

Hillphoenix®

a **DOVER** company

CO₂ ONE™



CO₂ Condensing Unit Manual

DECEMBER 2021

DISCLAIMER

This manual is designed to provide only general information. If advice about a particular system or component is needed, consult your supervisor or a senior technician. Any applicable specification sheets, data sheets, handbooks, and instructions for this installation provided by Hillphoenix should only be consulted for information including, without limitation, material regarding the design, installation, maintenance, care, warnings relating to, and proper uses of Hillphoenix products as they pertain to this installation. Any information pertaining to products referred to in this manual that are not provided by Hillphoenix is in no way intended to be authoritative or in any way ensured to be accurate.

INFORMATION CONTAINED WITHIN THIS MANUAL, IS PROVIDED “AS IS,” WITH ALL FAULTS, WITH NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUALITY OF INFORMATION, QUIET ENJOYMENT, AND TITLE/ NONINFRINGEMENT. HILLPHOENIX SPECIFICALLY DISCLAIMS ALL LIABILITY FOR ERRORS OR OMISSIONS IN, OR THE MISUSE OR MISINTERPRETATION OF, ANY INFORMATION CONTAINED IN THIS MANUAL. HILLPHOENIX DOES NOT WARRANT THE ACCURACY, COMPLETENESS OR TIMELINESS OF THE INFORMATION CONTAINED IN THIS MANUAL.

Copyright© 2021

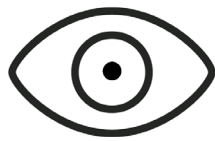
Rev: Ver 1.0

November 26, 2021

Important Notices

Hillphoenix emphasizes important information in installation and operations manuals with alert symbols. These symbols, and text, call attention to potential dangers to personal health and safety – as well as to equipment damage – if the instructions in this manual are not followed carefully.

Hillphoenix industrial Hillphoenix industrial refrigeration systems should only be installed and serviced by trained refrigeration systems should only be installed and serviced by trained and qualified technicians who have experience working with industrial refrigeration systems.



ATTENTION!

Indicates important information that is critical to proper system performance.



CAUTION!

Indicates the threat of potential injury if all instructions are not followed carefully.










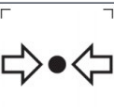
DANGER!

Indicates an immediate threat of serious injury or death if all instructions are not followed carefully.

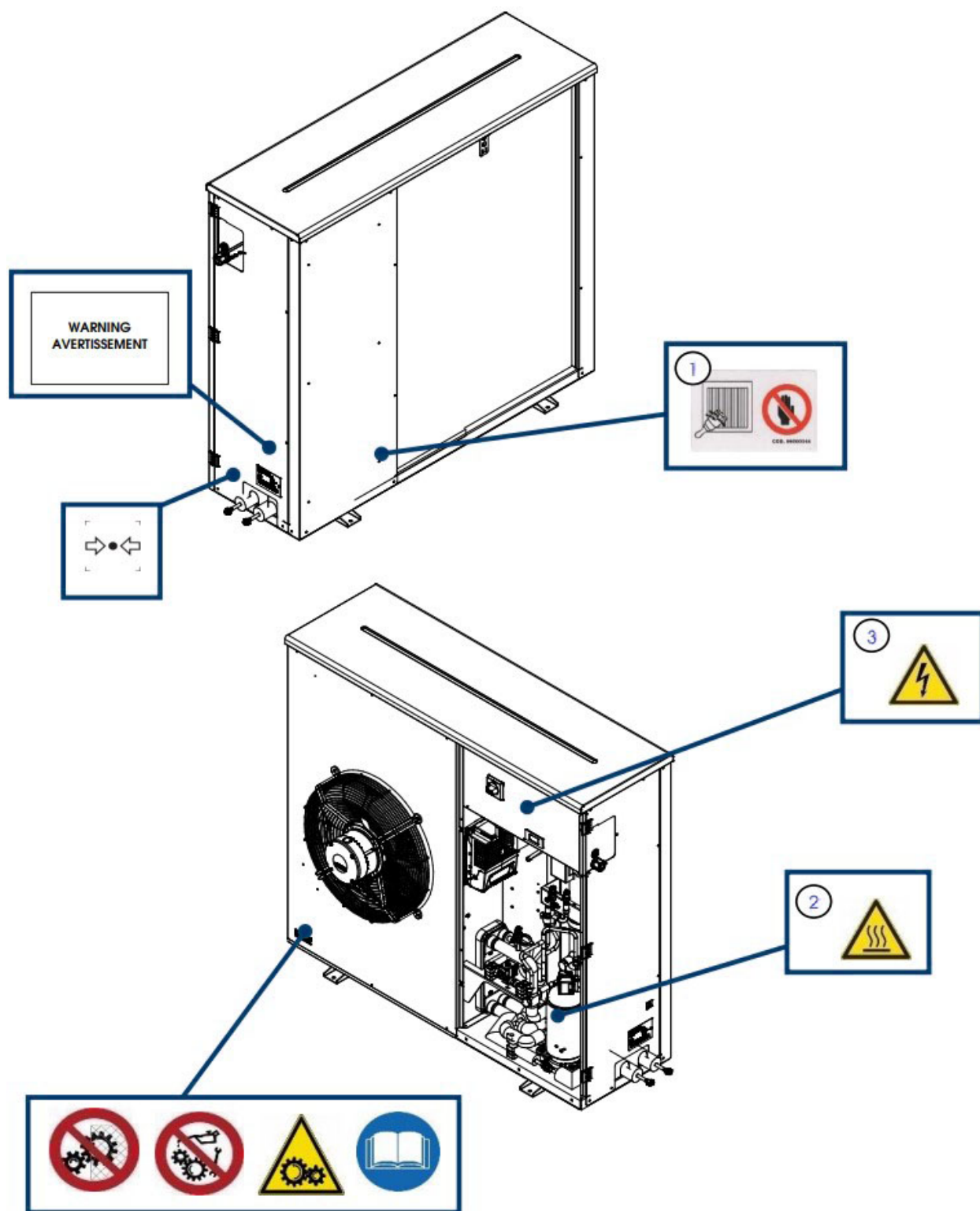
Experienced installers and technicians not only assure that customers enjoy optimum and technicians not only assure that customers enjoy optimum system performance, but that potential problems and unforeseen circumstances system performance, but that potential problems and unforeseen circumstances encountered during the installation process are either avoided or addressed in the most encountered during the installation process are either avoided or addressed in the most effective and efficient way possible. For a list of Hillphoenix-authorized installation and effective and efficient way possible. For a list of Hillphoenix-authorized installation and service contractors, including our own AMS Group, visit our website at www.hillphoenix.com.

Safety Labels

The warning labels shown in the table below are present on the equipment.

PLATE	DESCRIPTION
	Indicates that it is forbidden to remove the safety devices and protections installed; it is usually accompanied by the explanatory wording: DO NOT REMOVE THE PROTECTIVE DEVICES.
	Indicates that it is forbidden to perform any type of maintenance (including lubrication and cleaning) near moving parts; usually, it is accompanied by the explanatory wording: DO NOT REPAIR OR ADJUST WHILE THE MACHINE IS RUNNING.
	Signals the danger due to the presence of mobile parts near the area of the partly completed machinery where it is positioned.
	Signals the danger of electrical voltage.
	Signals the danger of hot surfaces.
	Signals that it is mandatory to read the manual/assembly instructions.
	Warns against touching the parts in near the area where it is affixed.
	System or component pressurized
<p>WARNING: System contains refrigerant under high pressure. Do not tamper with it. It must be serviced by qualified persons only</p> <p>AVERTISSEMENT: le système contient du réfrigérant sous haute pression. Ne le manipulez pas. Il doit être entretenu uniquement par des personnes qualifiées</p>	System contains refrigerant under high pressure. Do not tamper with it. It must be serviced by qualified persons only.
<p>The refrigerator is for use with R744 (carbon dioxide) system components where the design pressure of the refrigerator is not less than the design pressure of the associated components</p> <p>Le réfrigérateur est destiné à être utilisé avec des composants pour un système pour R744 (dioxyde de carbone) lorsque la pression de conception du réfrigérateur n'est pas inférieure à la pression de conception des composants associés</p>	The refrigerator is for use with R744 (carbon dioxide) system components where the design pressure of the refrigerator is not less than the design pressure of the associated components.
<p>WARNING: more than one source of electrical supply. Disconnect all sources before servicing.</p> <p>Attention: plus d'une source d'alimentation électrique. Déconnectez toutes les sources avant de procéder à</p>	WARNING: more than one source of electrical supply. Disconnect all sources before servicing.

Position of the Pictograms



1. On all the air exchangers present in the equipment
2. On each surface subject to high temperatures
3. On each energized part

Hillphoenix, Inc. - All rights reserved

These assembly instructions are intended for users of CO₂One and for the instruction of the technicians involved in installation and maintenance. The instructions, drawings, tables, and anything else contained in this instruction manual are of a reserved technical nature and cannot be reproduced and/or disclosed, either completely or partially, without the specific written authorization of Hillphoenix.

The installation and maintenance technicians are explicitly prohibited from disseminating the information contained and from using this manual for purposes other than for those strictly related to efficient maintenance of the equipment.

Hillphoenix cannot be held responsible or liable for damages caused by incorrect use of the documentation. In order to avoid actions that could cause danger to persons, it is important to read and understand all the documentation accompanying the equipment.

Manufacturer's Name	Hillphoenix, Inc.
Address	2016 Gees Mill Road Conyers, GA 30013
Telephone	770-285-3264
Fax	770-285-3080

General Information

This manual covers general installation, operation, maintenance, and troubleshooting of a Hillphoenix industrial refrigeration system. It can serve as a useful resource for understanding the system and its operation.

Receiving Equipment

Receiving Equipment Inspect all arriving equipment carefully. In the event of shipping damage and/or shortages, contact the Hillphoenix Service Parts Department at 800-283-1109.

Missing Items

Missing Items Hillphoenix carefully inspects all systems and products before shipping to ensure the highest level of quality. There may be occasions however, when a particular item or part is not included when the system or product is shipped. Any claim for missing items must be made to Hillphoenix within 48 hours of receipt of the equipment.

Technical Support

Technical Support For technical support issues regarding this unit, contact the Hillphoenix Refrigeration Technical Support at 770-285-3061.

Ordering Equipment Parts

Contact Hillphoenix OEM Genuine Parts at 833-3PARTS1 (833-372-7871) if any additional parts are needed during installation or any time afterwards for the system. If a part does not have a barcode, the following can assist in ordering the right part:

- Model number and serial number of the part
- Size of the part, if applicable
- Whether the part is for a left-handed or a right-handed application
- Quantity of parts required
- Ship-to location for parts delivery

If Hillphoenix decides that a part must be returned, a Return Material Authorization number will be provided to complete the process.



Hillphoenix

A DOVER COMPANY

WARRANTY

HEREINAFTER REFERRED TO AS MANUFACTURER

FOURTEEN MONTH WARRANTY. MANUFACTURER'S PRODUCT IS WARRANTED TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND MAINTENANCE FOR A PERIOD OF FOURTEEN MONTHS FROM THE DATE OF ORIGINAL SHIPMENT. A NEW OR REBUILT PART TO REPLACE ANY DEFECTIVE PART WILL BE PROVIDED WITHOUT CHARGE, PROVIDED THE DEFECTIVE PART IS RETURNED TO MANUFACTURER. THE REPLACEMENT PART ASSUMES THE UNUSED PORTION OF THE WARRANTY.

This warranty does not include labor or other costs incurred for repairing, removing, installing, shipping, servicing, or handling of either defective parts or replacement parts.

The fourteen month warranty shall not apply:

1. To any unit or any part thereof which has been subject to accident, alteration, negligence, misuse or abuse, operation on improper voltage, or which has not been operated in accordance with the manufacturer's recommendation, or if the serial number of the unit has been altered, defaced, or removed.
2. When the unit, or any part thereof, is damaged by fire, flood, or other act of God.
3. Outside the continental United States.
4. To labor cost for replacement of parts, or for freight, shipping expenses, sales tax or upgrading.
5. When the operation is impaired due to improper installation.
6. When installation and startup forms are not properly complete or returned within two weeks after startup.

THIS PLAN DOES NOT COVER CONSEQUENTIAL DAMAGES. Manufacturer shall not be liable under any circumstances for any consequential damages, including loss of profit, additional labor cost, loss of refrigerant or food products, or injury to personnel or property caused by defective material or parts or for any delay in its performance hereunder due to causes beyond its control. The foregoing shall constitute the sole and exclusive remedy of any purchases and the sole and exclusive liability of Manufacturer in connection with this product.

The Warranties are Expressly in Lieu of All Other Warranties, Express or Implied and All Other Obligations or Liabilities on Our Part. The Obligation to Repair or Replace Parts or Components Judged to be Defective in Material or Workmanship States Our Entire Liability Whether Based on Tort, Contract or Warranty. We Neither Assume Nor Authorize Any Other Person to Assume for Us Any Other Liability in Connection with Our Product.

MAIL CLAIM TO:

Hillphoenix
Display Merchandisers
1925 Ruffin Mill Road
Colonial Heights, VA 23834
1-800-283-1109

Hillphoenix
Refrigeration Systems &
Electrical Distribution Products
709 Sigman Road
Conyers, GA 30013
770-285-3200

General Conditions

The manufacturer, Hillphoenix, Inc., guarantees the equipment produced by the manufacturer itself as being free from material and processing defects for a period that is agreed upon when the contract for the sale of the same unit is concluded.

The parts subject to wear and all the tools and consumables supplied by the manufacturer together with the equipment are excluded from the warranty.

Actions That Invalidate the Warranty

Any attempt to disassemble, modify, or tamper with a component of the equipment by the user or by unauthorised personnel entails invalidating of the warranty and exempts the manufacturer from any responsibility for any damage to persons or property deriving from such tampering. The manufacturer is also deemed to be exempted from any liability with invalidation of the warranty relating to the equipment in the following cases:

- Use contrary to that described in Proper and Improper Use of the Equipment in *Section 2: Safety Introduction*
- Use contrary to local codes and ordinances
- Installation under conditions other than those specified in *Section 4: Transport and Installation*
- Installation not compliant with the specifications provided in *Section 4: Transport and Installation*
- Full or partial failure to comply with the instructions provided in this instruction manual
- Non- or incorrect maintenance
- Use of spare parts which are not original or not specified by the manufacturer

Assistance

This instruction manual does not replace the experience of trained and qualified installers, users, and maintenance technicians.

Hillphoenix provides telephone support as well as documentation covering the installation, use, and maintenance of the equipment.



WARNING: If in any doubt about the correct interpretation of the instructions provided in these assembly instructions, contact the Hillphoenix Technical Support team for clarification.

Provide the name, model, and serial number of the equipment when requesting assistance.

Table of Contents

Section 1: Overview	1
Introduction	1
Proprietary Information	1
Contents of the Assembly Instructions	2
Conventions and Definitions	3
Section 2: General Safety Information	5
Engineering Criteria	5
Devices and Solutions for Protection	6
Residual Risks	7
Proper and Improper Use of the Equipment	7
Incorporation Statement	8
General Warnings and Rules of Conduct	8
Section 3: Description of the Equipment	10
Identification Plate	13
Section 4: Transport and Installation	16
Environmental Requirements	16
Power Supplies and Utilities	16
Transport and Handling	17
Installation	19
Preparation for Startup	34
Storage	46
Uninstalling	46
Section 5: Maintenance	47
Maintenance and Cleaning	48
Safety Valve Operation	51
Section 6: Troubleshooting	52
Section 7: Appendices	54

CO₂One Condensing Unit

Section 1: Overview

Introduction

These assembly instructions are an integral part of the CO₂One product (identified in this document as the equipment or unit) produced by Hillphoenix, Inc.; they will need to be included in the documentation for the equipment when it is installed.

These instructions have been written to provide the technicians involved in the installation and maintenance of the equipment with the essential information and instructions to operate correctly and safely.

ATTENTION: Needing to be easily and immediately available, these instructions must be kept in a place that is known and accessible to all.



The purchaser may request a copy of this document (for example, in case of damage to the original document) with a written request to Hillphoenix Technical Support (see *Request for Assistance* later in this section), and agrees to return the damaged copy.

Proprietary Information

These assembly instructions contain confidential proprietary information. All rights reserved.

These instructions may not be reproduced or photocopied, in whole or in part, without the prior written consent of the manufacturer. Only the purchaser to whom the instructions have been provided may use this documentation with the equipment and only for the purposes of installation and maintenance of the equipment to which the instructions refer.

The manufacturer declares that the information contained in these instructions is consistent with the technical and safety specifications of the equipment to which the instructions refer. The drawings, diagrams, and technical data shown are updated at the date of publication of this document and are valid only for the equipment to which they have been attached.

The manufacturer reserves the right to apply changes or improvements to this documentation without prior notice.

The manufacturer assumes no responsibility for direct or indirect damage to persons, property, or pets resulting from use of this material or of the equipment in conditions other than those provided for.

Contents of the Assembly Instructions

These instructions are intended for technicians to understand and correctly install the equipment. These instructions also provide guidance for:

- Correct transportation and installation of the equipment
- Performing correct cleaning, adjustment, and maintenance of the equipment
- Drawing attention to the most important safety and accident-prevention rules

Carefully read all sections to understand the indications provided in these instructions and to properly operate the equipment. For easier searching through the contents, refer to the following table containing a description of the topics addressed in the sections.

SECTION	CONTENT
Section 1 General information	<ul style="list-style-type: none"> • Description of the assembly instructions, their structure, and the conventions used • Definition of the terms used • Definition of the relationship between the manufacturer and the purchaser/ user (in terms of warranty and assistance conditions)
Section 2 General Safety Information	<ul style="list-style-type: none"> • Presentation of general indications regarding the equipment and guidance for the protection of operating personnel • Presentation of the residual risks present
Section 3 Description of the Equipment	<ul style="list-style-type: none"> • Description of the equipment • Presentation of the main technical data concerning the equipment
Section 4 Transport and Installation	<ul style="list-style-type: none"> • Description of the methods of lifting and handling the equipment • Description of the installation methods, electrical connections, and commissioning of the equipment • Description of optimal storage of the equipment • Description of uninstallation of the equipment
Section 5 Maintenance and Dismantling	<ul style="list-style-type: none"> • Description of the verification and control procedures of the parts and components of the equipment (in particular, of the parts most subject to wear) • Description of the procedures for the designated personnel to clean the equipment • Instructions for disassembling, demolishing, and disposing of the equipment
Section 6 Troubleshooting	<ul style="list-style-type: none"> • List of possible malfunctions of the equipment and related solutions
Section 7 Appendices	<ul style="list-style-type: none"> • Technical datasheets of the possible versions of the equipment • Refrigeration diagram • Documentation of components fitted to the equipment • Declaration of incorporation

Conventions and Definitions

The assembly instructions for the uninstalled equipment were divided into sections to enable, for each life phase of the equipment (transportation, installation, maintenance, and decommissioning), readily available information necessary for the user of the equipment.

The entire documentation relating to the equipment was prepared in accordance with current safety regulations.

The configuration of certain elements or devices described or represented in the documents may differ from that of the equipment in the specific setup created according to particular requirements or safety regulations; in this case, certain descriptions, references, or best practices may have a generic character while retaining their effectiveness.

Dimensional drawings and photographs are provided as a reference for easier understanding of the text.

Definitions

P.P.E.: The acronym for Personal Protective Equipment.

DANGEROUS AREA: Any area inside or near the equipment that presents a risk to the health and safety of an exposed person.

USER: Any person (entrepreneur/company) who adequately uses the equipment or who entrusts its use to persons instructed on its proper operation.

EXPOSED PERSON: Any person wholly or partially present in a dangerous zone or near such areas.

MECHANICAL MAINTENANCE WORKER: A qualified technician allowed to work on any mechanical component to carry out the necessary adjustments, repairs, and maintenance.

The mechanical maintenance operator is not permitted to carry out maintenance on powered electrical plants.

MAINTENANCE ELECTRICIAN: A qualified technician in charge of electrical works (adjustment, maintenance, repairs) and, when necessary, works inside powered electric cabinets and the junction boxes.

HANDLING PERSONNEL: Qualified personnel who carry out the tasks of handling the equipment or the materials used if these tasks require the use of lifting devices.

MANUFACTURER'S TECHNICIAN: Qualified technician provided by the manufacturer of the equipment to carry out operations of a complex nature in particular situations or when agreed with the user.

Personal Protection Equipment and Rules of Conduct

For each of the procedures described in these instructions, mandatory protective measures and safety guidelines are specified for the safety of any personnel operating the equipment.

Editorial Conventions

The layout of these instructions allows easy readability of the contents with the use of bulleted and numbered lists, as indicated below:

- This symbol identifies a generic bulleted list or list in points consisting of simple actions (the order in which the actions are presented is not mandatory but recommended).
- 1. A numbered explanatory list of a complex procedure is identified (the order in which the actions are presented is mandatory to correctly and safely perform the work in question).






Italic text Italicized text is used, in particular, for:

- Cross-references; the cross references used in these instructions are expressed in the following form: “Paragraph/Table” with the number and, in general, the specification “of the section” with the number and name of that section (when it is not specified it is implied that the paragraph or the table belong to the current section).
- Technical and specialized terms, the first time they appear in the text.

Bold text Bold text is used to highlight words, phrases, or parts of the procedure.

Personal Protective Equipment (PPE)

This paragraph indicates the graphic symbols used in these instructions to indicate the need to use certain PPE.

SYMBOL	DESCRIPTION
	Indicates the need to use head protectors suitable for performing the described procedure.
	Indicates the need to use protective gloves suitable for performing the described procedure (possibly of the dielectrics type for work performed on the electrical system).
	Indicates the need to use protective clothing suitable for performing the described procedure.
	Indicates the need to use safety shoes suitable for performing the described procedure.
	Indicates the need to use protective goggles to perform the described procedure.

Section 2: General Safety Information

Engineering Criteria

The equipment has been designed in compliance with the standards indicated in the table below.

STANDARD	NAME
UL 60335-1	Safety of Household and Similar Appliances, Part 1: General Requirements, Edition 6, Issue Date 2016-10-31
	CAN/CSA-C22.2 No. 60335-1:16, Second Edition, Issue Date 2016-10-31
UL 60335-2-89	Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances with an Incorporated or Remote Refrigerant Unit or Compressor, Edition 1, Issue Date 2017-09-29
	CAN/CSA-C22.2 No. 60335-2-89:17, First Edition, Issue Date 2017-09-29

These standards are designed to reduce or eliminate risk of malfunction, damage, or injury to the greatest extent possible.

The components used have been carefully chosen from those available on the market; the equipment is comprised of materials that involve no risks to the health and safety of persons. All parts supplied by third parties are UL-certified (when envisaged) and comply with the relevant directives of reference. All components have been strictly controlled in accordance with the quality standards prescribed by the current regulations.

For the necessary warning and protection measures related to residual risks, see *Residual Risks* in *Section 2: Safety Introduction*.

Devices and Solutions for Protection

Passive Safety Devices

The equipment includes the following safety devices and features:

- Fixed guards close to the moving parts
- External fairing with fixed access doors (if equipped)
- Safety signs corresponding to the guards on the equipment

Active Safety Devices

The equipment includes the following active safety devices:

- Maximum safety pressure switch for each automatic reset compressor (PSH) or for specific versions with safety pressure switch for each manual reset compressor (PZH)
- Safety valve on the MT and LT circuit low-pressure side (if equipped)
- Safety valve(s) on the intermediate receiver
- Safety valve on the high-pressure side, (if equipped)

The valve calibration is shown on the valves themselves and is based on the EN 13136 standard.



ATTENTION: It is strictly forbidden to modify the calibration of the safety pressure switch and/or to inhibit its operation.

Protection Systems

The system is equipped with protections to safeguard against anomalous situations affecting either the pressure or voltage circuits.

Notifications

The unit is equipped, in addition to the signals and instruments installed on the electrical panel, with indicator lights on the inside. To access them, it may be necessary to remove one or more covering panels. For further information, refer to the wiring diagram and to the documentation attached to this manual.



ATTENTION: Operating the equipment with the panel removed should only be performed by authorized/qualified personnel. Observe all safety precautions and use the necessary PPE. At the end of such operation, always carefully replace all panels removed.



ATTENTION: All work requiring access to the compressor compartment and machine display can be done with power on and the right-hand compartment door open.



ATTENTION: DO NOT access the gas cooler zone by opening the fan panel with power on.



ATTENTION: DO NOT access the electrical enclosure with power on.



ATTENTION: DO NOT work on the inverter or the electronic components with power on.

Residual Risks

To avoid any dangerous condition for persons or damage to the equipment caused by residual risks, i.e., those risks that persist despite all provisions implemented, or potential risks which were not obvious, Hillphoenix recommends that maintenance personnel and all personnel in charge of operating the equipment strictly follow the warnings indicated on the following pages.



ATTENTION: Always comply with the signs and indications of the plates applied to the equipment and operate exclusively according to the instructions provided in this instruction manual.



ATTENTION: All work to be performed on the equipment must be performed by qualified, trained, and properly equipped personnel.



Residual risk of asphyxiation

To avoid leaks of gases that are dangerous to human health, install the unit in a dry, protected, and sufficiently-ventilated place in compliance with local codes and ordinances.



Residual risk of burns

Before carrying out any work on the equipment, make sure that the hot surfaces have cooled down; wear protective gloves to avoid burns.

Proper and Improper Use of the Equipment

The equipment discussed in these assembly instructions has been designed and constructed **exclusively** for refrigeration. The equipment is configured to use **only** R744 (CO₂) refrigerant gas.

The equipment is designed to use only the refrigerant specified above. It is therefore important to use the equipment in compliance with regulations applicable to the refrigerant fluid for which it was designed and built and as received from Hillphoenix.

The equipment has been designed and built to operate in environments with **no potentially explosive atmosphere**.

The equipment must be adequately protected from weather and environmental conditions.

As a precautionary measure, keep powder extinguishers in the vicinity of the equipment. To prevent the possibility of fire, keep the equipment clear of plastic pieces, oil, solvents, paper, and rags.

Use of the equipment for unauthorized purposes may cause harm to persons or damage to the unit itself and is therefore considered **improper use** for which Hillphoenix is not responsible.

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems



DANGER: The user **MUST** confirm the type and quantity of gas contained in the equipment to ensure proper operation.



ATTENTION: It is essential to consult Hillphoenix prior to any unapproved use.



DANGER: All work involving R744 (CO₂) refrigerant must be carried out only by qualified technicians trained to work with this type of refrigerant.

General Warnings and Rules of Conduct

In order to avoid any risk to persons or damage to the equipment, it is advisable to strictly follow the warnings and general rules of conduct reported here.



DANGER: The manufacturer disclaims any liability for any damage to property and/or persons arising from work performed by unqualified, untrained, or unauthorized personnel.

- Personnel in charge of operating the equipment must be adequately trained to avoid risk of damage or injury, and must work in a comfortable environment with the best possible safety and hygiene conditions.
- Prior to using the equipment, ensure that any hazardous safety conditions have been rectified and that no personnel are present in the danger area near the unit.
- After removing the packaging, make sure all equipment parts are intact; otherwise contact the dealer.
- Before using the equipment, ensure that all guards or other protections are fitted and that all safety devices are present and working.
- Carefully read the labels on the unit; do not cover them and replace them immediately if damaged.
- Do not place containers of liquids on the unit.
- Consult these instructions for the safety provisions in force and the specific Personal Protective Equipment (PPE) to implement for staff safety; in particular, the staff responsible for the equipment must wear suitable clothing, avoiding or paying due attention to:
 - Loose clothing
 - Wide sleeves
 - Ties or draping scarves
 - Necklaces, bracelets, and rings

- Staff responsible for maintenance of the equipment must be aware of all the procedures outlined in *Section 5: Maintenance* and must have adequate technical training to correctly interpret the instructions and diagrams attached to these instructions and to perform maintenance on the equipment.
- The area where the maintenance procedures are carried out must always be clean, dry, and with the appropriate equipment always available and operating efficiently.
- If it is necessary to perform maintenance procedures in the vicinity of electrical components, operate with dry hands and use dielectric gloves.
- If the equipment is installed in a position not easily accessible to the operator, it is necessary to have suitable structures to allow access to the components being serviced.



DANGER: It is necessary to ensure that the power supply is disconnected before starting any type of maintenance on the unit or on its components or accessory equipment. If this is not possible, it is necessary to take precautions to ensure safe working conditions in the area of the equipment.



DANGER: The leaking of refrigerant gas after the safety valve is engaged may result in damage to property and/or injury to persons.



DANGER: Tampering with or unauthorized replacement of one or several parts of the equipment and the use of accessories, tools, and consumables other than those indicated by the manufacturer may result in an accident.



DANGER: The R744 (CO₂) refrigerant is colorless and odorless. Its presence in the environment can cause asphyxiation. All work must be performed in the presence of gas presence detectors and in compliance with local codes and ordinances.



ATTENTION: All work involving R744 (CO₂) refrigerant must be carried out only by qualified technicians trained to operate with this type of refrigerant.



ATTENTION: All work involving R744 (CO₂) refrigerant must be carried out in the presence of gas presence detectors.



ATTENTION: All materials with an environmental impact must be disposed of according to the regulations in force. If necessary, use specialist facilities for their disposal.

Section 3: Description of the Equipment

The condensing units described in this document are designed for use in commercial refrigeration. These condensing unit systems are intended for use in locations where heat can be released outside of the building in which they are installed..

The condensing units are compact, low-noise systems that are also suitable for outdoor use.

The unit is designed and optimized to work with CO₂ (R744).

The operating modes can be transcritical or subcritical depending on the conditions of the external environment.

The electronic control, with appropriate logics, allows the equipment to always operate in conditions of maximum efficiency in different environmental conditions and cold demand. It also manages lubrication and any alarms by signaling them on the electronic control terminal.

Depending on the model, for the condensing unit, units can be provided with a single fan-motor, or with a double fan.

All models are equipped with the following refrigerator accessories:

- Compressor(s) driven by inverter
- Control valves
- Intermediate receiver
- Dehydrating filter and liquid indicator
- On-board gas cooler
- Electrical panel with relative electronic control

In low-temperature refrigeration models, a desuperheater (intercooler) is incorporated in the gas cooler battery.

All models also have a crankcase heater that prevents the accumulation of liquid in the lower area of the compressor during downturn periods. The unit is always enclosed in a self-supporting housing made of steel varnished with epoxy powder and is equipped with electrical equipment with a main disconnecting switch (the power supply wire that must be connected to the switch is not supplied).

The following variants are possible:

- Only for medium-temperature units
- Only for low-temperature units

The compressors are managed by a dedicated inverter, which allows modulation of the capacity from 25 to 100%.

The compressor(s) can include a bypass solenoid to facilitate starting. Each line includes a check valve.

The unit is equipped with pressure switches and safety valves to address any malfunctions.

In addition, there are: a high-pressure valve (HPV) in general delivery after the gas cooler, intermediate liquid and gas separation receiver, a flash gas bypass to keep the pressure constant at the receiver itself (only in certain configurations), a braze-weld liquid filter with relative indicator, a liquid-intake heat exchanger (if equipped), insulation of all cold parts, shut-off valves, and service valves for easy maintenance.

An electric power panel with electromechanical switches and electronic control allows the power supply and management of the entire gas cooler system and intercooler (if equipped).

The unit can communicate with the supervisory systems through Modbus RTU communication via RS485 and can also be provided with a system of remote communication with the owner.

The compact design allows installation even in small spaces. The structure is made of bent sheet metal with epoxy paint and suitable feet dampen the vibrations. Depending on the version, the equipment can be soundproofed.

The equipment, depending on the model, has two different voltages: 230/1/60 Hz and 460/3/60Hz. For refrigeration, electrical, management, and operating logics, refer to the appropriate documentation and manuals.

Regardless of the configuration, the equipment is always supplied without the air evaporators so it is not able to perform the function for which it is created without the evaporating unit. **To determine the desired refrigeration cycle, the customer must install it in a complete refrigeration circuit.**

The equipment is accessible via the two front panels (LH and RH front panels).

The RH front panel gives access to the electrical enclosure and compressor compartment. This panel is also fitted with the master power switch. The RH side is the only side which can be accessed for installation and maintenance when the machine is powered on.

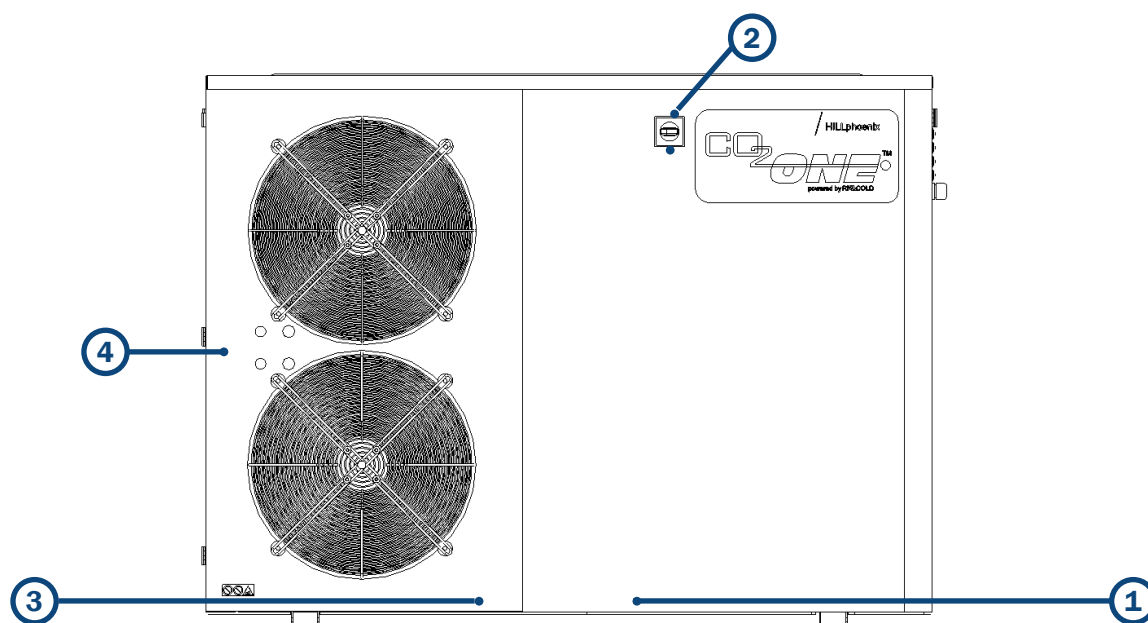
The LH front panel is equipped with the fans. This panel gives access to the gas cooler compartment, and can only be opened when the machine is powered off.

The layout is shown on the following page. For additional information, refer to the wiring diagram and enclosed documentation.

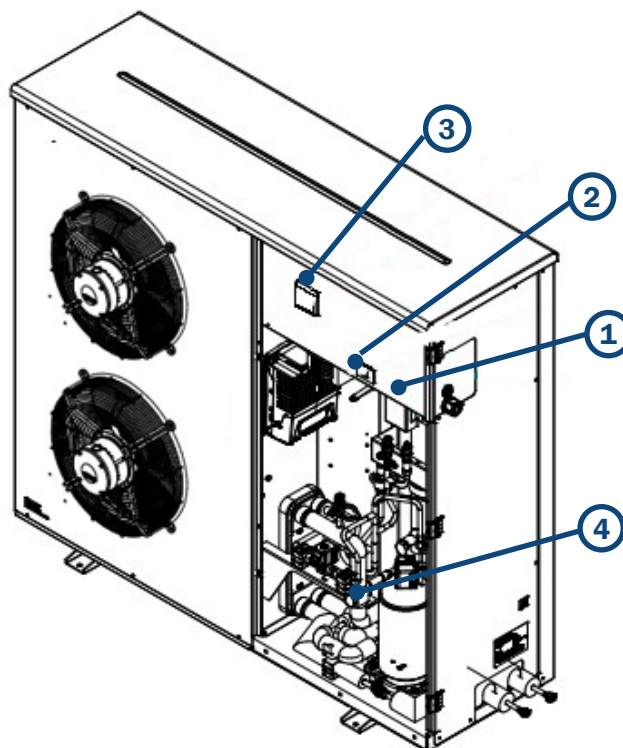
CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

Section 3: Description of the Equipment



1. RH compressor compartment door and electrical enclosure
2. Main switch/disconnect
3. LH gas cooler compartment door
4. Gas cooler fans

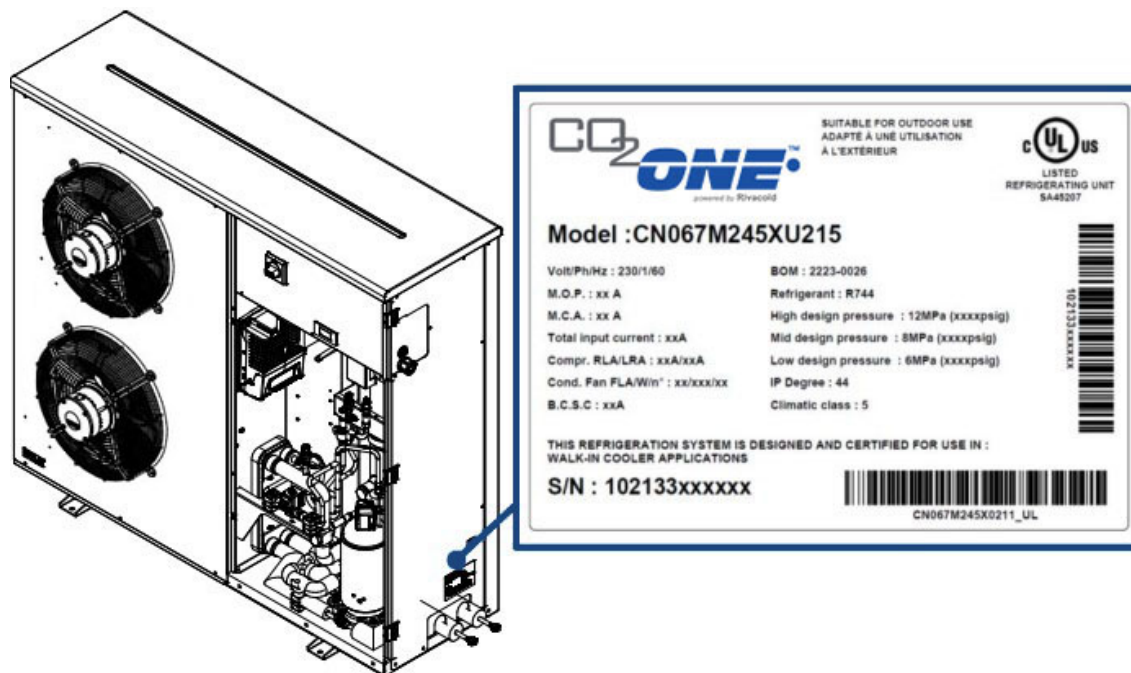


1. Electrical panel
2. Display*
3. Master power switch rod
4. Compressor compartment

* For the description of the display, see *Preparation for Startup* in *Section 4: Transport and Installation*.

Identification Plate

For identification of the unit, a specific UL identification plate has been affixed; the identification data shown on this plate must be reported to the manufacturer's offices for each request for service or for the ordering of spare parts. The identification plate contains the following data:



Model

Rated voltage/Phase/rated frequency

M.O.P. maximum rating of overcurrent protective device

M.C.A. minimum circuit ampacity

Total input current

Motor compressor ratings RLA/LRA

Fan motor rating FLA

Branch circuit selection current

BOM

Refrigerant R744

High design pressure

Mid design pressure

Low design pressure

IP degree

Climatic class

BCSC

Example of Serial / Registration number identification:

S/N : 102133XXXXXX

Digits 1 and 2 = production site

Digits 3 and 4 = the last two digits of the year of manufacture

Digits 5 and 6 = week of the year in which the partly completed machinery was manufactured

Digits 7 - 12 = sequential number

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

Name

A B C D E F G H I L M
CN 045 M 1 45 X U 2 1 5 00

A

B

C

D

E

F

G

H

I

L

M

Series: CO₂One with motor

Size of compressor(s)

Type of application:

M = medium temperature (MT)

L = low temperature (LT)

Number of fans:

1 = an electronic fan-motor

2 = two electronic fan-motors

Fan-motor diameter: 450 mm

Refrigerant type: R744

Progressive: U version UL

No. of gas cooler/capacitor rows

Expansion type: with thermostat valve

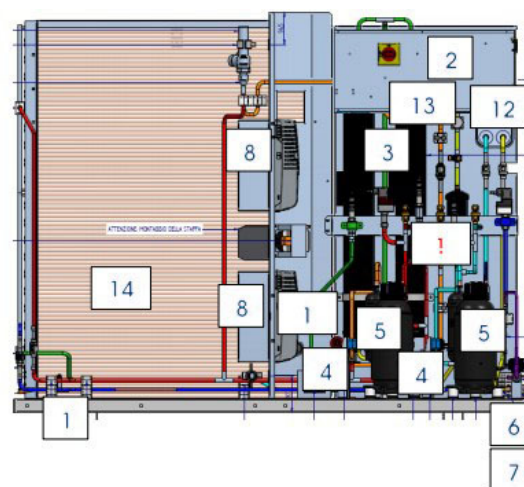
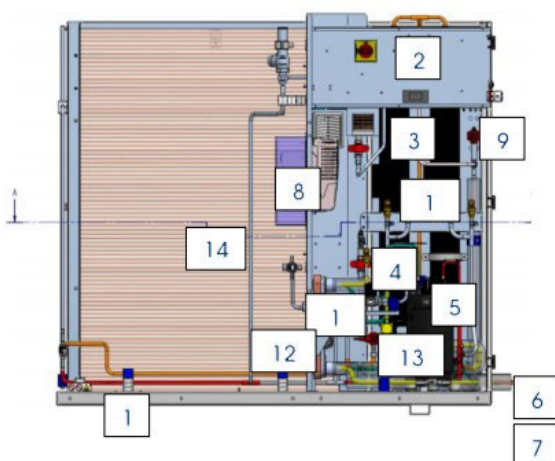
Supply voltage:

5 = 230/1/60

6 = 460/3/60 +
neutral

Optional *

Frame and Component Layout



1. Frame
2. Electrical panel
3. Received liquid tank
4. Solenoid valves
5. MV-LV compressors
6. Liquid line output
7. Suction line return

8. Inverter
9. Flash gas valve
10. HPV or backpressure valve
11. Liquid filter
12. ECO Subcooler
13. Liquid indicator
14. Gas cooler

Technical Data

The supporting documentation includes the following detailed technical information on the electric and refrigeration specifications for an individual unit:

- R744 (CO2) as the only usable refrigerant
- Machine code
- Number and model of compressors (including MT/LT compressors)
- Model of parallel compressor P (if equipped)
- Type and characteristics of the combined gas cooler
- Type and characteristics of the combined intercooler (if equipped)
- Rated and maximum electrical absorption data
- Performance coefficient
- Diameter and type of connections
- Design pressures in the various sections of the circuit
- Intermediate receiver volume
- Type of oil used
- Empty weight
- Overall dimensions of the unit and packaging
- Calculation conditions and set nominal values

Noise Levels

The noise level is shown in the attached documentation based on the model of the equipment.

The value of the maximum and average noise level (over 24Hz) is provided at a distance of 32.8 feet.

The presence of several units installed in a confined environment increases the overall noise level.



ATTENTION: It is the CUSTOMER's responsibility to carry out an assessment of the noise risk of their own activity as prescribed by the legislation in force in the place where the assembly is installed and to provide the operators with adequate Personal Protective Equipment (such as headphones for hearing protection).

Section 4: Transport and Installation



DANGER: The procedures outlined below must be carried out by qualified operators. The manufacturer declines all responsibility for activities conducted while not complying with the appropriate safety regulations, work performed by unqualified operators, and any actions not complying with the specifications of this manual.



ATTENTION: Upon the purchase of the equipment, the customer assumes responsibility for all components and must arrange for the legally-required checks such as the startup report and any periodic inspections to be performed according to current local regulations.



ATTENTION: All work involving R744 (CO₂) refrigerant must be carried out only by qualified technicians trained to work with this type of refrigerant.

Prior to installing the equipment, prepare the power supplies and the appliances necessary for correct operation of the system, following the instructions provided in this section and, if necessary, consulting the manufacturer before installation.

Ambient Conditions

The system does not have any specific restrictions regarding ambient temperature. The ambient temperature may vary between 14°F and +104°F.

The relative humidity must not exceed 50% with an ambient temperature of 104°F; higher relative humidity levels are permitted for lower temperatures (for example, RH 90% with an ambient temperature of 68°F).

The equipment cannot be installed over 3,280 feet above sea level unless otherwise specified.

The equipment has been engineered and manufactured to work in environments where no potentially explosive atmosphere is present.

Power Supplies and Utilities

The power supplies and utilities (responsibility of the customer) necessary for operation of the equipment consist exclusively of power supply.

Unless otherwise specified, the customer must:

- Prepare to transport the equipment to the assembly or installation place
- Prearrange the tools necessary for assembly and installation
- Provide the auxiliary equipment and consumables (use only water and cleaning cloths)



ATTENTION: The power supply to the partly-completed machine may be different from that of the associated evaporator unit.

Transport and Handling

All requirements must be strictly followed during the transportation and handling of the equipment and during its assembly and installation.



ATTENTION: During transport and handling, the operator must use all necessary Personal Protective Equipment (PPE).



DANGER: During transportation or handling of the equipment, it is necessary to follow the warnings listed below.

- The means used for lifting and transportation must be sized and suitable to the load being moved.
- During transport, ensure that the load is correctly balanced and that there are no parts that are incorrectly installed or at risk of damage.
- The structure of the equipment must be intact and completely assembled.
- Ensure that the area intended for handling is clear and that there are no obstacles that could create a dangerous situation.
- Do not move or stand under suspended loads. Always place the unit on bearing surfaces suitable for supporting its weight.

Lifting



DANGER: Lifting activities must be performed under the direct supervision of a qualified mechanical maintenance operator.



ATTENTION: During all these activities, exercise the necessary caution to avoid collisions and tipping over, handling the equipment in a manner that maintains balance.



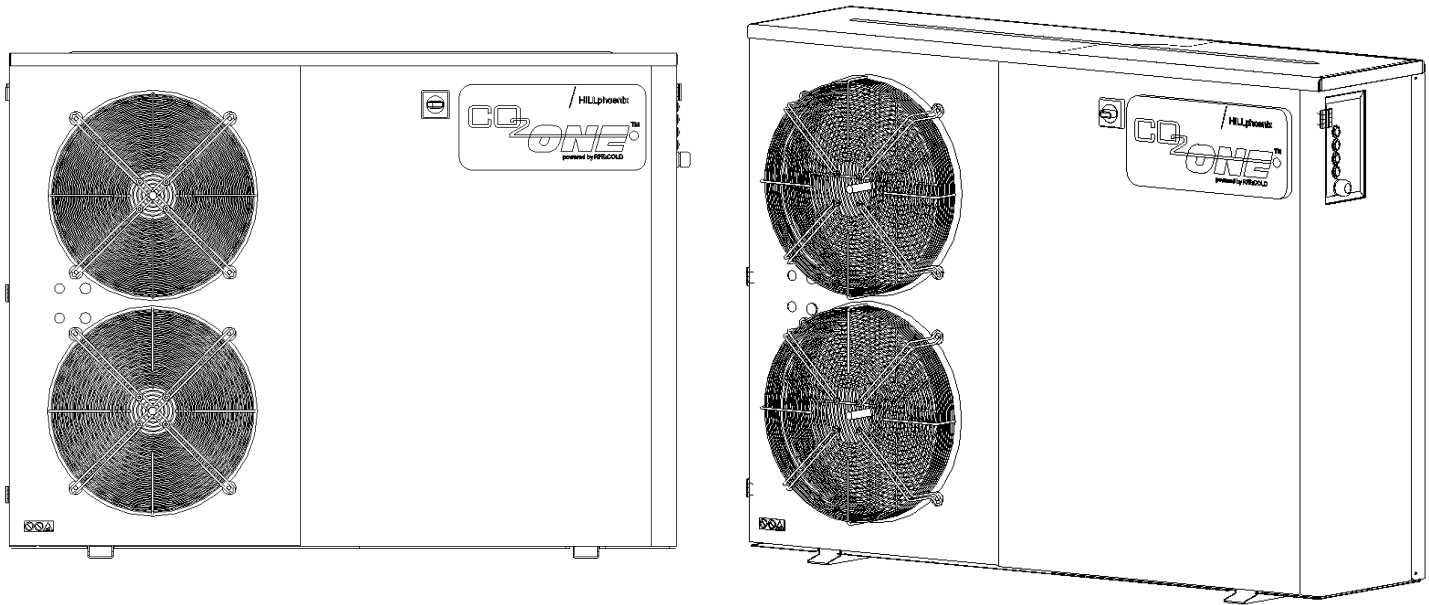
DANGER: Make sure there are no unauthorized personnel near the area where the lifting, handling, and unloading operations are taking place. Such persons must always remain at a safe distance.

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

Section 4: Transport and Installation


Lifting for handling and subsequent positioning of the unit must be performed using straps that must be inserted into the appropriate lifting pockets of the structure, as shown in the following figure.




Follow these additional recommendations for correct handling.


- Never use two lifting means simultaneously.
- Never stand beneath the suspended loads.
- If steel ropes are used, fit always the loop on the end on the lifting hook.
- If steel ropes are used, pay attention not to create narrow bends; i.e., with a bending radius lower than the loops on the end of the rope.
- Use ropes of suitable length so that the angle between ropes and the horizon is always greater than 45°.

Installation

 **ATTENTION:** The equipment that is the subject of this manual is part of a refrigeration system consisting of the condensing unit and components of a refrigeration system such as evaporator(s), pipes, and safety components. The equipment is designed for use outdoors.

 The total volume of the evaporators associated with the equipment must NOT exceed .3 cubic foot.

 **ATTENTION:** The unit is intended for use with R744 (carbon dioxide) system components where the design pressure of the refrigerator is not less than the design pressure of the associated components.

 **ATTENTION:** During installation, the operator must wear all necessary Personal Protective Equipment (PPE).



DANGER: If the equipment is installed in closed environments, adequate air recirculation must be ensured and acoustic-visual detection and signalling systems must be installed that intervene in the event of a refrigerant gas leak. Furthermore, for this type of installation, local codes and ordinances must be complied with.



DANGER: The installation surface must permanently support the weight of the equipment, persons, and equipment necessary for safe maintenance. Overloads should be considered in compliance with the conditions of the installation site and with local codes and ordinances.



DANGER: Perform the required installation steps using appropriate work tools and paying the utmost attention to elements that could cause accidents and in compliance with local codes and ordinances.



DANGER: There must be no access to rooms at a lower level and/or to wells close to the installation site of the equipment (this is to avoid any gas leak being channeled, such as heavy gas).



DANGER: The R744 (CO₂) refrigerant is colorless and odorless. Its presence in the environment can cause asphyxiation. All work must be carried out using gas presence detectors and in compliance with local codes and ordinances.

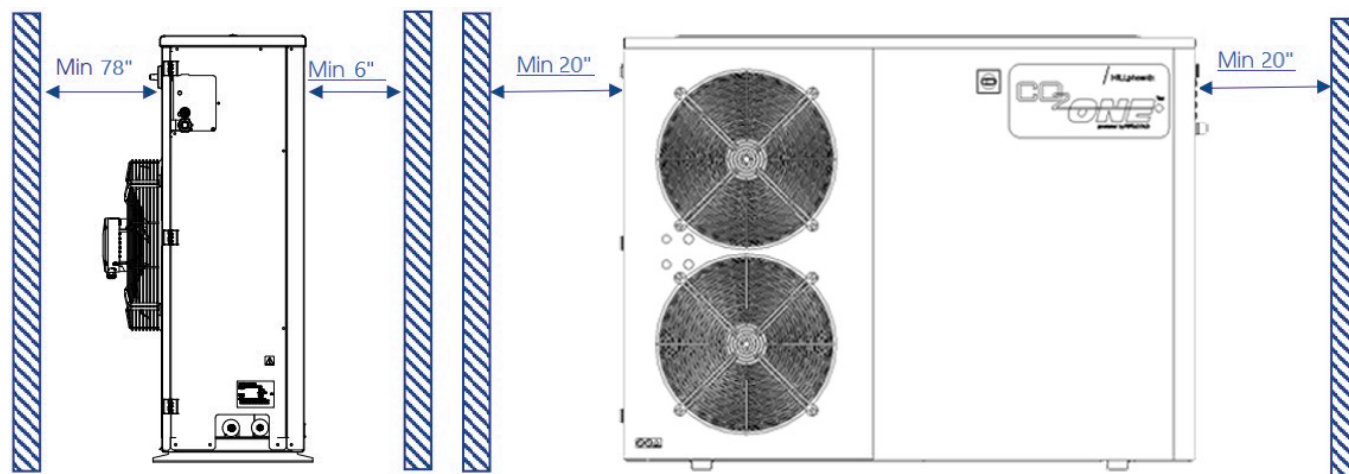
Prior to installation, ensure that the following items are defined:

- All components of the refrigeration system (i.e., condensing unit, evaporator, pipes, and safety components)
- All power, command, and communication lines
- Location of the system
- Piping route (layout)

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

The equipment must be installed on a horizontal plane to enable carrying out the necessary maintenance safely. The following figure shows the minimum distances regarding the recommended safety distances. Secure the unit to the floor by using the holes on the anti-vibration supports.



Power and Control Electrical Panel and Electrical Connection



DANGER: Electrical connections must be performed by qualified personnel who meet the necessary technical requirements established by local codes and ordinances.



ATTENTION: The manufacturer declines all responsibility deriving from non-compliance with the indications below.



ATTENTION: All work requiring access to the compressor compartment and machine display can be done with power on and the RH compartment door open.



ATTENTION: DO NOT open the fan panel with power on.



ATTENTION: DO NOT access the electrical enclosure with power on.



ATTENTION: DO NOT work on the inverter or the electronic components with power on.



ATTENTION: Check the power supply phases to obtain correct rotation direction of the compressors. Incorrect rotation can irreparably damage the compressors.

The power supply provided by the customer (voltage, phases, and frequency) must be correct and sufficient to adequately power the equipment. Specifically, the following requirements must be met:

- If required for a particular equipment configuration, install a differential electromechanical circuit breaker between the power supply line and the door lock switch installed on the equipment. This switch must be adequately sized to the application and in compliance with local codes and ordinances. Make sure that the supply voltage is the same as that shown on the plate and wiring diagram of the equipment; the permissible tolerance is $\pm 10\%$ of the rated voltage. In case of presence on the equipment of user devices that generate earth fault currents with high continuous and/or high-frequency components (inverter, UPS, etc.), use a class differential thermal breaker suitable for use with such non-linear circuits.



ATTENTION: The differential electromechanical circuit breaker must be placed in the immediate vicinity of the equipment so that it can be clearly visible and reachable by the technician while performing maintenance.

- The gauge of the power supply cable must be adequate for the power rating of the equipment. For further information on the total amp draw of the equipment, refer to the wiring diagram attached to this manual.
- The power supply cable must have construction characteristics that are suitable for the conditions of the installation site of the equipment.

The unit is equipped with an electrical panel for power and control. In general it has the following functions:

- General switch with door lock
- Electromechanical protection of all loads
- Electronic control terminal
- Compressors protected by electromechanical switches
- Power transformer for control circuits
- Management of the maximum (and optional minimum) pressure switches each according to its functionality

In the electrical panel, there is a customized electronic controller with different functions:

- Regulation with pressure or temperature probe
- Compressor operation management
- Control of the compressor work area
- Alarm management
- Oil management

- Management of the low-temperature system (if equipped)

Wiring of the Various System Components

The equipment components must be wired properly prior to powering up the system:

- Supervision network (if equipped)
- Other optional components



ATTENTION: The sizing and laying of the cables that connect the equipment to all its external components must be carried out in compliance with local codes and ordinances.



ATTENTION: When laying cables, where possible, it is recommended to avoid a common path between the cables used to transport energy for powering the equipment, or in general for powering motors (i.e., fans and solenoid valves) and those dedicated to the transmission of signals (such as network cables, or 0/10V). Failure to comply with this provision could jeopardize proper functionality of the system due to major disruption of the power supply.

Supervision Network

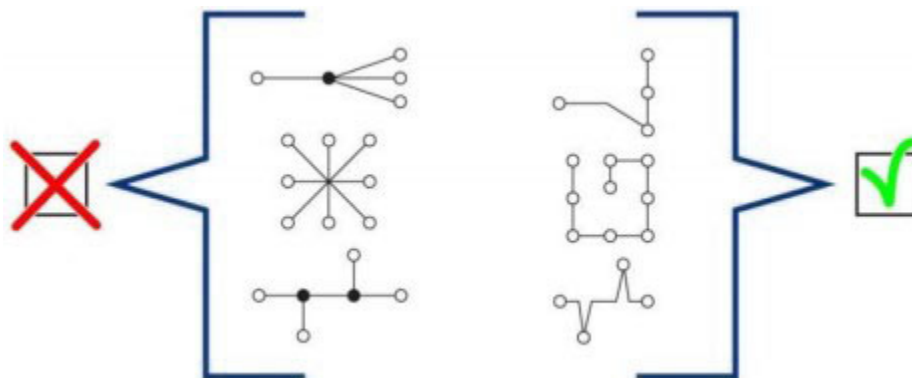


ATTENTION: Where possible, it is recommended to keep the equipment's supervision network separate from that of the supermarket control devices (i.e., desks, cells, and cabinets). This is to avoid conflicts between devices with the same network addresses.

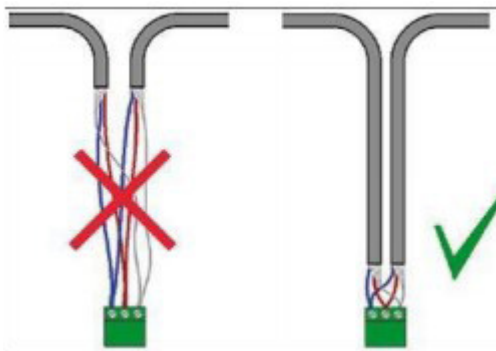
For the wiring of the RS485 serial line on which the supervision network will sit, the following are recommended:

- Use BELDEN 8762 AWG20 type cable
- Minimize the length of the serial line (RS485 max. 3,280 feet)

Do not create bifurcations of the line or star connections, as shown:



- Avoid passing the serial cable near power cables; provide separate conduits for power and communication cables. Furthermore, it is advisable to keep the cable away from devices that generate magnetic or electromagnetic fields, such as radio antennas, transformers, contactors, or neon lights.
- Strictly respect the polarity of the + and - wires. Use the same color for polarity; for example white wire for “+” and black for “-”. The sheath must always only be connected to the dedicated terminal (usually called “GND” and near the “+” and “-” terminals). The two terminals must be connected to the GND terminal, that of the incoming cable, and that of the outgoing cable.
- Avoid unsheathing the serial cable for an excessive length, as shown:



Refrigerant Circuit Connection

The pressure ratings and locations of the condensing unit safety valves are given in the refrigeration circuit diagram.

The system to which the condensing unit is to be connected must satisfy the following requirements:

- **Liquid line:** The lines, line components, and thermostat valves must be rated for a pressure at least equal to the pressure rating of the liquid line of the condensing unit to avoid problems when running at high ambient temperatures.
- **Suction line:** the lines, line components and evaporators may be rated for pressures lower than the pressure rating of the condensing unit's suction line.



ATTENTION: The pipes must be sized according to the type and extension of the system in full compliance with the safety restrictions imposed by local codes and ordinances. Hillphoenix is not responsible for the incorrect selection and execution of the system pipes.



ATTENTION: The pipes may have different dimensions from that of the equipment connection. Use the appropriate reduction to allow connection.



ATTENTION: The equipment may only be installed in a refrigeration plant if the total internal volume of the evaporators is no greater than 2.3 gallons.



ATTENTION: If installing system components on the suction line which are rated lower than the pressure rating of the condensing unit, an appropriately rated supplementary safety valve, calibrated to the correct setpoint, must be installed on the system.

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems



ATTENTION: To avoid problems with the condensing unit, do not install components or safety valves rated for less than 45 bar on the suction line.



ATTENTION: The system components, pressure ratings, and safety criteria must conform to all local codes and ordinances.

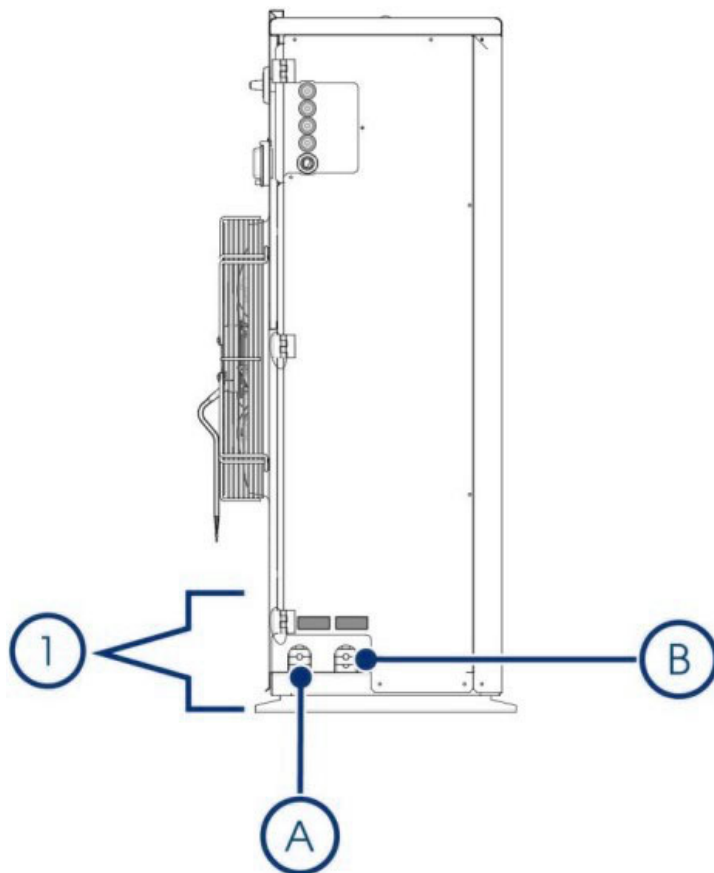
The unit must be connected to the following components to complete the entire system:

- Medium-temperature evaporators
- Low-temperature evaporators (if equipped)

The connections are as follows:

- Liquid
- MT suction
- LT suction (if equipped)

Near each connection is shown the relative label (1) with the type indicated, while the information regarding the diameter is shown in the refrigerator diagram attached to this manual.



The dimensions of the outlet pipes (intake line and liquid line) shown in the refrigeration diagram are calculated for a MAXIMUM TUBING LENGTH of 98.4 feet.

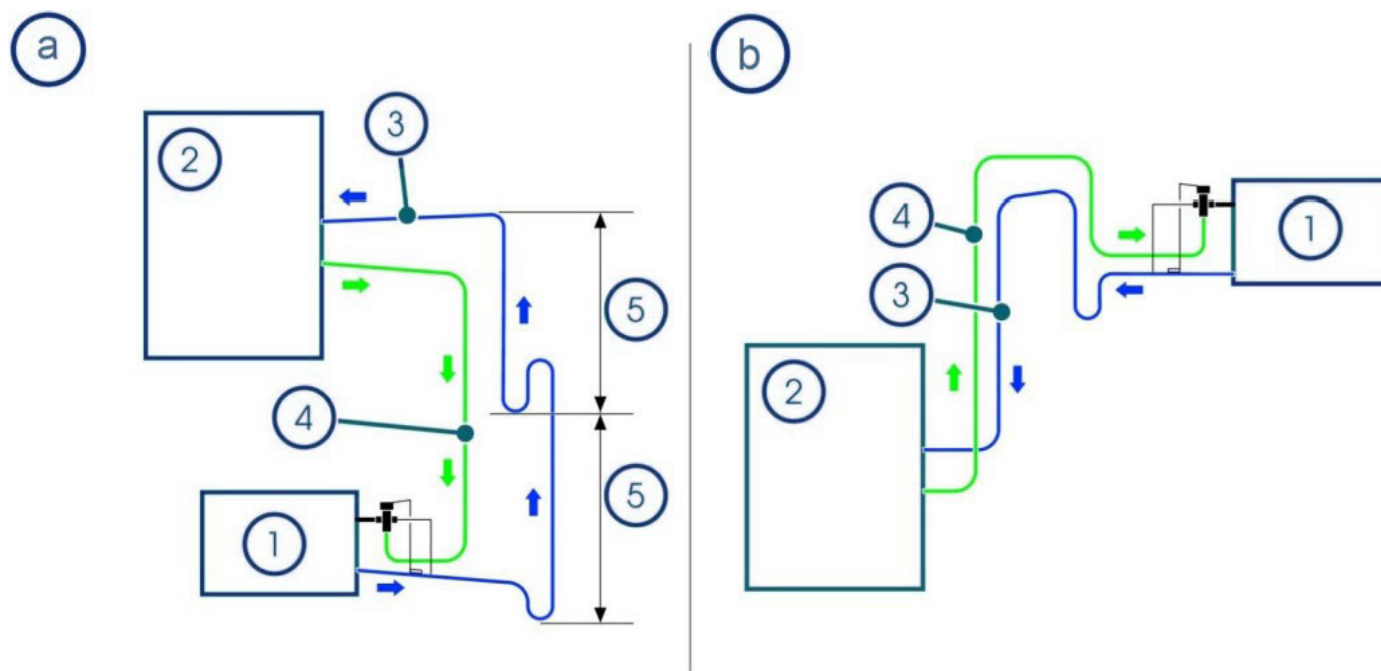
This maximum length, valid for each individual section of both intake and liquid, has been defined in order to obtain a pressure drop that does not compromise correct functioning of the evaporator.

Furthermore, the following functional requirements must be satisfied:

- The liquid line must be created in such a way that the refrigerant speed is between 1.9 and 3.9 feet per second and that the pressure drops are contained. It is advisable not to exceed 7.2 Psi.
- The liquid line must be insulated with a suitable thickness and not less than .5 inch for medium-temperature units and .74 inch for low-temperature units.
- The intake line from positive (if equipped) and/or negative (if equipped) users must be created in a way that guarantees correct oil return to the equipment and that reduces pressure drops. It is advisable not to exceed 7.2 Psi.
- The intake lines must be insulated with a suitable thickness and be not less than .74 inch.

The drawing below includes a number of explanatory notes for the installation of the described sections to guarantee a correct oil return by creating siphons and slopes.

- Evaporator positioned at a **lower** level with respect to the central point*
- Evaporator positioned at a **higher** level with respect to the central point*



1. Evaporator
2. CDU
3. Suction

4. Liquid
5. Siphon minimum distance 6.5 - 9.8 feet

IMPORTANT: In the vertical section of the pipe **create siphons every 6.5 - 9.8 feet**. In the horizontal section, **create inclination of the piping of 2 - 3%**, in the flow direction of the refrigerant.



ATTENTION: The outlet pipe of the relief valve must be sized in compliance with local codes and ordinances.

The relief valve is sized for use with a discharge tube no longer than 32.8 feet. The conveyance is needed where it is necessary to send the gas leaving the relief valve outside a machine room.

The connections are designed to permit welding or brazing in accordance with material type. In general, steel requires welding, while other materials such as K65 or copper require brazing.



ATTENTION: The equipment is supplied under nitrogen pressure. Before working on the connections, reduce the pressure by opening the appropriate service valves for the pressure outlets in the circuit. If there is no pressure in the circuit, do not install the equipment and instead contact Hillphoenix Technical Support.



ATTENTION: Prepare the connections by making a clean cut using appropriate tools.

Excessive pressure inside the refrigeration circuit

Excess pressure inside the refrigerating circuit during discharge can compromise system operation and can be dangerous to personnel. The safeguard against this pressure involves two phases:

- When the pressure reaches values exceeding acceptable conditions as determined by the type of refrigerant used, the size of the system, and the specifications of the compressor, the maximum pressure switches intervene and cause the associated compressor to stop.
- Resetting the system can occur automatically or manually, which should only be carried out after addressing the fault cause. The resetting differs on the basis of the equipment specifications.



ATTENTION: It is strictly forbidden to change calibration of the high-pressure safety switches once testing has been carried out during initial startup.

- The pressure of the relief valves is pre-set in accordance with design and safety standards. When operating, these devices cause leakage and loss, in whole or in part, of the refrigerant charged into the system.

Low refrigerant pressure

Conditions that can cause low suction pressures are:

- Insufficient refrigerant charge
- Improperly operating metering devices
- Refrigerant leaks

An improper charge can result in reduced efficiency and can cause compressor failure. If refrigerant loss occurs, safeguards are enabled to prevent operating with insufficient pressure. Refrigerant loss stops the compressor and automatically resets the system. If suction pressure increases, the system automatically restarts.

Pressure monitoring

The pressure reading at the different points of the circuit is provided by:

- Electronic control
- The installation of pressure gauges

The pressure gauges must be connected to the service valves on the various points of the circuit. To access the service ports, it is necessary to remove the covering panels.

Malfunctions and alarms

The presence of alarms is signaled by a red light on the electronic control terminal located on the unit door. The light can be flashing or fixed; in the first case, the light indicates the presence of active and unseen alarms, and the second indicates that an alarm has been viewed. A red light on the electronic control display in the panel area generally indicates a malfunction and/or alarm presence. The specific cause can be identified by checking the electronic control. These signals can be acquired by a supervisory system.

Some alarms involve manual reset and therefore require the services of a technician.



DANGER: Manual reset of the system or any of its components of it following an anomaly requires the services of a qualified technician who should restart the system only after analyzing the cause and resolving the problem.

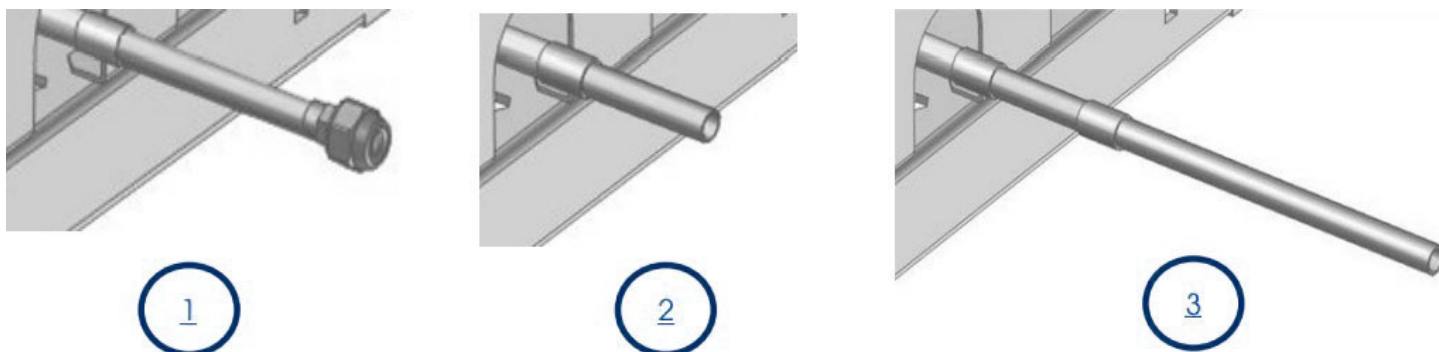


DANGER: All work involving R744 (CO₂) refrigerant must be carried out only by qualified technicians trained to work with this type of refrigerant.

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

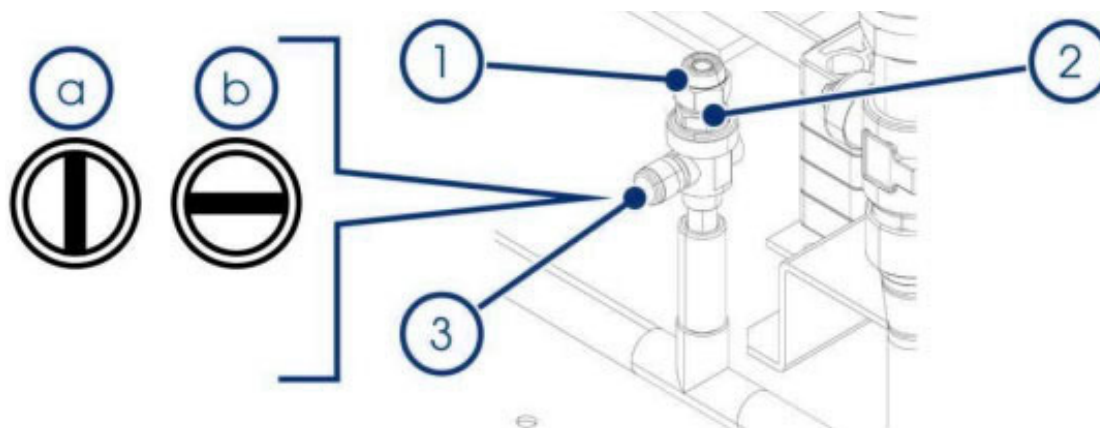
Braze-only connections



Information on the type of connection possible can be found on the refrigerator diagram.

1. Cut the cap
2. Prepare for brazing
3. Braze the line

RS service valve



1. Closure cap
 2. SAE 1/4 fitting
 3. Closure screw – Two positions
- a. Position – Passage open
 - b. Position – Passage closed

Service valves

RSD Gas cooler delivery service valve
RSS User suction service valve

RSLIQ Liquid line service valve
RS1 Second stage receiver/compressor line

Oil Preload

The oil in the compressor is PAG (polyglycols) 100 made by FUCHS RENISO PAG 100.



ATTENTION: Do not charge with any oil other than that specified by the manufacturer. For further information, contact a Hillphoenix service representative.



ATTENTION: The pre-charge must be run immediately prior to draining.



ATTENTION: the pre-charge amount is 3.5 ounces.

The amount of oil may need to be adjusted in light of the refrigerant load. This must be done during the draining procedure described below.

System Drain

For the refrigerating equipment and the compressors to work properly, it is essential to correctly draw a vacuum on the system to ensure values of air and especially of humidity below the permissible values.

Charging the new refrigerant requires the use of polyester-based oils with characteristics of high hygroscopicity, necessitating greater attention when drawing a vacuum.

The duration of the evacuation phase is variable as it depends on several factors, but must be at least 24 hours. In addition to reaching a vacuum level of at least 0.004 Psi, it must remain constant over time.



The IND1 indicator of liquid passage **must** be green to indicate the absence of humidity.



ATTENTION: Before proceeding with the evacuation phase, check that all the valves on the unit and on the system are open.



ATTENTION: The evacuation phase can take place when the equipment is not electrically powered.

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

Section 4: Transport and Installation



ATTENTION: Any removal of coils from solenoid valves must take place when the equipment is switched off. Only perform ignition after repositioning the coil on the solenoid valve.



ATTENTION: To avoid irreparable damage, do not start the compressors in vacuum conditions or without refrigerant charged.

The service valves to which the vacuum pump must be connected include the following:

- RSD supply
- RSLIQ liquid
- RSS suction

For LT/MT machines, as shown in the figure below, a magnet must be used to open the YVO solenoid valve, with the machine powered off.

- Remove the connector (1)
- Remove the coil (2)
- Insert the magnet (3)



Furthermore, the high pressure valve (HPV) downline of the gas cooler must be forced open, along with the flash gas bypass valve for MT versions, by removing the valves' stator coils and inserting and rotating a magnet (OPTIONAL P/N: EEVMAG0000).

Refer to the VACUUM PROCEDURE MANUAL MODE instructions in *Preparation for Startup* later in this section.

Before terminating the evacuation procedure, the circuit must be loaded with 3.5 ounces of oil.

The oil in the compressor is PAG (polyglycols) 100 made by FUCHS RENISO PAG 100.



ATTENTION: Do not load any oil other than that specified by the manufacturer. For further information, contact a Hillphoenix Field Support Engineer.

Proceed as follows:

- Close valve R1.
- Close general liquid valve R2.
- Also close valve R3 (LT versions only).
- Use valve RSS to load oil while applying suction with the vacuum pump to service valve RSD (MT versions) or RS1 (LT versions).
- When pre-charging is complete, close the RSS valve and RSD valve (MT) or RS1 valve (LT).
- Continue the vacuum procedure by re-opening the connections with the vacuum pump connected to RSD and RSS.

Liquid Sight Glass

A transparent indicator is installed along the liquid line to show the liquid level in the system. When the system is at full speed, the flow through the sight glass must be continuous and free from foams or gas bubbles. If there is considerable turbulence with the presence of gas, wait a few minutes before correcting the level; it could be a transitory phenomenon caused by rapid opening of a thermostatic valve.

Refrigerant Load

After evacuation, the system must be charged with carbon dioxide –CO2 – R744 Purity $\geq 99.99\%$ H2O ≤ 10 ppm, O2 ≤ 10 ppm, N2 ≤ 50 ppm or higher.

R744 refrigerant (CO2) is designated as safety class A1 per AHRI/ASHRAE standards (non-flammable, non-toxic). ODP = 0 and GWP = 1. High CO2 concentrations are dangerous. This refrigerant is odorless and colorless.



ATTENTION: The CO2 refrigerant is heavier than air. The use of CO2 detectors and a ventilation system is recommended if the equipment is installed in an equipment room or in areas where pockets of CO2 might form (i.e., underground floors).



ATTENTION: The first phase of refrigerant charging, or pre-charging, must ONLY take place with gas.



For refrigerant pre-charging, the following steps are necessary:

- The equipment must be electrically powered so that the YVEq.P YVEq.LT compressor bypass solenoid valves (if present) are energized.
- Leave the magnet on the YVO valve (if equipped) as explained above.
- The condensing unit and therefore the compressor and/or compressors are set to the OFF position from the electronic control keyboard.
- The HPV and VFL valves are manually opened by electronic control to guarantee opening of the entire refrigeration circuit.

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

During refrigerant pre-charging, it is necessary to use CO₂ gas at a pressure value well above the triple point (5.185 bar(a)) to avoid the formation of dry ice inside the system. Charging gas at 10 bars is recommended throughout the circuit.

The charge points are RS1, RS2, and RS3, as well as RS1.LT and RS2.P (if equipped).

The reading of the pressure on each section is possible from the main screen of the electronic control.



ATTENTION: Do not power the solenoid valve coils if they are not installed on the valve itself.

The next charging phase consists of starting the equipment, placing the condensing unit and/or the compressors in the ON position from electronic control, and following the steps provided in *Preparation for Startup* found later in this section.



ATTENTION: Energize the high pressure and flash gas valves (HPV and VFL) if previously removed



ATTENTION: Energize the YVO valve solenoid coil (if equipped).

Charging can then continue with liquid on RSLIQ valve and/or vapor on RSS. Add evaporative load gradually.



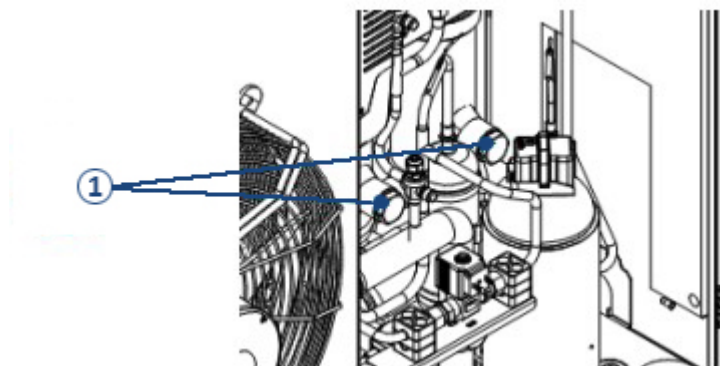
ATTENTION: Cases and unit coolers must already be configured properly for use with CO₂.



ATTENTION: During charging, the compressors will run and may set off alarms.

Charging is complete when liquid visible inside the sight glass is free of any bubbles.

The sight glass also detects the presence of moisture. If any is found, the system must be stopped and the emptying and charging phases repeated.



DANGER: For refrigerant charging, recovery, and verification procedures, wear gloves for protection against low temperatures. Refrigerant charging must be performed only by specialized technicians.



DANGER: The R744 (CO₂) refrigerant is colorless and odorless. Its presence in the environment can cause asphyxiation. All procedures must be performed in the presence of gas leak detectors and in compliance with local codes and ordinances.

Oil Fill

The oil in the compressor is PAG (polyglycols) 100 made by FUCHS RENISO PAG 100.



ATTENTION: Do not charge any oil other than that specified by the manufacturer. For further information, contact a Hillphoenix service representative.

The amount of oil may need to be adjusted in light of the refrigerant load, with reference to the following table.

REFRIGERANT LOAD R744	UP TO 8 lbs	OVER 8 lbs
OIL LOAD PAG100	DO NOT ADD OIL	ADD 1 oz OIL FOR EACH lb OF REFRIGERANT

The procedure is carried out by following these steps:

- Switch off the power and wait for the compressors to stop.
- Place the equipment in the OFF mode in the electronic control display.
- Close the general intake valve R1.
- Remove the internal pressure by acting on the RS1 and RS2 valves.
- Using the RS1 valve, charge oil and, at the same time, aspirate with an empty pump on the RS2 service valve.
- Once charging is complete, close the RS1 and continue with the evacuation phase to the value previously described.
- Remove the vacuum pump and related pipes from the service valve.
- Reopen the previously closed valves.
- Restart the equipment by placing it in the ON mode in the electronic control display.
- Switch on the power.
- Wait for the system to stabilize and for no alarms to be present.



ATTENTION: DO NOT charge more than 8.8 ounces of oil at a time. If more oil is needed, repeat the above procedure.

The equipment does not include oil monitoring to check its presence inside the compressor and in the refrigerant circuit.

However, the electronic controller includes a function that facilitates return of the oil to certain working conditions of the compressor by forcing the compressor to work at a fixed speed for a set time to recover the oil lost along the refrigerant circuit.

Oil level indicator light

It is installed on the oil separator (if equipped) and indicates the minimum level. Depending on the version of the equipment, there may be a second indicator to identify the maximum level. The oil level check must be carried out when the system is fully operational for a few hours and for a few days after starting.

If it is necessary to top up, always use only the type of oil indicated on the plate of the unit and/or in the enclosed documentation.

Humidity reporting

On the liquid passage indicator it is possible to observe a colored element that indicates if the refrigerant is dry or contains moisture. Based on the color, it is possible to determine the status.

In the presence of moisture it is possible to replace the dehydrating filter. Should the problem persist, stop the system and repeat evacuation and charging.

Preparation for Startup



DANGER: The following procedures must out be carried only by qualified and specifically trained technicians. Hillphoenix declines all responsibility for activities carried out without respecting the safety regulations, by unqualified operators, and without compliance with the specifications of this manual.



ATTENTION: During startup operations, the operator must use all necessary Personal Protective Equipment (PPE).



Before bringing the equipment to full capacity, a number of preliminary checks are necessary to carry out at startup.

Check valves

Make sure that all the valves on the equipment and on the system are open, that the service valves are closed, and that they all are fitted with caps.

Check operation of electronic expansion valves

Ensure that electronic expansion valve controls are properly programmed.



ATTENTION: Medium- and low-temperature systems must have a minimum superheat of 9° R and a correct MOP value on the expansion valve control to avoid increasing the intake pressure in the event of system shutdown. 35 bar 30°F and 507.5 PSI is recommended.

Pre-heating of the compressor casing (if equipped)

Crankcase heating for compressors is active during the evacuation procedure, if the latter is done as instructed below.

Furthermore, crankcase heating is active if the compressor is off and the external temperature is low.

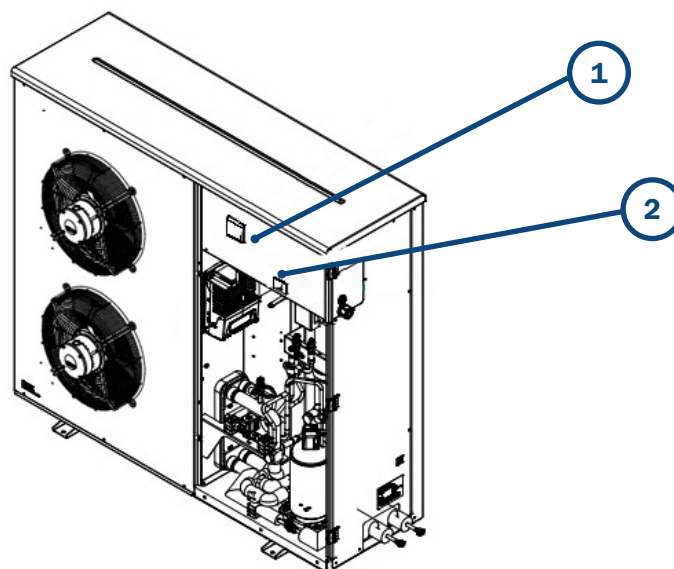
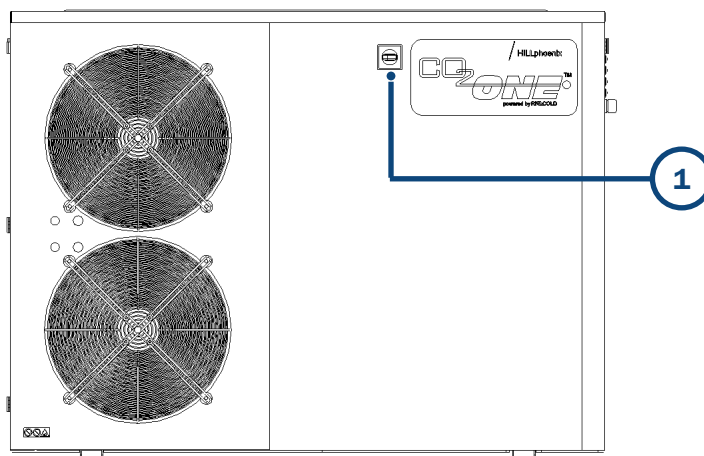
Insufficient compressor lubrication

In the oil circuit (if equipped) there is an oil separator, positioned on the discharge line, which redistributes the oil collected to the compressors themselves through appropriate logics and circuits. Furthermore, the electronic control includes checking of the compressor speed in order to guarantee the correct oil return to the compressor.

Electronic control

To start the system, it is necessary to follow this sequence of steps:

- Set the disconnecter (1) of the electrical panel to ON to supply the entire system.
- Set the electronic control to ON via the display (2).
- Using the display (2), perform the functions indicated.



Electronic control malfunction

In the event of malfunction of the electronic control acting on the compressors, electronic valves, and gas cooler, there may be limited functionality or system shutdown depending on the type of fault. The high-pressure safety related to the pressure switches, independent of the electronic control, continues to be active. Probe reading failure or breakage of the probes, related to electronic control, may limit certain features or generate system shutdown. All malfunctions can be acquired by a supervisory system. Malfunction of the electronic control does not pose a risk to personal safety.

Looking at the display on the door of the electrical panel, the following are evident:



BUTTONS		ASSOCIATED
	ALARM	List of active alarms and access to the alarm logs
	PRG.	Access the main menu
	BACK	Return to the previous page
	UP	Switch to the upper value in a list or increase the value of a variable highlighted by the cursor
	DOWN	Switch to the lower value in a list or decrease the value of a variable highlighted by the cursor
	ENTER	Enter the selected sub-menus or confirm the set values

MANAGEMENT OF LED SIGNALS

BUTTONS		ASSOCIATED
Red		Flashing: Active alarms not seen Fixed: Alarms seen
Yellow		Control Hecu CO2 in state of ON
Green		Control Hecu CO2 powered

- Turn the controller ON.
- Turn on the application software that manages the compressors:

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

Inside the electrical panel there are two electronic boards: one for the management of the high-pressure part of the equipment (i.e., heat recovery, gas cooler, back pressure valve, and gas flash valve) and one for the management of rotary compressors.

Normally, the display on the electrical panel is connected (via a 6-pole telephone cable) to the management controller of the high-pressure part (pRack application). Therefore, to turn the software of the second controller ON, it is necessary to disconnect the telephone cable connected to the display and to attach the second telephone cable located nearby. This procedure provides accessibility to the second controller.

- Turn the pRack CO₂ application ON.

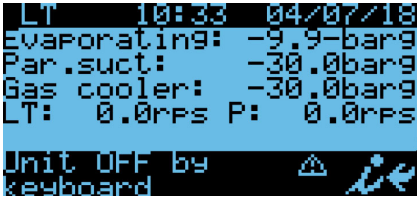

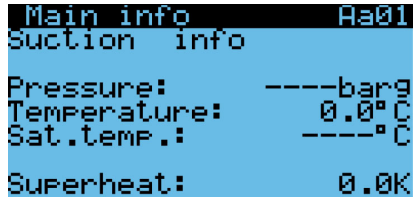

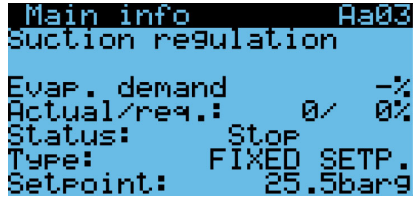

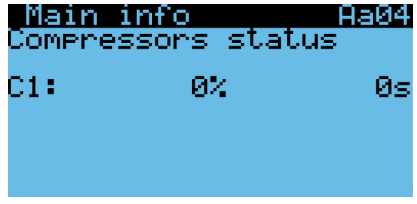

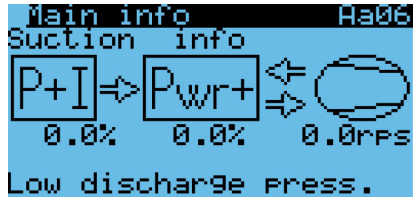

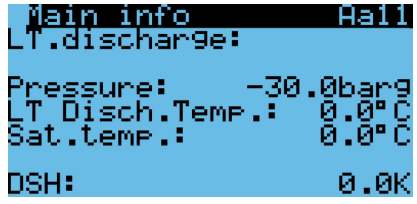

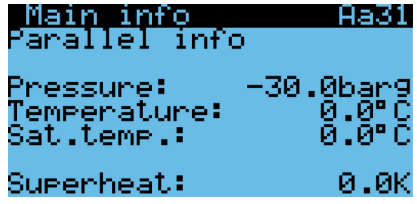

Follow these steps for this application:

MAIN PAGE



1	Time and Date
2	Main Values: <ul style="list-style-type: none">• Evaporation• Parallel aspiration• Condensing• Compressor speed: LV and parallel
3	Unit Status: <ul style="list-style-type: none">• Compressor status• Gas cooler fan status• HPV valve status
4	Signal of active alarm and/or manual operation
5	Access to additional information pages










INFORMATION PAGES

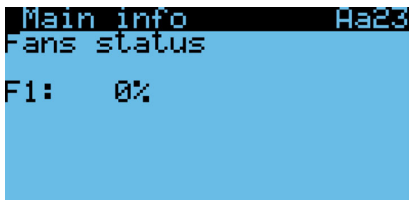
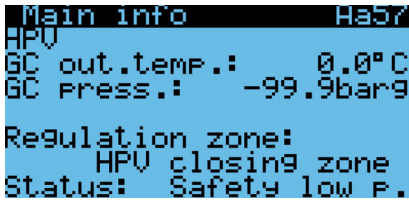
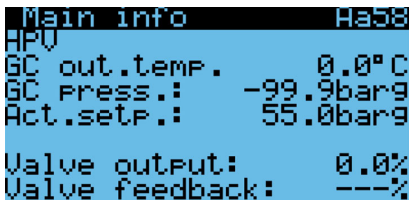
	Press the key	
	Information on the variables of the intake side.	
	Information on the compressor	
		
		
		
		

Section 4: Transport and Installation

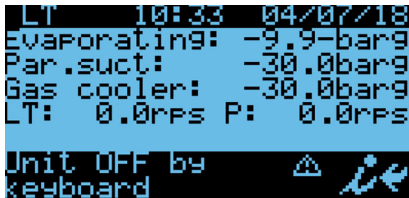
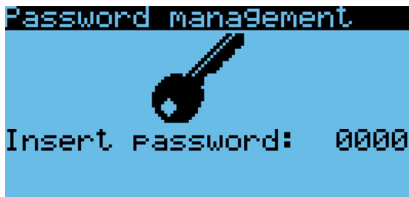
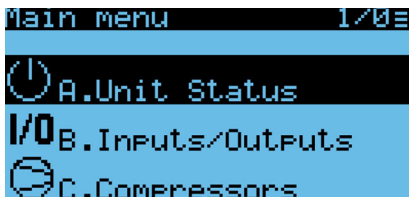
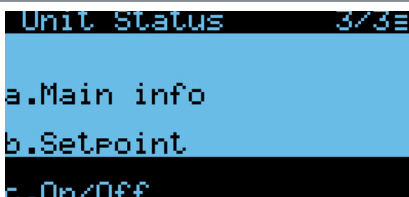

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

<pre> Main info Ha33 Parallel regulation Actual/req.: 0/ 0% Status: Stop Type: FIXED SETP. Setpoint: 37.0barg </pre>		
<pre> Main info Ha34 Parallel comp status C1: 0% 0s </pre>		
<pre> Main info Ha36 Parallel info P+I => Pwr+ <=>  0.0% 0.0% 0.0rps Low discharge Press. </pre>	Information on the parallel compressor (LT)	
<pre> Main info Ha41 Parallel discharge Pressure: -99.9barg Par.disch.temp: 0.0°C Sat.temp.: 0.0°C DSH: 0.0K </pre>		
<pre> Main info Ha11 Gas cooler: Pressure: -99.9barg Disch.Temp.: 0.0°C Sat.temp.: 0.0°C DSH: 0.0K </pre>		
<pre> Main info Ha24 Gas cooler: Gas Cool.Temp: 0.0°C Subcooling: 0.0K External temp.: 0.0°C </pre>	Information on the gas cooler	
<pre> Main info Ha60 Gas cooler: Temp.GC: 0.0°C Pressure: -99.9barg T_ext.: 0.0°C Act.setpoint: 20.0°C Differential: 4.0°C </pre>		
<pre> Main info Ha22 Gas cooler regulation Actual/req.: 0/ 0% Status: Stop Type: Proportional Setpoint: 20.0°C </pre>		

	Information on the gas cooler fans	↓
	Information on the HPV and VFL valves (if applicable)	↓
		↓

UNIT ON/OFF

	Press the key.	⊙
	Press the key.	↶
	The cursor will move onto the first figure of the password. Enter the password "0000" and press the key.	↶
	Select the "A.Unit Status" item.	←
	Press the key.	↶
	Select the "c.On/Off" item.	←
	Press the key.	↶
	Press the key.	↶

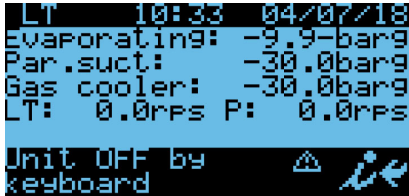












CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

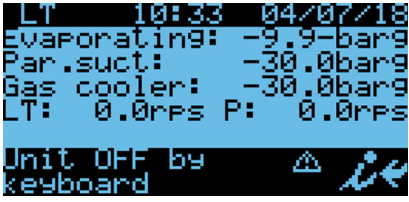

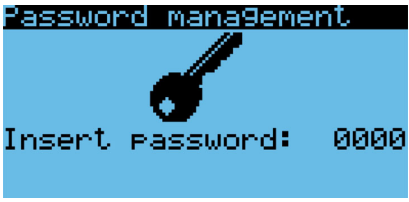


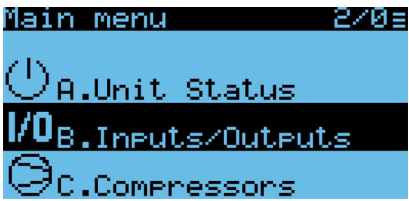


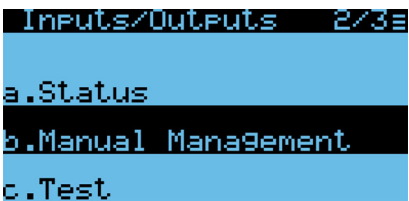


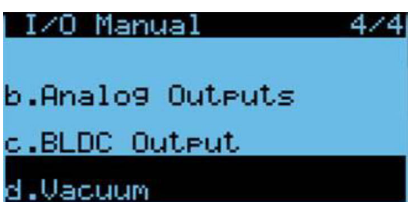


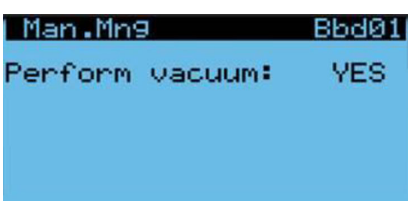

Manual Mode for the Drain Procedure

Perform this procedure only during the evacuation phase and with the unit OFF.

UNIT ON/OFF

	Press the key.	
	Press the key.	
	The cursor will move onto the first figure of the password. Enter the password "0000" and press the key.	
	Select the "A.Unit Status" option.	
	Press the key.	
	Select the "c.On/Off" option.	
	Press the key.	
	Press the key.	


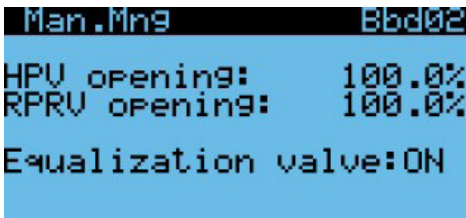

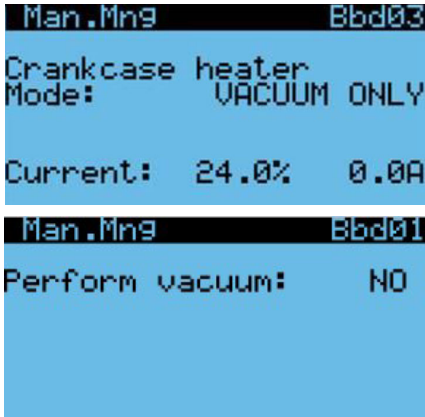



Starting from the main screen:

	Press the key.	
	Press the key.	
	The cursor will move onto the first figure of the password. Enter the password "0000" and press the key.	
	Move down with the key until "B. Inputs/Outputs" is highlighted, then press the key.	
		
	Move down with the key until "b. Manual Management" is highlighted, then press the key.	
		
	Move down with the key until "d. Vacuum" appears then press the key.	
		
	Press the key to move to the mask as shown in the figure and press one of the arrow keys to switch from NO to YES. Then select YES with the ENTER key.	

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

Section 4: Transport and Installation

	<p>Press the key to reach the mask as shown in the figure; make sure that the values are equal to 100% of opening for the valve and in position 0=Open for the equalization valves present.</p> <p>NOTE: In the MT units, the Bbd02 mask is as follows:</p> 	
	<p>Confirm by pressing the key.</p> <p>Move down with the key.</p> <p>Check and retain the default values.</p> <p>End of evacuation procedure.</p> <p>Press the key to reach the mask as shown in the figure. At that point, press one of the arrow keys to switch from NO to YES. Now select NO with the ENTER key.</p>	  

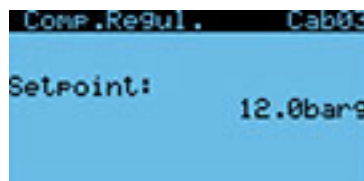
If a DC coldroom controller is connected to the unit it is also possible to force the evaporator's electronic thermostatic valve.

Setpoints and optimization parameters

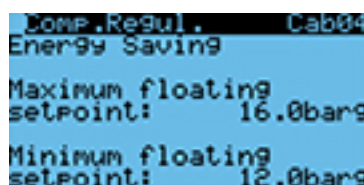
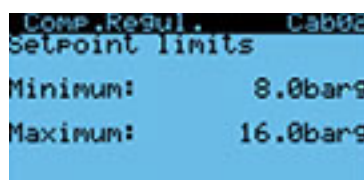
The equipment parameters are configured and set by the manufacturer.

The setpoint is also factory set. The defaults, for the MT and LT versions, are given in pages Cab03 and Cbb03 (LT configuration). The regulation setpoint in the above pages is a single fixed value which controls the unit when it is running as a standalone system.

This parameter can be modified to suit the final application.



If the unit is combined with a dedicated evaporator, the suction setpoint regulation is not fixed, but rather floating when serial communications with evaporator are available. Serial communications enable exchange of realtime information between the main Hecu CO2 controller and the coldroom controller. The floating suction pressure setpoint can vary over a configurable range. This range is indicated in page CAb04, conforming with the limits set in Cab02.



Make sure that all equipment panels are correctly positioned, closed, and secured.

Storage

If it is necessary to keep the equipment for a certain period of time before installing it, it should be adequately protected and stored in a suitable environment with the following characteristics:

- External surfaces resistant to weather
- No access permitted to unauthorized persons
- Meeting the following conditions
 - Well ventilated
 - Ambient temperature between 14°F and 104°F
 - Relative air humidity between 30% and 80%



ATTENTION: Do not remove the packages possibly present for certain equipment components, or take appropriate precautions to protect the parts exposed.

Uninstalling

If it is necessary to uninstall the equipment, perform the installation procedure provided in Paragraph 4.4 “Installation” in reverse sequence. The service valves on which to operate are RSD, RSLIQ, and RSS. Do not remove the gas from the liquid line to avoid ice formation for pressures below 5.6 bar.



DANGER: The following activities must only be performed by qualified and specifically-trained technicians. Hillphoenix declines all responsibility for work conducted without complying with all applicable safety regulations or specifications of this manual, or for any work performed by unqualified operators.

Section 5: Maintenance

To guarantee maximum reliability on the equipment and to avoid dangerous conditions, carefully follow the instructions and warnings on the following pages.

Periodic maintenance and proper use are essential to guarantee the full efficiency and safe operation of the equipment.

The prescribed maintenance procedures and operating instructions help prevent problems due to noncompliance with safety measures or resulting from equipment downtime.



DANGER: The following procedures must only be performed by qualified and specifically-trained technicians. The manufacturer declines all responsibility for work conducted without complying with all applicable safety regulations or specifications of this manual, or for any work conducted by unqualified operators.



DANGER: Before carrying out any maintenance or cleaning procedures described in this section, it is necessary to disconnect the equipment from the electric power supply via the main disconnecting switch located on the panel that closes the electrical equipment. The disconnecter must be locked in the open position with a padlock.



ATTENTION: During maintenance or dismantling procedures, the operator must use all necessary Personal Protective Equipment (PPE).



DANGER: During the maintenance or dismantling of the equipment, it is necessary to follow the warnings listed below.



DANGER: Before carrying out any type of maintenance or dismantling, it is necessary to check, with a specific gas detector, for the absence of CO2 leaks (R744).



ATTENTION: All work requiring access to the compressor compartment and machine display can be done with power on and the RH compartment door open.



ATTENTION: DO NOT access the gascooler zone by opening the fan panel with the power on.



ATTENTION: DO NOT access the electrical enclosure with the power on.



ATTENTION: DO NOT work on the inverter or the electronic components with the power on.

- Clearly post appropriate warning signs to inform personnel of any maintenance or dismantling work in progress to prevent any undesired operation.
- Only authorized personnel may access the work area while any maintenance or dismantling is in progress.
- Disassemble only the parts of the equipment required to perform the specific maintenance functions. Before returning the equipment to the operators, verify its integrity and functionality.
- Operate, to the extent possible, on the equipment and pipes only after evacuating them. Before proceeding with restart, ensure thorough cleaning of the system.
- Do not, for any reason, use gasoline, solvents, corrosive products, or flammable fluids to clean parts. Use neutral and approved non-flammable, non-toxic commercial detergents.
- Do not make alterations to the equipment that could compromise safety without first obtaining written authorization from Hillphoenix.
- All environmental impact materials removed as a result of maintenance must be disposed of in accordance with current regulations.



ATTENTION: For the disposal of materials with high environmental impact, if necessary, use specialist waste collection facilities.

Checking the availability of necessary material

60 days prior to the date of scheduled maintenance, perform a detailed examination of the necessary material:

1. Check if the material is in stock.
2. If necessary, request any missing parts from Hillphoenix or the component manufacturer at least **30 days** in advance.

Maintenance and Cleaning



DANGER: Hillphoenix cannot be held in any way liable for any damage or injury caused to property or persons due to incorrect or incomplete maintenance.



DANGER: Before carrying out any scheduled ordinary maintenance, ensure that the equipment has been disconnected from the mains; wait for the hot surfaces to cool.



ATTENTION: In the event the equipment parts require replacement, only use original spare parts.



ATTENTION: Any brazing work conducted on the system must be carried out by qualified personnel.

Frequency



ATTENTION: On completion of maintenance procedures, replace all previously removed guards.

DESCRIPTION OF MAINTENANCE	FREQUENCY
Check electrical terminal connections	
Check the tightness of all electrical terminals both inside the electrical panels and in the terminals of each electrical utility.	Monthly
Check for refrigerant and oil leaks	
Visually check the entire refrigerant circuit for refrigerant leaks, including inside the unit. These leaks are also evident from traces of lubricating oil. Promptly investigate further in case of uncertainty.	Monthly
Confirm that the unit is properly grounded	
Check the earthing terminal and its efficiency with appropriate instrumentation.	Monthly
Clean the gas cooler and intercooler (if equipped)	
Periodically clean the gas cooler and intercooler (if equipped) by removing any accumulated debris. The surface of the coil must be unobstructed and must permit adequate airflow. Clean with compressed air or vacuum, taking care not to damage fin surface.	Monthly
Clean the air filters	
Check, and if necessary, clean the air filters (if present). During certain periods, especially in spring, it is necessary to perform cleaning procedures more frequently due to the presence of increased impurities in the air.	Monthly
Check electrical cable status	
Check that the cables inside the equipment compartment do not show any alterations of any kind (abrasion, burns, deterioration, etc.) Any possible variation in cable quality requires immediate replacement of the cables.	Monthly
Check the tightness of the cable connections.	Monthly
Check safety control devices	
Verify the functionality of all safety control devices by checking the anomalies signalled by the electronic control, which detects probe faults and anomalies of the same. Refer to the specific manual.	Monthly
Check for the presence of oil in the separators (if any)	
Check that there are no oil alarms on the electronic control and that the level on the separators is higher than the minimum as indicated by the sensor. In the event that the level is low before adding oil, wait a day and check for any alarms. In the presence of alarms, add oil to the minimum level and check throughout the following days.	Monthly
Check non-return valves on compressors (if any)	
Check the tightness of the non-return valves on each compressor outlet.	Monthly

CO₂One Condensing Unit

Hillphoenix Refrigeration Systems

Section 5: Maintenance

DESCRIPTION OF MAINTENANCE		FREQUENCY
Clean the compressor body		
Perform regular cleaning of the external surfaces of the electric motor of the compressor to prevent the accumulation of dust deposits.		Monthly
Check air extraction fans (if equipped)		
Check for correct operation of the air extraction fan.		Quarterly
Check the status of electrical contacts		
Clean all fixed and mobile contacts, replacing them if they show signs of deterioration.		Quarterly
Check the moisture content		
Check the regular flow of the refrigerant in the sight glass on the IND1 liquid line and carefully examine the color of the moisture indicator through the sight glass. The green color indicates dry conditions and the yellow color indicates humidity. In case of high moisture, immediately stop the equipment, replacing the gas only after repeating the evacuation procedure. It may also be necessary to replace the filter on liquid FL1, which is installed by brazing. Replacement can be done by closing the R4 and R5 valves upstream and downstream of the filter itself. The RS3 service valve will allow the refrigerant to be removed as well as the subsequent pressure test procedures, evacuation, and preload up to 10 bar.		Quarterly
Check compressor noise		
The control procedures must be performed in the absence of unauthorized personnel and with instruments suitable for the type of operation. The instruments must be positioned with the equipment switched off and, if inside the unit, all protections that were removed must be repositioned. The presence of clicks or vibrations may be a sign of breakage or excessive mechanical clearance between moving parts.		Quarterly
Check HPV high-pressure and VFL flash gas electronic valves		
Clean the internal filter (if equipped) and the internal mechanisms of the HPV and VFL electronic valves after collecting all the gas inside the liquid receivers using the shutoff valves in the equipment and the service valves for discharge and subsequent drainage.		Annually
Replace HPV high-pressure and VFL flash gas electronic valves		
Replace the internal mechanisms of the HPV and VFL electronic valves using the shutoff valves in the equipment and using the service valves for discharge and subsequent evacuation.		Every 5 years

Safety Valve Operation

It is advisable to replace the safety valve if it has been engaged as it may be damaged and no longer fit or function correctly, thus causing loss of refrigerant. Check the safety valve (if equipped) **every three years** or according to different periods depending on the valve manufacturer.

Replacement of the valves may be done using either shut-off valves (if any) or valves in the system.



DANGER: Before replacing the valve, confirm that, in the work area, the system is neither pressurized nor at a high temperature.



ATTENTION: No maintenance is required for the safety valves. Removal of the cap or tampering with the seal is considered unauthorized modification to the factory settings, which will void the manufacturer's warranty. Inspection of the safety valves is only permitted by supervisory bodies and is governed by local codes and ordinances.

Disassembly and Demolition

See the instructions provided at the beginning of this section regarding the warnings and the Personal Protective Equipment (PPE) to be used.

Section 6: Troubleshooting

Section 6: Troubleshooting

	POSSIBLE CAUSE	SOLUTION
	The compressor does not start and does not hum	
A	• Absence of voltage; starter relay with contacts open	• Check the line or replace the relay.
	• Thermal protector	• Check the electrical connections.
	• Loose electrical connections or incorrect electrical connections	• Tighten the connections or redo the connections according to the wiring diagram.
	• Inverter compressor	• Check the power and communication cables. • Check for the presence of alarms on the compressor.
	The compressor does not start (emits hum)	
B	• Incorrect electrical connections	• Check the connections.
	• Low voltage on the compressor	• Identify the cause and eliminate it.
	• Incorrect rotation of the compressor	• Check the phase sequence.
		• Check the compressor-inverter wiring.
	• Inverter	• Check the power cables between the inverter and compressor and communication cables.
		• Check for the presence of alarms on the compressor.
• Replace the compressor.		
	Inverter alarm issues	
C	• Low voltage to the compressor (unbalanced phases on three-phase motors)	• Identify and eliminate the cause.
		• Check its characteristics and replace it if necessary.
	• Alarm occurrence	• Check compressor rotation.
		• Check compressor working conditions.
		• Check the alarm type to identify and eliminate the cause.
	The compressor starts and runs, with short operating cycles	
D	• High-pressure switch	• Check that the fan-motor is operating.
		• Check for correct operation of the HPV valve.
	• Low-pressure protection	• Check and repair any refrigerant leaks. Then reload the refrigerant.
		• Verify correct operation of the expansion valves. Replace the component if necessary.
		• Check and correct user control parameters.
		• Insufficient gas load. Add refrigerant.
	• Inverter alarm	• Verify the type of alarms identifying and eliminating the causes.
• Replace the compressor.		

	POSSIBLE CAUSE	SOLUTION
	The compressor emits loud noise	
E	• Incorrect rotation	• Incorrect rotation. Check the electrical connection.
	• Insufficient oil	• Add oil to the intake of the individual compressor, attempting to restart.
		• Replace the compressor.
	The compressor works continuously or for long periods	
F	• System not sufficiently sized according to the load	• Replace the system with a more powerful one.
	• Excessive load to cool or insufficient insulation	• Reduce the load and improve insulation if possible.
	• Evaporator covered with ice	• Defrost the evaporator.
	• Limited thermal exchange on clogged gas cooler	• Check the function of the gas cooler.
	High pressure in main circuit supply	
G	• Gas cooler malfunction	• Clean and check the gas cooler and the relevant fans.
		• Check the temperature probes for the STH2 and STA gas cooler output.
	• HPV high-pressure valve not working properly	• Check the valve, check alarms, and reset.
		• Confirm correct operation of the HPV valve.
		• Check the minimum set-point.
		• Clean the entire mechanism and filter if provided for the HPV valve.
		• Replace the HPV valve.
	High-pressure liquid receiver	
H	• VFL gas flash valve not working properly	• Check the valve, check alarms, and reset.
		• Confirm correct operation of the VFL valve.
		• Clean the entire mechanism and filter if required for the VFL valve.
		• Replace the VFL valve.
	• Parallel compressor (if present)	• Check the set-point.
		• Confirm correct compressor operation and related alarms, and reset.
	Frosted or wet drain pipes - low overheating	
I	• Thermostatic valve functioning	• Possible liquid return to the compressor. Check for thermostatic valve overheating and related parameters.
	• Expansion valve blocked in opening	• Clean the valve of foreign substances or replace it if necessary.
	• Incorrect parameters for management of utilities and/or related defrosts, utilities management, and defrost management	• Check the parameters and optimize them to achieve overheating of at least 15K.

Section 7: Appendices

Machine specifications are outlined in the following supporting materials:

- Datasheet
- Refrigeration diagram
- Wiring diagram