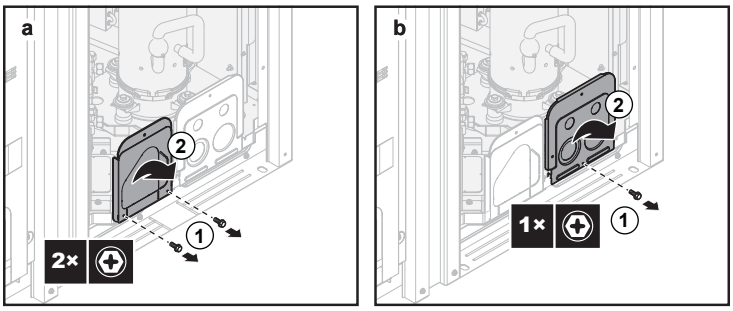
1 Remove the screws of the right small front plate.

2 Remove the right front panel.



a Outdoor unit, right small front plate
b Outdoor unit, right front plate

3 Remove the small front plates of the removed right front panel.



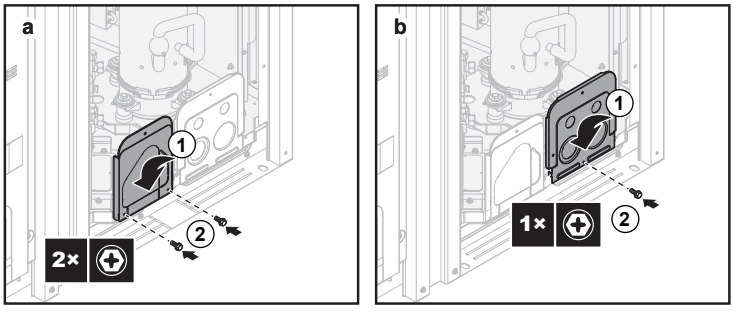
a Small front plate left
b Small front plate right

6.2.2 To close the right side of the outdoor unit

NOTICE

When closing the outdoor unit cover, make sure that the tightening torque does NOT exceed 3.98 N•m.

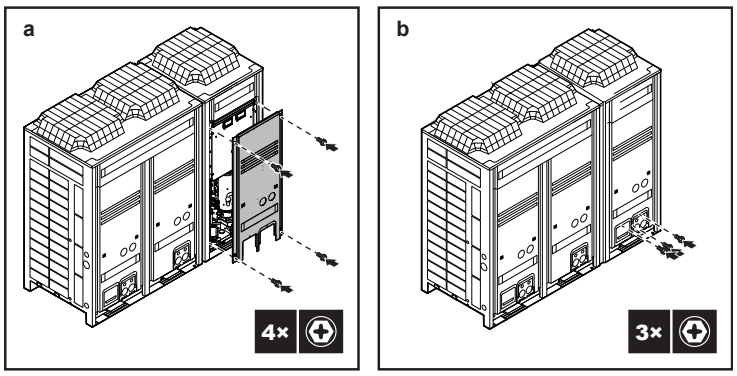
1 Reinstall the small front plates of the removed right front panel.



a Small front plate left
b Small front plate right

2 Reinstall the right front panel.

3 Attach the right small front plate to the right front panel.



a Outdoor unit, right front plate
b Outdoor unit, right small front plate

6.3 Installing the heat recovery system

6.3.1 Precautions when installing the heat recovery system

INFORMATION

Also read the precautions and requirements in the following chapters:

- General safety precautions
- Preparation

6.3.2 To install the heat recovery system

INFORMATION

For installation of the heat recovery system, see "7 Piping installation" [▶ 19].

7 Piping installation

In this chapter

7.1 Preparing refrigerant piping

7.1.1 Refrigerant piping requirements

NOTICE

Do NOT reuse piping from previous installations.

NOTICE

The refrigerant R744 requires strict cautions for keeping the system clean, dry and tight.

- Clean and dry: foreign materials (including mineral oils or moisture) should be prevented from getting mixed into the system.
- Tight: R744 does not contain any chlorine, does not destroy the ozone layer, and does not reduce earth's protection against harmful ultraviolet radiation. R744 can contribute to the greenhouse effect if it is released. Therefore pay special attention to check the tightness of the installation.

NOTICE

Foreign materials inside pipes are NOT allowed (including oils for fabrication).

NOTICE

The piping and other pressure-containing parts shall be suitable for refrigerant and oil. Use K65 (or equivalent) copper-iron alloy tube system for high-pressure applications with a working pressure of 120 bar gauge at the heat recovery connection side.

NOTICE

NEVER use standard hoses and manometers. Use ONLY equipment that is designed to use with R744.

INFORMATION

Also read the precautions and requirements in the "2 General safety precautions" [▶ 6].

7.1.2 Refrigerant piping material

- **Piping material:** K65 and equivalent piping, maximum operating pressure = 120 bar gauge.

- **Piping temper grade and thickness:**

	Outer diameter (Ø)	Temper grade	Thickness (t)[a]	Design pressure	
Heat recovery gas piping	15.9 mm (5/8")	R300	1.05 mm	120 bar gauge	

[a] Depending on the applicable legislation and the maximum working pressure of the unit (see "PS High" on the unit name plate), larger piping thickness might be required.

7.2 Connecting the refrigerant piping

7.2.1 Precautions when connecting the refrigerant piping

See "Precautions when connecting the refrigerant piping" in the LREN* installer and user reference guide.

INFORMATION

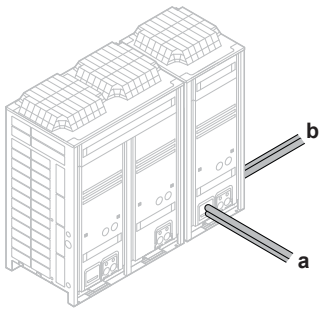
Also read the precautions and requirements in the following chapters:

- "2 General safety precautions" [▸ 6]
- "7.1 Preparing refrigerant piping" [▸ 19]

DANGER: RISK OF BURNING/SCALDING

7.2.2 To connect the refrigerant piping to the outdoor unit

The refrigerant piping towards the plate heat exchanger passes through the front or side of the outdoor unit.



a Front connection
b Right side connection

NOTICE

Precautions when making knockout holes:

- Avoid damaging the casing.
- After making the knockout holes, we recommend you remove the burrs and paint the edges and areas around the edges using repair paint to prevent rusting.
- When passing electrical wiring through the knockout holes, wrap the wiring with protective tape to prevent damage.

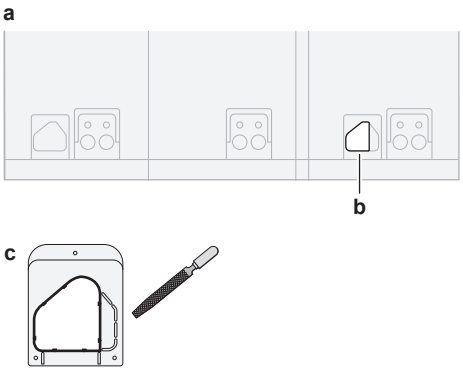
Front connection

NOTICE

Protect the unit from damage during brazing.

1 Remove the right front panel of the outdoor unit. See "6.2.1 To open the right side of the outdoor unit" [▸ 16].

2 Remove the knockout in the small front plate of the outdoor unit. See "Guidelines when knocking out knockout holes" in the "Electrical installation" chapter of the LREN* installer and user reference guide for more information.



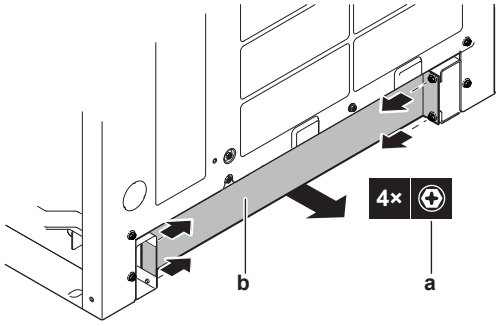
Side connection

NOTICE

Protect the unit from damage during brazing.

1 Remove the right front panel of the outdoor unit. See "6.2.1 To open the right side of the outdoor unit" [▸ 16].

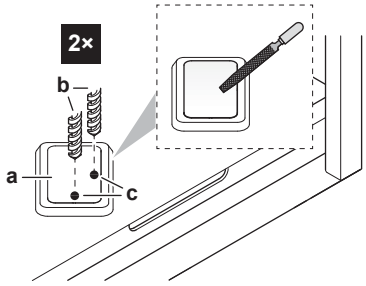
2 Unscrew the 4 screws to remove the side plate of the outdoor unit.



a Screw
b Side plate

3 Dispose of the plate and its screws.

4 Remove the knockout in the bottom plate of the outdoor unit. See "Guidelines when knocking out knockout holes" in the "Electrical installation" chapter of the LREN* installer and user reference guide for more information.



a Knockout plate
b Drill (Ø6 mm)
c Drill here

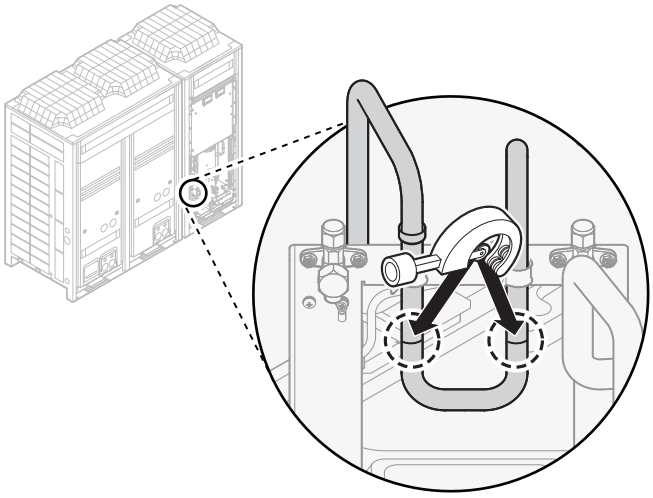
Connecting the refrigerant piping

WARNING

If the outdoor unit is already charged with R744 (CO_2) refrigerant, it is necessary to release the CO_2 pressure into the atmosphere, before cutting the pipes.

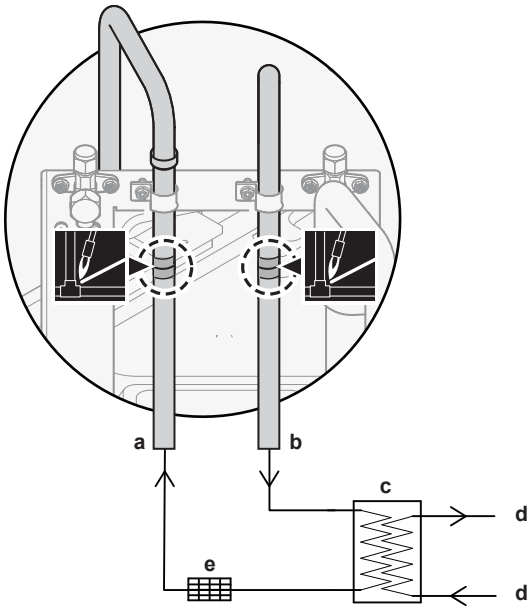
See "To remove refrigerant using the service ports" in the "Maintenance and service" chapter of the LREN* installer and user reference guide for more information.

1 Cut the pipes at the indicated location. Only use appropriate tools, such as a pipe cutter or pair of nippers. Respect the cut off rules, in the LREN* installer and user reference guide.



2 Wait until the oil has dripped out of the piping.

3 Braze the appropriate refrigerant (gas) pipes onto the outdoor unit pipes. Respect the brazing guidelines, in the LREN* installer and user reference guide.



a Refrigerant pipe(gas in)
b Refrigerant pipe(gas out)
c Plate heat exchanger
d Water/glycol flow
e Filter

4 Install the plate heat exchanger at maximum 5 meter from the LREN* outdoor unit.

5 Braze the refrigerant (gas) pipes onto the plate heat exchanger. Respect the brazing guidelines, in the LREN* installer and user reference guide.

6 Perform the refrigerant piping checks. See "7.3 Checking the refrigerant piping" [▸ 23].

7 Insulate the heat exchanger and the refrigerant piping. See "7.4 Insulating the refrigerant piping" [▸ 24].

7.3 Checking the refrigerant piping

Checking the refrigerant piping involves:

- Performing a strength pressure test.
- Performing a leak test.
- Performing a vacuum drying.

To perform a strength pressure test

Follow the procedure "To perform a strength pressure test" as described in the "Piping installation" chapter of the LREN* installer and user reference.

Additionally execute the following test:

The test must satisfy the specifications of EN378-2.

Prerequisite: To prevent the safety valve from opening during the test, do the following:

- Remove the safety valve(s) and, if present, the changeover valve.
- Install a cap (field supplied) onto the treaded piece.

1 Make sure all stop valves are open.

2 Close stop valve CsV3 and CsV5.

3 Pressure the unit side via service port SP11, at least 132 bar gauge is mandatory

4 Make sure there is no pressure drop.

5 If there is a pressure drop, locate the leak, repair it and repeat the test.

6 If the test was successful, remove the pressure and replace the cap on the threaded piece with the changeover valve (if applicable) and safety valve(s).

7 Open stop valve CsV3 and CsV5.

To perform a leak test

Follow the procedure "To perform a leak test" as described in the "Piping installation" chapter of the LREN* installer and user reference guide for more information.

To perform a vacuum drying

Follow the procedure "To perform a vacuum drying" as described in the "Piping installation" chapter of the LREN* installer and user reference.

7.4 Insulating the refrigerant piping

1 After finishing the leak test, insulate the heat exchanger and the refrigerant piping. See "Insulating the refrigerant piping" in the "Piping installation" chapter of the LREN* installer and user reference guide for more information.

2 Close the right side of the outdoor unit. "See "6.2.2 To close the right side of the outdoor unit" [▸ 17].

3 Add sealing between the insulation and the front or bottom panel of the outdoor unit (respectively depending on front or side connection). See "Insulating the refrigerant piping" in the "Piping installation" chapter of the LREN* installer and user reference guide for more information.

8 Charging refrigerant

8.1 Precautions when charging refrigerant

WARNING

- ONLY use R744 (CO_2) as refrigerant. Other substances may cause explosions and accidents.
- When installing, charging refrigerant, maintaining or performing service, ALWAYS use personal protective equipment, such as safety shoes, safety gloves and safety glasses.
- If the unit is installed indoors (for example, in a machine room), ALWAYS use a portable CO_2 detector.
- If the front panel is open, ALWAYS beware of the rotating fan. The fan will continue rotating for a while, even after the power switch has been turned off.

CAUTION

A vacuumed system will be under triple point. To avoid solid ice, ALWAYS start charging with R744 in vapour state. When the triple point is reached (5.2 bar absolute pressure or 4.2 bar gauge pressure), you may continue charging with R744 in liquid state.

CAUTION

Do NOT charge liquid refrigerant directly to a gas line. Liquid compression could cause compressor operation failure.

NOTICE

If the power of some units is turned off, the charging procedure cannot be finished properly.

NOTICE

Only when charging the unit for the first time, turn ON the power 6 hours before operation in order to have power running to the crankcase heater and to protect the compressor.

NOTICE

Before starting charging procedures, check if the 7-LEDs display is as normal (see "To access mode 1 or 2" in the LREN* installer and user reference guide).

If a malfunction code is present, see "Solving problems based on error codes" in the LREN* installer and user reference guide.

NOTICE

Close the front panel before any refrigerant charge operation is executed. Without the front panel attached the unit cannot judge correctly whether it is operating properly or not.

NOTICE

Do NOT fully close the stop valve for field piping after the refrigerant has been charged into the unit.

NOTICE

Do NOT fully close the liquid stop valve while the unit is stopping. The field liquid piping might burst because of liquid seal. Furthermore, continuously keep a connection between the safety valve and the field liquid piping to avoid bursting of the piping (if pressure increases too much).

INFORMATION

Also read the precautions and requirements in the following chapters:

- General safety precautions
- Preparation

INFORMATION

For the operation method of the stop valves, refer to "Using stop valves and service ports" in the LREN* installer and user reference guide.

8.2 To charge refrigerant

INFORMATION

No additional refrigerant charge required due to heat recovery.

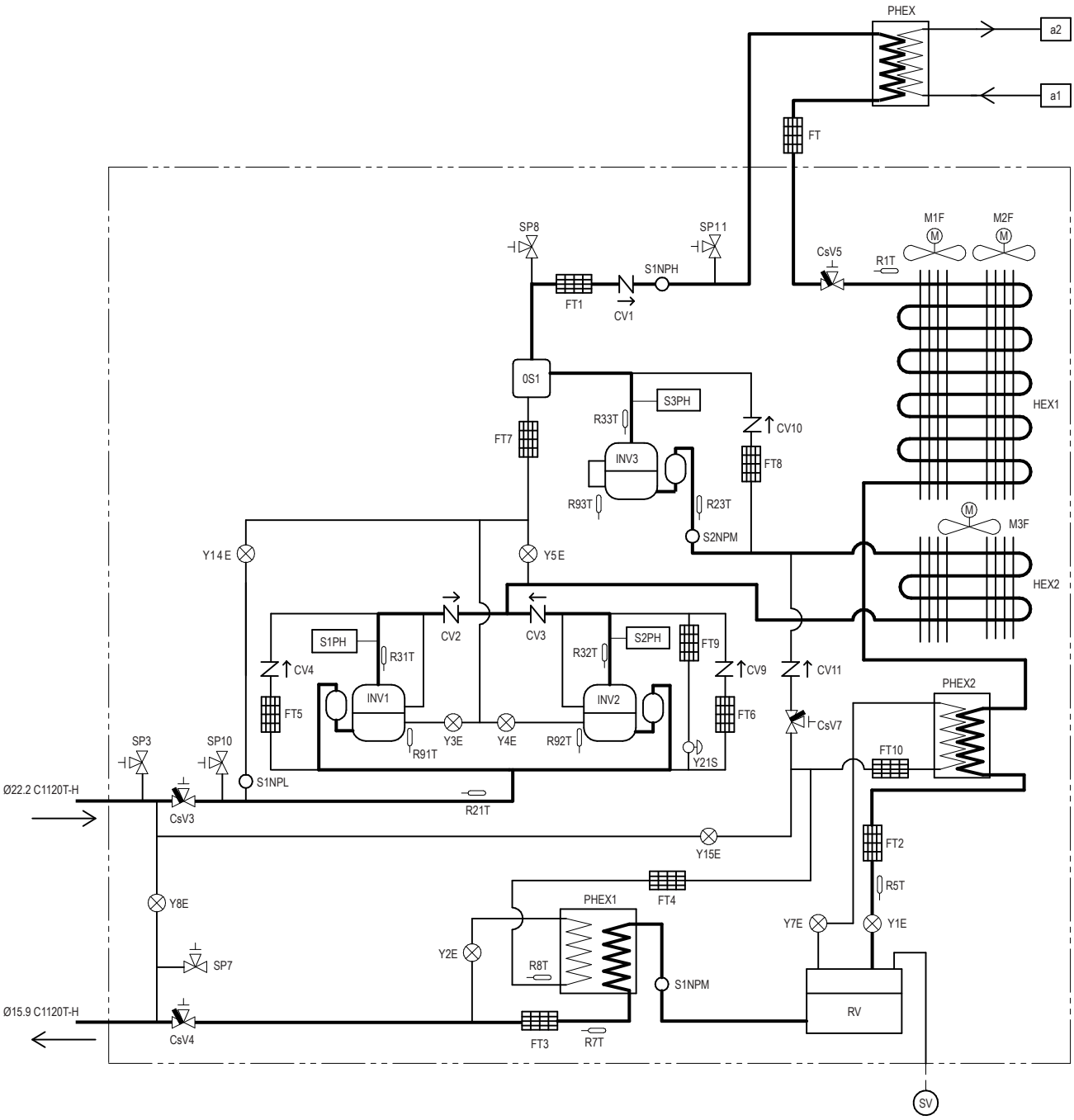
Follow the instructions as described in the "Charging refrigerant" chapter of the LREN* installer and user reference guide.

9 Technical data

A **subset** of the latest technical data is available on the regional Daikin website (publicly accessible). The **full set** of latest technical data is available on the Daikin Business Portal (authentication required).

In this chapter

9.1 Piping diagram: Outdoor unit



a1 Water/glycol circuit – liquid IN

a2 Water/glycol circuit – liquid OUT

Pressure sensor

HPS Pressure switch

Check valve

Stop valve

Service port

SV Safety valve

Electronic expansion valve

Solenoid valve

Filter

Thermistor

Compressor with accumulator

Heat exchanger

OS Oil separator

RV Liquid receiver

Plate heat exchanger

Oil and injection pipe

Refrigerant pipe

Propeller fan

9.2 Technical specifications: Heat recovery system

9.2.1 Requirements heat recovery system installation

The complete heat recovery system installation must comply with the following specifications.

INFORMATION

The specified values are indicative and depend on the operating conditions and the plate heat exchanger type.

Requirements	Value
Piping length	0~ 5 m
Piping material	Designed to work with R744 (CO_2) K65 or equivalent piping
Piping design pressure	120 bar gauge
Piping connections	15,9 mm
Flow direction	CO_2 up-down Water/glycol down-up
Insulation on PHEX and pipes	Advised
CO2 side filter	Obligated
Water/glycol inlet temperature	10 ~70°C

Heat recovery capacity

INFORMATION

- The heat recovery capacity values were obtained in a controlled environment with the Alfa Laval AXP27-84 (recommend plate heat exchanger) and should be used as reference only.
- The capacities are based on the following conditions: suction superheat 10K, heat recovery measured at water/glycol temperature of 30°C inlet and 35°C outlet.
- The heat recovery capacity depends on several factors, such as: ambient temperature, cooling load, evaporating temperature, water/glycol temperature, …
- The CO_2 discharge temperature (TD) listed in the table below serves as an indication of the maximum achievable water/glycol outlet temperature at a given ambient condition, provided water/glycol flow is adjusted appropriately.
- Low ambient temperature will result in significantly lower heat recovery.

Ta[(a)] (°C DB)	Evaporating temperature							
	Medium temperature (-10°C)				Low temperature (-35°C)			
	Q (%)[(b)]	Q (kW) (c)	HR (kW) (d)	TD (°C) (e)	Q (%)[(b)]	Q (kW) (c)	HR (kW) (d)	TD (°C) (e)
LREN8*								
43	100	15.8	28.3	70	100	9.0	17.4	77
32	100	19.8	24.3	65	100	11.2	14.2	68
25	90	17.8	9.0	54	95	10.6	9.1	60

Ta[a] (°C DB)	Evaporating temperature							
	Medium temperature (-10°C)				Low temperature (-35°C)			
	Q (%)[b]	Q (kW) [c]	HR (kW) [d]	TD (°C) [e]	Q (%)[b]	Q (kW) [c]	HR (kW) [d]	TD (°C) [e]
15	75	14.8	2.0	36	87	9.8	2.3	44
5	60	11.9	–[f]	20	80	9.0	–[f]	23
LREN10*								
43	100	17.5	32.2	72	100	10.6	20.6	81
32	100	23.1	29.2	67	100	13.5	17.8	70
25	90	20.7	11.1	56	95	12.8	11.3	63
15	75	17.3	2.3	37	87	11.8	2.9	46
5	60	13.9	–[f]	23	80	10.8	–[f]	30
LREN12*								
43	100	19.0	35.9	75	100	12.2	23.8	89
32	100	26.3	33.8	68	100	15.5	21.3	74
25	90	23.6	13.2	59	95	14.7	13.4	66
15	75	19.7	2.8	40	87	13.6	3.5	52
5	60	15.8	–[f]	25	80	12.4	–[f]	34
LREN12* + LRNUN5*								
43	100	24.3	35.9	75	100	13.2	23.8	89
32	100	31.7	33.8	68	100	17.3	21.3	74
25	90	28.4	13.2	59	95	16.4	13.4	66
15	75	23.7	2.8	40	87	15.1	3.5	52
5	60	19.0	–[f]	25	80	13.8	–[f]	34

[a] Ta: Ambient temperature
[b] Q (%): part load of nominal cooling capacity
[c] Q (kW): cooling capacity
[d] HR (kW): heat recovery capacity
[e] TD: CO_2 discharge temperature
[f] Water/glycol outlet temperature of 35°C cannot be reached.

9.2.2 Requirements plate heat exchanger

NOTICE

The plate heat exchanger shall comply with local regulations.

Recommended plate heat exchanger

Alfa Laval AXP27-84H-F, brazed plate heat exchanger

Alternative plate heat exchanger

If you choose an alternative plate heat exchanger, it must comply with the following specifications:

Requirements	Value
Design pressure /temperature	120 bar gauge / 110°C

Requirements	Value
Design capacity[a]	35 kW
CO_2–side pressure drop	maximum 0.2 bar
CO_2–side volume	maximum 3 litre
CO_2–side piping connection	15.9 mm with copper or brass breezing sleeves

[a] Operating conditions: -10°C evaporation temperature, 32°C ambient temperature, 30°C water/glycol inlet temperature and 35°C water/glycol outlet temperature.

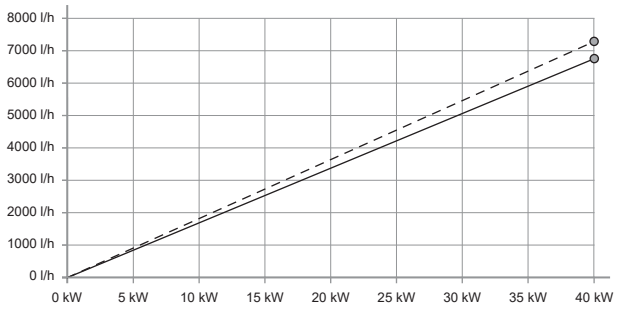
Plate heat exchanger CO_2 inlet at nominal operating conditions (full load and 32°C ambient): 90 bar gauge / 85°C / 0.12 kg/s

9.2.3 Requirements water/glycol

Water/glycol flowrate

The required water/glycol flowrate supplied by the pump, is based on the heat recovery capacity and desired in-out temperature difference. The curves below refer to water and a mixture of water and 30% propylene glycol, at a temperature of 30°C in and 35°C out (ΔT=5K).

Diagram: Required water/glycol flowrate (ΔT=5K)



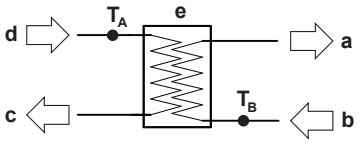
- - - - PG30

——— Water

Water/glycol reverse heat exchange

Reverse heat exchange by warming up of the refrigeration side with hot water/glycol is not allowed. Refrigeration performance may decrease.

To prevent water/glycol from heating up the refrigerant side, monitor the CO_2 inlet (T_A) and the water/glycol inlet temperature (T_B). Use third party equipment to modulate or switch ON/OFF the water/glycol flow through the PHEX to respect that $T_A > T_B$ in all conditions.



a Water/glycol OUT
b Water/glycol IN
c CO_2 OUT
d CO_2 IN
e PHEX[1]
T_A Temperature CO_2 IN
T_B Temperature water/glycol IN

[1] PHEX: plate heat exchanger

9.2.4 Requirements freeze protection

Freeze protection by glycol

Frost can damage the system. Adding glycol to the water lowers the freezing point of water.

WARNING

Ethylene glycol is toxic.

WARNING

Due to the presence of glycol, corrosion of the system is possible. Uninhibited glycol will turn acidic under the influence of oxygen. This process is accelerated by the presence of copper and high temperatures. The acidic uninhibited glycol attacks metal surfaces and forms galvanic corrosion cells that cause severe damage to the system. Therefore it is important that:

- the water treatment is correctly executed by a qualified water specialist,
- a glycol with corrosion inhibitors is selected to counteract acids formed by the oxidation of glycols,
- no automotive glycol is used because their corrosion inhibitors have a limited lifetime and contain silicates which can foul or plug the system,
- galvanized pipes are NOT used in glycol systems since the presence may lead to the precipitation of certain components in the glycol's corrosion inhibitor.

NOTICE

Glycol absorbs water from its environment. Therefore do NOT add glycol that has been exposed to air. Leaving the cap off the glycol container causes the concentration of water to increase. The glycol concentration is then lower than assumed. As a result, the hydraulic components might freeze up after all. Take preventive actions to ensure a minimal exposure of the glycol to air.

Types of glycol

The types of glycol that can be used depend on whether the system contains a domestic hot water tank:

If...	Then...
The system contains a domestic hot water tank	Only use propylene glycol[(a)]
The system does NOT contain a domestic hot water tank	You can use either propylene glycol[(a)] or ethylene glycol

[(a)] Propylene glycol, including the necessary inhibitors, classified as Category III according to EN1717.

Required concentration of glycol

The required concentration of glycol depends on the lowest expected outdoor temperature. To prevent the system from freezing, more glycol is required.

Add glycol according to the table below.

Lowest expected outdoor temperature	Glycol concentration
–5°C	15%
–10°C	25%
–15°C	35%

NOTICE

- The required concentration might differ depending on the type of glycol. ALWAYS compare the requirements from the table above with the specifications provided by the glycol manufacturer. If necessary, meet the requirements set by the glycol manufacturer.
- If the liquid in the system is frozen, the pump will NOT be able to start. Mind that if you only prevent the system from bursting, the liquid inside might still freeze.
- When water is at standstill inside the system, the system is very likely to freeze and get damaged.

10 Glossary

Dealer

Sales distributor for the product.

Authorised installer

Technical skilled person who is qualified to install the product.

User

Person who is owner of the product and/or operates the product.

Applicable legislation

All international, European, national and local directives, laws, regulations and/or codes that are relevant and applicable for a certain product or domain.

Service company

Qualified company which can perform or coordinate the required service to the product.

Installation manual

Instruction manual specified for a certain product or application, explaining how to install, configure and maintain it.

Operation manual

Instruction manual specified for a certain product or application, explaining how to operate it.

Maintenance instructions

Instruction manual specified for a certain product or application, which explains (if relevant) how to install, configure, operate and/or maintain the product or application.

Accessories

Labels, manuals, information sheets and equipment that are delivered with the product and that need to be installed according to the instructions in the accompanying documentation.

Optional equipment

Equipment made or approved by Daikin that can be combined with the product according to the instructions in the accompanying documentation.

Field supply

Equipment NOT made by Daikin that can be combined with the product according to the instructions in the accompanying documentation.

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