



Owner's Manual

for
Ecosaire® EN Series

EN027	Air-Cooled Direct Expansion
EN035	Water-Cooled Direct Expansion
EN042	Glycol-Cooled Direct Expansion
EN051	FreeCool
EN068	DualCool
EN079	Chilled Water
EN087	
EN102	

With *Supervisaire®* CONTROLLERS(PCO5)

For future reference, write your model number* here _____
write your serial number* here _____

*See **Product Description - Unit Nameplate.**

NOTE:

For your convenience this manual is organized into tasks arranged in a workable order. Most material relevant to a single task is on one page or a group of sequential pages.

Please feel free to attach copies of the appropriate pages to the task work-order.

To the Owner:

This manual contains important instructions in operating and maintaining your Ecosaire® system. Please read the entire manual carefully and if you have any questions contact your local Ecosaire® representative. Your warranty is valid only if conditions explained in this manual are met.

To the Installer:

This manual contains vital instructions for installing and starting up the Ecosaire® system. Please read the entire manual carefully and if you have any questions contact your local Ecosaire® representative. Your customer's satisfaction is at stake and the Ecosaire® warranty may be void if conditions explained in this manual are not met.

Contents

Ecosaire® EN Series Precision Environmental Control for Industrial and Commercial Applications

All Ecosaire® equipment offers maximum design flexibility ensuring continuous and simultaneous control of temperature, humidity, air purity, and air-flow within each dedicated operating site.

Ecosaire® Precision Environmental Control Systems are feature-rich, premium products that are available in product ranges with uniquely engineered designs that no other manufacturer duplicates. Ecosaire® units offer the best possible environmental protection.

For over 25 years Ecosaire® equipment has demonstrated superior performance in thousands of applications around the world.

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Product Description

DESCRIPTION

All sensitive electronic equipment requires a stable environment for optimum performance. The **Ecosaire®** Precision Environmental Control system provides the best possible protection for any application.

The Ecosaire® product line is made up of feature-rich, energy-efficient premium products that are available in sizes and configurations to suit several mission critical applications such as Data Centers, Server Rooms, Telecom Switching Rooms, Medical Applications, MRI Rooms, including Museums and Archival Storages. Custom-built units serve in corrosive industrial process environments for Control Rooms, Electrical Equipment and Transformer Rooms. Ecosaire® contains unique, highly engineered subsystems that no other manufacturer duplicates, ensuring continuous simultaneous control of temperature, humidity, air purity, and airflow at each operating site.

Ecosaire® performs with the highest energy efficiency through intelligent design: less energy wasted on undesired latent cooling, on-demand dehumidification, and the state-of-the-art **Supervisaire®** Control System. These new controls offer maximum design flexibility, networkable units, BACNET™, and MODBUS™ compatibility. This allows remote monitoring and alarm logging from either a graphics display panel, personal computer, or via modem.

The **Ecosaire®** product line offers the maximum in environmental control performance and the lowest life-cycle cost of ownership.

Stable environmental conditions are further ensured by on-demand dehumidification. Unlike conventional computer-grade systems that constantly dehumidify, **Ecosaire®** eliminates the costly process of removing and then replacing moisture.

The **Supervisaire®** Microprocessor Controls provide extremely user-friendly, programmable monitoring and control for all **Ecosaire®** Precision Environmental Control systems. Individual **Ecosaire®** units can be connected on a built-in local area network together with a supervisory panel complete with a backlit graphics display for robust, redundant environment control. At the same time, the network can be connected to a personal computer supervisory system, or to a BACNET™, or MODBUS™ network.

The LCD panel is large and easy to read (4 x 20 characters) and the simple layout provides an easy-to-use interface for the operator. English language menus (other languages available) and built-in diagnostics walk the user step-by-step through the monitoring and control of the system.

A powerful 16-bit microprocessor ensures high program-execution speed and efficient real-time management of even the fastest transients.

The computer-site conditions and utilities will determine the type of environmental control units selected. A cooling-load calculation based on design criteria should be performed according to standard air-conditioning practice. The calculation should include the heat gains of: exterior walls and windows; area exposed to unconditioned spaces (i.e. partitions, ceilings, and floors); people; lighting; and all computer and auxiliary equipment. With this information the type, size and number of **Ecosaire®** units can be selected to best match the equipment configuration in the computer room. Allowances for expansion and redundancy should be considered at this time.

While many important factors require evaluation when designing a computer room, the most important are security, expandability, location within the building, proximity of related data processing operations and proximity to outdoor air-conditioning components. Computer rooms are best located in a central part of a building so as not to be affected by outside temperature and humidity. When a room must be designed with an outside wall, the wall should be insulated and windows should be kept to a minimum. Thermopane windows should be used to prevent condensation. Equipment access through doors, elevators, etc., as well as elevator capacity, must be carefully considered.

Product Description

EN Series Standard Features

The cabinet and frame are constructed of heavy-gauge, Penta-Post design, bolted construction using wiped coat galvanized steel.

All interior air surfaces as well as access panels are lined with 1-inch, 1.5 pound density, black mat-coated-fiberglass, this provides double-skin construction for reduced noise levels and eliminates exposed insulation, reducing the risk of inhaling fiber dust. Access panels are mounted on lift-off hinges and may be easily removed when necessary. For sites with restricted clearance through elevators or doors, the unit may be factory- or field- separated into the mechanical section and coil and blower section. If further clearance is necessary, the door hinges may be easily removed. All units are provided with top corner lifting lugs for easy rigging. For installations with restricted clearance through elevators, doors, etc., the unit may be factory or field separated into upper and lower sections. If further clearance is required, even the filter frame and door hinges may be removed easily.

The extra-large surface area of the **evaporator coil** allows Ecosaire® to provide high sensible cooling with low air velocity and smooth air flow. Each side of the evaporator coil is completely independent of the other. Each is fitted with a corrosion-free stainless-steel condensate pan. The coil is constructed of copper tubes expanded into aluminum fins.

Deep-pleated **filters** rated at 30% efficiency by the ASHRAE 52-76 method are standard on all Ecosaire® units. They may be easily replaced from the top, left, or right sides of the unit.

Dual Refrigeration circuits are fitted with filter/driers, sight glasses/moisture indicators, liquid-line solenoid valves, adjustable externally-equalized thermal-expansion valves, manual-reset high-pressure switches, low-pressure switches, quick-connect refrigeration service valves, and high-efficiency heat-pump-duty hermetic compressors. Water-cooled, glycol-cooled, and FreeCool units have stainless-steel plate condensers. Other than the evaporator, all refrigeration components are located out of the air stream.

System reliability is enhanced with multiple, direct-driven independent fan assemblies, which maintain 66% to 50% of the airflow in the event of a fan failure. The direct-drive feature eliminates the need for belt and pulleys and offers reduced drive losses, also negating the need for time-consuming drive maintenance. Multiple fan assemblies also permit automatic airflow adjustment with varying static pressures, and allow for increased dehumidification capacity. All fans are arranged for draw-through airflow and include motors with permanently lubricated ball bearings and inherent overload protection. As a standard feature one fan on the unit has the capability of speed control, employing either a EC Motor or a VFD drive, allowing for variances and field

adjustment of the air flow, resulting from changes in external static pressures.

An EC (Electronically Commuted) motor or a VFD drive can optionally be provided for speed control. Fan speed control is achieved by a 0-10 v DC input signal, provided by transducers with various inputs, providing high efficiency if part load operation is required.

Ecosaire® standard dual-circuited **condensers** feature both horizontal and vertical airflow, along with ambient temperature ratings up to 105°F. Air side control is accomplished by cycling fans or pair of fans in response to outdoor-air ambient temperature. Air temperature sensors are located in the air flow.

In order to reduce stress on condenser coil, one fan or one pair of fans must operate constantly when a compressor(s) is operating. All Ecosaire® air-cooled condensers feature Friction-Free Coil Tracks® (All tube sheets are provided with oversized holes and tubes are supported in sliding cushions for friction-free assembly and maximum reliability).

All components require electric power in the following ranges under all conditions, including compressor inrush:

Rated Voltage (V)	Voltage Range (V)
208	192 - 220
230	207 - 253
460	414 - 506
575	518 - 633

Ecosaire® units are built to relevant standards and comply with all relevant listing agency requirements. Units must be installed in accordance with all applicable codes. If components must be added to meet local codes, please contact the factory in advance for engineering approval and warranty considerations. Any additional components are by others.

Product Description

Major Cooling Options

DESCRIPTION

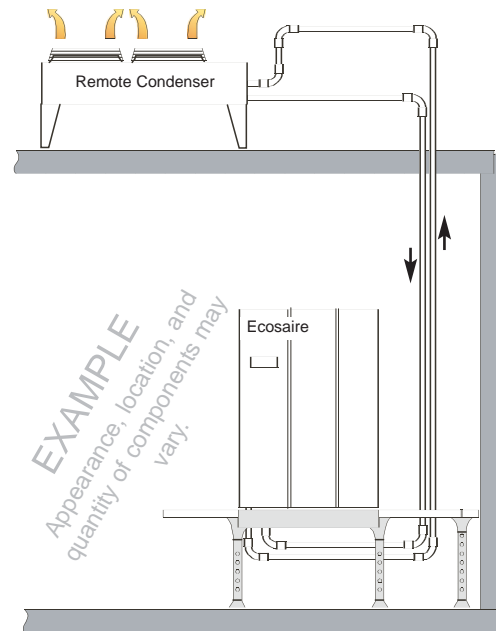
Air-Cooled Direct Expansion

The **Ecosaire®** unit operates its refrigeration system as needed to control room conditions.

Heat is transported via refrigerant-vapor flow to an outdoor air-cooled condenser. The refrigerant liquifies in the condenser and returns to the **Ecosaire®** unit.

Outdoor condensers are rated for 95°F (35°C) ambient with optional models available for higher or lower ambient temperatures. They are constructed of copper tubes and aluminum fins. A factory-wired control panel is provided for field connection. Fan cycling and pressure-actuated fan speed control maintain head pressure of either compressor down to -20°F (-29°C). Optional flood-back controls are available for either 30°F (-34°C) or -40°F (-40°C) operation.

See **Installation - Piping** for details.

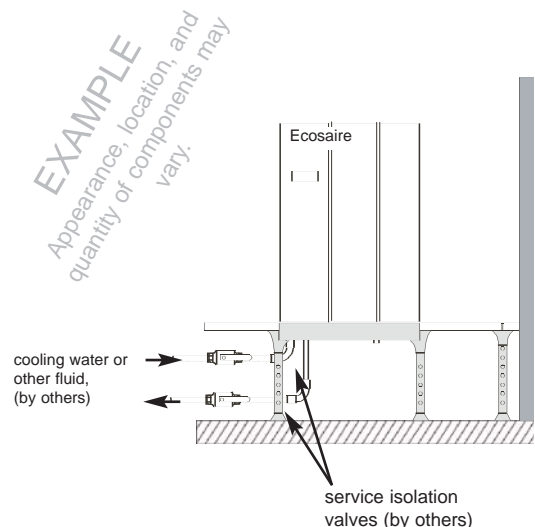
**Water-Cooled Direct Expansion**

The **Ecosaire®** unit operates its refrigeration system as needed to control room conditions.

Heat is transported via refrigerant-vapor flow to an internal water-cooled condenser. The refrigerant liquifies in the condenser and re-circulates.

Water is pumped through the condenser to carry the heat away. Proper flows and temperatures of water or other fluid must be provided by others. See **Installation - Piping**.

The cooling water entering the unit must have minimum temperature of 65°F (18°C). Contact the factory for lower temperatures.



Major Cooling Options

Product Description

Glycol-Cooled Direct Expansion

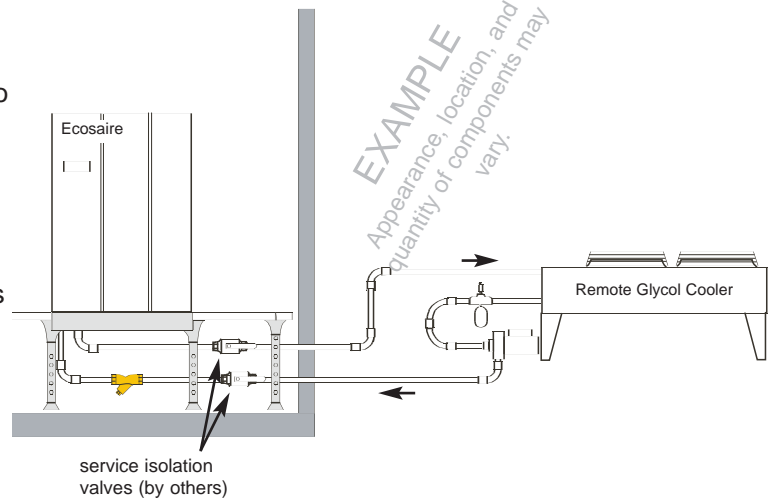
The **Ecosaire®** unit operates its refrigeration system as needed to control room conditions.

Heat is transferred via pumped glycol-fluid flow to an outdoor heat exchanger.

The outdoor heat exchanger has multiple direct-drive propeller fans and is built with aluminum body panels and copper tubes with aluminum fins. A factory-wired control box is supplied for field connection. The TEFC NEMA-rated pump mounts directly to the glycol-cooler subbase. Pre-wired fan and pump control boxes are provided.

Glycol coolers are available for the following ambient conditions:

Design
Temp.
95°F (35°C)
100°F (38°C)



DESCRIPTION

Product Description

Major Cooling Options

DESCRIPTION

FreeCool

When the outdoor temperature is above 60°F (16°C), the **Ecosaire®** unit operates its refrigeration system to move heat into a flow of glycol solution. Refrigeration condensing pressure is controlled by pressure-controlled throttling valves.

Heat is transferred via pumped glycol-fluid flow to an outdoor heat exchanger.

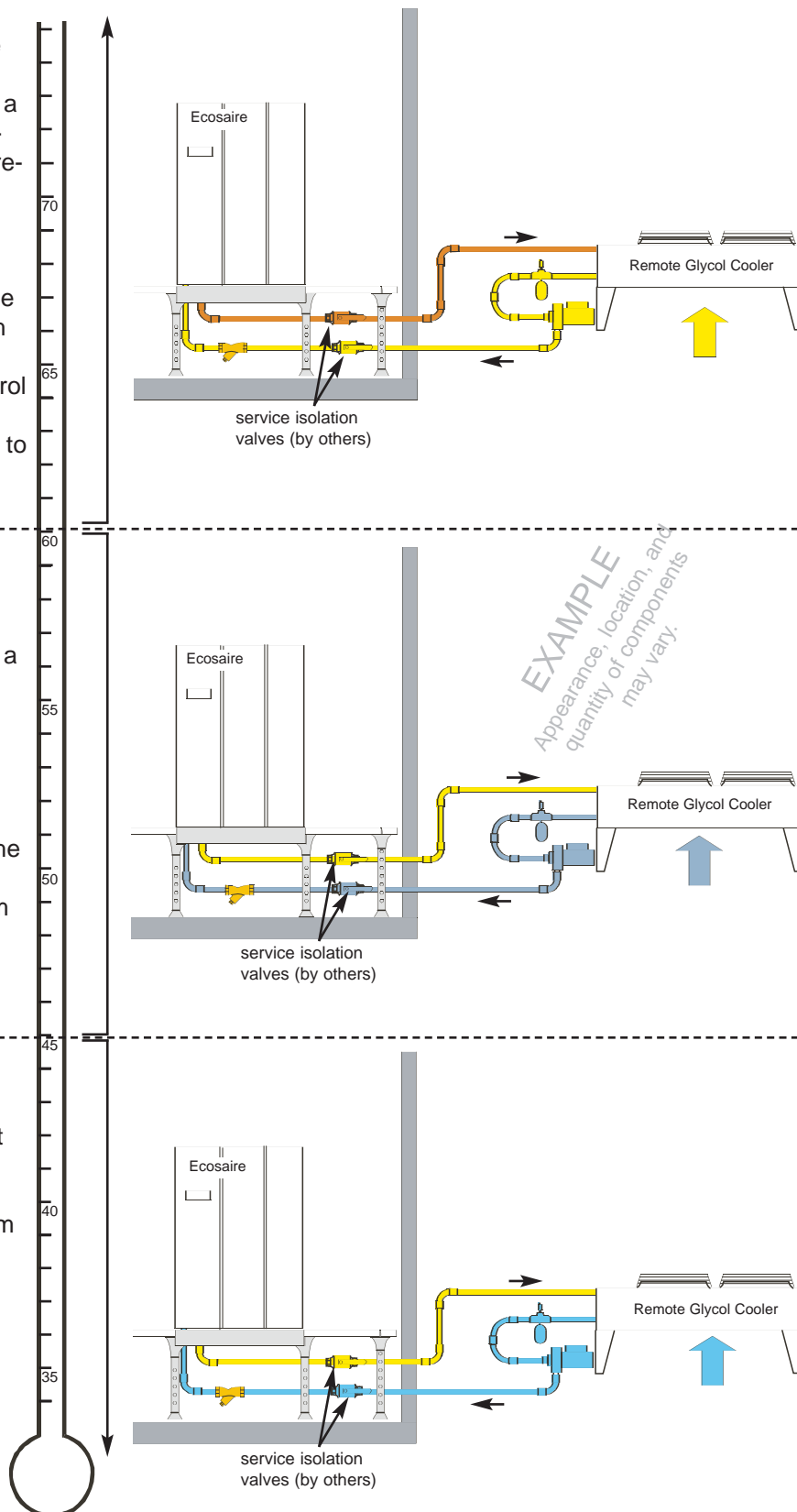
The outdoor heat exchanger has multiple direct-drive propeller fans and is built with aluminum body panels and copper tubes with aluminum fans. A factory-wired control box is supplied for field connection. The TEFC NEMA-rated pump mounts directly to the glycol-cooler subbase. Pre-wired fan and pump control boxes are provided.

When the outdoor temperature is below 60°F (16°C), the **Ecosaire®** unit operates its refrigeration system to move heat into a flow of glycol. Refrigeration condensing pressure is controlled by pressure-controlled throttling valves.

Heat is transferred via pumped glycol-fluid flow to an outdoor heat exchanger.

Whenever refrigeration is not needed, the glycol flow is diverted to internal air heat exchangers to transfer as much heat from the room as possible. This extends the compressor off-time.

When the outdoor temperature is below 45°F (7.2°C), the **Ecosaire®** unit does not use the refrigeration system. The glycol flow is diverted to internal air heat exchangers and transfers all the heat from the room to outdoor air.



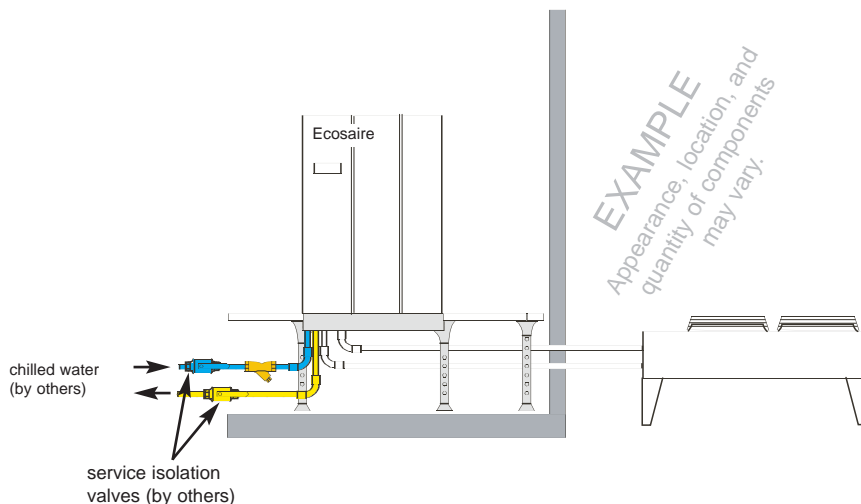
Major Cooling Options

Product Description

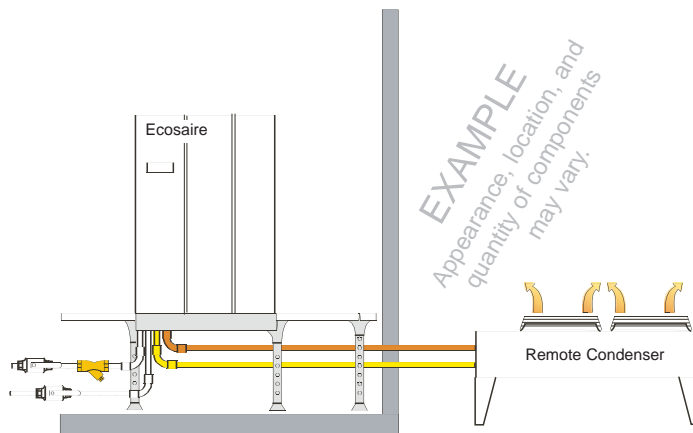
Air-Cooled DualCool

Normally, heat is transferred to a flow of chilled water (by others).

DualCool units include a three-way proportional chilled-water valve, balanced bypass line, flow switch and water-temperature sensor. All are factory mounted to copper piping for a standard working-pressure rating of 400 psig (2758kPa), ideal for high-rise buildings.



If the flow rate or temperature of the chilled water becomes inadequate for proper operation, the unit will automatically change to Air-Cooled Direct Expansion.



Air-cooled condensers are available for the following conditions:

Design Temp.	Standard min - max (°F)	Low-Ambient min - max (°F)
95°F (35°C)	0 - 105°F (-17 - 41°C)	-40 - 105°F (-40 - 41°C)
100°F (38°C)	0 - 110°F (-17 - 43°C)	-40 - 110°F (-40 - 43°C)

Product Description

Major Cooling Options

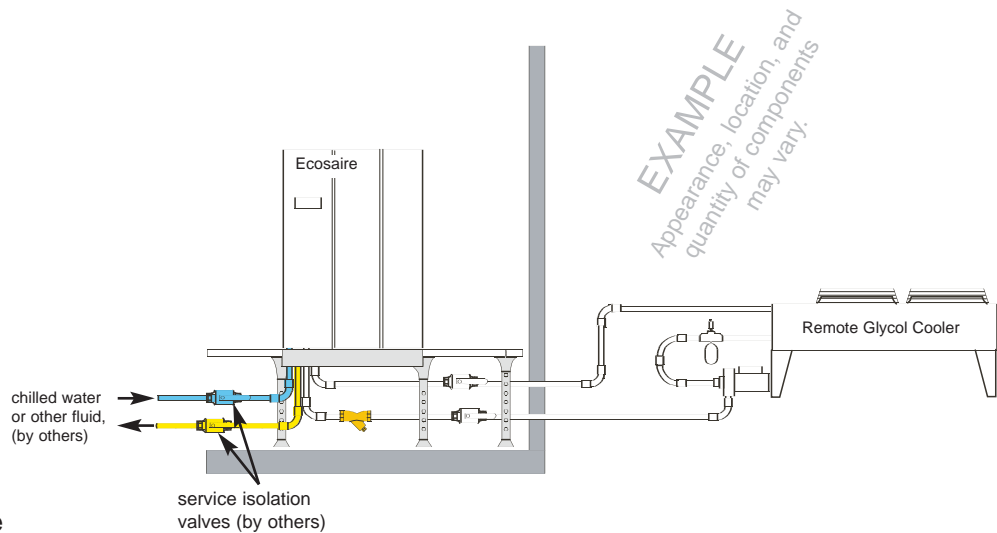
DESCRIPTION

Glycol-Cooled DualCool

Normally, heat is transferred to a flow of chilled water (by others).

DualCool units include a three-way proportional chilled-water valve, balanced bypass line, flow switch and water-temperature sensor. All are factory mounted to copper piping for a standard working-pressure rating of 400 psig (2758kPa), ideal for high-rise buildings.

The unit is rated for use with 45°F (7.2°C) chilled water. For flow rates and other details, see **Installation - Piping**.



If the flow rate or temperature of the chilled water becomes inadequate for proper operation, the unit will automatically change to Glycol-Cooled Direct Expansion.

Glycol coolers are available for the following ambient conditions:

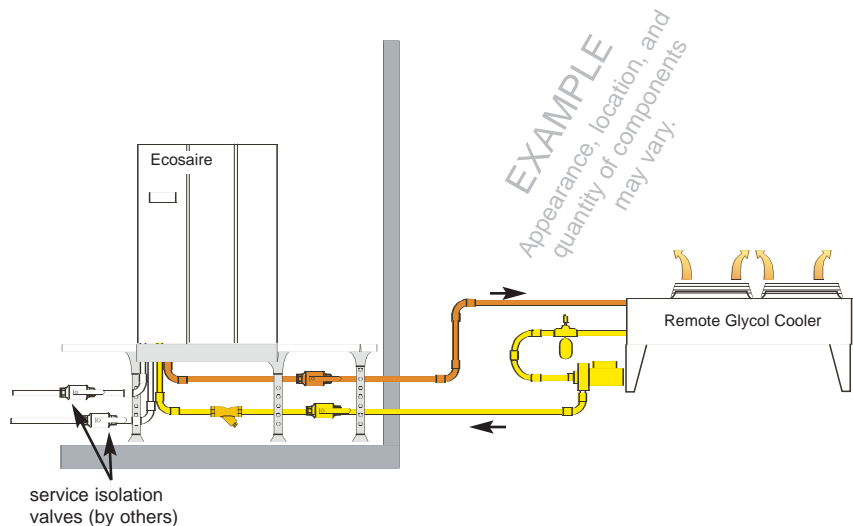
Design

Temp.

95°F (35°C)

100°F (37.8°C)

105°F (40.6°C)



Major Cooling Options

Product Description

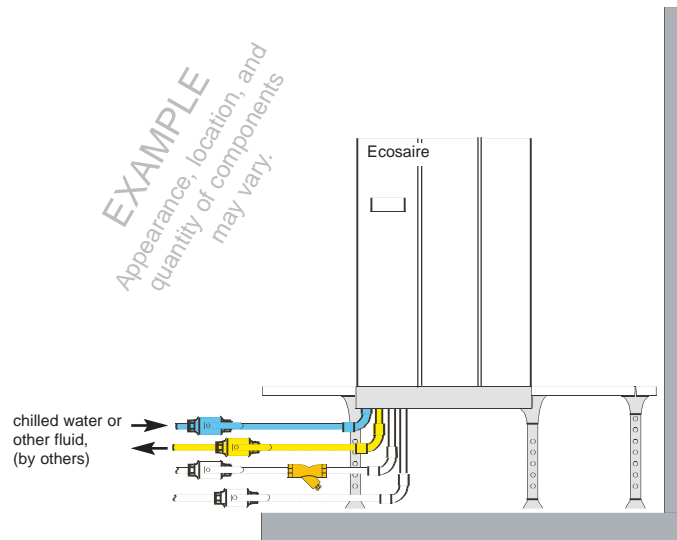
DESCRIPTION

Water-Cooled Dual-Cool

Normally, heat is transferred to a flow of chilled water (by others).

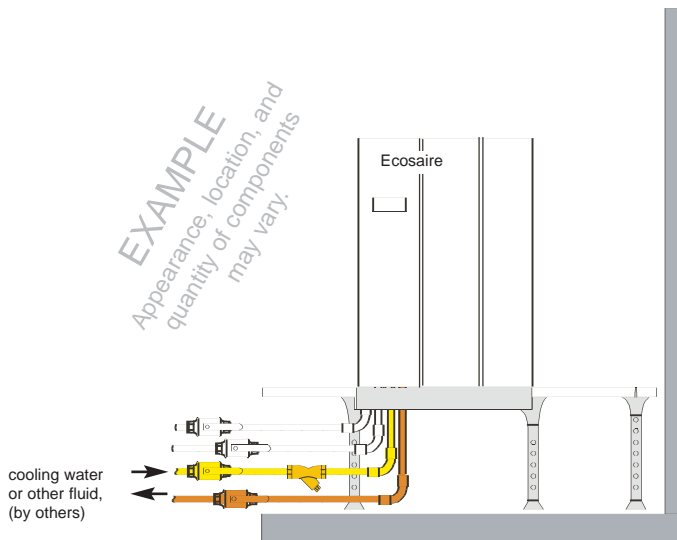
DualCool units include a three-way proportional chilled-water valve, balanced bypass line, flow switch and water-temperature sensor. All are factory mounted to copper piping for a standard working-pressure rating of 400 psig (2758kPa), ideal for high-rise buildings.

The unit is rated for use with 45°F (7.2°C) chilled water. For flow rates and other details, see **Installation - Piping**.



If the flow rate or temperature of the chilled water becomes inadequate for proper operation, the unit will automatically change to Water-Cooled Direct Expansion.

The temperature of the cooling water entering the unit must be between 65°F (18.3°C) and 85°F (29.4°). Contact the factory for lower temperatures.



Chilled Water

The **Ecosaire** unit increases or decreases the flow of chilled water (by others) through an internal heat exchanger to control room conditions.

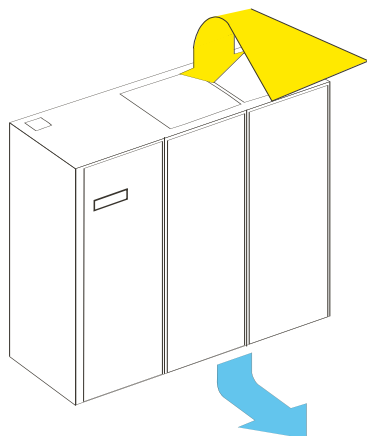
The unit is rated for use with 45°F chilled water. For flows and other details, see **Installation - Piping**

Product Description

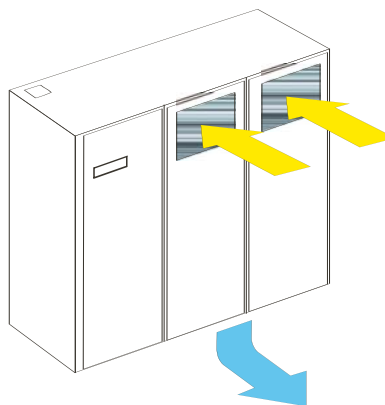
Air-Flow Options

DESCRIPTION

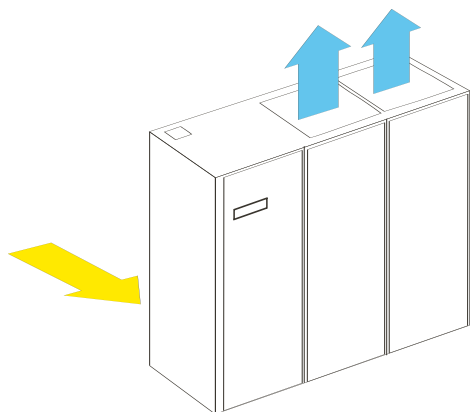
Airflow Pattern U



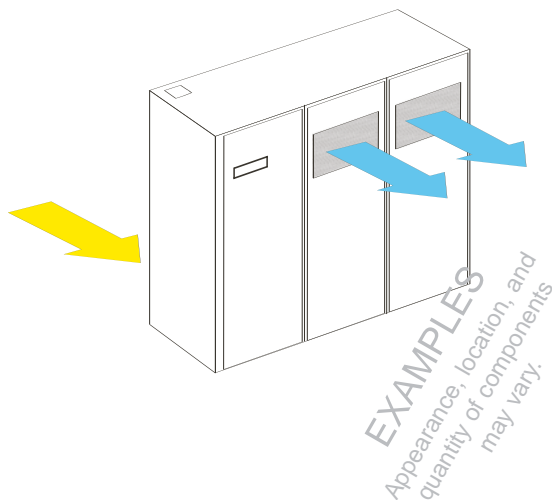
Airflow Pattern W



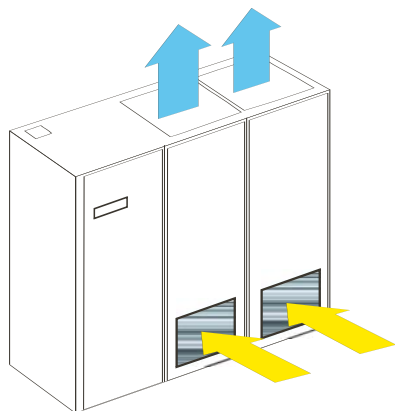
Airflow Pattern R



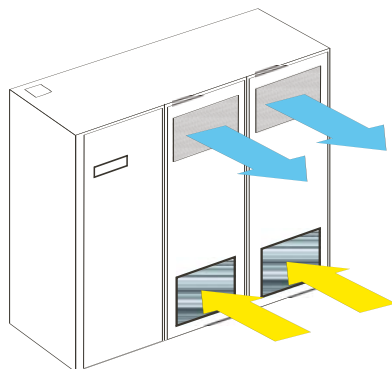
Airflow Pattern S



Airflow Pattern N



Airflow Pattern M



Model Designation Chart

Product Description

EN U G 068 F Z 6 9 E H F S C G K L T Y

SERIES:

EN: Ecosaire EN series

ARRANGEMENT:

U: Downflow (Underfloor)
 W: Downflow (Underfloor) & Front Return
 R: Upflow- Rear return & top ducted supply
 S: Upflow- Rear return & top supply plenum
 N: Upflow- Front return & top ducted supply
 M: Upflow- Front return & top supply plenum

BLOWER/MOTOR TYPE:

G: 560MM EC Blower/Motor
 (STD - 208-230-460/3/60)
 J: 560MM AC Blower/Motor w/VFD
 (STD-573/3/60)

Model:

027 (8 ton)	068 (20 ton)
035 (10 ton)	079 (23 ton)
042 (12 ton)	087 (25 ton)
051 (15 ton)	102 (30 ton)

Cooling Type:

A: Air Cooled (A/C)
 D1: DualCool Air Cooled (D/W)
 D2: DualCool Water Cooled (D/W)
 D3: DualCool Glycol Cooled (D/G)
 F: Free-Cool (F/C)
 G: Glycol Cooled (G/C)
 W: Water Cooled (W/C)
 C: Chilled Water

Compressor Type:

D: Danfoss Scroll
 Q: Bitzer Scroll
 T: Copeland Tandem Scroll
 Z: Copeland Scroll
 V: Danfoss Variable Scroll

Refrigerant:

4: R-407c
 6: R-410a

Voltage:

3: 200/3/50
 5: 208-230/3/60
 6: 380-400/3/50
 8: 575/3/60
 9: 460/3/60

Miscellaneous:

C: Condensate Pump
 D: Hot Gas Bypass
 E: Coil Temperature Sensor
 F: Graphic Controller
 G: RS485 Modbus RTU
 H: PCO Webcard
 I: LONworks Comm. Card
 J: Wall Controller (PGD)
 K: Smoke & Fire Detector
 L: Water Detector (Point Sensor)
 M: Water Detector (Tape Sensor)
 N: Water Coil Solenoid Valve (D1/D2/D3/F)
 O: 2-way Water Reg. Valve (D2/D3/F/G/W)
 P: 3-way Water Reg. Valve (D2/D3/F/G/W)
 Q: 2-way Water Modul. Valve (D2/D3/F/G/W)
 R: 3-way Water Modul. Valve (D2/D3/F/G/W)
 S: Water-Flow Switch
 T: Non-fused Disconnect
 U: Fused Disconnect
 V: Circuit Breaker
 X: Shell & Tube Heat Exchanger
 Y: Adjustable Floor Stand
 Z: Alarm Buzzer & Silence Push Button

Control Type:

0: No Microprocessor
 S: Standard Microprocessor
 T: Wall Thermostat

Filter Section:

F: 30%
 G: 65%

Humidifier:

0: None
 H: 17lb/hr (8kg/h) Electrode Steam Humidifier
 L: Live Steam (Steamgrid)

Heating:

0: None
 E: 2-stage Electric
 F: 3-stage Electric
 G: SCR Electric
 R: Hot-Gas Reheat
 T: Steam
 W: Hot Water

DESCRIPTION

For special applications an "S" is placed in front of the above nomenclature.

All water/glycol and FreeCooled units feature plate heat exchangers as standard. Shell & tube is optional.

Product Description

Unit Nameplate

DESCRIPTION



PRECISION CONTROL AIR CONDITIONER

UNIT MODEL
SERIAL #
TAG
JOB

ELECTRICAL RATING
MCA
MOP

COMPRESSOR
RLA
LRA
QTY

FAN MOTOR
HP
FLA
QTY

ELECTRIC HEATER
KW
AMPERAGE
QTY

HUMIDIFIER
KW
FLA
QTY

REFRIGERANT TYPE
REFRIGERANT
FACTORY CHARGE
DESIGN PRESSURE
HIGH/LOW



COMFORMS TO ANSI/UL STD 1995
CERTIFIED TO STD CAN/CSA-
C22.2 NO. 236

TEL: 1-800-800-1868

TORONTO, MONTREAL

EXAMPLE
Appearance, location, and
quantity of components
may vary.

Before calling for assistance, be sure to have the model, serial, and tag numbers available for the service department.

Be sure the voltage and current ratings of the unit branch circuit match these values.

This is important compressor electrical information for those units so equipped.

This is important blower electrical information.

This is important heater electrical information for those units so equipped.

This is important humidifier electrical information for those units so equipped.

This is important refrigerant information for those units so equipped.

Nameplate specifications supersede any other specifications or statements found in this manual.

Moisture Migration

Building Construction

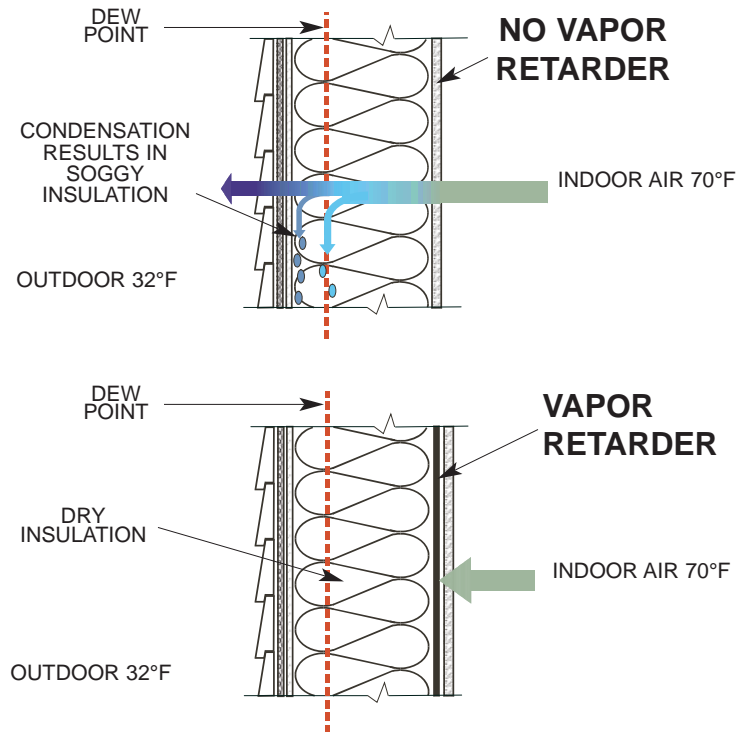
DESCRIPTION

In order to prevent moisture migration, the room (including the ceiling plenum, if any) must have a sealed vapor retarder. Rooms with concrete walls or floor should be painted with a rubber- or plastic-based paint. Doors should seal tightly and must not have grilles in them.

Light fixtures must be selected to prevent overheating, and should not allow room air to escape into the ceiling plenum.

Because of the small number of personnel in a typical computer site, outdoor air should be reduced to less than 5% of the total circulated air. If outdoor air is introduced, it must be filtered. The effect of bringing in outdoor air must be added to the cooling and dehumidification loads.

Measures should be taken to prevent dirt and dust from affecting equipment reliability. Printers, bursters, copy machines and other paper handling equipment should be located in areas removed from disc drives and similar equipment.



Installation

Unpacking and Locating

Ecosaire® Unit

Important!

Inspect your unit immediately for shipping damage. Claims for shipping damage must be made with the shipping company.

Inspect the unit carefully upon arrival.

Notify the carrier immediately if shipping damage is suspected. If internal damage is suspected, indicate "contingent on internal inspection" when signing for the shipment. Keep copies of all documents, including photographs of any damage.

Storage

It is best not to store your Ecosaire® unit for long periods. If it must be stored, it should be stored indoors in a space that is safe from accidental damage or vandalism.

NOTE: Do not stack units.

Where more than one Ecosaire® unit are stored together, maintain proper inventory identification since each Ecosaire® is designed to a particular job specification.

Ecosaire® room units

- must be stored in a clean and dry place
- must not be stacked
- must be stored in an upright position

Lifting

It is recommended that the unit be moved as close as possible to the final position with the skid attached.

Important!

Locate your unit where it will be protected from damage. Allow adequate space for service.

If the room unit is positioned or installed in an area where painting, plastering, etc., are underway, it must be covered with the shipping carton or plastic film in order to keep the filters and internal components clean.

Do not allow water, plaster, concrete, dusts, or other foreign materials to enter any open pipes or tubes.

Do not operate the unit or otherwise allow construction dust to enter the unit. The resulting damage is not covered by the Ecosaire® warranty.

DX units (Cooling Type = A)

The maximum one-way length of tube connecting the Ecosaire unit and the remote condenser is 100 ft. (30 m).

Clearances

Allow clearances as shown below.

Unpacking

On a level surface, remove external crating materials. Remove any fasteners securing the unit to the freight skid.

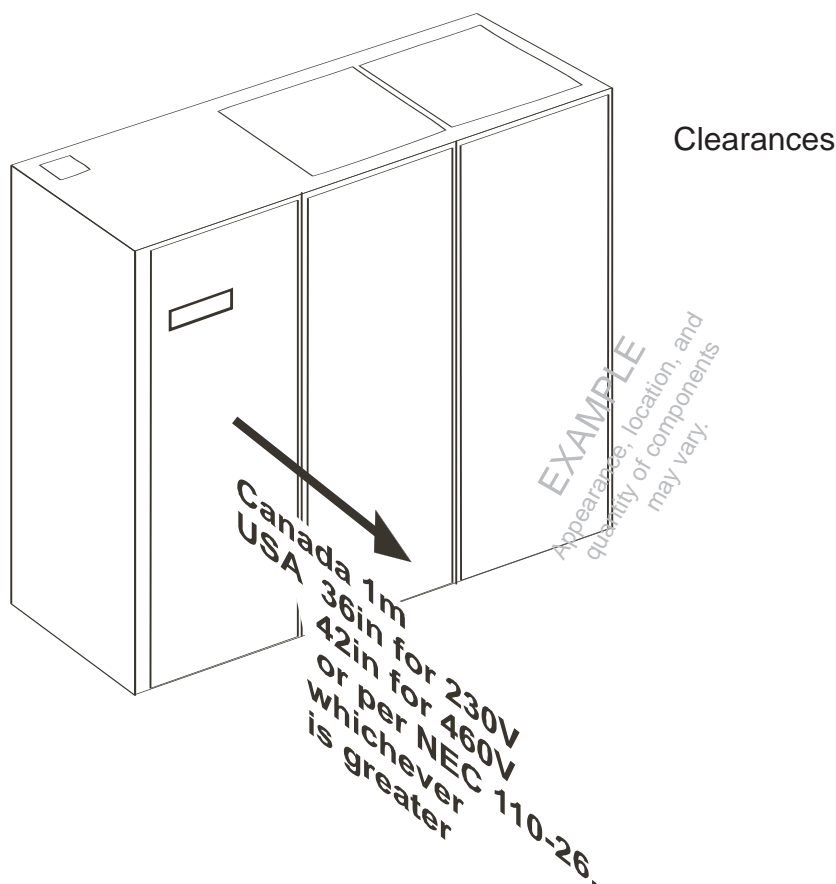
Be sure that the unit is in its final location and will not have to be moved or adjusted before making connections.

Drain Pan

A secondary drain pan is recommended for all overhead installations.

Completing

After the unit is positioned remove any internal shipping braces or pads. Release or remove any blower restraints. Confirm that the blower turns freely. Confirm the blower belt tension. Release or remove any compressor locks or restraints.



Air-Cooled Direct Expansion, Glycol-Cooled Direct Expansion, Air-Cooled DualCool, & Glycol-Cooled DualCool Units Only

Installation

Outdoor Heat Exchanger, Vertical Flow

Unpacking and Locating

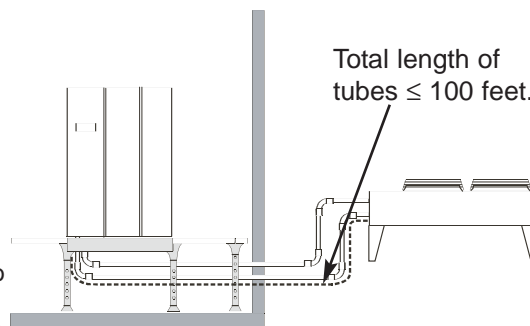
Important! - Inspect your unit immediately for shipping damage. Claims for shipping damage must be made with the shipping company. Notify the carrier immediately if shipping damage is suspected. If internal damage is suspected, indicate "contingent on internal inspection" when signing for the shipment. Keep copies of all documents, including photographs of any damage.

For units with a remote heat exchanger, select a suitable location for the outdoor unit, where it will not be subject to damage. Outdoor condensers (with Ecosaire unit of Cooling Type = A) must have no more than 100 ft. (30 m) of tube (one way) connecting to the Ecosaire unit. Areas subject to heavy snow and ice accumulation should be avoided. Areas subject to public access should be avoided. Locate outdoor units in an area of clean air away from steam, hot air, or fume exhausts.

Units installed on roofs should be mounted on steel supports in accordance with local codes. A concrete pad is sufficient for ground installations.

Provide clearances as shown below. Insulate hot-gas tubes where they might be accidentally touched.

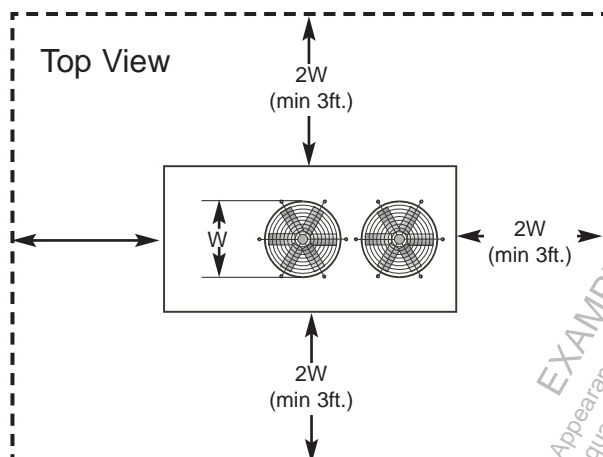
Lifting holes are provided at the top of the support legs. The nuts and bolts securing the unit to the crate are used to mount the lower support leg sections and horizontal braces to the unit. Assemble the outdoor unit according to the instructions provided with it.



INSTALLATION

Allow clear space around the condenser equal to at least twice the diameter of the fan.

Control enclosure end
2W
minimum:
Canada 1m
USA 36 in. for 230V
42 in. for 460V
or per NEC
110-26,
whichever is greater)

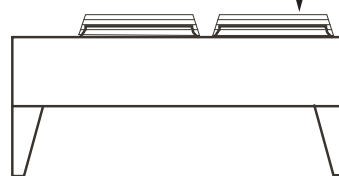


any overhanging obstruction

Allow clear space
above the condenser.

min. 10 ft
(3 m)

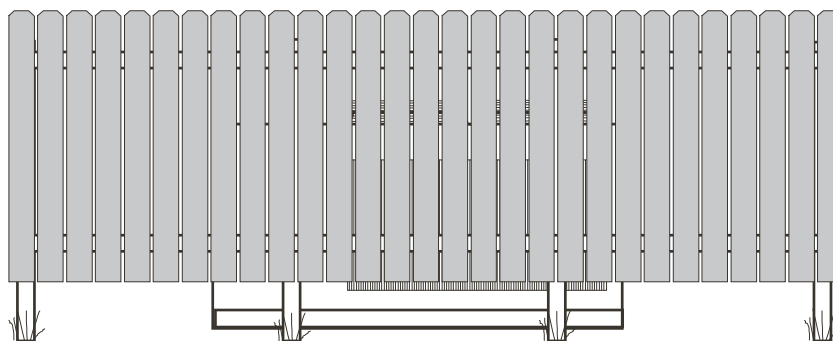
Side View



The outdoor heat exchanger should **not** be enclosed within a solid fence or wall, since such structures prevent adequate air flow. If a fence or wall must be installed, it must be no closer to the condenser than shown above, no higher than 6 ft (2 m) and must not extend lower than 12 inches (30 cm) above grade. Fences lower than 12 inches above grade may cause recirculation of heated air and a corresponding reduction in performance.

Vegetation must be
kept short.

minimum 12 in.
(30 cm)



Data subject to change without notice.

Installation

**Air-Cooled Direct Expansion, Glycol-Cooled Direct Expansion,
Air-Cooled DualCool, & Glycol-Cooled DualCool Units Only**

Unpacking and Locating**Outdoor Heat Exchanger, Horizontal Flow**

Important! - Inspect your unit immediately for shipping damage.
Claims for shipping damage must be made with the shipping company.

NOTE: Horizontal-flow and Vertical-flow Condensers are not interchangeable. The fans of horizontal-flow condensers must not face into the prevailing wind.

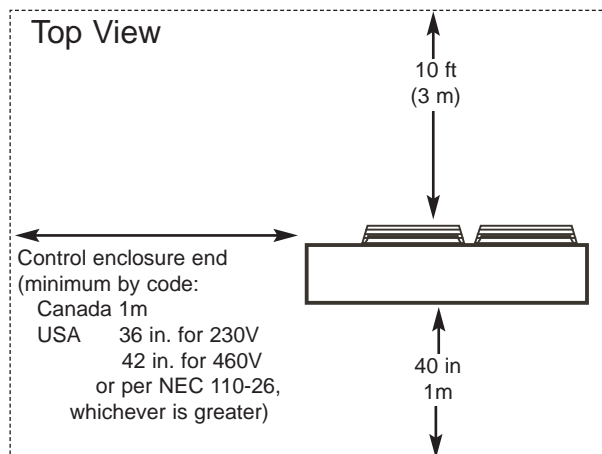
Notify the carrier immediately if shipping damage is suspected. If internal damage is suspected, indicate "contingent on internal inspection" when signing for the shipment. Keep copies of all documents, including photographs of any damage.

For units with a remote heat exchanger, select a suitable location for the outdoor unit, where it will not be subject to damage. Outdoor condensers (with Ecosaire unit of Cooling Type = A) must have no more than 100 ft. (30 m) of tube (one way) connecting to the Ecosaire unit. Areas subject to heavy snow and ice accumulation should be avoided. Areas subject to public access should be avoided. Locate outdoor units in an area of clean air away from steam, hot air, or fume exhausts.

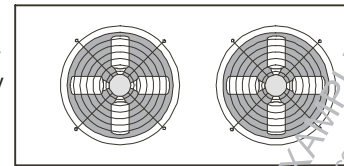
Units installed on roofs should be mounted on steel supports in accordance with local codes. A concrete pad is sufficient for ground installations.

Provide clearances as shown below. Insulate hot-gas tubes where they might be accidentally touched. Assemble the outdoor unit according to the instructions provided with it.

Allow clear space around the condenser equal to at least twice the diameter of the fan.

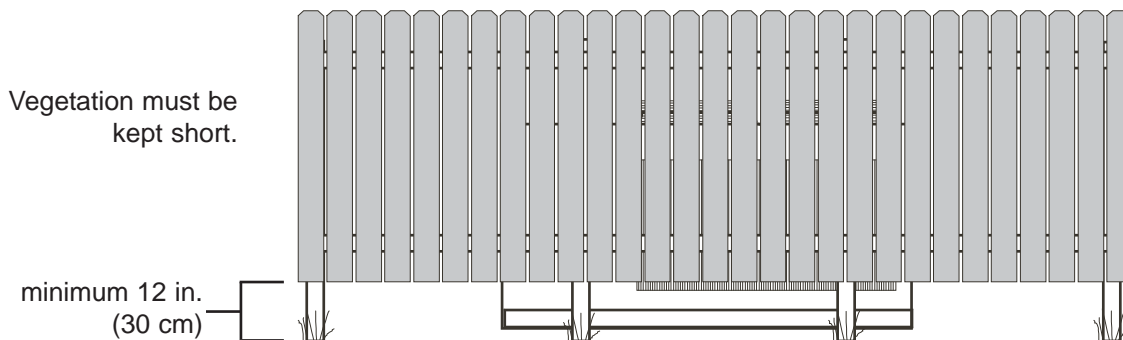


Control enclosure end
2W
minimum:
Canada 1m
USA 36 in. for 230V
42 in. for 460V
or per NEC
110-26,
whichever is greater)



EXAMPLE
Appearance, location, and
quantity of components
may vary.

The outdoor heat exchanger should **not** be enclosed within a solid fence or wall, since such structures prevent adequate air flow. If a fence or wall must be installed, it must be no higher than 6 ft (2 m), no closer to the condenser than shown above, and must not extend lower than 12 inches (30 cm) above grade. Fences lower than 12 inches above grade may cause recirculation of heated air and a corresponding reduction in performance.



Important!

Poor duct design can reduce the amount of air delivered.

Duct design must conform to the ASHRAE low-pressure, low-velocity duct standards. If there is a question concerning duct design, sizing, choice of materials, air velocities, or static pressures contact Ecosaire for assistance.

Air velocities should be kept low to allow good air movement and low noise. Higher static pressures result in higher power requirements and increased noise. The maximum external static pressure is

specified for each unit. Static pressures higher than specified may reduce air flow below the minimum acceptable value.

Select grilles, registers, and diffusers for low static pressure loss, required throw, and specified air flow. Choose hardware resistant to deterioration due to chemicals in the pool enclosure.

Δ Duct material

The Ecosaire® unit is suitable for use with any duct material, subject to the requirements of this section and standard practice. Standard galvanized steel duct is recommended.

All elbows must be equipped with

aerofoil turning vanes and acoustic insulation.

Where located in areas below room temperature, ductwork must be insulated on the outside with 2 inch fiberglass wrap with FSK facing. All ducts must be designed to be dry. All seams must be sealed.

Δ Flexible duct connectors

Use flexible duct connectors to attach the ducts to the Ecosaire® unit. Install the flexible duct in such a way as to prevent mechanical loads from being applied to the unit, and to prevent unit vibration from being transmitted to the ductwork.

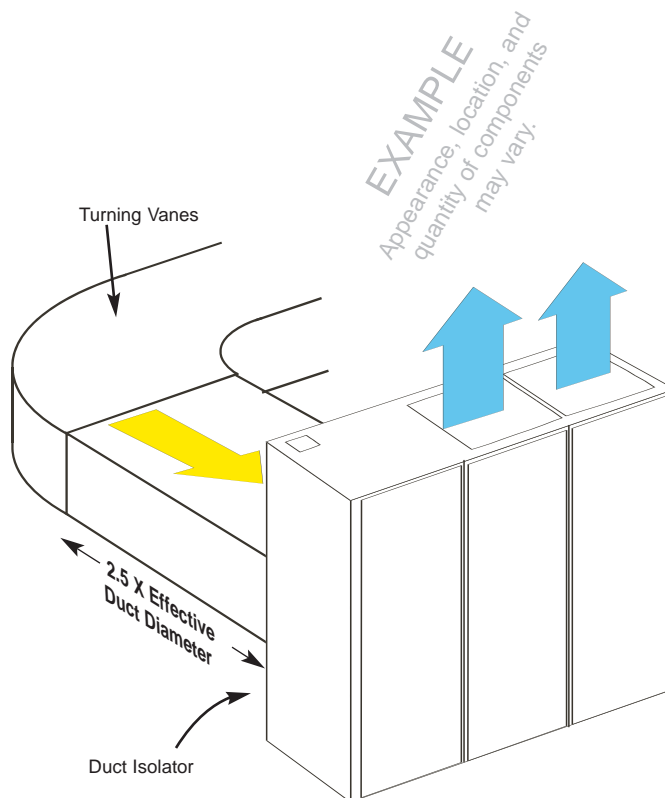
Return Duct

Poor return-duct design can prevent proper dehumidification by causing uneven air distribution over the evaporator. Reduced capacity and/or equipment damage may result.

It is very important to allow straight length in the return duct as shown. There should be no elbows, transitions, offsets, or other flow interruptions closer than 2.5 times the effective width of the return duct.

If turning vanes are not used in elbows, allow a length of straight duct equal to at least 5 times the effective width of the return duct.

The straight length is not required for units with top or bottom return air connections.



Installation

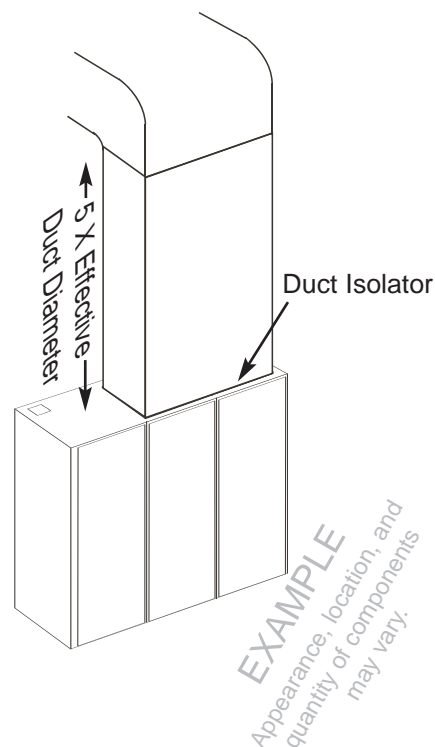
Ductwork

Unit-duct Connection

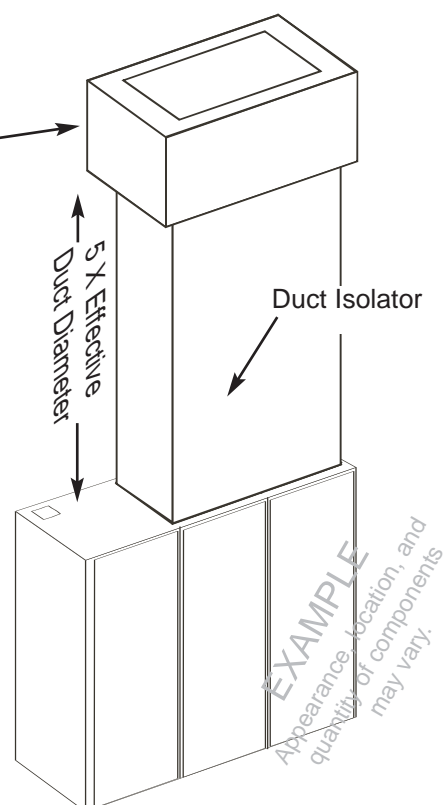
Supply Duct

Refer to AMCA¹ guidelines for system effect considerations.

Some installations may use supply duct. To prevent unexpected external energy loss, allow a section of straight duct with a length five times the blower width leaving the ECOSaire®. There should be no elbows, transitions, offsets, duct heaters, or other flow interruptions closer than 5 X the width of the blower.



Some installations may have external duct heaters (by others). To prevent heater failures and hot spots, locate the heater at least $5 \times$ the duct width away from the blower, or any air flow interruptions such as elbows and transitions.

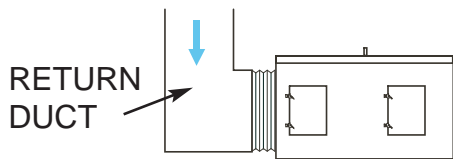


1. Air Movement and Control Association International, Inc.
30 West University Drive
Arlington Heights, Illinois 60004-1893

Standard Practice

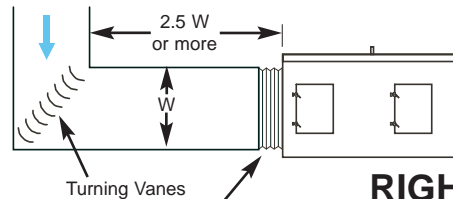
Ductwork

Installation



WRONG

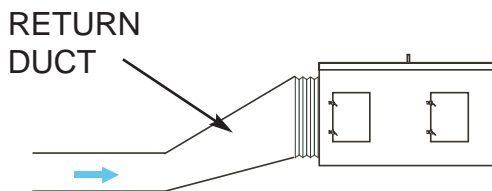
The air will not be evenly distributed over the evaporator.



RIGHT

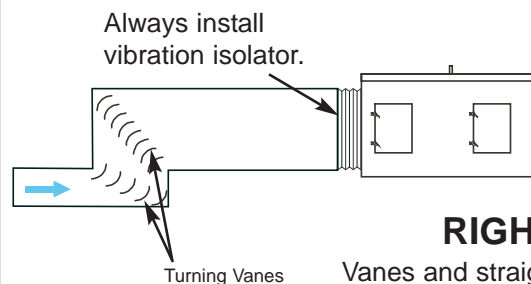
Always install vibration isolator.

Vanes and straight length allow air to flow evenly.



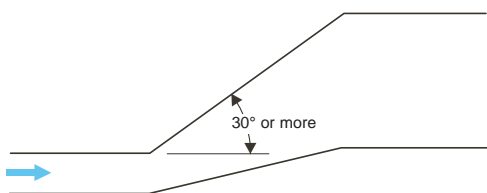
WRONG

The air will not be evenly distributed over the evaporator.



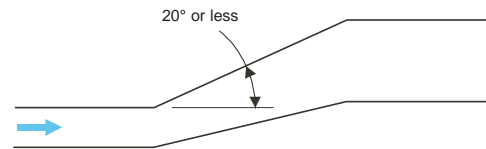
RIGHT

Vanes and straight length allow air to flow evenly.



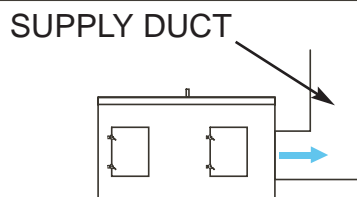
WRONG

Air cannot follow this steep angle.



RIGHT

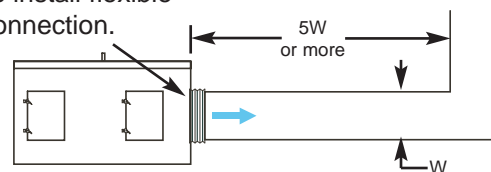
Air can follow this transition.



WRONG

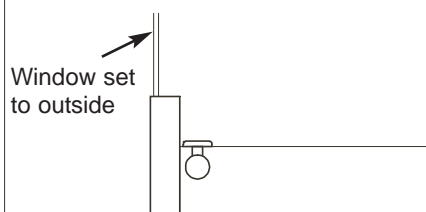
Reduction of airflow will result from the elbow being too close.

Always install flexible duct connection.



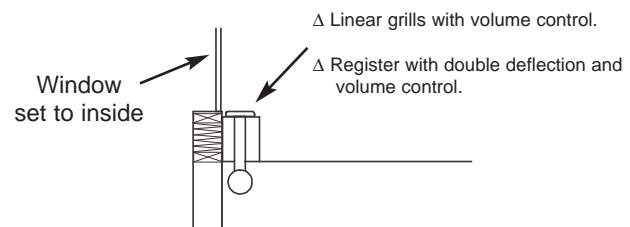
RIGHT

Sufficient straight length allows proper air flow. Flexible duct connection absorbs vibration.



WRONG

Air cannot reach the lower part of the window.



RIGHT

Dry air reaches all the window.

Installation

Piping

Humidifier

For installation connections for the humidifier, please refer to the Carel humidifier manual included with this manual.

INSTALLATION

Condensate

Piping

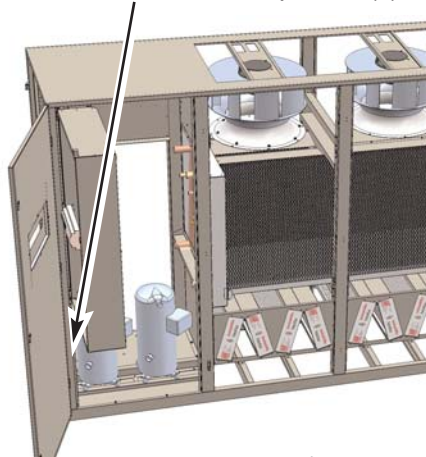
Installation

IMPORTANT!

The condensate drain must be installed and the P-trap must be filled before starting the unit.

Location

The condensate drain is a 3/4" FPT connection in the left bottom of the unit, behind the compressor(s).



EXAMPLE
Appearance, location, and
quantity of components
may vary.

Select materials

Ordinary schedule 40 PVC or ABS plastic pipe is adequate in most cases. Do not reduce the pipe size below that provided on the unit.

Install P-trap

If there is no condensate pump, a drain trap must be installed. The trap must be at least two (2) inches deep to maintain a water seal. For long runs or possible unintentional traps, a vacuum breaker on the outlet side of the P-trap may be necessary. Follow standard procedures.

Route drain pipe

Route the drain pipe so that the only trap is the P-trap. In horizontal runs, slope the pipe downward at least 1/4" per foot (2 cm per meter).

Deliver the condensate to a suitable point. Check local codes for allowable procedures.

Fill P-trap

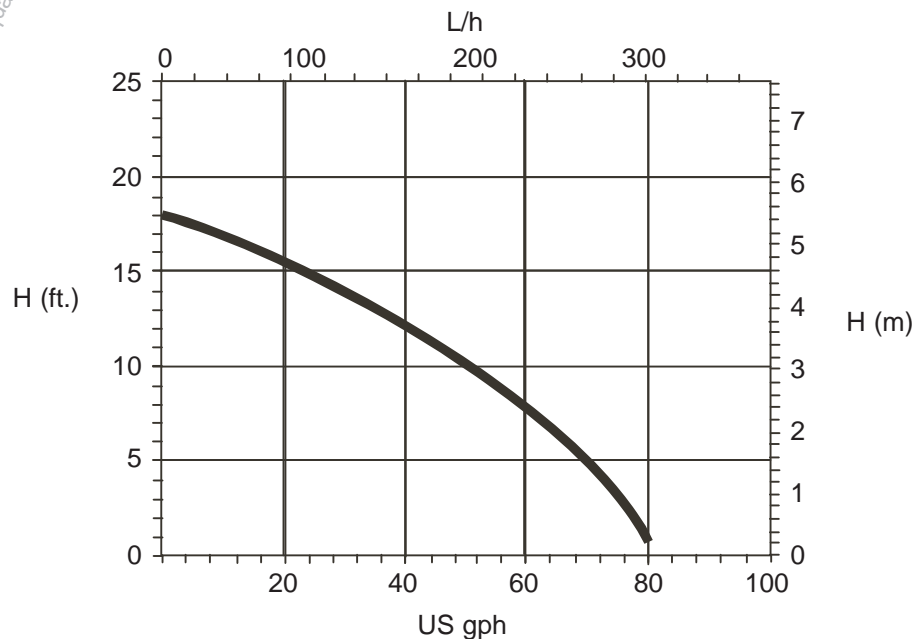
To prevent air from being drawn through the condensate drain pipe, the P-trap must be filled with water before starting the unit blowers. Failure to do this will cause the drain pan to overflow during operation.

Condensate pump

Condensate pumps are standard, with the curve shown below.

If the condensate is to be delivered to a pipe that might be pressurized above atmospheric pressure, install a check valve to prevent backflow.

**Condensate Pump
Average Curve**



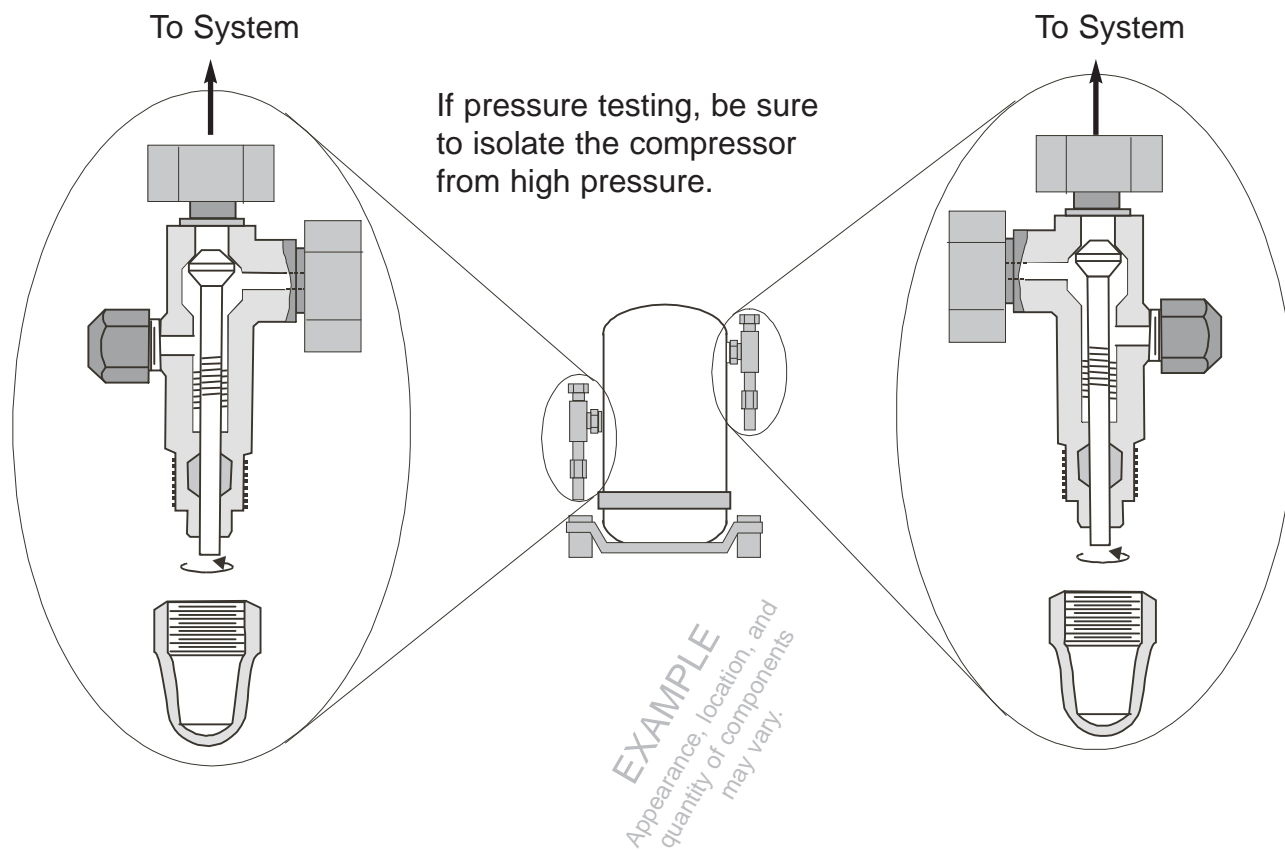
Installation

Piping

Refrigerant

Note below the operation of rotalock service valves, as found on Ecosaire® compressors and receivers.

INSTALLATION



Refrigerant

Piping

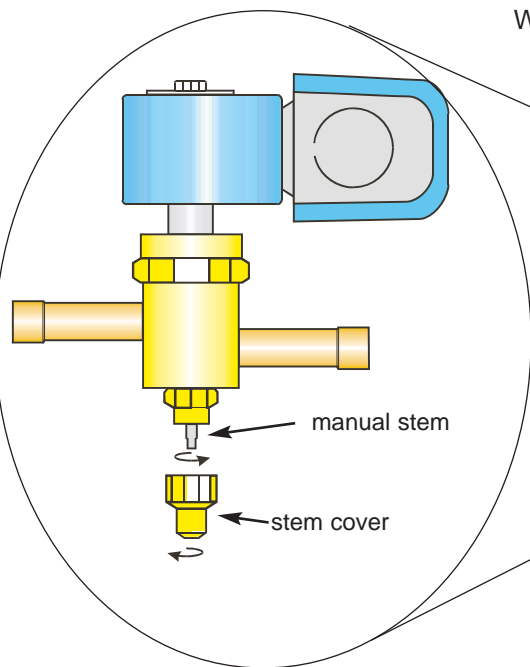
Installation

Air-Cooled Direct Expansion and DualCool Units Only

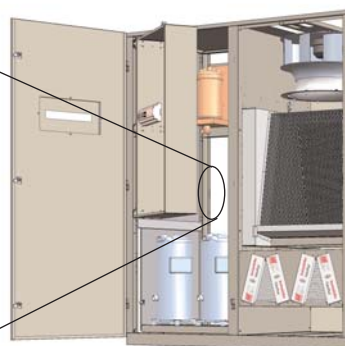
When shipped, remote air-cooled units contain a refrigerant holding charge. **The holding charge must be reclaimed before removing the caps on the remote-condenser tube stubs. Failure to reclaim the holding charge can lead to property damage and/or personal injury.**

Locate the refrigerant liquid-line solenoid valves (usually two per circuit). Some units may be equipped with manual-lift valves. Where this is the case:

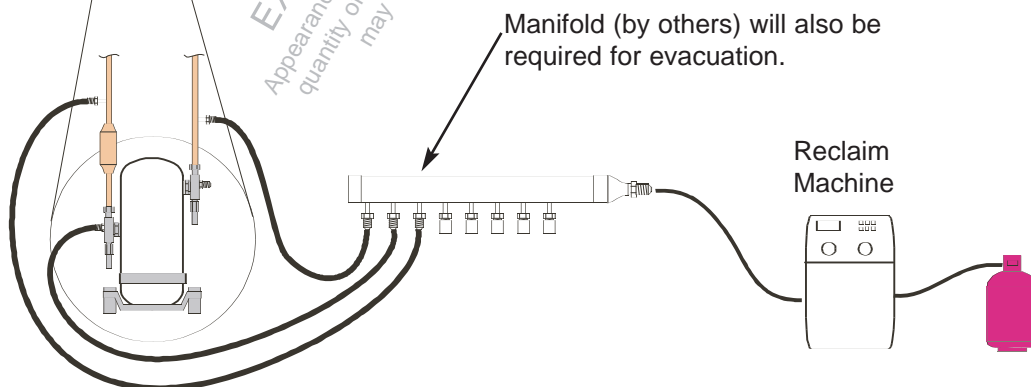
1. Using two wrenches, remove the manual-stem covers.
2. Turn the manual stems clockwise to open the valves.



EXAMPLE
Appearance, location, and quantity of components may vary.



EXAMPLE
Appearance, location, and quantity of components may vary.



Installation

Piping

Refrigerant

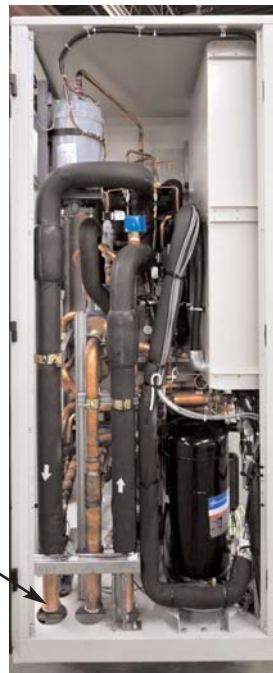
Air-Cooled and DualCool units Only

NOTE: After the following step, installation must proceed immediately and rapidly to the evacuation stage, since the filter-drier will be exposed to atmosphere.

Close the rotalock valves and remove the reclaim equipment. Remove the condenser tube-stub caps with heat or with a tube cutter. To prevent the introduction of foreign materials into the refrigeration system, do not use a saw.

EXAMPLE
Appearance, location, and
quantity of components
may vary.

Remote-condenser connections. Use
care to prevent cross-connections.



Air-Cooled Direct-Expansion and Air-Cooled DualCool Units Only

Equivalent length of tube, ft., one way	R-410a condenser-connecting tube sizes, inches O.D.															
	EN-027A		EN-035A		EN-042A		EN-051A		EN-068A		EN-079A		EN-087A		EN-102A	
	Gas	Liq.	Gas	Liq.	Gas	Liq.	Gas	Liq.	Gas	Liq.	Gas	Liq.	Gas	Liq.	Gas	Liq.
20	7/8	5/8	7/8	5/8	1 1/8	5/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	1 1/8	1 3/8	1 1/8
30	7/8	5/8	7/8	5/8	1 1/8	3/4	1 3/8	7/8	1 3/8	7/8	1 3/8	5/8	1 3/8	1 1/8	1 3/8	1 1/8
40	7/8	5/8	7/8	5/8	1 1/8	3/4	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	1 1/8	1 3/8	1 1/8
50	7/8	5/8	7/8	5/8	1 1/8	3/4	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	1 1/8	1 3/8	1 1/8
75	7/8	5/8	1 1/8	5/8	1 1/8	3/4	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	1 1/8	1 3/8	1 1/8
100	7/8	5/8	1 1/8	3/4	1 1/8	3/4	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	1 1/8	1 5/8	1 1/8
125	1 1/8	3/4	1 1/8	3/4	1 1/8	3/4	1 3/8	7/8	1 3/8	7/8	1 3/8	1 1/8	1 5/8	1 1/8	1 5/8	1 1/8
150	1 1/8	7/8	1 1/8	3/4	1 1/8	3/4	1 3/8	7/8	1 3/8	7/8	1 3/8	1 1/8	1 5/8	1 1/8	1 5/8	1 1/8

NOTE: Long indoor tube runs may vibrate and may thus transfer noise to the structure. Discharge mufflers (by others) on hot-gas lines may be necessary to reduce such noise. Where noise is objectionable, tubes should be supported by vibration-damping clamps (by others) or other suitable devices.

Liquid tubes may sweat. Insulate and seal as necessary.

Installation

Piping

Refrigerant Tube

Air-Cooled Direct-Expansion and Air-Cooled DualCool Units Only

IMPORTANT:

Cut tubes as necessary using a tube-cutter only. DO NOT use a saw.

Never apply heat to a refrigerant line until all pressure has been released - unsafe pressures could result, causing violent explosion and serious personal injury or death. Be sure the area is well ventilated.

Air-cooled systems must be installed by qualified refrigeration technicians, using industry-standard practices.

Dectron, Inc. assumes no responsibility for improper installations or for the results of failure to follow instructions in this manual.

IMPORTANT:

The total length of tube one way must not be greater than 100 ft. (30 m). The total equivalent length must not be greater than 150 ft. (45 m). The remote condenser must not be located below the Ecosaire® unit.

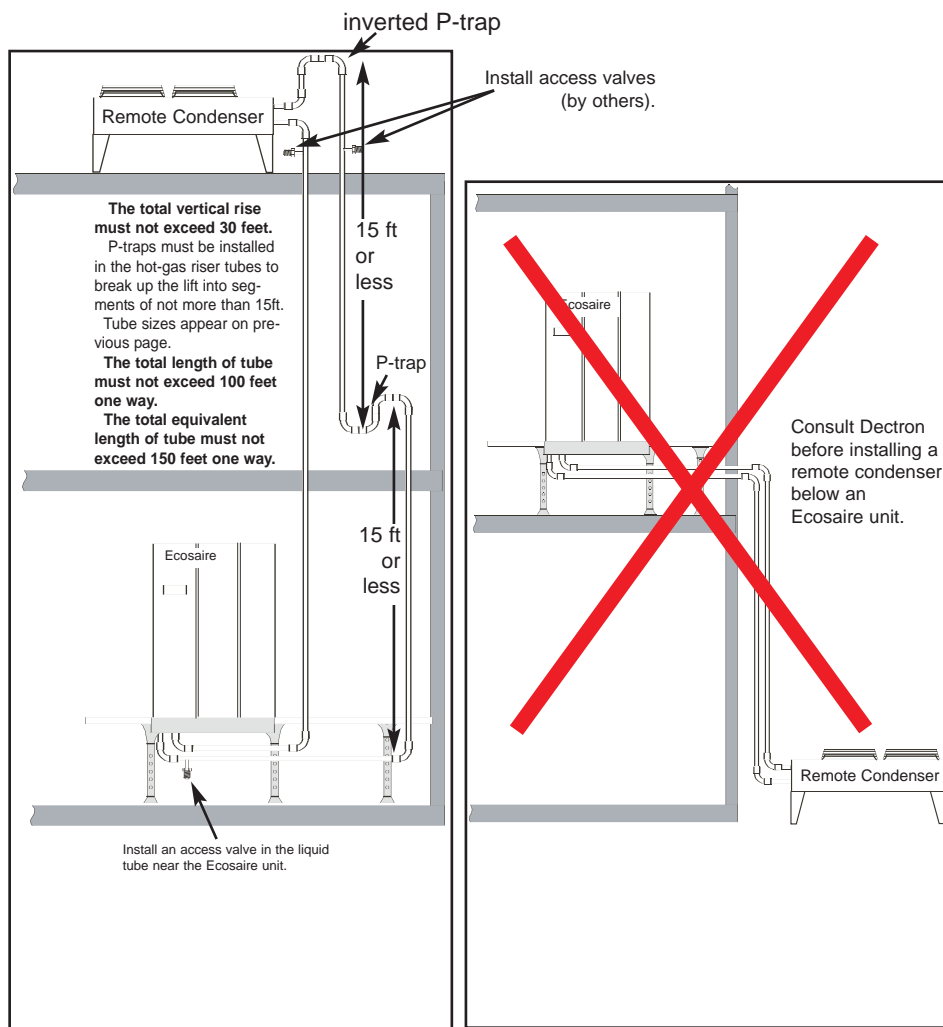
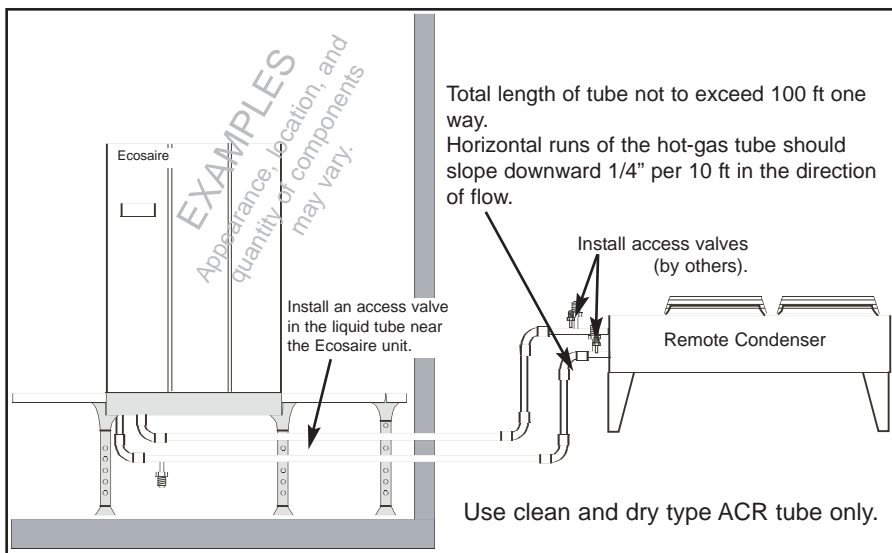
IMPORTANT:

Never allow dirt or other foreign materials to enter the remote condenser or the tubes connecting it to the Ecosaire® unit. Foreign material may damage valves and other components.

If the inside of the tubes is contaminated with dirt, oil, sludge, rust, or other materials, then they must be thoroughly cleaned.

IMPORTANT:

Never allow liquid water to enter the remote condenser or the tubes connecting it. Water must be removed from the remote condenser and the tubes that connect it to the Ecosaire®. Evacuation will take much longer if liquid water is present.



Air-Cooled Direct-Expansion and Air-Cooled DualCool Units Only

For options, see **Product Description - Model Designation Chart**.

Note: Water- and Glycol-cooled units are shipped with a full refrigerant charge.

The necessary refrigerant charge is made up of three parts - that required to fill the unit, that required to fill the liquid line, and that required to fill the remote condenser.

Ecosaire Unit (R-410a lb. per circuit)		
Model		
EN-027	3.7	= _____
EN-035	4.8	= _____
EN-042	4.8	= _____
EN-051	4.8	= _____
EN-068	7.4	= _____
EN-079	7.4	= _____
EN-087	7.4	= _____
EN-102	9.9	= _____

Liquid Line (R-410a lb. per circuit)			
O.D. (in.)	lb./ (ft.)	length (ft.)	
5/8	0.126	X _____	= _____ lbs.
3/4	0.185	X _____	= _____ lbs.
7/8	0.259	X _____	= _____ lbs.
1 1/8	0.441	X _____	= _____ lbs.

Condenser (lb.)		
KMG041	21	= _____
KMG051	31	= _____
KMG061	33	= _____
KMG075	48	= _____
KMG085	66	= _____
KVG085	38	= _____
KVG096	38	= _____
KVG106	57	= _____
KVG116	57	= _____
KVG126	76	= _____
KVG160	85	= _____
KVG181	112	= _____
KVG208	112	= _____
KVG239	150	= _____
KVG253	150	= _____
KVG321	170	= _____

 + _____
 + _____

 Total _____ ← Add this much R-410a (by others).
 Copy this amount into BOX A on the following page.

Example:

An EN-027A has a KMG041 remote condenser. They are connected with 60 feet of 5/8" O.D. liquid line. The required amount of R-410a is
 $7.4 \text{ lb} + (0.126 \text{ lb/ft} \times 60 \text{ ft}) + 21 \text{ lb} = 36 \text{ lb}.$

Installation

Piping

Calculate Oil Charge

Air-Cooled Direct-Expansion and Air-Cooled DualCool Units Only

BOX A

 pounds of refrigerant

Some installations may require the addition of extra refrigeration oil.

1. Note the compressor model from the compressor nameplate. If it is not a Copeland brand, please contact Ecosaire.
2. Note the type of oil to be added from the compressor nameplate. Copy this type into BOX C on page 32.
3. Add 1 fluid ounce of oil for every 5 pounds of refrigerant over 20 pounds.

BOX A1

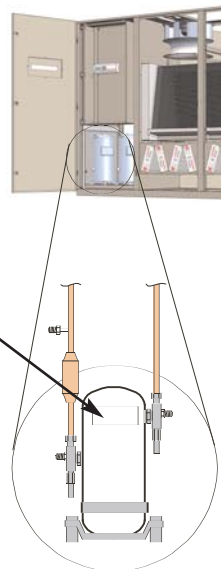
BOX A - 20 lb =

BOX B

(BOX A1) / 5 lb =

Prepare to add this many ounces of the type of oil specified on the compressor nameplate.

Copy this amount into BOX B on page 32.



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Installation

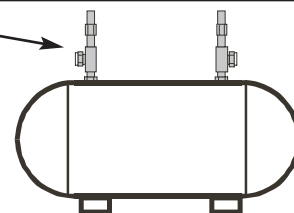
Piping

Refrigerant-Tube Joining

Air-Cooled Direct-Expansion and Air-Cooled DualCool Units Only

After eliminating all leaks, locate the refrigerant receiver in the remote condenser unit. Open the receiver isolation valves (if any).

Open the compressor(s) rotalock valves to the access (middle) position. The Ecosaire® unit, condenser, and tubes must be evacuated to a pressure below 500 microns of mercury as measured by an electronic vacuum gauge. **Compound gauges as found on refrigeration manifolds are not adequate.**

**IMPORTANT!**

Under no circumstances use the compressor as a vacuum pump or apply power to a compressor under vacuum. Damage to the motor windings will result.

Connect a good set of refrigeration service gauges, an electronic micron-level vacuum gauge, and a vacuum pump as shown below. Use core-removal adapters to remove the cores from Schraeder-type access valves.

To insure a correct vacuum reading, install the electronic vacuum gauge far away from the vacuum pump or use a reliable vacuum valve to isolate the gauge and system from the pump while reading the vacuum.

Colder ambient temperatures require longer evacuation times. Allow enough time at low pressures to remove any water from the tubes. The triple-evacuation method can be helpful.

After proper evacuation, close the vacuum pump valve and break the vacuum with vapor refrigerant until a positive pressure is reached.

Close the compressor rotalock valves.

Continue adding the specified weight and type of refrigerant (by others), through the condenser access valve, until the total amount shown in BOX A has been added.

Add the amount and type of oil shown in BOX B and BOX C.

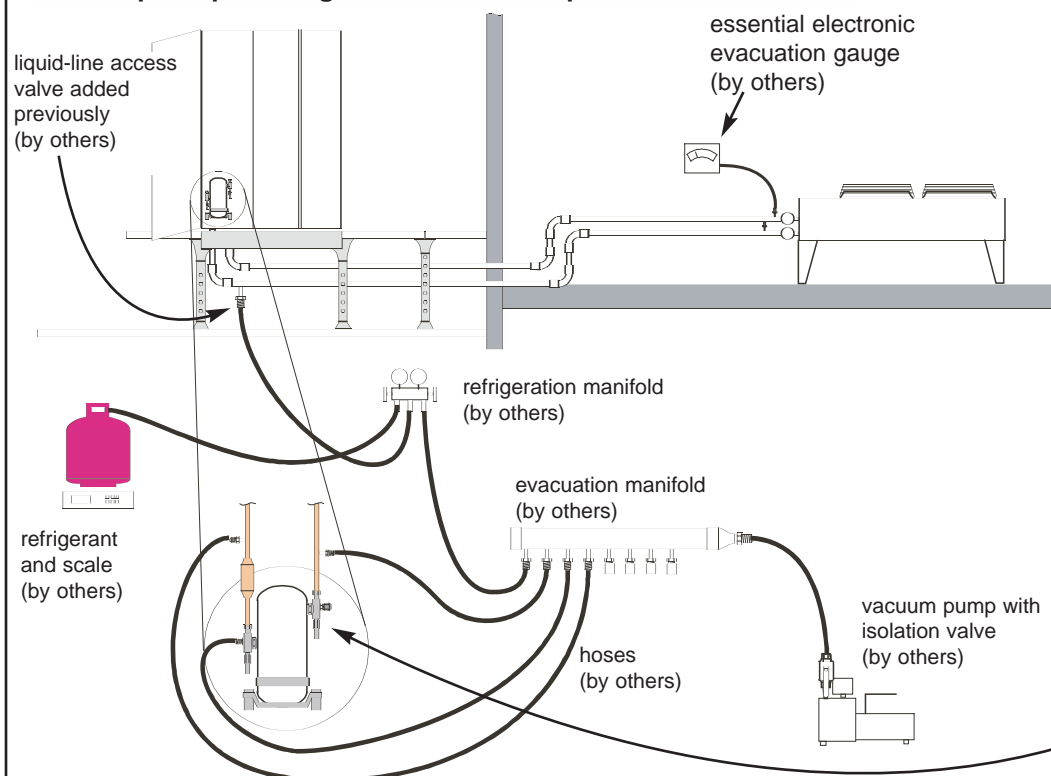
Replace the access-valve cores and remove the adapters.

DO NOT put liquid refrigerant into the low-pressure access valve.

BOX A

BOX B

BOX C



EXAMPLE
Appearance, location, and quantity of components may vary.

Open compressor rotalock valves to access position during evacuation.



Piping

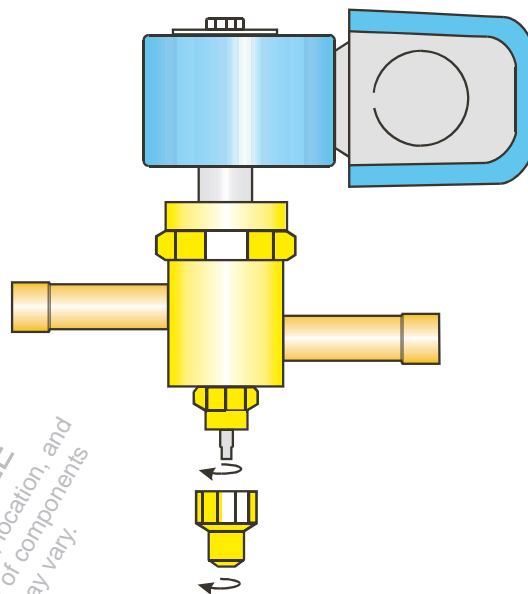
Installation

Air-Cooled Direct-Expansion and Air-Cooled DualCool Units Only

Each circuit of an Ecosaire unit may have two liquid-line solenoid valves. Release the liquid-line solenoid valve from the locked-open position by turning the manual stem counter-clockwise all the way.

Replace and tighten the stem cap.

EXAMPLE
Appearance, location, and
quantity of components
may vary.



INSTALLATION

Installation

Piping

Water

Water-Cooled Direct-Expansion and Water-Cooled DualCool Units Only

IMPORTANT:

Contact the factory before using a flow rate or temperature outside the ranges in the chart below.

IMPORTANT:

Never allow dirt or other foreign materials to enter the tubes connecting to the Ecosaire® unit. Foreign material may cause damage to valves and other components.

If the inside of the tube is contaminated with dirt, oil, sludge, rust, or other materials, then the pipes must be thoroughly cleaned.

Where connection must be made to metal tube other than copper tube, install a dielectric union between the different tubes to reduce corrosion.

If tubes are silver-soldered, the inside of the tube **must be protected from oxidation by flooding the tube with an inert gas such as nitrogen, argon, or carbon dioxide.** Silver soldering copper tubes with air inside will produce a flaky copper oxide scale that

can contaminate the system and damage components.

If flux must be used, use only enough flux to solder. Excess flux can contaminate the heat transfer fluid.

IMPORTANT:

Constant water flow is essential. All pumps, cooling towers, fans, etc., involved in cooling the water must be enabled whenever the Ecosaire® unit is operational. Do not allow a timer or other device to inhibit operation at any time the Ecosaire® unit is operational.

IMPORTANT:

Cooling water must be protected from freezing if the water flow could be interrupted during low ambient temperatures.

Water-Pressure Switch

The flow-pressure switch must be adjusted at installation. Adjust the switch to close as the flow rate approaches normal and to break as the flow rate decreases to less than 1/2 of normal.

Condenser water pipes must be sized to deliver the required condenser water flow. Pipe size is determined by the available water pressure, pressure drop within the pipe and unit, length of run, maximum velocity, maximum water temperature and flow requirements. The table below lists the flow requirements over a 65°F to 85°F temperature range.

Connection sizes and locations are shown on the unit dimensional drawings.

The inlet header is connected to the water regulating valves which feed the top of the condensers. The outlet header connects to the bottom of the condensers.

To prevent condensation on the pipes, insulate them if the water temperature is likely to drop below room-air dew point.

Model

		EN-027W	EN-035W	EN-042W	EN-051W	EN-068W	EN-079W	EN-087W	EN-102W
85°F (29°C) Entering Water Temp.	Flow (GPM)	26.0	34.0	44.0	54.0	56.0	66.4	66.4	72.4
	Pressure Drop (ft.W.C.)	8.5	14.7	9.4	14.3	7.6	10.6	10.6	7.8
	Pressure Drop (PSI)	3.7	6.4	4.1	6.2	3.3	4.6	4.6	3.4
	Flow (l/min)	98	129	167	204	219	251	251	274
	Pressure Drop (kPa)	25.5	44.1	28.3	42.7	22.8	31.7	31.7	23.4
75°F (23°C) Entering Water Temp.	Flow (GPM)	16.6	21.0	27.0	32.0	32.6	38.0	38.0	44.0
	Pressure Drop (ft.W.C.)	5.3	8.3	4.6	6.7	2.5	3.7	3.7	3.0
	Pressure Drop (PSI)	2.3	3.6	2.0	2.9	1.1	1.6	1.6	1.3
	Flow (l/min)	63	80	102	121	123	144	144	167
	Pressure Drop (kPa)	15.9	24.8	13.8	20.0	7.6	11.0	11.0	9.0

Glycol

Piping

Installation

Glycol-Cooled Direct-Expansion, Glycol-Cooled DualCool, & FreeCool Units Only

On the remote DryCooler, mount the pump to its mounting plate and mount the assembly between the cooler legs.

For units with brazed-plate condensers, install a 16-20 mesh strainer in the fluid-inlet tube nearest the unit.

An installer trained in the application of closed-loop systems should perform glycol-pipe size selection. Improper pump and/or glycol pipe selection can result in excessive noise, inadequate solution flow or premature pipe and pump impeller erosion.

Glycol piping should be installed according to standard practice. The factory-supplied expansion tank should be installed upstream of the pump. The air purger and automatic float-type air vent should be installed downstream of the pump - ideally at the system high point. If not, manual or automatic air vents must be installed at the high point along with the fill funnel. Air vents must also be

installed anywhere air can be trapped in the system. All horizontal piping runs should be pitched upward in the direction of flow to prevent trapping air.

Insulate the pipes where they run through conditioned spaces if the water temperature is likely to drop below room-air dew point.

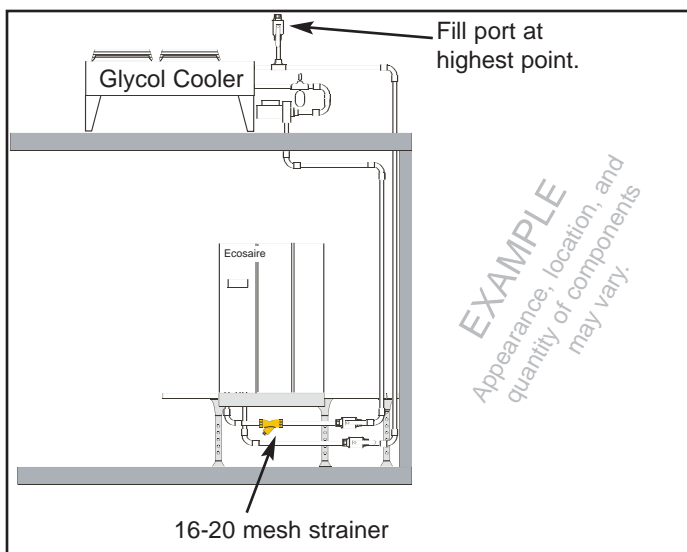
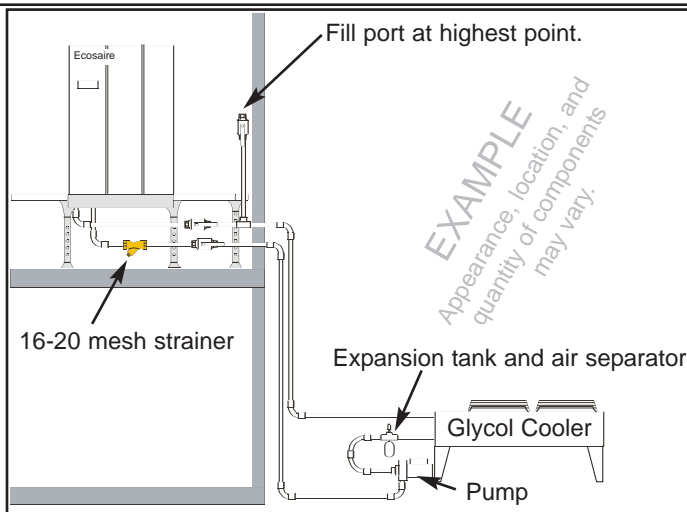
Install temperature gauges (or wells), pressure gauges, valves, and pipe unions according to the factory piping diagrams.

Install a fill port at the highest point of the system. To insure proper glycol/water ratio, never use automatic fillers.

Where copper tubing (use Type L only) is used, joints should be hard soldered.

The inlet header is connected to the top of the condensers and the outlet header to the bottom.

FreeCool units include head-pressure-controlled glycol regulating valves at the inlet connections.



(40% Glycol, 95°F)	Model							
	EN-027F	EN-035F	EN-042F	EN-051F	EN-068F	EN-079F	EN-087F	EN-102F
Flow Rate (GPM)	34.8	40.9	53.8	60.8	72.5	81.4	91.3	107.8
Flow Rate (l/m)	132	155	204	230	274	308	346	408
Ecosaire unit Std. P.D. ¹ (PSI)	6.8	7.3	6.9	7.4	7.1	7.2	7.5	7.7
Ecosaire unit Opt. P.D. ² (PSI)	6.7	11.8	7.0	3.9	6.3	3.1	3.1	8.8
Glycol Cooler P.D. (PSI)	6.4	3.7	3.7	2.5	9.6	8.8	4.2	3.9
Pump HP	2	2	3	3	3	5	5	5
Pump Head (PSIG)	43.5	42.6	43.5	42.6	44.8	43.5	42.6	43.5
Available Head (PSIG)	30.3	31.6	32.9	32.7	28.1	27.5	30.9	31.9

1. with standard brazed-plate heat exchanger

2. with optional shell & tube heat exchanger

Data subject to change without notice.

Installation

Piping

Glycol Filling

Glycol-Cooled Direct-Expansion, Glycol-Cooled DualCool, & FreeCool Units Only

After all piping connections have been completed, the system should be leak tested by pressurizing it with air to approximately 50 psig. Check each joint with soap solution or perform a pressure-drop vs. time test. After testing, the system can be charged with the glycol/water mixture.

First, determine the proper water-to-glycol mixture to provide adequate freeze protection in your area. This may already have been determined by a consulting engineer. Do not exceed the recommended glycol concentration for your area since increased concentrations reduce heat exchange efficiency. These concentrations and corresponding freeze temperatures are listed in the table included here.

IMPORTANT!

Use only an inhibited ethylene glycol suitable for HVAC applications, such as Dowtherm SR-1 or equivalent. DO NOT use automotive antifreeze since it may

damage components.

All glycol-cooled and FreeCool data is based on forty-percent glycol by volume.

If possible use a pre-mixed glycol/water solution. Where this is not possible, mix the solution by volume in a clean non-galvanized container.

Open the fill valve and all air vents, including the petcocks at the top of the **FreeCool coils** on the right-hand side of the unit.

The pipe plugs on the pump impeller housing and at the top of the room unit inlet and outlet headers should be carefully loosened to permit air to escape.

Do not remove the plugs since they can be difficult to replace once glycol reaches the port. The core of the access valve on the glycol-cooler inlet header must be held open or temporarily removed.

Pour the glycol mixture into the system fill port until full.

GLYCOL SOLUTIONS

Percent Ethylene Glycol	Solution Freezing Point (°F)	Gallons of Water Per Each Gallon of Ethylene Glycol
0	32	All Water
10	25	9.0
20	16	4.0
30	4	2.3
40	-11	1.5
50	-33	1.0

INTERNAL VOLUMES (GALLONS)

Glycol-Cooled Model No.	EN-027G	EN-035G	EN-042G	EN-051G	EN-068G	EN-079G	EN-087G	EN-102G
Brazed-Plate Cond.	0.3	0.3	0.4	0.4	0.4	0.4	0.7	0.9
Shell & Tube Cond.	1.2	1.2	1.6	1.6	1.6	1.6	2.2	3.6
Glycol Cooler Model @ 95°F Internal Volume	GVD122F-F14 5.8	GVD123F-F21 8.8	GVD124E-F29 11.7	GVD133D-F43 12.9	GVD133E-E26 15.6	GVD134C-F29 17.2	GVD143E-F43 17.1	GVD224E-F58 23.3

INTERNAL VOLUMES (GALLONS)

FreeCool Model No.	EN-027F	EN-035F	EN-042F	EN-051F	EN-068F	EN-079F	EN-087F	EN-102F
Brazed-Plate Cond.	5.5	7.0	7.1	7.1	10.7	10.7	11.0	11.2
Shell & Tube Cond.	6.4	7.9	8.3	8.3	11.9	11.9	12.5	13.9
Glycol Cooler Model @ 95°F Internal Volume	GVD122F-F14 5.8	GVD123F-F21 8.8	GVD124E-F29 11.7	GVD133D-F43 12.9	GVD133E-E26 15.6	GVD134C-F29 17.2	GVD143E-F43 17.1	GVD224E-F58 23.3

Data subject to change without notice.

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Installation

Wiring

Power

IMPORTANT!

Before working on this or any electrical equipment, disconnect all electrical power. Failure to do so may result in serious personal injury or death due to accidental electrical shock.

The branch-circuit conductors should be brought through the unit cabinet to the high-voltage terminal strip or factory-mounted disconnect switch.

Wiring for the unit and remote heat exchanger (if any) should comply with applicable codes.

Important!

Always cover the electrical components with plastic sheet before drilling or sawing the electrical enclosure. Do not allow metal chips to fall into the enclosure.

Important!

Use only copper conductors to connect the unit. The power input lugs are not sized for use with other conductors. **THE USE OF OTHER THAN COPPER CONDUCTORS WILL VOID THE EQUIPMENT WARRANTY.** For

units with factory-supplied disconnects, follow instructions inside the disconnect.

Important!

Ground the unit using the grounding lug provided.

Important!

For

- Air-Cooled Direct Expansion,
- Glycol-Cooled Direct-Expansion,
- Air-Cooled DualCool,
- Glycol-Cooled DualCool, and
- FreeCool units

refer to the remote heat-exchanger manual.

Wire the remote heat exchanger according to the wiring diagram provided with it. Insure that the fan motors turn in the correct direction.

Use properly sized wire

Refer to the unit nameplate for electrical ratings. Size wires according to applicable codes, with allowance for voltage drops. Unit terminal voltage should be nominal $\pm 10\%$ under all conditions, including compressor starting.

Insure phase rotation

All the motors in the unit are connected for the same phase rotation. Be sure the phase rotation is correct before completing the installation. **Do not move any factory-installed wires.**

NOTE: The blower running direction can be used to test phase rotation.

Insure phase voltage

The Ecosaire® unit complies with NEMA MG-1 and other standards for applied voltage. The applied voltage should be within $\pm 10\%$ of the nominal voltage shown on the nameplate. See ANSI C84.1. Phase voltages should be balanced within 2%.

208V units

A minimum of 187V at the compressor terminals is required for compressor starting (see NEMA MG-1). Allow for voltage drop under inrush current conditions.

Connect input power as indicated.

Use copper wire only. Torque all connectors per NEC 110-14 or relevant code.

Position of power lugs may vary.



EXAMPLE
Appearance, location, and
quantity of components
may vary.

Some Ecosaire® units may have optional voltage monitors that prevent operation in the event the branch circuit has voltage that is too high, too low, has lost a phase, or has reversed phase rotation. If the green LED is not lit when power is applied to the unit, confirm that the applied voltage is within $\pm 10\%$ of the nameplate voltage (NEMA MG-1), that all three phases are present, and that the phase rotation is correct.



Power

Wiring

Installation

Remote Condensers and Heat Exchangers

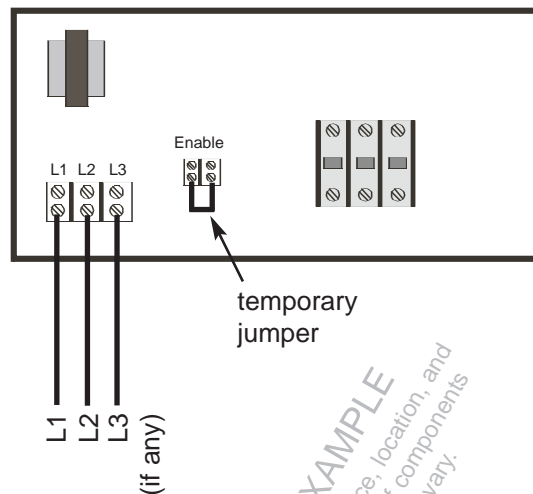
Select branch-circuit voltage from the condenser nameplate data.
Select branch-circuit conductors from the condenser nameplate data.

Connect the conductors as shown. Note that L3 will not be present on single-phase condensers.

Single-phase motors inherently turn the correct direction. A three-phase branch circuit must be tested for proper motor rotation.

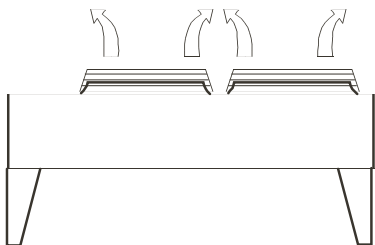
1. Temporarily connect a jumper across the enable contacts as shown.
2. Apply electric power to the branch circuit connected to terminals L1, L2, and L3.
3. If the fans do not blow air in the proper direction (see below)
 - a) disconnect electric power, following all safety precautions
 - b) a qualified person should interchange any two branch circuit conductors.
4. If the fans blow air in the proper direction (see below) then
 - a) disconnect electric power
 - b) remove the temporary jumper.

DO NOT CHANGE ANY FACTORY WIRES.

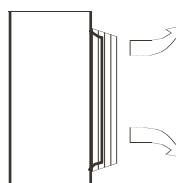


EXAMPLE
Appearance, location, and
quantity of components
may vary.

Proper air-flow direction for vertical-flow



Proper air-flow direction for horizontal-flow



EXAMPLES
Appearance, location, and
quantity of components
may vary.

INSTALLATION

Installation

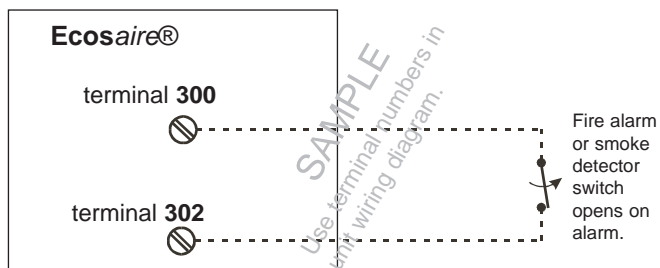
Wiring

Control Wiring

INPUT - FIRE ALARM

For units requiring a fire-alarm interlock, remove the jumper between terminals **300** and **302**, or as shown on the unit wiring diagram. In the jumper's place substitute an isolated normally-closed switch closure from the fire alarm (by others).

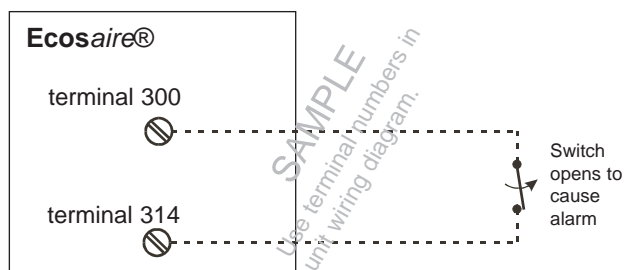
If the fire alarm is triggered, the resulting open circuit between these terminals will cause the **Ecosaire®** to shut-down.



OPTIONAL EMERGENCY POWER INPUT

Some installations may use the optional emergency power input. In this case, an open circuit on the input will register an alarm and will cause the number of operating **Ecosaire®** units in a group to be reduced to a predefined number to reduce the load on the emergency generator.

Note that a reduction in number of operating units may allow room temperature and humidity to go outside the desired range during the emergency.



OUTPUT - ENABLE REMOTE HEAT EXCHANGER

- Air-Cooled Direct-Expansion,
- Glycol-Cooled Direct Expansion,
- Air-Cooled DualCool,
- Glycol-Cooled DualCool, and
- FreeCool units only

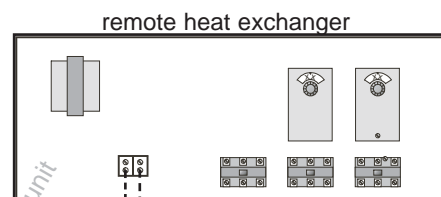
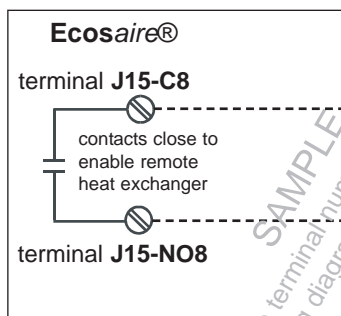
The remote air-cooled heat-exchanger controls must be wired to the **Ecosaire®** controls (see unit wiring diagram). The remote heat exchanger has its own power supply.

Some condensers may require the use of Class 1 Remote Control and Signalling Circuit wiring methods.

The **Ecosaire®** dry contacts are rated 5A at 24VAC 60Hz. Do not overload these outputs. Do not attempt to use an internal **Ecosaire®** power source.

The condenser control-wire size must be selected to allow for contactor coil inrush currents. See the chart at right. Alternatively, a pilot relay (by others) may be installed.

In some cases temperature switches inside the remote condenser may have to be adjusted.



Condenser control wire size (AWG)

wire length (ft)	Number of fan contactors					
	1	2	3	4	5	6
10	20	20	20	20	20	18
20	20	20	20	20	18	14
30	20	20	20	20	18	14
40	20	20	20	18	16	12
50	20	20	20	18	14	10
60	20	20	20	16	14	10
70	20	20	18	16	14	10
80	20	20	18	16	12	10
90	20	20	18	16	12	10
100	20	20	18	14	12	10
110	20	20	16	14	12	10

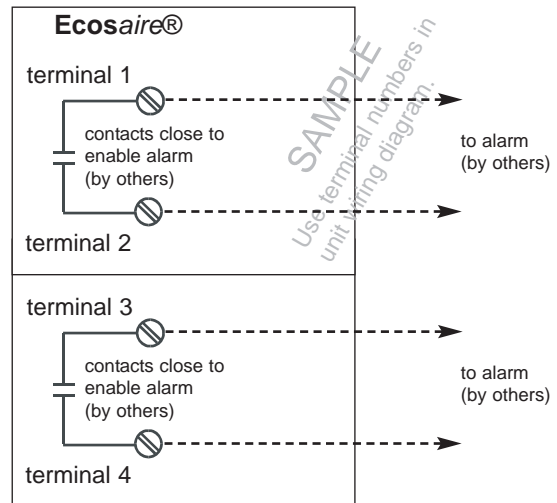
Control Wiring

Wiring

Installation

GENERAL ALARM

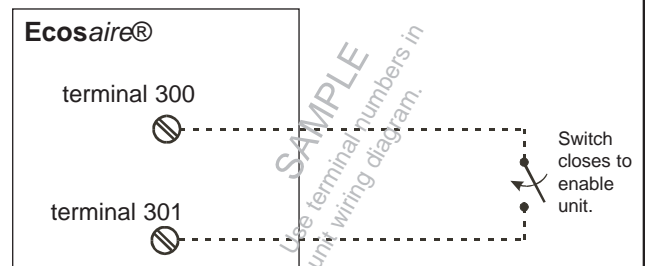
Ecosaire® units may be provided with an output for a general alarm. Two dry-contact switch-closures are provided to enable an alarm (by others) in the event of a condition that prevents the normal operation of the unit. The Ecosaire® dry contacts are rated 5A at 24VAC 60Hz. Do not overload these outputs. Do not attempt to use an internal Ecosaire® power source.



INSTALLATION

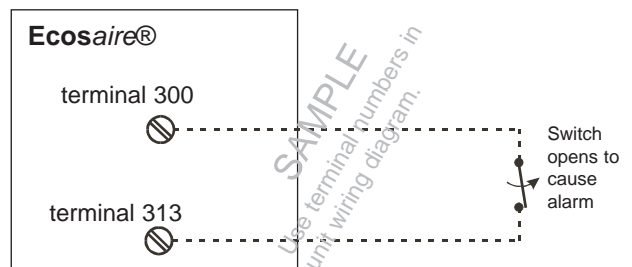
OPTIONAL REMOTE ON/OFF SWITCH (by others)

Some installations may use remote on/off switches provided by others. In this case the remote on/off switch must be wired to the Ecosaire® controls (see unit field-wiring diagram in unit information package). When dry contacts are open, the unit will be disabled.



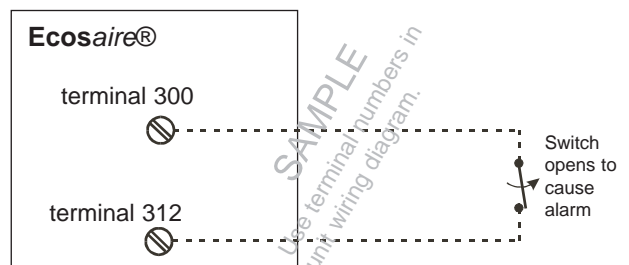
OPTIONAL SPECIAL ALARM INPUT

Some installations may use the optional special alarm input. An open circuit on this input will cause an alarm. Use dry contacts only, do not apply voltage from an external source.



OPTIONAL CUSTOMER ALARM SWITCH

Some installations may use the optional customer alarm input. An open circuit on this input will cause an alarm. Use dry contacts only, do not apply voltage from an external source.



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Installation

Wiring

Control Wiring

Optional Remote Display

Note: Cables may be supplied, depending on options.

The communication system between the controller and the remote display (if any) is based on ANSI/IEEE RS-485. For best results, proper RS-485 wiring and splicing methods should be used. These include, but are not limited to the use of shielded RS-485 cable ($Z_0=120\Omega$, e.g. Belden 7202A), the use of connectors rated for RS-485, minimized untwist of conductors, etc.

In some cases, shorter lengths of cable may allow approximations to RS-485 methods. These methods are shown on the following pages. Methods for longer cables will work for shorter cables also.

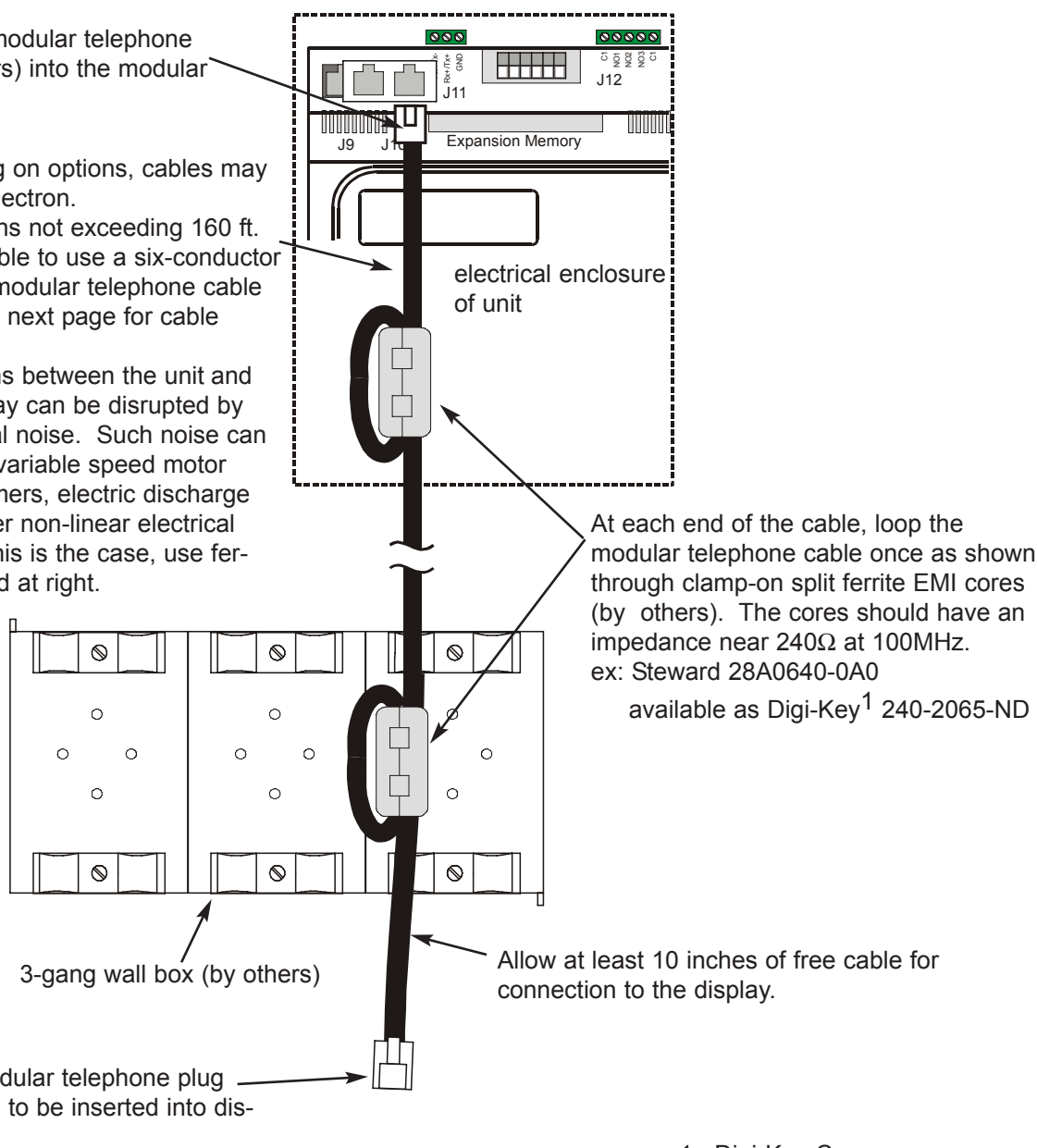
For cable lengths not exceeding 160 ft (50m) -

Insert 6P6C modular telephone plug (by others) into the modular port.

Note: Depending on options, cables may be supplied by Dectron.

For cable lengths not exceeding 160 ft. (50m), it is possible to use a six-conductor data (reversed) modular telephone cable (by others). See next page for cable details.

Communications between the unit and the remote display can be disrupted by external electrical noise. Such noise can be produced by variable speed motor drives, light dimmers, electric discharge lighting, and other non-linear electrical loads. Where this is the case, use ferrites as described at right.



1. Digi-Key Corp.
1-800-344-4539
www.digikey.com

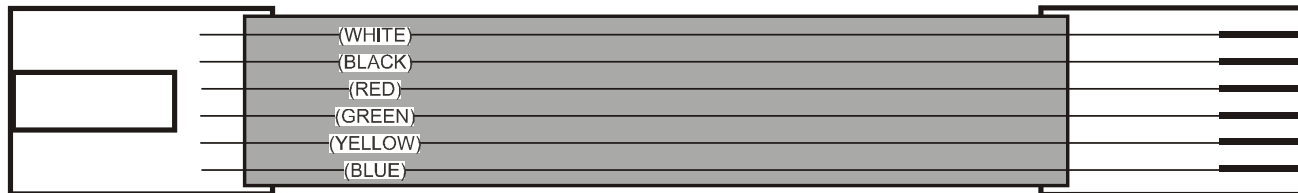
Optional Remote Display

Assembling data (reversed) modular telephone cable

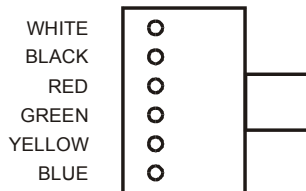
Note that the lock tabs of the plugs are on opposite sides of the cable.

(Colors are for example only, colors may vary by cable vendor.)

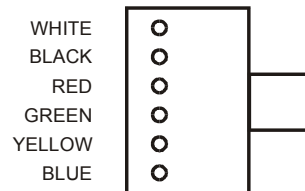
TOP VIEW



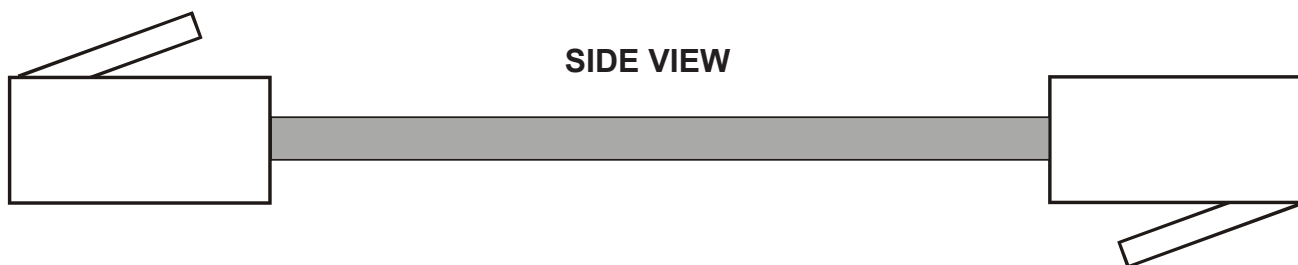
END VIEW



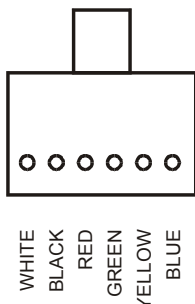
END VIEW



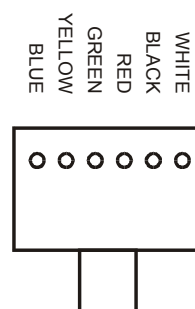
SIDE VIEW



END VIEW



END VIEW



Installation

Wiring

Control Wiring

Insert 6P6C modular telephone plug (by others) into the modular port.

Loop the modular telephone cable once as shown through clamp-on split ferrite EMI core (by others). The cores should have an impedance near 240Ω at 100MHz.

ex: Steward 28A0640-0A0 available as Digi-Key¹ 240-2065-ND

Short six-conductor data (reversed) modular telephone cable (by others). See previous page for cable details.

Keep pairs together. **DO NOT SPLIT PAIRS.**

Minimize untwist.

Minimum 24 AWG copper 3-pair shielded RS-485 cable, $Z_0 = 120\Omega$

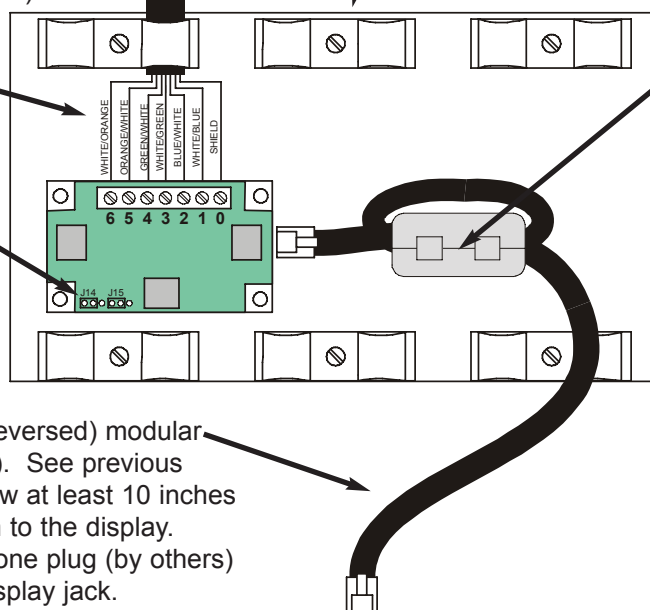
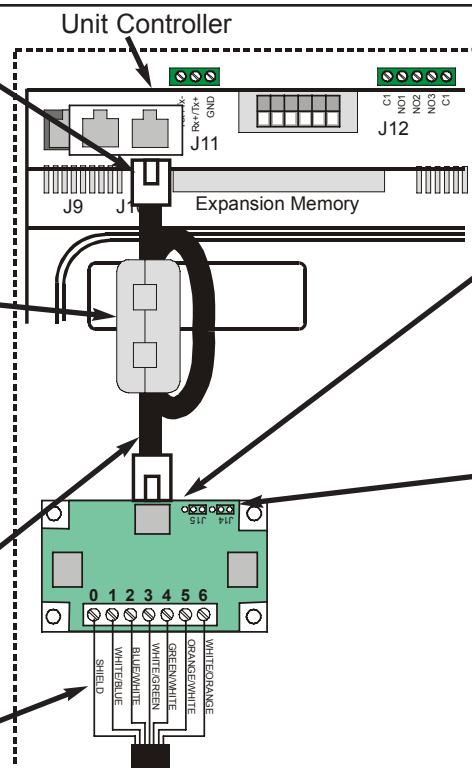
ex: Belden³ 7202A

Maximum length 650 ft (200m)

Keep pairs together. **DO NOT SPLIT PAIRS.** Minimize untwist.

Where TCONN6000 (shown) is used, jumpers J14 and J15 must be on pins 1 & 3 as shown.

Short six-conductor data (reversed) modular telephone cable (by others). See previous page for cable details. Allow at least 10 inches of free cable for connection to the display. The six-pin modular telephone plug (by others) is to be inserted into the display jack.



Optional Remote Display

For cable lengths not exceeding 650 ft (200m) -

Note: Cables may be supplied by Dectron, depending on options.

Modular cable to round cable adapter, (by others), two required

Ex: Carel¹ TCONN6J000 (shown)

Ex: Leviton 40276-I, (not shown)

available as Grainger² 5C381

Where TCONN6000 (shown) is used, jumpers J14 and J15 must be on pins 1 & 3 as shown.

Cable conductor-terminal assignment			
terminal	function	cable pair	conductor
0	GND	SHIELD	
1	+VRL (~30Vdc)	1	A
2	GND	1	B
3	Rx/Tx-	2	A
4	Rx/Tx+	2	B
5	GND	3	A
6	+VRL (~30Vdc)	3	B

Clamp-on split ferrite EMI core (by others), as above.

1. CAREL USA LLC
Ph: (717) 664-0500
Fax: (717) 664-0449
www.carelusa.com

2. USA
W.W. Grainger
Ph: 1-888-361-8649
www.grainger.com

Canada
Acklands Grainger
Ph. 1-800-668-8989
www.acklandsgrainger.com

3. Belden
Ph. 314-854-8000
www.belden.com

Control Wiring

Wiring

Installation

For cable lengths not exceeding 1640 ft (500m) -

Note: Cables may be supplied by Dectron, depending on options. Consult factory for longer cable requirements.

Loop the modular telephone cable once as shown through clamp-on split ferrite EMI cores (by others). The cores should have an impedance near 240Ω at 100MHz.

ex: Steward 28A0640-0A0
available as Digi-Key¹
240-2065-ND

Minimum 24 AWG copper 1-pair shielded RS-485 cable, $Z_0 = 120\Omega$

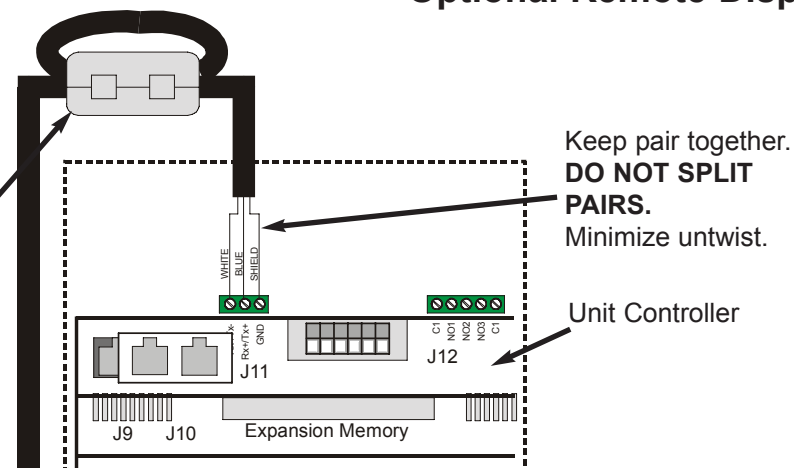
ex: Belden³ 7200A
Maximum length 1640 ft (500m)

Insulate shield at this end.
Do not connect shield to a terminal.

Keep pair together.
DO NOT SPLIT PAIRS.
Minimize untwist.

Short six-conductor data (reversed) modular telephone cable (by others). See previous page for cable details. Allow at least 10 inches of free cable for connection to the display. The six-pin modular telephone plug (by others) is to be inserted into the display jack.

Optional Remote Display



Cable conductor-terminal assignment			
terminal	function	cable pair	conductor
0	GND		
1	+VRL (~30Vdc)		
2	GND		
3	Rx/Tx-	1	A
4	Rx/Tx+	1	B
5			
6			

DC Power Supply
24 - 30 VDC
150 mA
(by others)

3-gang wallbox,
by others)

Clamp-on split ferrite EMI
core (by others), as
above.

1. CAREL USA LLC
Ph: (717) 664-0500
Fax: (717) 664-0449
www.carelusa.com

2. USA
W.W. Grainger
Ph: 1-888-361-8649
www.grainger.com

Canada
Acklands Grainger
Ph: 1-800-668-8989
www.acklandsgrainger.com

3. Belden
Ph: 314-854-8000
www.belden.com

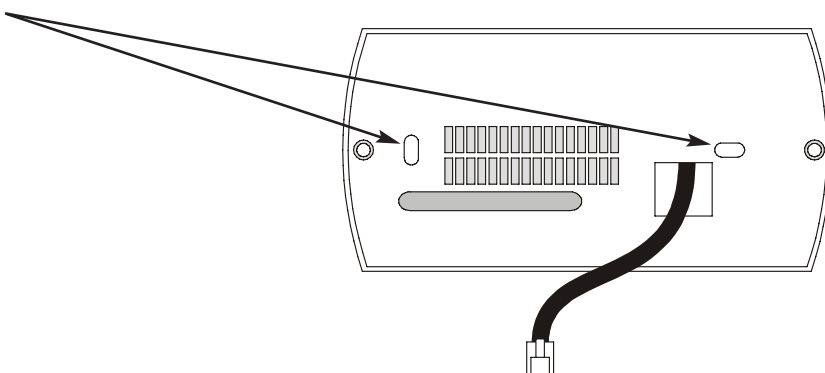
Installation

Wiring

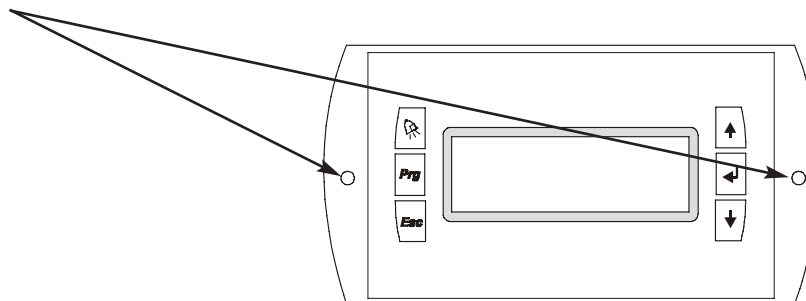
Control Wiring

Remove the display from its box. Refer to the instructions included. Separate the display into its three pieces.

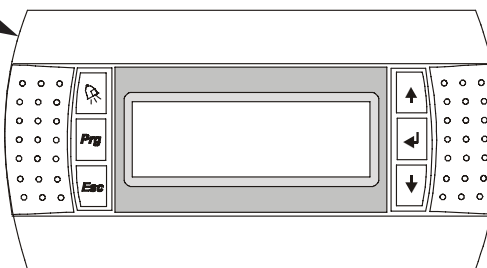
Thread the end of the cable through the hole in the sub-base as shown. Using care to maintain level, screw the sub-base to the wall box here.



Connect the cable to the modular telephone jack on the back of the display. Screw the display to its sub-base here.



Snap the front cover over the display.



NOTE: If power is applied before the Start-up tasks are accomplished, the display may show "NO LINK". This is normal, and will be corrected under the **Startup** section of this manual.

Contents

Startup

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Startup

Pre-Startup Adjustments

Adjust Airflow

IMPORTANT!

Never run the blower without the filters in place. Regardless of filters, never run the blower when construction dust is present. The resulting heat exchanger damage is not covered by the Ecosaire® warranty.

IMPORTANT!

Airflow must be set and confirmed before the refrigeration system is adjusted.

Turn off electric power to the unit.

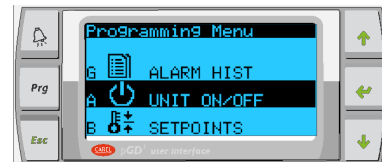
Locate the compressor contactor and remove one contactor-coil wire to prevent the compressor from starting.


If possible and safe, turn on electric power to the unit.

Be sure that all air filters are clean and in place.


Note: The following adjustment requires the user password, see **Enter Password**.

On the controller interface, press Prg. The screen will be as shown.



Press  to move the cursor under "OFF".

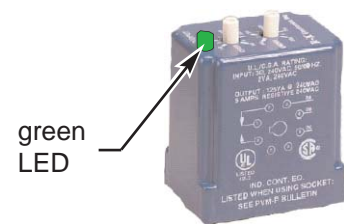
Press  to change "START" to "STOP".

Press  to move the cursor back to the top left corner. The blower should start. If it does not, check for alarms such as Fire Alarm.

A qualified air-balance technician should determine, set, and confirm that the airflow is within $\pm 10\%$ of the specified value. Airflow must be measured with all access doors closed.

Airflow is adjusted by changing the variable sheave on the blower motor shaft. The airflow rate should be within $\pm 10\%$ of the value stated on the submittal forms.

Some Ecosaire® units may have voltage monitors that prevent operation in the event the branch-circuit voltage is too high, too low, has lost a phase, or has reversed phase rotation. If the green LED is not lit, confirm that the applied voltage is within $\pm 10\%$ of the nameplate voltage (NEMA MG-1), that all three phases are present, and that the phase rotation is correct.



When the airflow is set and confirmed:

Disconnect electric power.

Reconnect the compressor contactor wire that was removed in the step above.

Fill out the air balance report and save a copy to be sent to Dectron along with the startup report.

Initial the appropriate box in the Pre-Startup Checklist in this section.

Adjust Remote Heat Exchanger Controls

Startup

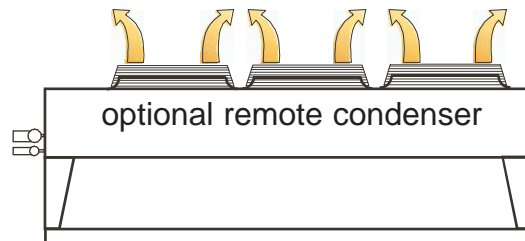
Air-Cooled Direct Expansion, Glycol-Cooled Direct Expansion, Air-Cooled DualCool, & Glycol-Cooled DualCool Units Only

HEAT EXCHANGER FAN ROTATION

The remote heat exchanger fans must rotate so as to produce an upward or outward air discharge as shown.

Single-phase fans will inherently turn the proper direction. If three-phase fans turn the wrong way, a qualified person should disconnect the branch circuit and interchange any two wires on the power inlet lugs in the condenser control enclosure. **Do not move any factory-installed wires.**

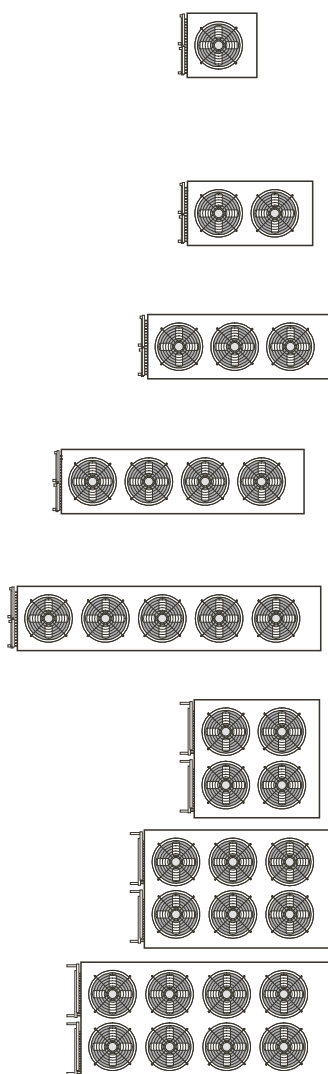
Discharge air must flow upward or outward.



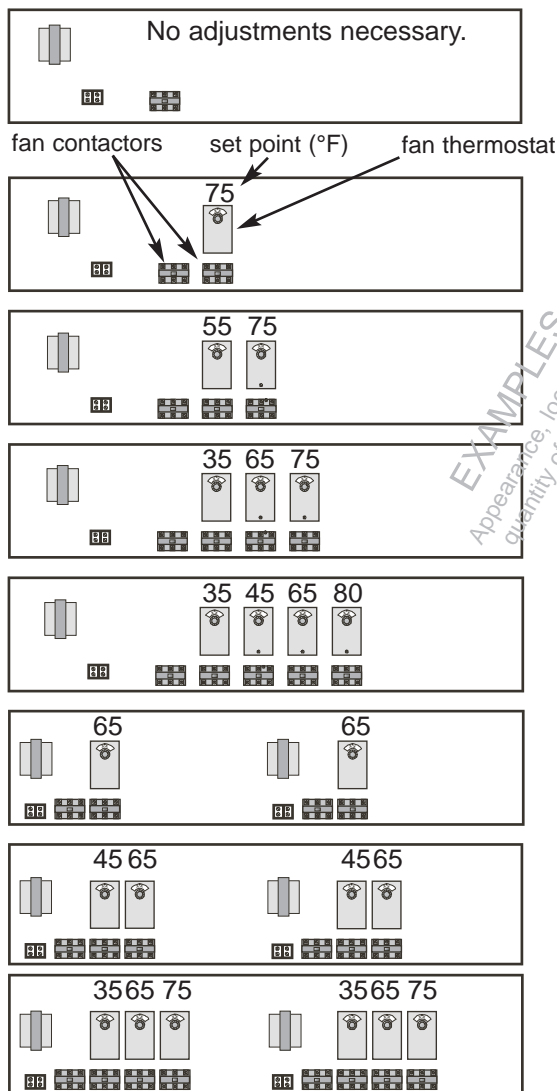
HEAT EXCHANGER FAN THERMOSTATS

Remote heat exchangers have a minimum number of fans that run whenever the **Ecosaire®** unit is in cooling mode. Other fans may be controlled by thermostats sensing outdoor air temperature. Where this is the case, the thermostats must be adjusted at installation, using the diagrams below.

FAN ARRANGEMENT



HEAT EXCHANGER CONTROL ENCLOSURE



STARTUP

Data subject to change without notice.

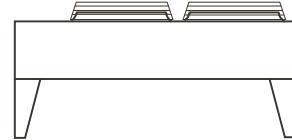
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Adjust Remote Heat Exchanger Controls

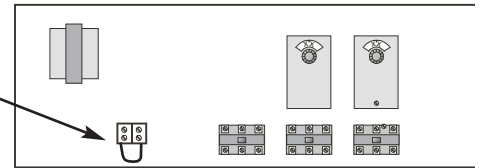
Startup

Air-Cooled Direct Expansion, Glycol-Cooled Direct Expansion, Air-Cooled DualCool, & Glycol-Cooled DualCool Units Only

For glycol coolers, be sure that the system is full of glycol solution.
Turn off electrical power to the remote heat exchanger.



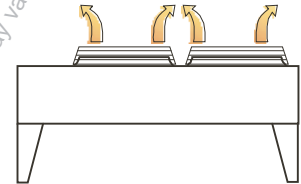
Carefully attach a temporary jumper to the enable input of the remote heat exchanger, as shown.
Close the electrical enclosure of the remote heat exchanger.
Turn on the electrical power to the remote heat exchanger.



Confirm that the fans (and pumps, if any) of the remote heat exchanger operate.

For remote heat exchangers with three-phase fans, confirm that the fans turn in the proper direction to blow air upward. If they do not, a qualified person should disconnect power from the remote heat exchanger, swap any two branch-circuit wires, and re-connect electrical power to the remote heat exchanger. **Do not move any factory-installed wires.**

EXAMPLE
Appearance, location, and
quantity of components
may vary.



For Air-Cooled Direct Expansion and Air-Cooled DualCool units, remove the temporary jumper installed in step above. For all others, leave jumper in place and go to next page.

Startup

Check Remote Heat Exchanger Operation

Glycol-Cooled Direct Expansion, Glycol-Cooled DualCool, & FreeCool Units Only

(continued from previous page)

Check that the glycol solution is flowing at the proper flow rate. See table below.

After the pump(s) run for a while, residual air may be removed. Check that the system is still full of glycol solution.

Turn off the electrical power to the remote heat exchanger.

Remove the jumper from step 2 (previous page).

STARTUP

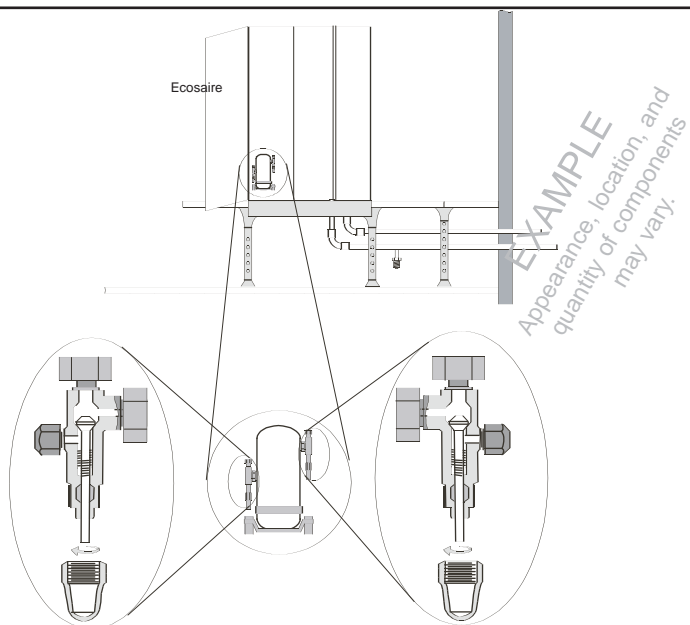
REQUIRED GLYCOL FLOWS

Model No.			EN-27	EN-35	EN-42	EN-51	EN-68	EN-79	EN-87	EN-102
Glycol-Cooled Direct Expansion or Glycol-Cooled DualCool or FreeCool	Outdoor Temp. 95°F	GPM	34.8	40.9	53.8	60.8	72.5	81.4	91.3	107.8
		lpm	132	155	204	230	274	308	346	408
	Outdoor Temp. 100°F	GPM	34.8	40.9	53.8	60.8	72.5	81.4	91.3	107.8
		lpm	132	155	204	230	274	308	346	408

Open Refrigerant Valves

Startup

For all circuits, be sure the compressor rotalock valves are open.

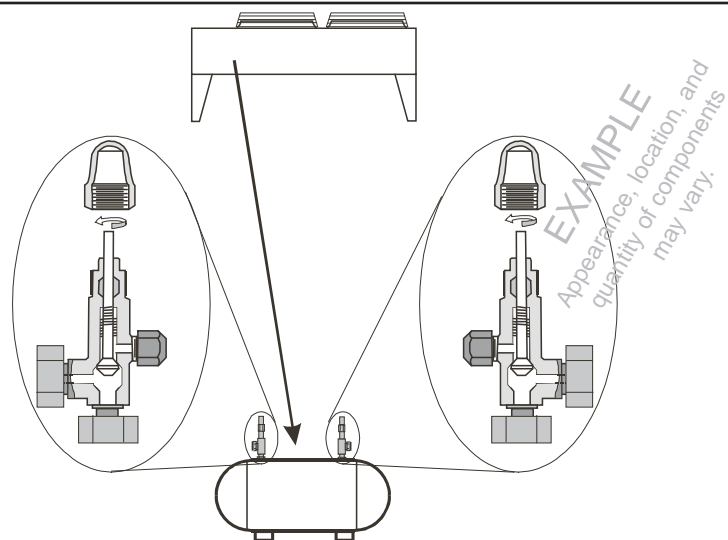


Air-Cooled Direct Expansion and Air-Cooled DualCool Units Only

Locate the refrigerant receiver in the remote condenser.

Be sure the rotalock valves on the receiver are open by turning the stems counter-clockwise.

Replace the stem caps.



STARTUP

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Check Valve Positions

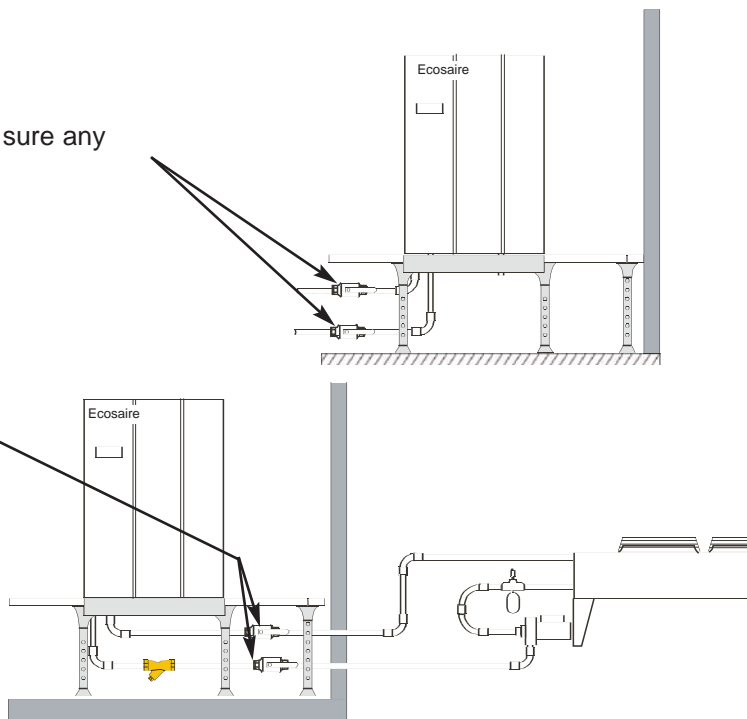
Pre-Startup Adjustments

Startup

For **Water-Cooled Direct-Expansion** units, be sure any water valves (by others) are open.

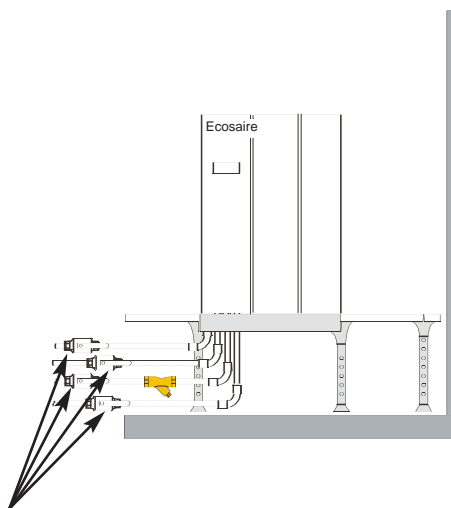
For **Glycol-Cooled Direct-Expansion** units, be sure any glycol valves (by others) are open.

EXAMPLES
Appearance, location, and
quantity of components
may vary.



STARTUP

For **Glycol-Cooled DualCool** units and **FreeCool** units, be sure that any fluid valves (by others) are open.



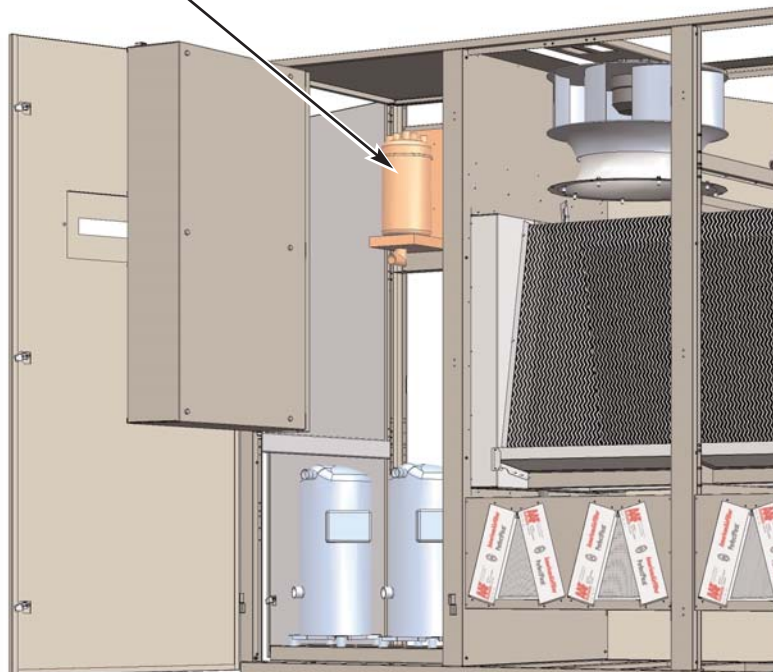
Startup

Humidifier

Humidifier (if any)

Some units may be equipped with electrode-type humidifiers.

Refer to the humidifier manual supplied with this manual.



Prepare to Add Refrigerant

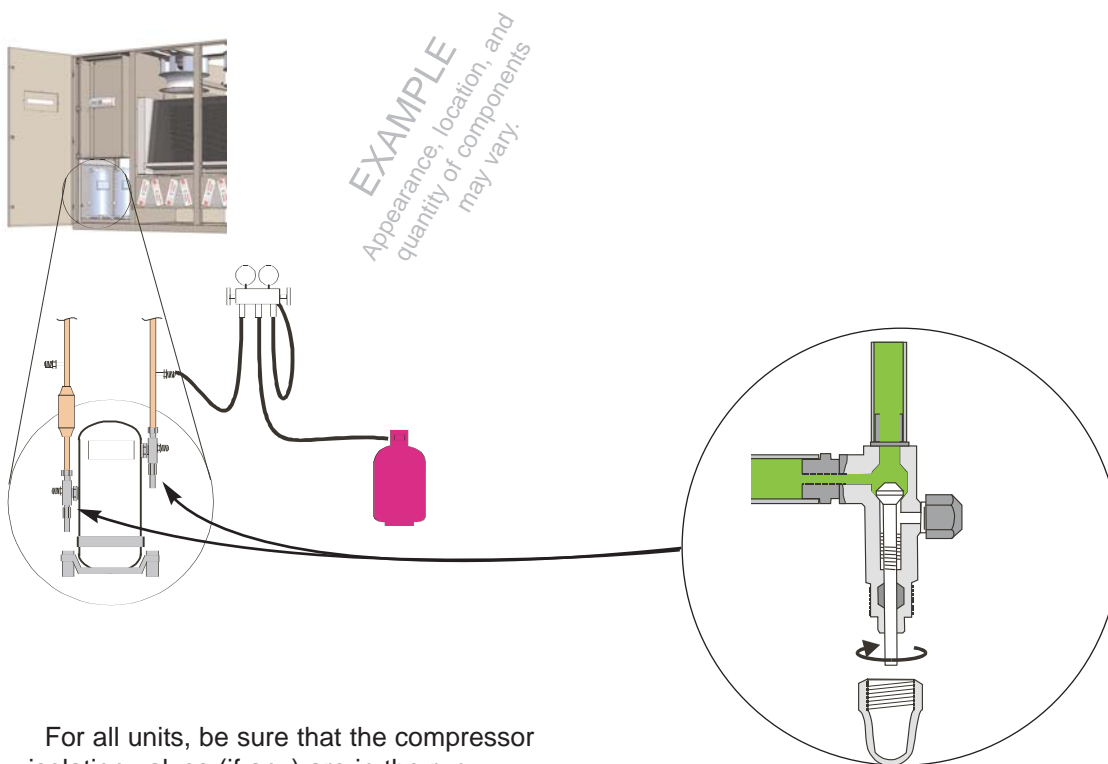
Startup

Air-Cooled Direct Expansion & Air-Cooled DualCool Units Only

For Air-Cooled Direct Expansion or Air-Cooled DualCool units, the required weight of refrigerant should have been added when the remote condenser was installed in **Installation - Piping - Refrigerant**. If all the necessary refrigerant was not added during installation, it must be added at startup.

If the total amount of refrigerant cannot be pumped into the high-pressure access valve while the compressor is OFF, then refrigerant vapor only can be added to the unit through the suction access valve while the compressor is running. **NEVER ADD LIQUID REFRIGERANT TO THE SUCTION ACCESS VALVE.** Units with two refrigeration circuits will have two sight glasses and two suction access valves.

Arrange as below to add refrigerant. Close the access panels as far as possible and temporarily tape them in place for operation later.



For all units, be sure that the compressor isolation valves (if any) are in the run (backseated) position.

Startup

Prepare to Adjust Expansion Valves

Air-Cooled Direct Expansion, Water-Cooled Direct Expansion, Glycol-Cooled Direct Expansion, Air-Cooled DualCool, Glycol-Cooled DualCool, & FreeCool Units Only

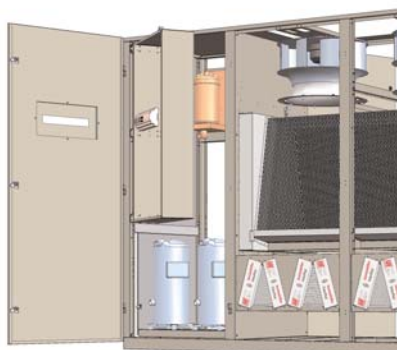
The refrigerant expansion valves must be adjusted at startup.

Firmly attach a thermocouple or other temperature sensor to the suction tubes.

Insulate the sensor and all around the suction tube with 1/2" thick insulation for at least three inches on either side of the temperature sensor. Tape the insulation to prevent air flow from changing the temperature reading.

Locate and identify the refrigerant sight glasses.

Locate and identify the expansion valves associated with each sight glass.



EXAMPLE
Appearance, location, and
quantity of components
may vary.

Model	Serial Number	Pre-Startup Checklist	Startup
<p>Print your initials in the boxes to indicate completion. Print "N/A" for items which are not applicable to the installation.</p>			
<p>Space</p> <p>Confirm that the walls and ceiling have been adequately insulated and have a proper vapor barrier (see Building - Moisture Migration). your initials</p> <p>Confirm that any windows are constructed and installed to allow proper air flow over the glass (see Building - Moisture Migration). your initials</p> <p>Confirm that adequate space has been left around the Ecosaire® (see Installation - Unpacking and Locating). your initials</p> <p>Confirm that no construction dust or other debris is in the return duct. your initials</p> <p>Confirm that no construction dust or other debris will be drawn into the return duct or the outdoor-air duct (if any). your initials</p> <p>Humidifier</p> <p>Check all electrical connections for wires which may have become loose in shipping. Components damaged due to loose connections are NOT covered by the warranty. your initials</p> <p>Check electrode plugs to ensure they are pressed firmly onto the electrode pins. IMPORTANT: Loose connections will cause overheating of the cylinder plugs, possible melting the plugs and/or cylinder. your initials</p> <p>Open the isolating valve in the feed water line to the unit. your initials</p>	<p>Piping</p> <p>For Air-Cooled Direct Expansion & Air-Cooled DualCool units, confirm that refrigerant piping is installed and free of leaks. your initials</p> <p>For Air-Cooled Direct Expansion & Air-Cooled DualCool units, confirm that both circuits have been evacuated to 500 microns of mercury or less, and filled with refrigerant. your initials</p> <p>For water-cooled, glycol-cooled or FreeCool units, confirm that the water or fluid flow is within tolerance according to the unit specifications. your initials</p> <p>Confirm that the condensate drain pipe is properly connected with a P-trap, and is free of leaks. your initials</p> <p>Confirm that the condensate drain P-trap has been filled with water and that the drain works. your initials</p> <p>For units with humidifiers, confirm that the water-supply tube is complete and tested. your initials</p> <p>For units requiring a condensate pump, confirm that the pump is operating. your initials</p> <p>Make sure copper lines, including the capillary tubes at the thermal expansion valves, are not touching each other. your initials</p>	<p>Wiring</p> <p>Confirm that the voltage to be applied to the Ecosaire® corresponds to that specified on the unit nameplate and to the other requirements of Installation - Wiring - Power. your initials</p> <p>Confirm that the size of the wire supplying electric power to the Ecosaire® is adequate for the circuit ampacity shown on the nameplate. your initials</p> <p>For long lengths of power wiring or marginal voltage, confirm that the wire size is adequate for less than 10% voltage drop under compressor starting current. your initials</p> <p>Confirm that only copper wire was used for any connections to the Ecosaire® unit. your initials</p> <p>Confirm that the unit is properly grounded. your initials</p> <p>Confirm that all electrical connections have been checked for tightness and re-torqued as necessary. your initials</p> <p>Confirm that all electrical enclosures are clean and dry. your initials</p> <p>For 3-phase units, confirm that the phase sequence is correct for proper blower rotation. your initials</p> <p>See Startup - Airflow.</p> <p>Confirm that the control signal wiring is complete, as shown in the unit field-wiring diagram. your initials</p> <p>Where applicable, confirm that inter-unit circuits are complete. your initials</p> <p>Where applicable, confirm that unit-supervisory circuits are complete. your initials</p>	STARTUP
<p>Completed by _____ Ph. () _ _ _ - _ _ _ _</p>			

Startup

Pre-Startup Checklist

Model _____ Serial No. _____

Unit preparation

Confirm that the **Ecosaire®** unit is properly supported.

your initials

Confirm that all shipping blocks, shipping braces, compressor locks, etc., have been removed or released for normal operation.

your initials

Confirm that the air volumes have been measured and are correct (see **Installation - Air Distribution - Adjust Airflow**).

your initials

Confirm that a copy of the air-balance report is available.

your initials

Confirm that all air filters are clean and in place.

your initials

Confirm that the air heat exchangers are clean.

your initials

Confirm that power has been applied to the crankcase heaters for at least 12 hours.

your initials

Check that the blower(s) rotates freely.

your initials

Check that the blower wheel is securely tightened to the shafts.

your initials

Confirm that all ducts and plenums have been sized and installed correctly to limit the external static pressure to no more than the specified amount.

your initials

Confirm that all grilles and diffusers are unobstructed.

your initials

Confirm that all construction dust and debris has been removed from ducts and plenums.

your initials

For glycol-cooled and Free-Cool units, make sure all pipe air vents are closed tightly.

your initials

Exchanger (if any)

Confirm that the heat exchanger is located properly for good airflow (see **Installation- Locate Remote Heat Exchanger**).

your initials

Confirm that the voltage applied to the heat exchanger corresponds to that specified on the nameplate, NEMA MG-1 and ANSI C84.1.

your initials

Confirm that the heat exchanger tubes have been tested for refrigerant leaks.

your initials

Confirm that the top and side clearances are at least as large as specified in **Installation - Locate Remote Heat Exchanger**.

your initials

Confirm that no construction dust, leaves, or other debris will be drawn into the heat exchangers.

your initials

Confirm that any shipping blocks, spacers, or retainers have been removed.

your initials

Check that the heat exchangers are clean, the fins are straight, and there are no obstructions to airflow.

your initials

Air distribution**Remote Heat**

Completed by _____ Ph. () _ _ _ - _ _ _ _

Data subject to change without notice.

Set Clock

Pre-Startup Adjustments

Startup

Note: This adjustment requires the user password, see **Startup - Pre-start-up Adjustments - Controller Password**.

The clock is set at the factory for date and Eastern Time. These settings can be changed as below.

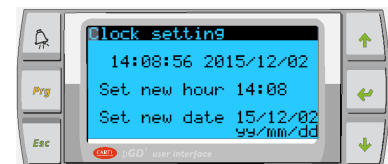
To access Clock Function press **Prg** and highlight **CLOCK** as shown



To select **CLOCK** press **↵** to view the **CLOCK** menu.

To **change the clock**, press **↵** repeatedly until the cursor is at the desired value. The example is to change the hour.

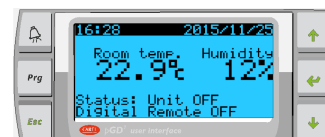
Press either **↑** or **↓** to change the selected value.



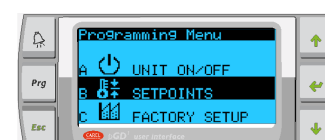
To store the setting, press **↵** until the cursor is back in the upper left corner.

Note: This adjustment requires the user password, see **Startup - Pre-startup Adjustments - Controller Password**.

Press **Prg**, enter the password, and press \downarrow , as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen will appear as shown.



Press \downarrow to access Humidity Set Points. To access the humidity set point field press enter to move to each field, Set point, Low and High Limit



To select the humidity set point press \downarrow to move the cursor to the set point.

To change the humidity set point, press either the \uparrow or the \downarrow button to select the desired humidity. The longer the button is held, the faster the set point changes.

To store the new set point, press \downarrow . The cursor moves to the next field.



Press \downarrow to change the humidity alarm set point screen. The humidity alarms are factory set for High=80% and Low=20%. If the room temperature goes over "High" or under "Low" for a period greater than "Delay", an alarm will be registered. Unit operation will not be affected. These settings can be changed as below.

To select the alarm set point to change, press \downarrow repeatedly to move the cursor to the desired position. The example is for the High humidity alarm set point.

To change the set point, press either the \uparrow or the \downarrow button.

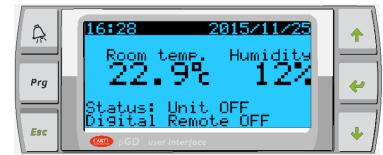
To store the new value, press \downarrow repeatedly to move the cursor back to the top left corner.

Temperature Set Points

Pre-Startup Adjustments

Startup

Note: This adjustment requires the user password, see **Startup - Pre-startup Adjustments - Controller Password**.



To adjust the temperature set point screen, first press **Prg**, enter the password, and press \downarrow , as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen will appear as shown.

Press \downarrow to access **Temperature Set Pts**.



Press \downarrow to move the cursor to the set point.

To **change the temperature set point**, press either \uparrow or \downarrow to select the desired temperature. The longer the button is held, the faster the set point changes.



Press \downarrow to store the new set point. The cursor moves to the top left corner.

The temperature alarms are factory set for High=80°F and Low=60°F. If the room temperature goes over "High" or under "Low" for a period greater than "Delay", an alarm will be registered. Unit operation will not be affected. These settings can be changed as below.

Press **Prg**, enter the password, and press \downarrow , as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen will appear as shown.

To access the **temperature alarm set point** screen, press \downarrow twice.

To **select the alarm set point to change**, press \downarrow repeatedly to move the cursor to the desired position. The example is for low temperature alarm set point.

To **change the set point**, press either \uparrow or \downarrow .

To **store the new value**, press \downarrow repeatedly to move the cursor back to the top left corner.

Startup

Enable Operation

IMPORTANT!

Start-up must be performed by a qualified factory-trained service and installation technician.

Once startup is completed, all portions of the “Startup Report and Warranty Registration” form must be completely filled in and a copy must be sent to the factory in order to register and validate the warranty.

IMPORTANT!

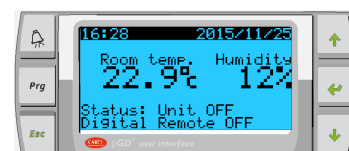
Do NOT turn on the electric power unless the power supply voltage matches that specified on the unit nameplate. Be certain that there is no construction dust in the space, ducts, or plenums.

1. Apply electric power. Allow at least 10 hours of crankcase heater operation before enabling a compressor. (if applicable)
2. Do not allow a compressor to run without adequate refrigerant.(if applicable)

STARTUP

Note: This adjustment requires the user password, see Startup - Pre-startup Adjustments - Controller Password.

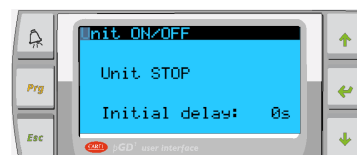
To access the **System ON/OFF** menu, press **Prg** and enter the password as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen will appear as shown.



Press **↓** to move the cursor to “UNIT ON/OFF”.

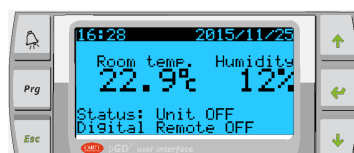


Press **↑** to change “STOP to “START”.



To **store the setting**, press **↓** to return the cursor to the upper left corner.

The unit is now operational. After a short delay, the display will return to the default **Room Status** screen.



Adjustments

Startup

Adjust Head Pressure

Air-Cooled Direct Expansion Units Only

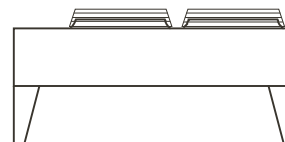
For each refrigeration circuit:

With the compressor running, check that the refrigerant sight glass is full.

Check the suction pressure and the discharge pressure at the compressor. The suction pressure should be above 50 PSI. If it is not above 50 PSI, stop and determine the cause.

The discharge pressure should be 250 PSI \pm 15 PSI. If it is not, then:

Locate the remote air-cooled condenser. Be sure the temperature of the ambient air is less than the rating of the condenser.



Startup

Adjustments

**Water-Cooled Direct Expansion, Glycol-Cooled Direct Expansion,
Air-Cooled DualCool, Glycol-Cooled DualCool,
& FreeCool Units Only**

With the compressor running, check that refrigerant sight glass is full.

Check the suction pressure and the discharge pressure at the compressor. The suction pressure should be above 50 PSI. If it is not above 50 PSI, stop and determine the cause.

The discharge pressure should be 250 PSI \pm 15 PSI. If it is not, then check that the cooling-fluid temperature and flow rate are within specifications.

STARTUP

Add Refrigerant and Adjust TXV

Startup

The evaporator superheat must be adjusted at startup. It should be $12^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($6^{\circ}\text{C} \pm 1^{\circ}\text{C}$) for room temperatures between 68°F (20°C) and 73°F (23°C).

The temperature sensors and pressure gauges were connected under **Startup - Prepare to Adjust TXV**.

1. Adjust the set points to cause a compressor to operate for at least 15 minutes.
2. Be sure the refrigerant sight glass shows all liquid. If bubbles are present, additional refrigerant may be needed.
3. Read the temperature of the suction tube by the temperature sensor.
4. Read the suction pressure. **NOTE: The expansion valves cannot be adjusted if the suction saturation temperature is above 50°F .** Decrease the room temperature and start over.
5. Use the chart below to determine the suction saturation temperature.
6. Subtract the suction saturation temperature from the temperature sensor temperature.
7. Adjust the expansion valve to cause the difference in step 5 to be $12^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($6^{\circ}\text{C} \pm 1^{\circ}\text{C}$).
8. Repeat steps 1 through 7 for a other refrigerant circuit, if any.
9. When the room temperature reaches 68°F (20°C) to 73°F (23°C), run the unit for an additional 15 minutes, then confirm the superheat.
10. For glycol-cooled units, leave the refrigerant gauges in place for the next page.

STARTUP

FOR GLYCOL-COOLED AND FREE-COOL UNITS ONLY

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ECOSaire®

Startup Report & Warranty Registration

Warranty void unless this form is completed and a copy returned to factory within 2 weeks after start-up!

Installation Name.....

Installation Address

Ecosaire® Representative.....

Model #.....Serial #.....

Compressor 1 (if any) Serial #.....Blower Belt Size.....

Compressor 2 (if any) Serial #.....Software date Rev.

Compressor 3 (if any) Serial #.....

Compressor 4 (if any) Serial #.....

	L1-L2	L2-L3	L3-L1	NAMEPLATE		L1	L2	L3	NAME PLATE
Blower volts (V)					Humidifier amps (A)				
Remote HX (if any) volts (V)					Heater Stage 1 amps (A)				
Blower 1 amps (A)					Heater Stage 2 amps (A)				
Blower 2 (if any) amps (A)					Heater Stage 3 amps (A)				
Blower 3 (if any) amps (A)					Transformer 1 (smaller) output voltage _____				
Remote HX (if any) amps (A)					Transformer 2 (larger) output voltage _____				

Proper air distribution provided?
(See **Installation - Air Distribution.**)

your initials

Vapor retardant installed properly?
(See **Building - Moisture Migration.**)

your initials

Adequate service access provided?
(See **Installation - Unpacking & Locating.**)

your initials

Unit level?

your initials

Main disconnect switch installed?
(See **Installation - Wiring - Power.**)

your initials

Optional fire alarm tested?

your initials

Water detectors tested?

your initials

Condensate drain connected, P-trap installed, filled and tested?

your initials

Condensate pump (if any) operating?

your initials

Remote heat exchanger installed properly?
(See HX manual.)

your initials

Wire connections checked for tightness?
(See **Installation - Wiring - Power.**)

your initials

Pre-Startup check list complete?
(See **Startup - Pre-Startup Checklists.**)

your initials

Blower rotation on 3-phase units correct?
(See **Installation - Wiring - Power.**)

your initials

Airflow and blower speed adjusted?
(See **Installation - Air Distribution - Adjust Airflow.**)

your initials

Airflowcfm

your initials

Refrigerant charge OK?

your initials

No alarms displayed?

your initials

Set points at design conditions?

your initials

Loss-of-airflow alarm tested?

your initials

Dirty filter alarm tested?

your initials

Humidifier jumpers correct?

your initials

Humidifier connectors tight?

your initials

All sensor readings true?

your initials

Date and time set?

your initials

All alarms cleared?

your initials

Optional outdoor air-cooled heat exchanger location Above ECOS . . . ft Below ECOS . . . ft Same level as ECOS ☐Refrigerant connection size.....Hot gasLiquid Pipe length from **Ecosaire®** to remote heat exchanger ft

Startup

Ecosaire® EC Series

Start-up Report & Warranty Registration

Warranty void unless this form is completed and a copy returned to factory within 2 weeks after start-up!

Operational Data

NOTE: To obtain adequate readings, a delay of ten (10) minutes is required after every operation or adjustment.

Place measured values in the boxes. Put "N/A" where not applicable.	1st stage Dehumidification Only	2nd stage Dehumidification Only	1st stage Cooling Only	2nd stage Cooling Only	Humidification Only	Heating Only		
Air Temperature Set Point °F					See previous page.	See previous page.		
Air Humidity Set Point %								
Entering Air Temperature °F								
Leaving Air Temperature °F								
Room Relative Humidity %								
Chilled Water Temp. °F								
Cooling Water Temp. °F								
Glycol Temp. °F								
Sight Glass Clear? Y/N	#1	#2	#1	#2				
TX Valve Bulb Temperature °F	#1	#2	#1	#2				
Condenser Pressure PSIG	#1	#2	#1	#2				
Evaporator Pressure PSIG	#1	#2	#1	#2				
Compressor voltage V	L1-L2	L2-L3	L3-L1	L1-L2	L2-L3	L3-L1		
Compressor Current A	Comp1	Comp2	Comp3	Comp4	Comp1	Comp2	Comp3	Comp4
	L1							
	L2							
	L3							

Comments: -----

Form completed bySignature

Company Name

DateTelephone ()

Data subject to change without notice.

Dectron Internationale Terms and Conditions of Sale for Products Installed in the United States of America and Canada

Ecosaire® Units and Factory-Supplied Accessories

1. This Contract constitutes the entire agreement between the parties relating to the transaction described herein and shall prevail over the terms of the Buyer's purchase order and the Seller's acknowledgment, except that quantities, prices, dates, places of delivery and means of transportation shall be fixed by the terms of the Seller's acknowledgment. No modification, waiver or discharge of this Contract shall bind the Seller, unless made in writing and signed by Seller's authorized representative at its home office in Montreal, Quebec, Canada.

2. This Contract shall be governed and interpreted in accordance with the applicable laws of the State of New York, U.S.A.

3. If any of the terms of this Contract are held to be invalid, illegal or unenforceable, the validity and enforceability of the remaining portions shall not in any way be affected or impaired thereby.

4. The prices quoted are F.O.B. Montreal, Quebec, Canada. It is agreed that the term F.O.B. is a price term only and imposes no obligation upon Seller apart from price.

5. Transfer of the equipment from the Seller to a common carrier or a licensed public trucker shall constitute delivery. Upon such delivery, title shall pass to the Buyer, subject to the Seller's right of stoppage in transit. In the instance of equipment held subject to Buyer's instructions, equipment for which the Buyer has failed to supply shipping instructions, or in any case where Seller, in its sole discretion, determines that any part of the equipment purchased by Buyer shall be held for Buyer's account, Seller may invoice the equipment and Buyer agrees to make payment at the maturity of the invoice so rendered. Equipment invoiced and held at any location, for whatever reason, shall be at Buyer's risk and Seller may charge for insurance and storage at prevailing rates.

Partial deliveries shall be accepted by the Buyer and paid for at contract prices and terms. When Buyer has declared or manifested an intention that it will not accept delivery in accordance with the provisions of this Contract, no tender of delivery shall be necessary, but Seller may, at its option, give notice in writing to Buyer that Seller is ready and willing to

deliver in accordance, with the provisions of the Contract and such notice shall constitute a valid tender of delivery.

6. Seller assumes responsibility, up to the time of delivery to a common carrier or licensed public trucker. All risk of loss or damage, including damage caused by the carrier's negligence, is assumed by the Buyer.

7. Seller shall not be liable for damages arising out of its failure to make, or delay in making, delivery because of fire, flood, strikes, riots, accidents, insurrections, lockouts, breakdown of machinery, loss or damage of goods in transit, Acts of God, inability to obtain component parts, or any other circumstance or cause beyond the Seller's control, except for its own negligence.

8. The remedies provided in this Contract for breach thereof shall constitute the exclusive remedy available to Buyer and all other remedies which might otherwise be available under the law of any jurisdiction are hereby waived by Buyer.

9. Seller warrants that the title conveyed under the terms of this Contract shall be good and marketable and that the goods shall be delivered free from any lien, encumbrance or security interest whatsoever.

10. Seller warrants that the sale or use of its products will not infringe any United States patent, and undertakes to indemnify Buyer against all judgments, decrees, costs or expenses resulting from such alleged infringement, and covenants that, upon receipt of timely written notification and request from Buyer and at Seller's own expense, it will defend, or assist in the defense of, any suit or action which may be brought against Buyer by reason of any alleged infringement of any United States patent in the sale or use of Seller's product.

11.(a) Material Replacement. Subject to the terms and conditions contained herein, Seller warrants all equipment to Buyer for a period of 18 months from shipment or 12 months from the date of start-up, whichever is earlier, to be free from defects in material and workmanship. Seller's responsibility under the foregoing warranties shall be limited to supplying, at its option, new or remanufactured

parts to replace parts containing defects in material or workmanship discovered within the above warranty periods. The warranty on such new or remanufactured parts shall not extend beyond the original warranty period. (b) Labor. Seller shall provide labor to repair any defect in material or workmanship in precision air conditioning products within the 30 day period following a purchased factory start-up, but only if such start-up is purchased from Seller, (with such labor warranty not to extend beyond the expiration of the material replacement warranty period described in the first section of this paragraph).

12. Subject to the terms and conditions contained herein, Seller warrants all separately purchased replacement parts to Buyer for a period of 90 days following shipment to be free from defects in material and workmanship. Within the 90 day period following shipment, Seller's sole responsibility hereunder shall be to provide replacement parts upon request by Buyer and evidence satisfactory to Seller of the existence of a bona fide defect covered by this warranty. No part may be returned until Buyer has obtained a signed goods return authorization from Seller's home office in Montreal, Quebec, Canada.

Parts are to be returned to Seller prepaid and must be received by Seller within 90 days after the issuance of Seller's goods return authorization. Upon inspection by Seller confirming coverage under this warranty, a replacement part credit will be issued.

13. Buyer may, at its option, prior to delivery of the equipment by Seller, purchase an Extended Four (4) Year Warranty on any purchased refrigeration compressors. If this Extended Four (4) Year Warranty is purchased, Seller warrants the compressor to be free from defects in materials and workmanship. This obligation is limited to providing replacement parts or replacing the compressor at Seller's option for four (4) years following the expiration of the standard warranty described in this Contract. This warranty extends only to the Buyer as defined above and it cannot be transferred unless authorized in a writing signed by the Seller.

Dectron Internationale Terms and Conditions of Sale for Products Installed in the United States of America and Canada**Ecosaire® Units and Factory-Supplied Accessories**

14. The conditions below apply to all warranties offered hereunder and failure to comply with any of the following shall render the applicable warranty null and void:

(a) All repairs shall be performed in accordance with Seller's standard warranty labor authorization procedures, as the same may be revised from time to time and which are available from Seller upon request. Equipment or defective components may be returned only at Seller's discretion, upon prior written goods return authorization from Seller's home office in Montreal, Quebec, Canada.

(b) Failure to make payment in full in accordance with Seller's credit terms shall void all warranties extended by Seller or set forth herein until payment in full has been received.

(c) Warranty claims must be received by Seller in writing prior to the expiration of the applicable warranty period in order to be valid.

(d) ALL WARRANTIES, EXCEPT AS EXPRESSLY SET FORTH HEREIN, WHETHER THEY BE OF MERCHANTABILITY, FITNESS FOR A SPECIFIC PURPOSE OR OTHERWISE, OR WHETHER OR NOT THEY ARE EXPRESS OR IMPLIED, ARE HEREBY DISCLAIMED. SELLER SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES FROM ANY CAUSE WHATSOEVER. SELLER SHALL NOT BE LIABLE FOR PROSPECTIVE PROFITS OR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, NOR SHALL ANY RECOVERY OF ANY KIND AGAINST SELLER BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE SPECIFIC EQUIPMENT SOLD AND CAUSING THE ALLEGED LOSS, DAMAGE OR INJURY TO THE BUYER OR OTHERS.

(e) Seller shall not be liable for claims, damages, losses or charges of any kind either for labor, labor expenses or otherwise, suffered or incurred by Buyer in replacing or repairing defective equipment, or occasioned by such defective equipment, except charges authorized by Seller in accordance with its standard labor authorization procedures.

Unauthorized service work performed upon any product shall void all warranties.

(f) No warranty may be extended beyond the terms described herein unless expressly agreed to in writing and signed by Seller's authorized representative at its home office in Montreal, Quebec, Canada.

(g) All equipment start-up must be supervised by a party authorized by Seller following instructions provided by Seller.

(h) This warranty does not cover: (i) inadequate or interrupted electrical service from an outside source; (ii) unless specifically agreed to in writing at the time of sale, product delivered outside of the United States of America or Canada; (iii) product not supplied by Seller or damage or loss occasioned by the use thereof; (iv) damage or loss caused by misuse, alteration or abuse of the product; (v) excessive labor costs due to inaccessible equipment or other factors beyond the control of Seller; (vi) overtime, holidays, travel time and mileage, emergency calls or anything other than straight labor time authorized hereunder; (vii) damage to product after it has been delivered to a common carrier, licensed public trucker or Buyer or its agent; (viii) any loss or damage caused by failure to install or maintain equipment in accordance with Seller's instructions, including without limitation, failure to replace filters and belts, or clean, lubricate or properly calibrate equipment; (ix) consumables, such as, but not restricted to, humidifier bottles, filters, fuses, refrigerant, lubricant, sundries and shop supplies; (x) air freight, next day air, courier services and similar and related charges; (xi) defects due to faulty specifications or drawings; (xii) any other loss or damage not specifically covered by this warranty, or beyond the reasonable control of Seller, and (xiii) maintenance and service including replacing filters and belts, and cleaning, lubricating, calibrating and adjusting the equipment.

(i) The warranties contained herein may not be transferred unless authorized in writing by Seller.

(j) Seller may, at its option, allow a credit against all or part of the purchase price in lieu of replacement or repair of any product covered by the warranty set forth herein. IN ANY EVENT, SELLER'S MAXIMUM EXPOSURE UNDER THE WARRANTIES DESCRIBED HEREIN SHALL BE THE ORIGINAL PURCHASE PRICE OF THE COVERED EQUIPMENT OR PART.

15. Unless otherwise agreed in writing by the Seller, the purchase price, for credit approved Buyers, shall be paid to the Seller net cash 30 days from the date of Seller's invoice. Upon failure of the Buyer to pay within 30 days, interest on the balance due will be charged at the rate of 1 ½% per month, or the maximum rate permitted by law, whichever is less, and the Seller, without prejudice to any other lawful remedies, reserves the right to suspend further shipments and deliveries to the Buyer whether provided for in this or any other agreement, and further reserves the right, either with or without legal process and using such force as may be reasonably necessary, to enter into and onto the premises where the equipment may be or is believed to be and take possession thereof. Upon default by Buyer in any credit terms extended by Seller, Seller shall be entitled to recover from Buyer its reasonable costs in collection of any outstanding indebtedness of Buyer to Seller, including, without limitation, reasonable attorney's fees and disbursements.

16. The terms of this Contract shall govern the liability and obligations of Seller with regard to this order whether the sale was procured directly by Seller or indirectly through its authorized sales representatives. No oral or written representation of any sales representative of the Seller shall be binding upon or enforceable against Seller unless such representation is specifically recited and included in this Contract.

17. Unless Buyer shall notify Seller in writing to the contrary with five business days after receipt of this acknowledgment form, it will be deemed accepted and the sale and shipment by the Seller of the goods covered hereby shall be conclusively deemed to be subject to the terms of sale herein set forth.

Contents

Operation

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Operation

Maintenance

Schedule

The following list is **IMPORTANT** to the proper function and long life of the unit.

Every Week**Check for Alarms**

- Check that the red alarm light is not activated. If the alarm light comes on at any time, **call a service technician.**

Check Room Temperature and Relative Humidity

- Check that the room temperature and relative humidity are within acceptable limits.

Every Month**Check the Air Filters**

For units equipped with Dirty Filter alarm, change filters immediately upon alarm, then reset.

- All units have return air filters. The unit cannot work properly with dirty filters.
- All dirty filters should be replaced with identical new filters.
- Do not operate the unit for any amount of time without all filters in place.

Check the Humidifier

- Make sure the strainer is clean.
- If the **High Water Sensor** light on the humidifier is illuminated (except during startup, see **Startup - Humidifier**), the cylinder must be replaced. For replacement instructions, see **Operation - Maintenance - Humidifier.**

Check that the condensate drain pan(s) is clean.

For units so equipped, check that the remote heat exchanger is clean.

Clean any trash or leaves that might interfere with proper airflow.

Check remote heat exchanger (if any) fan operation.

See **Operation - Maintenance - Remote Heat Exchanger.**

Every Six Months

For units with mechanical refrigeration, check that there are no bubbles in the sight glass after 10 minutes of compressor operation. See Startup - Adjustments.

Check the evaporator superheat. See Startup - TXV Adjustment.

With the unit disconnect switch open, check that all power connections and terminal screws are tight. Refer to NEC 110.14 or other applicable codes.

Every Twelve Months

Check the condensate drain pan for any accumulated residue. Clean as necessary.

Check the air heat transfer coils for dirt and/or trash.

- If the coils are dirty
 - Clean the coils with a solution of mild soap in warm water. Do not use corrosive cleaning agents.
 - Increase the frequency of filter replacement. Dirty filters leak dirt onto the coils.

In the event of a future shutdown, leave power on the unit for the crankcase heaters if safe to do so. To start the Ecosaire® unit again, follow the steps in the STARTUP section of this manual.

Photostat the next two pages as needed.

Tape the spine edges of the copies together.

Post the copies as appropriate to be filled out by maintenance personnel.

	DATES																											
No alarms?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Room temperature	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Room humidity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air filters clean?				<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	
Humidifier strainer clean?				<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	
Humidifier high-water sensor not lit?				<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	
Condensate drain-pan clean?				<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	
Remote heat-exchanger clean?				<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	
Remote heat-exchanger fans OK?				<input type="checkbox"/>				<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	
Sight glass clear?																												
Evaporator superheat																												
Electrical terminals tight?																												
Internal air heat-exchangers clean?																												

DATES

[illegible]

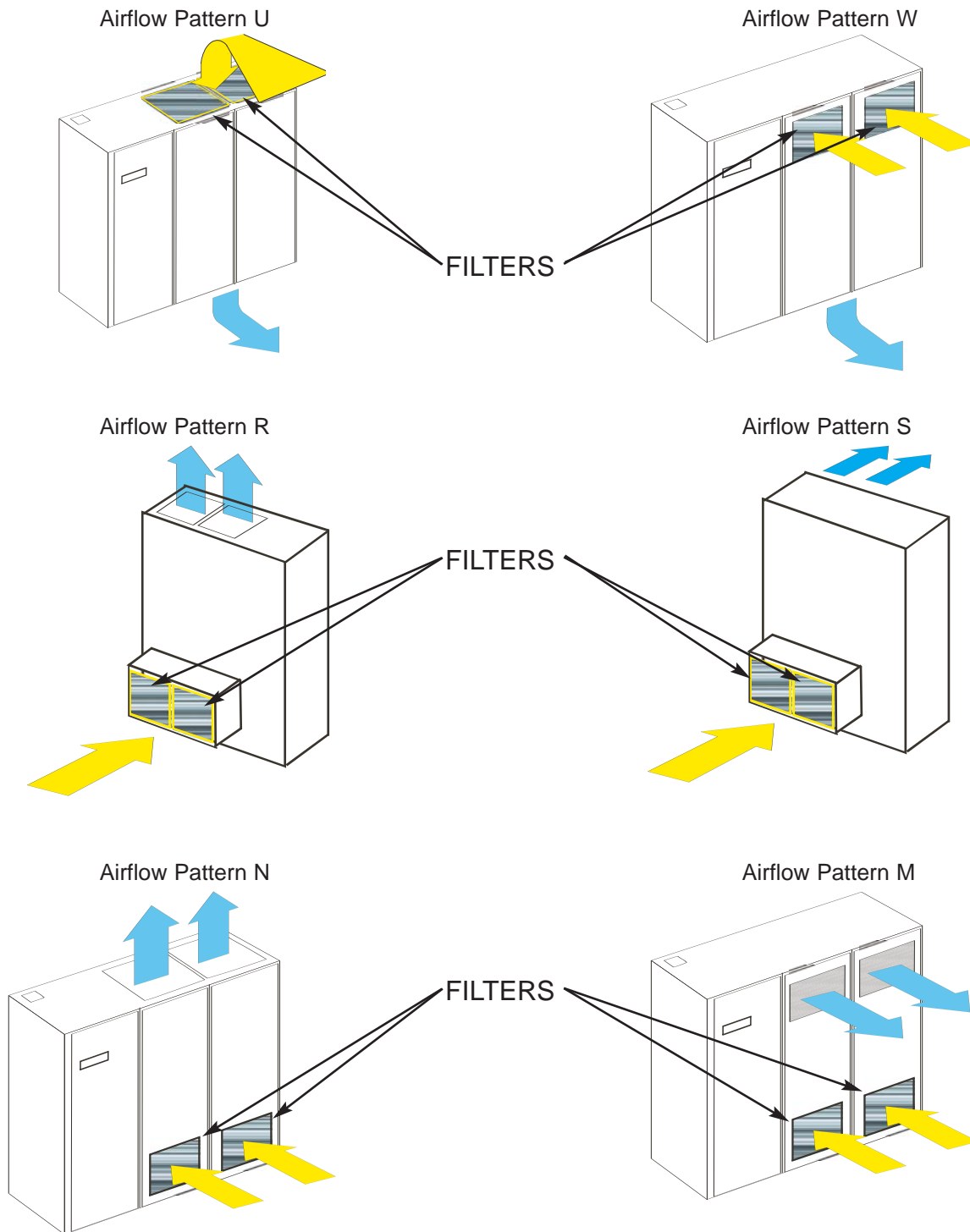
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Air Filters

Maintenance

Operation

Air filters should be checked at least every month. Dirty filters can prevent proper operation and can lead to expensive repairs. If filters are dirty, replace them with filters of equal performance. If filters are extremely dirty after a month of operation, replace them more often.



Operation

Maintenance

Remote Heat Exchanger

Air-Cooled Direct Expansion, Glycol-Cooled Direct Expansion, Air-Cooled DualCool, Glycol-Cooled DualCool, & FreeCool Units Only

NOTE: Units must be completely disconnected before servicing.

1. Be sure the remote condenser has not been damaged.
2. Be sure that nothing has been stored closer to the condenser than twice the fan width.
3. Be sure that no plants have grown closer to the remote condenser than twice the fan width.
4. Be sure that nothing has been built or stored within 10 feet above the condenser.
5. For remote condensers surrounded by a wall or fence (see ground clearance below), be sure that any grass under the fence is cut short.
6. Be sure the remote condenser is clean. There should be no leaves or dirt interfering with good airflow. Periodic cleaning of finned surfaces can be done by washing down with warm water spray and a mild non-foaming detergent. To protect the heat exchangers from corrosion, do **not** use alkaline or acidic cleaning solution.

Allow clear space around the condenser equal to at least at least twice the width of the condenser fan.

any overhanging obstruction

Allow clear space above the condenser.

10 ft
(3 m)

Side View

Control enclosure end
(minimum by code:

Canada 1m

USA 36 in. for 230V

42 in. for 460V

or per NEC 110-26,
whichever is greater)

EXAMPLE
Appearance, location, and
quantity of components
may vary.

The condenser should **not** be enclosed within a solid fence or wall, since such structures promote recirculation of air. If a fence or wall must be installed, it must be no closer to the condenser than "2W" (twice the width of the condenser fan) shown above, and must not extend lower than 12 inches (30 cm) above grade. Fences lower than 12 inches above grade may cause recirculation of heated air and a corresponding reduction in performance. **Be sure any grass is kept short.**

minimum 12 in.
(30 cm)

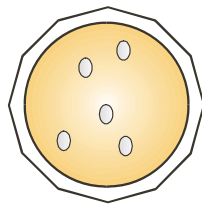
Refrigerant Sight Glasses

Maintenance

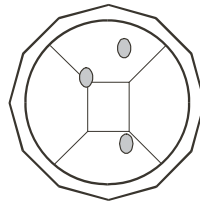
Operation

Be sure there are no bubbles or droplets in the refrigerant sight glasses after five minutes of compressor operation.

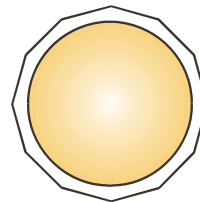
If bubbles or droplets are noted, contact a service technician or the factory.



Bubbles in the sight glass indicate problems such as a possible loss of refrigerant.



Oil droplets in the sight glass may indicate severe problems such as loss of refrigerant.



After 5 minutes of compressor operation, the sight glass should be clear and full of liquid refrigerant.

Operation

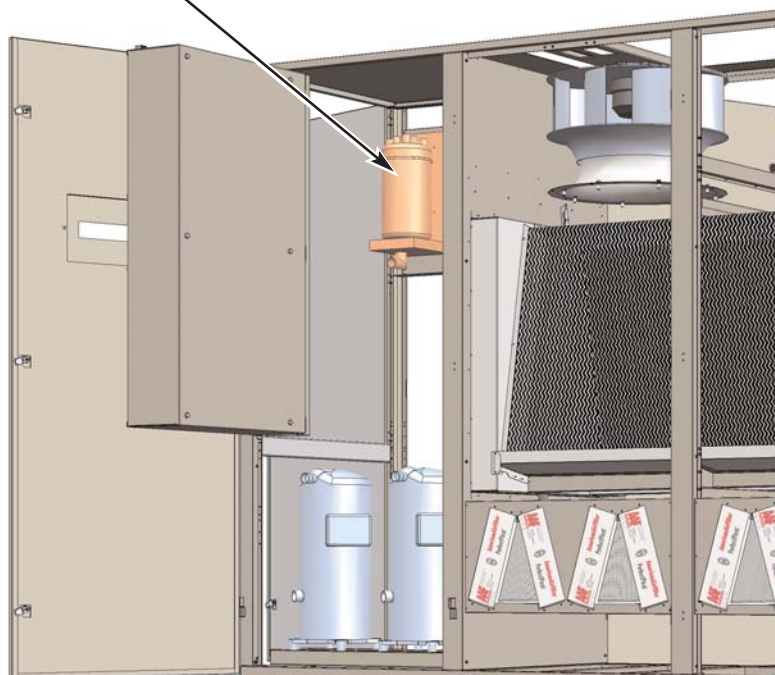
Maintenance

Humidifier

Humidifier (if any)

Some units may be equipped with electrode-type humidifiers.

Refer to the humidifier manual supplied with this manual.

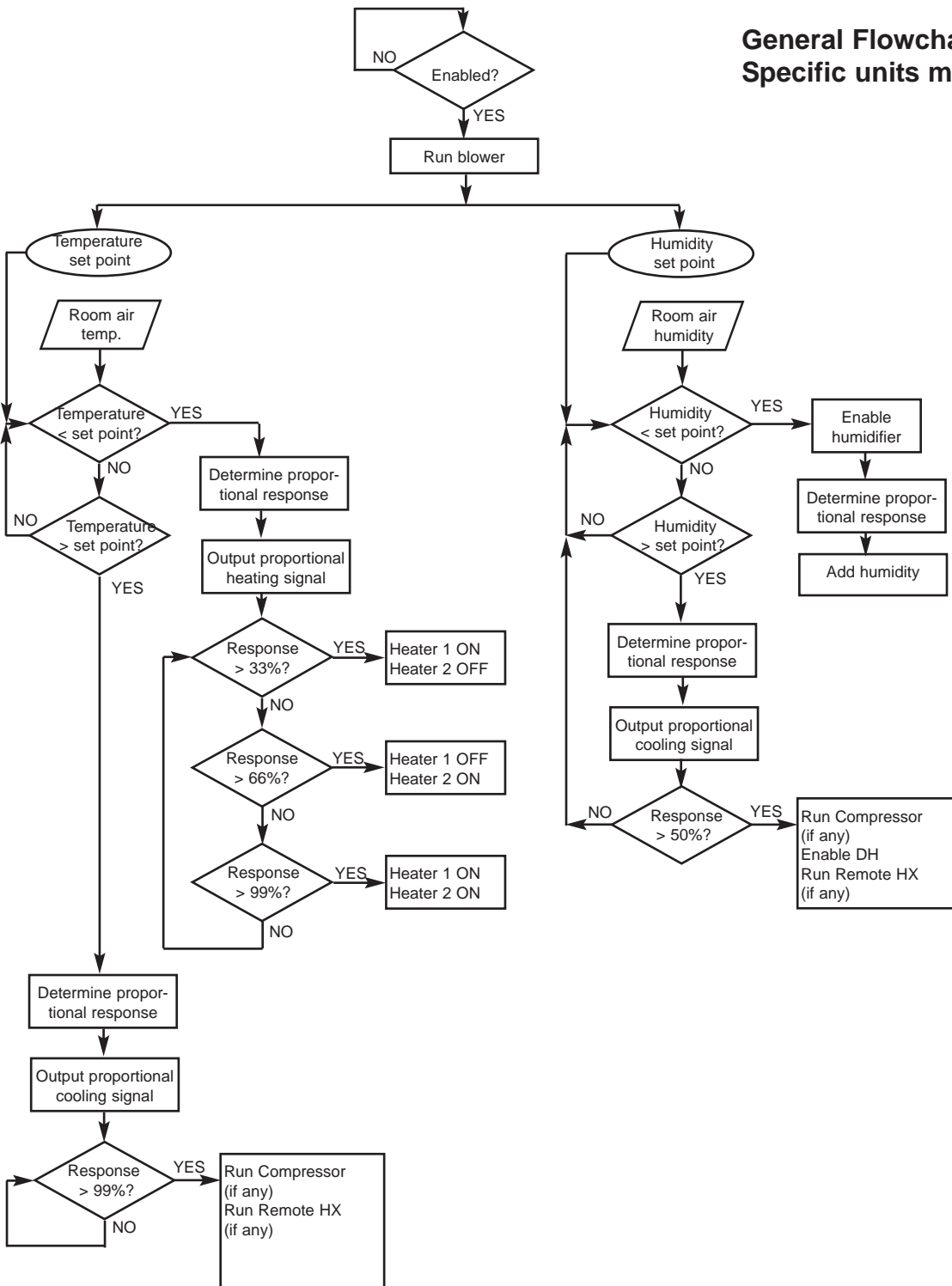


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Operation

Logical Flowchart

General Flowchart
Specific units may vary.





OPERATION


Controller Interface

Operation

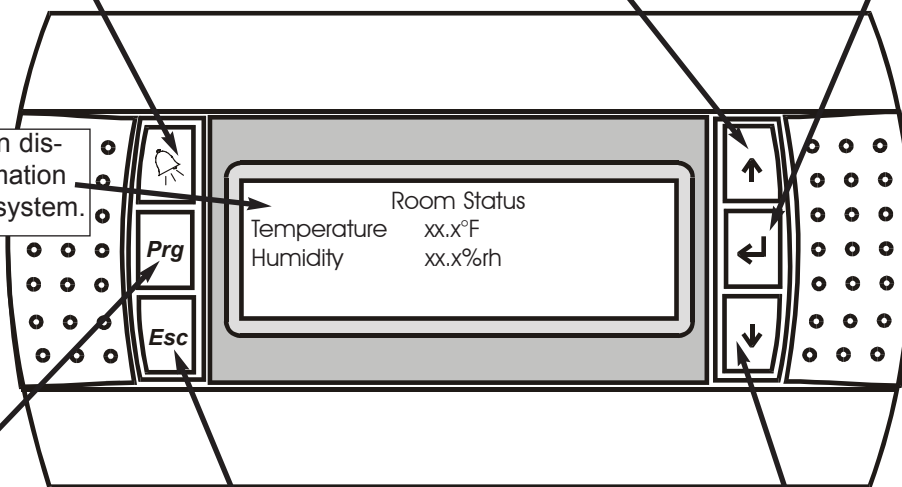
The Supervisaire® controller handles all the functions of the Ecosaire® unit. The initial startup at installation requires the manual input of the set points and permission to run. After this all functions are fully automatic.

The  button is used to announce and to access any alarms that might arise. This button illuminates to indicate a current alarm condition. Pressing this button brings up a sequence of current alarm description screens.

The  button is used for scrolling upward to change set points, enter passwords, and to select display screens and menus.


The  button is used to navigate through menu selections and to accept changes.

The backlit LCD screen displays any needed information on the operation of the system.



The **Prg** button is used to access the set point screens. It is also used in combination with the **Esc** button to access certain service screens.

The **Esc** button is used to revert to an earlier screen. It is also used in combination with the **Prg** button to access certain service screens.

The  button is used for scrolling downward to change set points, enter passwords, and select display screens and menus.


Security




The Supervisaire® controller is protected by three password levels. Set points, run enabling, and site-specific setup values are protected by a User Password. Detailed service settings and information are protected by a Service Password. Model specific operation constants are protected by a Factory Password.

Passwords are automatically cleared after two minutes pass with no button activity.

NOTE: The password will be cleared automatically if no button activity for the duration of the password timer



Some settings require the User Password. To **enter the password** when prompted - press  to move the cursor to the password.

Press  until the password reads "0008" for USER and 0017 for SERVICE. If you overshoot, press  .. If you overshoot, press .

OPERATION

Press . The password is entered and changes can be made.

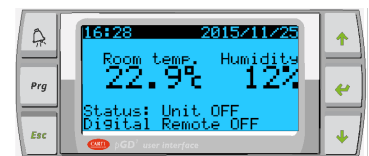
Enable and Disable Unit

Operation

Note: This adjustment requires the user password, see

Startup - Pre-Startup Adjustments - Controller Password.

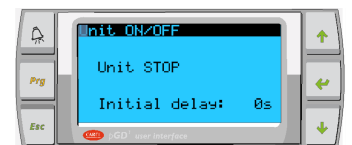
To access the **System ON/OFF** menu, press **Prg** and enter the password as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen should appear as shown.



press **←** to move the cursor under "ON/OFF"

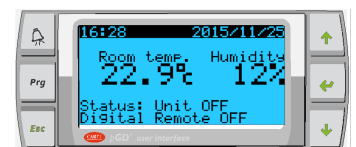


Press **↑** to change "STOP" to "START".



To **store the setting**, press **←** to return the cursor to the upper left corner.

The refrigeration system is not operational. After a short delay, the display will return to the default **Room Status** screen. Alternatively, press **Esc** as necessary to return to the default screen.



Note: This adjustment requires the user password, see Startup - Pre-startup Adjustments - Controller Password.

The clock is set at the factory for date and Eastern Time. These settings can be changed as below.

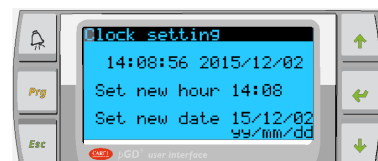
To access Clock Function press Prg and highlight CLOCK as shown



To select CLOCK press ↵ to view the CLOCK menu.

To change the clock, press ↵ repeatedly until the cursor is at the desired value.

The example is to change the hour.



Press either ↑ or ↓ to change the selected value.

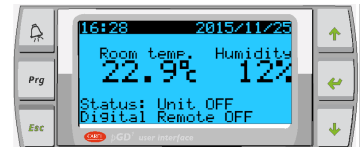
To store the setting, press ↵ until the cursor is back in the upper left corner.

Change Room Humidity Set Points

Operation

Note: This adjustment requires the user password, see **Startup - Pre-startup Adjustments - Controller Password**.

Press **Prg**, enter the password, and press **↵**, as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen will appear as shown.



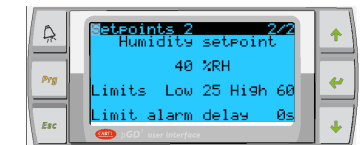
Press **↓** repeatedly to access Humidity Set Points. To access the humidity set point screen, press **↓** three times.



To select the humidity set point press **↵** to move the cursor to the set point.

To change the humidity set point, press either the **↑** or the **↓** button to select the desired temperature. The longer the button is held, the faster the set point changes.

To store the new set point, press **↵**. The cursor moves to the top left corner.



Press **↓** to access the humidity alarm set point screen. The humidity alarms are factory set for High=80% and Low=20%. If the room temperature goes over "High" or under "Low" for a period greater than "Delay", an alarm will be registered. Unit operation will not be affected. These settings can be changed as below.

To select the alarm set point to change, press **↵** repeatedly to move the cursor to the desired position. The example is for the High humidity alarm set point.

To change the set point, press either the **↑** or the **↓** button.

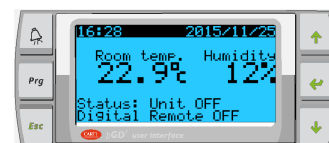
To store the new value, press **↵** repeatedly to move the cursor back to the top left corner.

Operation

Change Room Temperature Set Points

Note: This adjustment requires the user password, see **Startup - Pre-startup Adjustments - Controller Password**.

To adjust the temperature set point screen, first press **Prg**, enter the password, and press **↵**, as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen will appear as shown.



Press **↓** to access **Temperature Set Pts**.

Press **↵** to move the cursor to the set point.



To **change the temperature set point**, press either **↑** or **↓** to select the desired temperature. The longer the button is held, the faster the set point changes.

Press **↵** to store the new set point. The cursor moves to the top left corner.

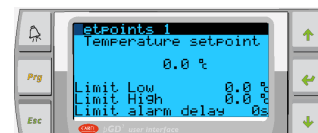
The temperature alarms are factory set for High=80°F and Low=60°F. If the room temperature goes over "High" or under "Low" for a period greater than "Delay", an alarm will be registered. Unit operation will not be affected. These settings can be changed as below.

Press **Prg**, enter the password, and press **↵**, as discussed in **Startup - Pre-startup Adjustments - Controller Password**. The screen will appear as shown.

To access the **temperature alarm set point** screen, press **↓** twice.

To **select the alarm set point to change**, press **↵** repeatedly to move the cursor to the desired position. The example is for low temperature alarm set point.


To **change the set point**, press either **↑** or **↓**.




To **store the new value**, press **↵** repeatedly to move the cursor back to the top left corner.

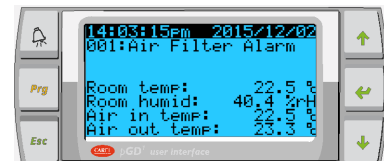
Alarms


Operation


If an alarm other than Power Restart is registered, the ALARM button  will light.



To **view the alarm information**, press . In the example, the hour of occurrence is “hh”, the minute of occurrence is “tt”, the month of occurrence is “mm”, the day of occurrence is “dd”, and the name of the alarm is “xxxxxxxx”.



To **view all the current alarms**, press  repeatedly, noting each alarm. Eventually the screen will show “No more alarms”.

To **clear the current alarms**, press . The alarms are stored in the Alarm History for later viewing if needed. The default ROOM STATUS screen is shown.

For the meanings of these alarms, along with checks and corrections, see **Operation - Controller Diagnostics**.

Operation

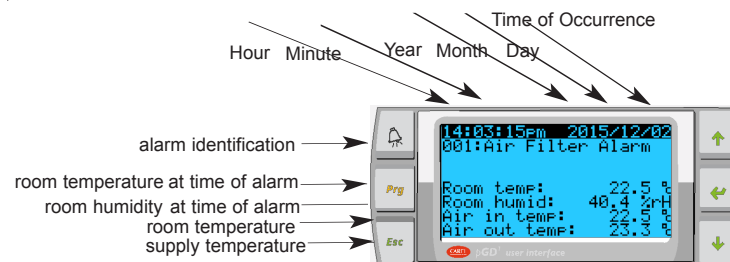
Alarm History

Select **Programming Menu** by pressing **Prg** and **Esc**

To select **Alarm History**, pressing ↓

Press ↵ to bring up the Alarm History

To view the alarm list, press ↓.



OPERATION

To view previous alarms, press

↓ repeatedly.

The display will return to
ROOM STATUS
after a short delay.

View Component Run Times

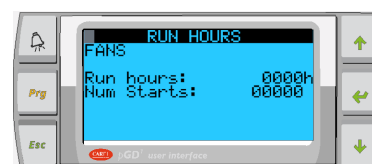
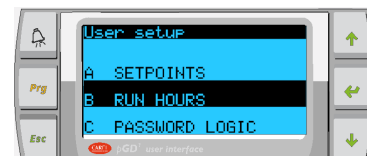
Chilled Water Units

Operation

Select **User Setup** from the **Programming Menu** by pressing **Prg** and ↵



Select **Run Hours** by pressing ↵.



The display will return to **ROOM STATUS** after a short delay.

Operation

Controller Diagnostics

CHECKS

CORRECTIONS

*** ALARM ***
00:00 00/00
Change Air Filters

1. Be sure that the airflow was correctly adjusted at installation.
2. Check filters
3. Check blower operation
4. Check blower motor operation
Operate motor contactor
Measure contactor terminal voltage
Check blower fuses
5. Check controller output
6. Check external duct dampers (by others)
7. Check that diffusers are open
8. Check airflow sensor and connections

- Consult air balancing records. Correct as necessary.
- Filters must be kept clean. Replace as necessary
- Blowers must turn in proper direction.
- Reset motor overloads.
- Correct as necessary.
- Replace as necessary.
- Check by wiring diagram.
- Open as necessary for proper airflow.
- Open as necessary.
- Be sure all tubes and wires are connected.
- Re-adjust set point if necessary. Consult factory for method.

*** ALARM ***
00:00 00/00
Compressor 1
High Pressure

1. Check that remote condenser (if any) operates on controller demand.
2. Check that remote condenser (if any) has adequate clearance from air obstructions.
3. Check that remote condenser (if any) has sufficient flow of air and that the air is less than 105°F.
4. For water-cooled units, check that water is flowing and of proper temperature.
5. Check that all refrigerant isolation valves are open.

- Check remote control wires for continuity. The voltage between C8 and NO8 should be zero in cooling mode and 24VAC at other times.
- See **Installation - Unpacking and Locating - Outdoor Heat Exchanger.**
- Check for leaves or trash obstructing airflow. Be sure condenser is located in an area that will not cause re-circulation of heated air through the condenser.
- Water temperature and flow rate should be as specified in the installation guidelines.
- Open as necessary.

Controller Diagnostics

Operation

	CHECKS	CORRECTIONS
<div> <div>*** ALARM ***</div> <div>00:00 00/00</div> <div>Fire detected</div> </div>	<ol style="list-style-type: none"> 1. Check for fire or smoke 2. Check for fire alarm input - voltage 	<ul style="list-style-type: none"> • If fire or smoke is found, follow proper emergency procedures. • If necessary, correct operation of fire detector (by others), continuity of cable (by others), or operation of controller.

Operation

Controller Diagnostics

*** ALARM ***

00:00 00/00
Compressor 1
Low pressure

CHECKS

1. Check that there is adequate air flow. See previous alarm "Change air filters".
2. Check for dirt or corrosion on the evaporator.
3. Check that the room temperature is within 20% of design specification.
4. Check that the room relative humidity is within 20% of design specification.
5. Check the refrigerant low pressure. It should be above 55 PSI after the compressor has been running for two minutes.
6. Check the operation of the refrigerant low pressure switch. It should open as the pressure falls below 20 PSI and close as the pressure rises above 50 PSI.

CORRECTIONS

- Correct as in previous alarm "Change air filters".
- Clean or replace as necessary.
- Correct temperature set points for design conditions.
- Correct humidity set points for design conditions.
- Check operation of the liquid line solenoid valve. The valve should be open when the associated compressor is running, except in pump-down mode.
- Check the refrigerant expansion valve setting.
- Check that the pressure drop across the liquid line filter-drier is less than 5 PSI.
- Add refrigerant if needed.
- Adjust or replace as necessary.

Controller Diagnostics

Operation

	CHECKS	CORRECTIONS
<div>*** ALARM ***</div> <div>00:00 00/00</div> <div>High Room Temperature</div> <div>*** ALARM ***</div> <div>00:00 00/00</div> <div>Low Room Temperature</div>	<ol style="list-style-type: none"> 1. Check temperature of return air with a known good thermometer. 2. Check for unexpected loads such as open doors and windows, new electrical equipment, more people than usual, etc. 3. Check resistance of sensor and cable. 	<ul style="list-style-type: none"> • If controller does not agree with known good thermometer, contact factory for corrective measures. • If room temperature is too high or too low, check and adjust temperature set point. • Correct as necessary. • If the cable continuity is correct but the sensor resistance does not correspond to that shown in the chart for the known temperature, the sensor must be replaced.
<div>*** ALARM ***</div> <div>00:00 00/00</div> <div>High Room Humidity</div> <div>*** ALARM ***</div> <div>00:00 00/00</div> <div>Low Room Humidity</div>	<ol style="list-style-type: none"> 1. Check humidity with a known good psychrometer. 2. Check for unexpected loads such as open doors and windows, new electrical equipment, more people than usual, etc. 	<ul style="list-style-type: none"> • If controller does not agree with known good psychrometer, contact factory for corrective measures. If the sensor is outside the $\pm 10\%$ calibration range, it must be replaced. • If room humidity is too high or too low, check and adjust humidity set point.

Operation

Controller Diagnostics

	CHECKS	CORRECTIONS
<div>*** ALARM ***</div> <div>00:00 00/00</div> <div>Discharge Temp</div> <div>Sensor failure</div>	<ol style="list-style-type: none"> 1. Check the temperature of the supply air at the unit. 2. Check the resistance of the sensor and sensor wires. 	<ul style="list-style-type: none"> • If controller does not agree with known good thermometer, contact factory for corrective measures. • If the cable continuity is correct but the sensor resistance does not correspond to that shown in the chart for the known temperature, the sensor must be replaced.
<div>*** ALARM ***</div> <div>00:00 00/00</div> <div>Room temperature</div> <div>Sensor failure</div>	<ol style="list-style-type: none"> 1. Check the temperature of the return air at the unit. 2. Check the resistance of the sensor and sensor wires. 	<ul style="list-style-type: none"> • If controller does not agree with known good thermometer, contact factory for corrective measures. • If the cable continuity is correct but the sensor resistance does not correspond to that shown in the chart for the known temperature, the sensor must be replaced.
<div>*** ALARM ***</div> <div>00:00 00/00</div> <div>Room humidity</div> <div>Sensor failure</div>	<ol style="list-style-type: none"> 1. Using a known good psychrometer, check the humidity of the return air at the unit. 2. Check the resistance of the sensor and sensor wires. 	<ul style="list-style-type: none"> • If the controller does not agree with a known good psychrometer, contact factory for corrective measures. • Compare the voltage to that shown on the chart for this relative humidity. If the voltage is 0VDC or 19VDC, replace the sensor.

Diagnostics

Operation

SYMPTOM	CHECKS	CORRECTIONS
In heating mode the room air temperature does not rise to the set point in cold weather.	<ol style="list-style-type: none"> 1. Check heaters for operation. 2. Have a qualified HVAC engineer check that the unit heater capacity is adequate to the load. 3. Check for changes in heating load since design stage. 	<ul style="list-style-type: none"> • Correct as necessary. • If the heating capacity is not sufficient, contact factory for solutions. • Close any doors or windows that have been left open. • Check for excessive makeup airflow.
In heating mode, the room temperature repeatedly rises above set point, then falls below it.	<ol style="list-style-type: none"> 1. Heating Band may too small. 2. Integral term may be too small. 	<ul style="list-style-type: none"> • Contact factory.
In cooling mode, the room temperature does not decrease to set point.	<ol style="list-style-type: none"> 1. Have a qualified HVAC engineer check that the unit cooling capacity is adequate to the load. 2. Check for changes in cooling load since design stage. 3. If the cooling capacity is adequate, check the magnitude of the cooling band. 	<ul style="list-style-type: none"> • If the cooling capacity is not sufficient, contact factory for solutions. • Close any doors or windows that have been left open. • Check for excessive makeup airflow. • Contact factory.
In heating mode, the room temperature repeatedly rises above set point, then falls below it.	<ol style="list-style-type: none"> 1. Heating Band may too small. 2. Integral term may be too small. 	<ul style="list-style-type: none"> • Contact factory.

Operation

Diagnostics

SYMPTOM	CHECKS	CORRECTIONS
In humidification mode, the room relative humidity does not rise to the set point.	<ol style="list-style-type: none"> 1. Have a qualified HVAC engineer check that the humidifier capacity is adequate to the load. 2. Check for changes in humidification load since design stage. 3. If the humidifier capacity is adequate, check the magnitude of the humidity band. 	<ul style="list-style-type: none"> • If the humidifier capacity is not sufficient, contact the factory for solutions. • Close any doors or windows that have been left open. • Check for excessive makeup airflow. • Contact factory.
In dehumidification mode, the room relative humidity does not fall to the set point.	<ol style="list-style-type: none"> 1. Have a qualified HVAC engineer check that the dehumidification capacity is adequate to the load. 2. Check for changes in humidity load since design stage. 	<ul style="list-style-type: none"> • If the dehumidification capacity is not sufficient, contact the factory for solutions. • Close any doors or windows that have been left open. • Check for excessive makeup air flow. • Contact factory.

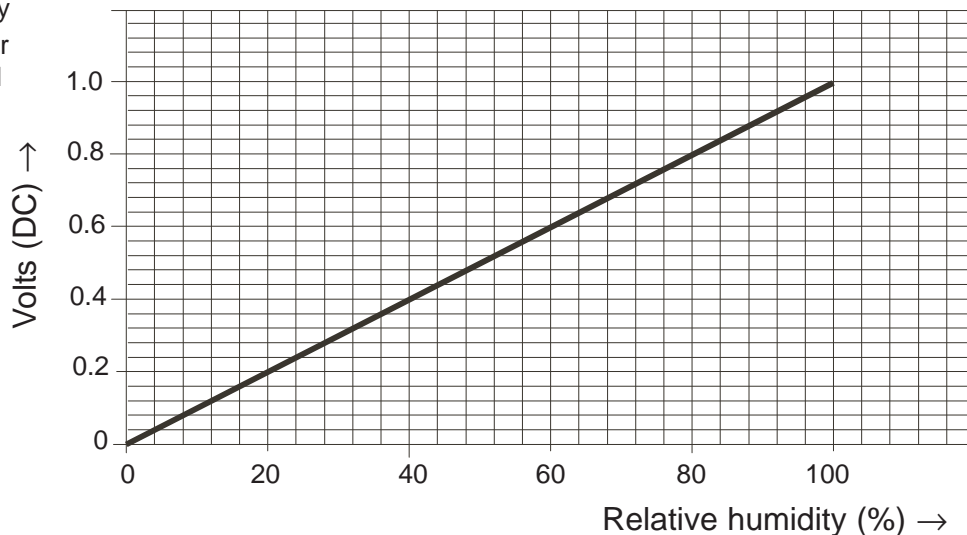
Data subject to change without notice.

Sensors

Diagnostics

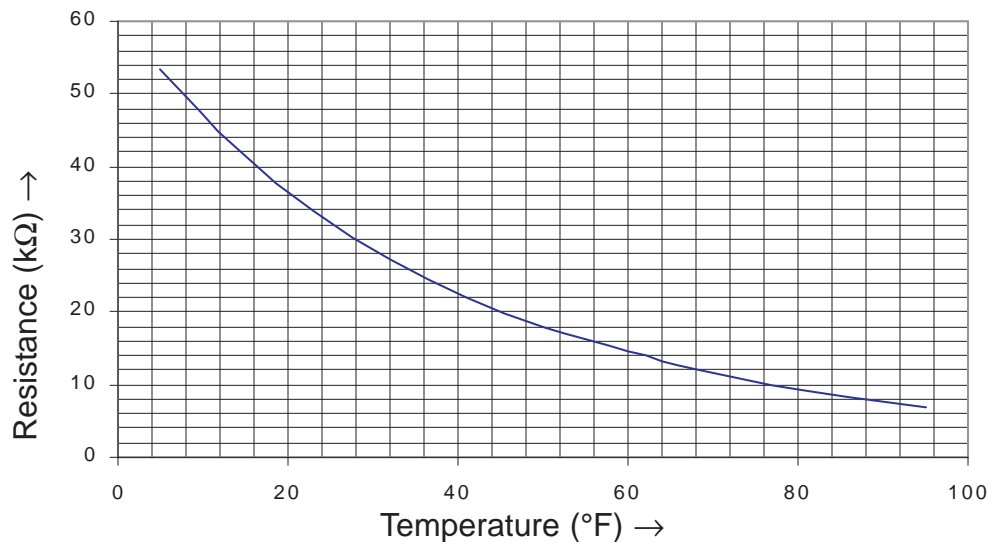
Operation

Humidity is represented by a 0 - 1 VDC signal which is linear with relative humidity. This signal cannot be calibrated in the field. Contact the factory for software solutions.



Air and fluid temperatures are measured by NTC thermistors, with the output shown here.

Remove at least one of the sensor wires before attempting to measure resistance.



OPERATION

OEM



User manual

→ **LEGGI E CONSERVA
QUESTE ISTRUZIONI** ←
**READ AND SAVE
THESE INSTRUCTIONS**

CAREL
Technology & Evolution



We wish to save you time and money!

We can assure you that the thorough reading of this manual will guarantee correct installation and safe use of the product described.

IMPORTANT WARNINGS



BEFORE INSTALLING OR HANDLING THE APPLIANCE, PLEASE CAREFULLY READ AND FOLLOW THE INSTRUCTIONS AND SAFETY REGULATIONS CONTAINED IN THIS MANUAL AND INDICATED ON THE LABELS ATTACHED TO THE UNIT.

**INSTRUCTION SHEET +050003755 OF THE CP* CONTROL BOARD IS AN INTEGRAL PART OF THIS MANUAL!
CAREFULLY KEEP INSTRUCTION SHEET +050003755 TOGETHER WITH THIS MANUAL!**

This humidifier produces non-pressurised steam by means of electrodes immersed in the water contained in the cylinder-boiler (hereafter referred to as the **cylinder**). The electrodes pass electric current through water, which, acting as electrical resistance, heats up. The steam produced is used to humidify rooms or industrial processes, by means of special distributors.

As the quality of the water in use affects the evaporation process, the appliance may be supplied with untreated water **as long as it is drinkable and not demineralised** (refer to supply water requirements); the evaporated water is automatically topped up using of a fill valve.

This appliance has been designed exclusively to humidify rooms directly or in ducts through a distribution system. Installation, use and maintenance shall be carried out according to the instructions contained in this manual.

The environmental conditions and the power supply voltage must comply with the specified values.

Any other use and modification to the appliance not expressly authorised by the manufacturer shall be considered as improper.

Liability for injuries or damage caused by improper use lies exclusively with the user.

Please note that the unit contains live electrical devices and hot surfaces.

All service and/or maintenance operations must be carried out by specialist and qualified personnel aware of the necessary precautions and able to operate properly.

Disconnect the unit from the mains before accessing any internal parts.

The appliance must be installed in compliance with the local regulations in force.

The local safety regulations in force must be applied in all cases.

Disposal of the parts of the humidifier: the humidifier is made up of metal and plastic components. All these parts must be disposed of in compliance with the local legislation on waste disposal.

Materials warranty: 2 years (from the date of production, consumable parts excluded – e.g. the cylinder).

Certification: the quality and safety of Carel's products are guaranteed by the **ISO 9001** certified design and production system,

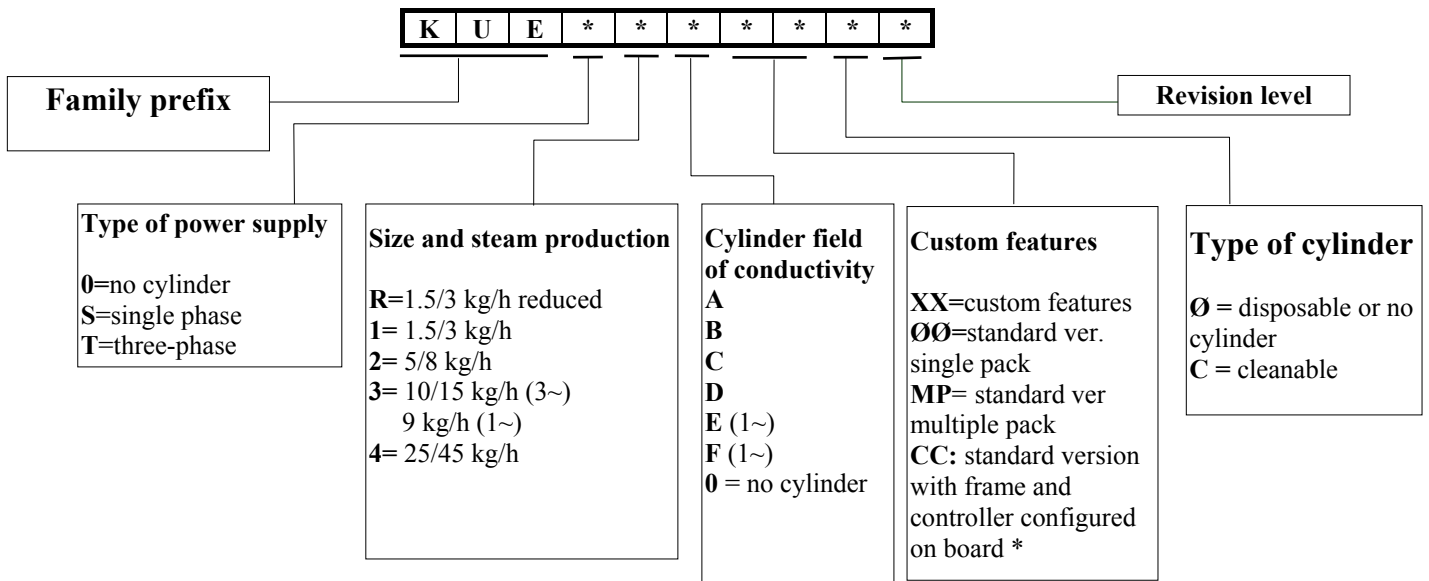
as well as by the  mark.

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1. MODELS AND DESCRIPTION OF THE COMPONENTS

The code that identifies the model of humidifier is made up of 10 characters, with the following meaning:



* The controller is configured for the maximum capacity of the KUE selected and can be modified using humiSet.

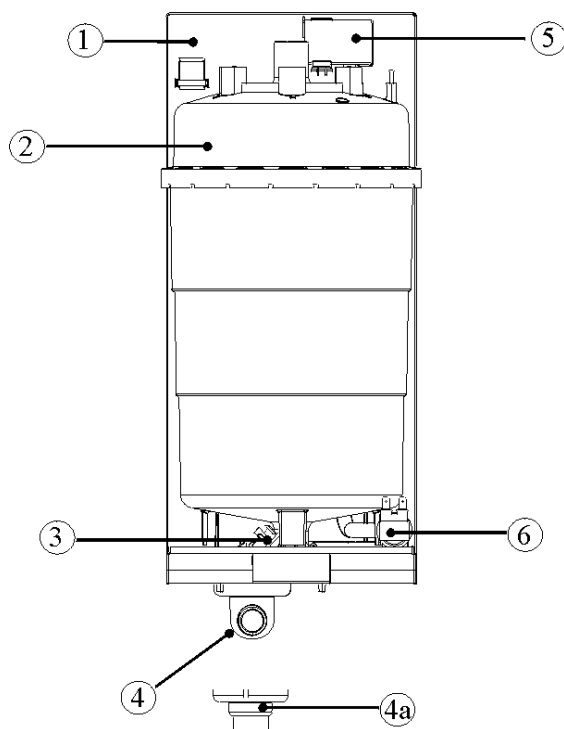
Example:

KUET3C00C0 = OEM UE KIT with three-phase cylinder, cleanable, 15 kg/h steam, for standard conductivity, revision level 0;

KUE0R0MP00 = OEM UE KIT, reduced, 1.5/3 kg/h steam, no cylinder, multiple pack, revision level 0.

KUETR0CC00 = OEM UE KIT, reduced, three-phase, 1.5/3 kg/h steam, no cylinder, with frame and controller configured for 3 kg/h, 400 V three-phase.

1.1 Description of the components



KUE*R / KUE*1 / KUE*2 / KUE*3	
no.	description
1	Load-bearing frame
2	Cylinder
3	Drain solenoid valve
4	90° revolving drain connector
4a	Straight drain connector (supplied)
5	Supply tank + conductivity meter
6	Fill solenoid valve

Table 1.1.1

Fig. 1.1.1

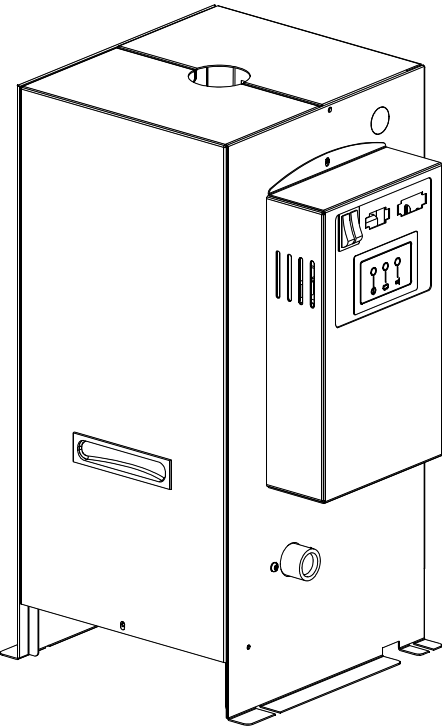


Fig. 1.1.1 A

KUE***CC**	
no.	description
*	For the details of the components see Chap.3

Table 1.1.1

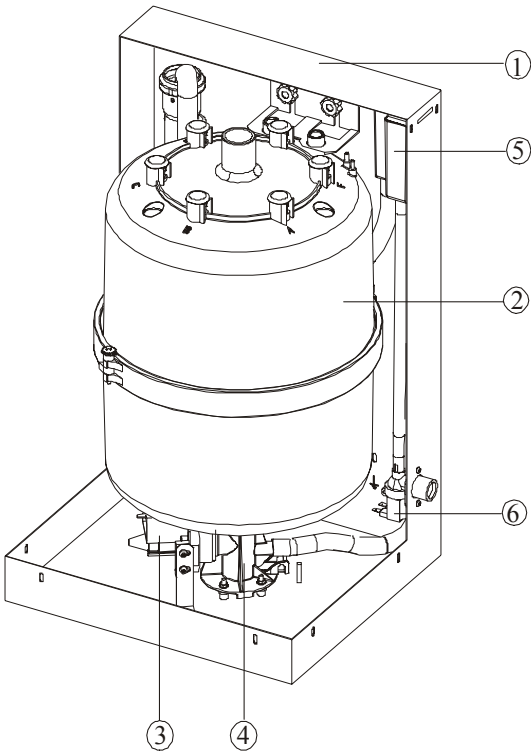
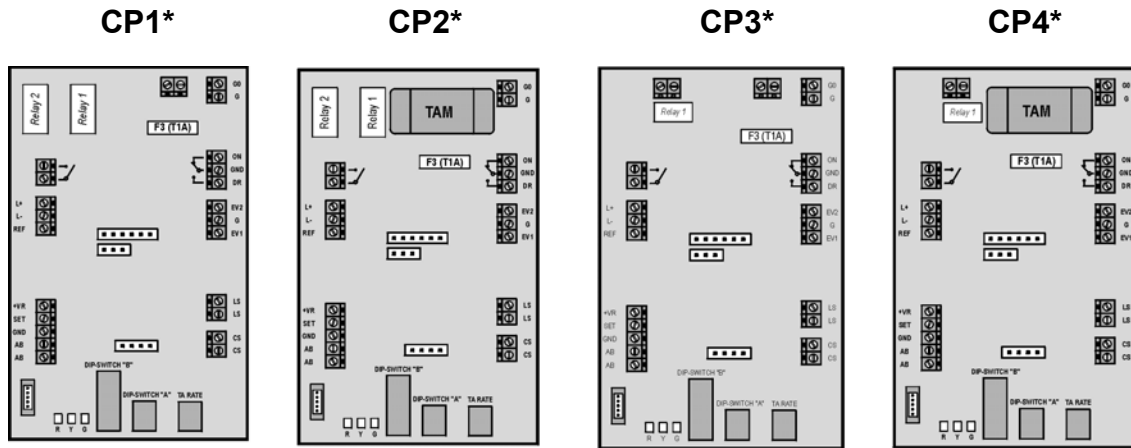


Fig. 1.1.1 B

KUE*4	
no.	description
1	Load-bearing frame
2	Cylinder
3	Drain pump
4	Supply/drain manifold
5	Supply tank + conductivity meter
6	Fill solenoid valve

Table 1.1.1



CP* control boards (also see instruction sheet +050003755 for the boards)



Fig. 1.1.1a. External TAM (current transformer) (required only for boards CP1* and CP3*)

Fig. 1.2.2 refers to the following table for the description.

no.	description
1	fill solenoid valve
2	flow limiter
3	supply hose
4	fill hose
5	overflow pipe
6	electrodes for measuring the conductivity
7	supply tank - overflow *
8	high level electrodes
9	steam outlet
10	electrodes (2/6 in the single-phase model, 3/6 in the three-phase model)
11	cylinder casing
12	bottom filters
13	drain solenoid valve
14	corrugated drain pipe
15	drain column
16	drain pump

Table 1.2.1

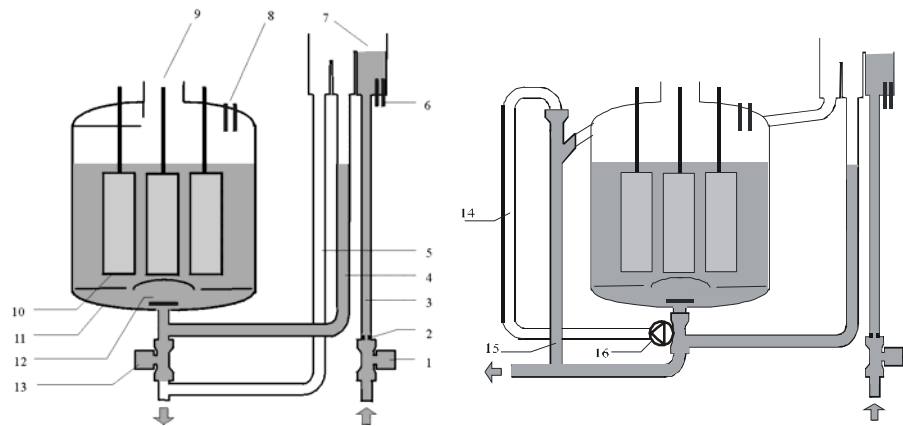


Fig. 1.2.2

* Device used to prevent the water in the supply tank from exceeding the safety level (for example due to a malfunction of the controller or leaks from the fill solenoid valve, or back pressure).

The supply tank is fitted with an overflow diaphragm that releases the excess water introduced, draining it through a special pipe.

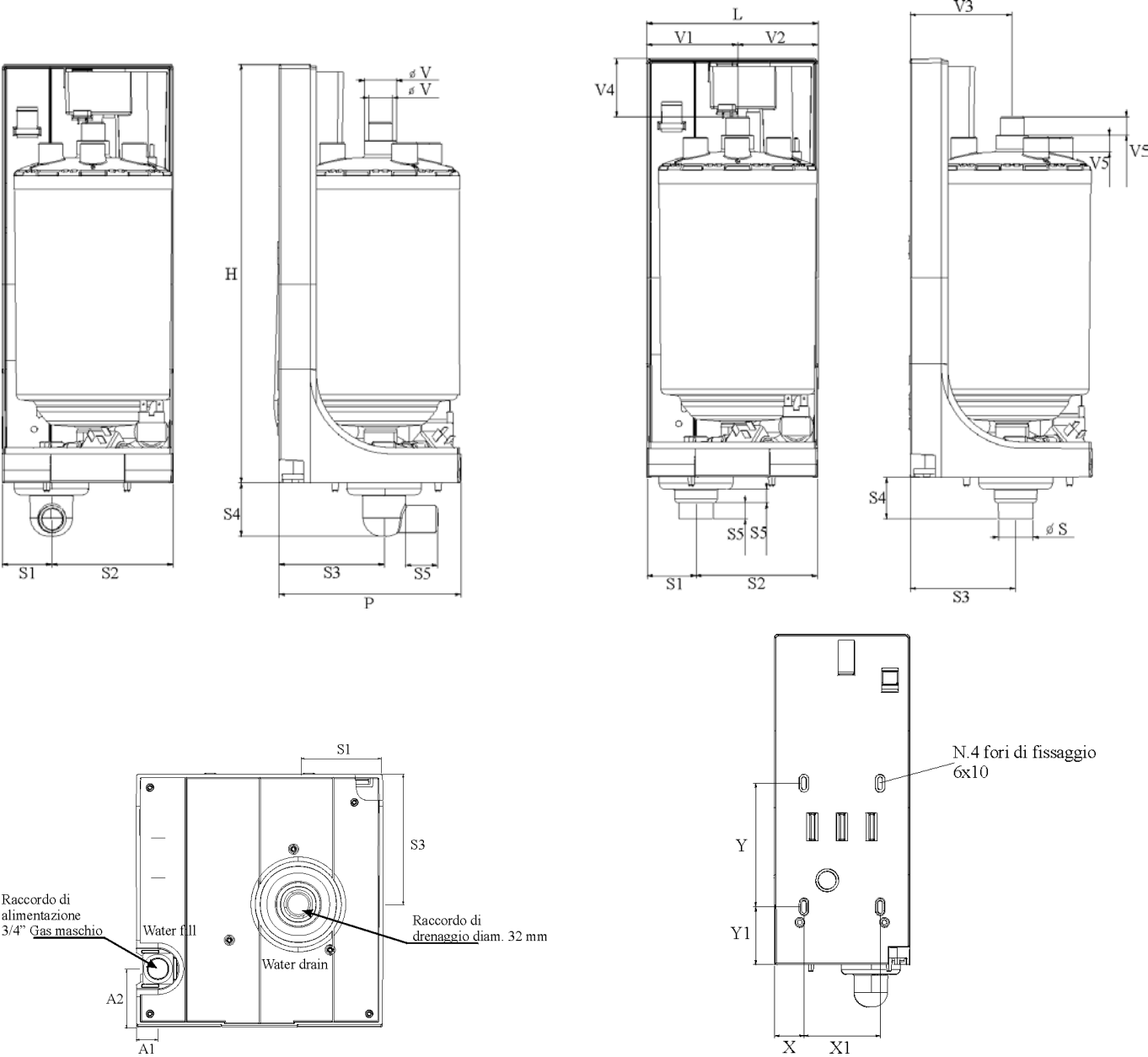
The overflow diaphragm is below the fill to prevent backflow into the supply hose.

2. INSTALLATION: dimensions, weights, hose connections

2.1 Positioning

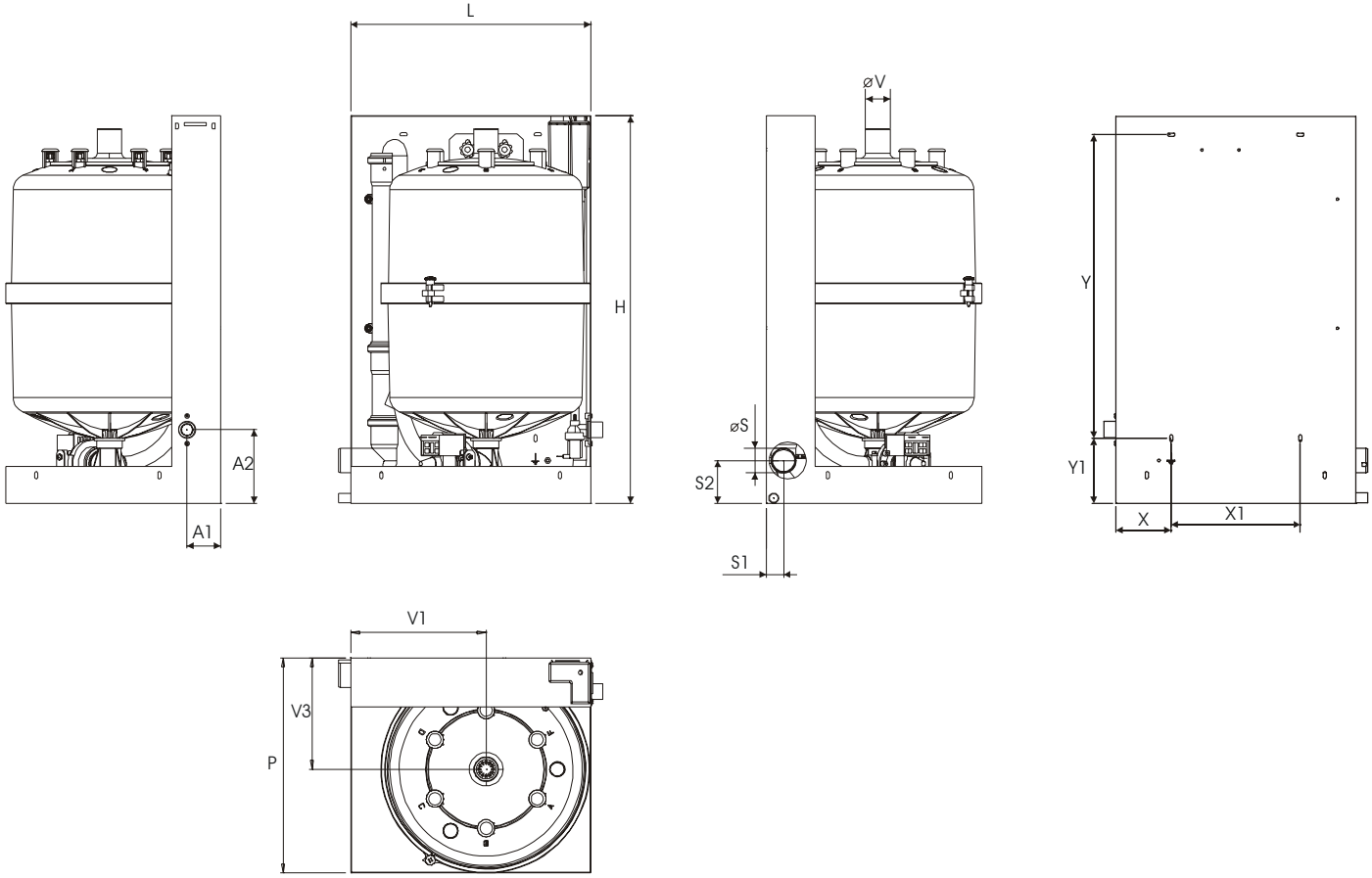
- To favour steam distribution, position the appliance so as to minimise the length of the steam outlet pipe (max 4 m). The unit has been designed for wall mounting; the wall must be able to support the weight of the unit during operation.
- The cylinder of the humidifier may reach temperatures above 60°C.
- Make sure that the humidifier is level.

KUE*R / KUE*1 / KUE*2 / KUE*3

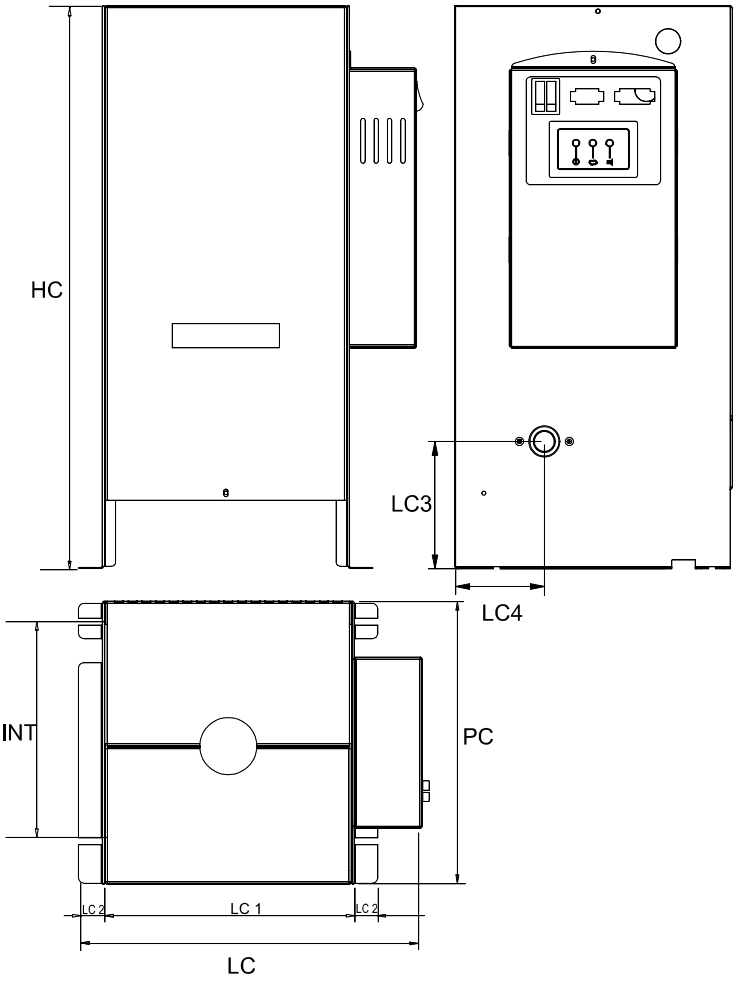


Italian	English
Raccordo di alimentazione 3/4 " Gas maschio	Supply connection 3/4" Gas male
Raccordo di drenaggio diam. 32 mm	Drain connector dia. 32mm
N. 4 fori di fissaggio 6x10	4 fastening holes 6x10

KUE*4



KUE***CC**



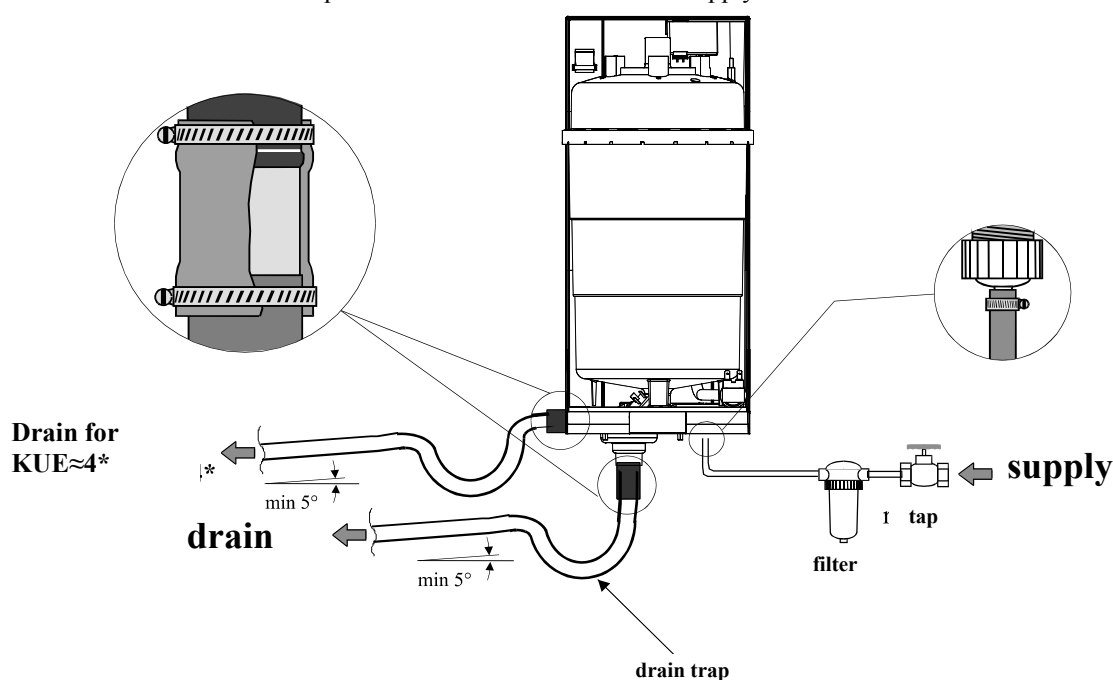
		models				
		KUE*R*	KUE*1*	KUE*2*	KUE*3*	KUE*4*
Weights (kg)	Empty	1,2	1,6	2,9	3,5	7,2
	Packaged	2,0	2,4	3,7	4,3	8,9
	Installed	3,7	5,5	8,9	13,8	39
	Installed + frame	7,7	10	14,3	21	
Dimensions (mm)	H	300	391	412	511	630
	L	160	160	185	225	390
	P	170	170	220	230	350
	dia. V	23-30	23-30	31	31	40
	dia. S	32	32	32	32	40
	V1	81	82	93	113	220
	V2	79	78	92	112	
	V3	99	99	124	135	181
	V4	54	54	20	26	
	V5	16-17	16-17	37	37	
	S1	45	46	54	77	28
	S2	114	114	131	148	70
	S3	98	98	120	118	
	S4	40-50	40-50	40-50	40-50	
	S5	13-15-30	13-15-30	13-15-30	13-15-30	
Hose connection	A1	19,5	19,5	19,5	19,5	55
	A2	53	53	53	53	120
Mounting distances	X	35	35	47	68	90
	X1	90	90	90	90	210
	Y	146	146	213	288	494
	Y1	68	68	69	69	106
Dimensions of the frame (mm)	HC	380	470	490	590	
	LC	277	277	302	354	
	LC1	196	196	221	273	
	LC2	21	21	21	21	
	LC3	56,5	115	115	115	
	LC4	80	80	80	80	
	PC	198	198	248	260	
	INT	142.3	142.3	192.3	204.3	

Table 2.1.1

The appliance can be either wall-mounted by using the appropriate fastening holes or installed on bracket so that the water connections can be completed.

2.2 Connecting the hoses

The installation of the humidifier requires the connection to the water supply and drain hoses.



2.3 Drain

	models				
	KUE*R*	KUE*1*	KUE*2*	KUE*3*	KUE*4*
Max. instant drain flow l/min	~ 4	~ 4	~ 4	~ 4	~ 22.5
Darin water attachment (mm)	32	32	32	32	40
Min. ID of the drain hose	25	25	25	25	36

2.4 Supply

	models				
	KUE*R*	KUE*1*	KUE*2*	KUE*3*	KUE*4*
Max. instant supply flow l/min	0.6	0.6	0.6	1.2	4
Supply water attachment	3/4" G Male	3/4" G Male	3/4" G Male	3/4" G Male	3/4" G Male
Min. ID of the sill pipe or hose	6	6	6	6	6

Table 2.4.1

To simplify installation, it is recommended to use the CAREL hose with an inside diameter of 6 mm and an outside diameter of 8 mm (code 1312350APN) and the revolving 3/4" G connection, either straight (code 9995727ACA) or 90° (code 9995728ACA), available upon request.

A shut-off tap and a mechanical filter should be installed to trap any solid impurities.

The drain water is connected using a section of rubber or plastic hose resistant to 100°C, with a recommended inside diameter of 32 mm or 40 mm for the 25 to 45kg/h models (compliant with DIN 19535, UNI 8451/8452).

The drain connector is suitable for heat sealing with polypropylene drain pipes.

IMPORTANT WARNING: the drain hose must be free, without backpressure and with a drain trap immediately downstream of the connection to the humidifier.

2.5 Checks

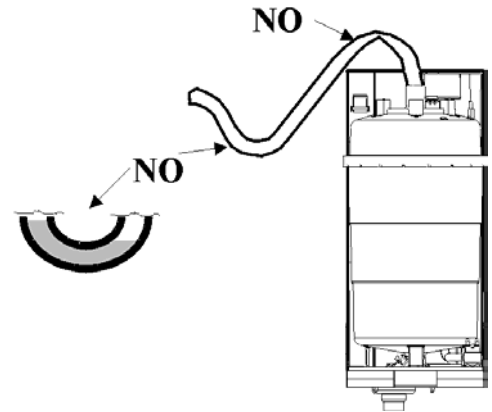
The following conditions represent correct water connection:

- installation of a shut-off tap in the supply water line;
- presence of a mechanical filter in the supply water line;
- water temperature and pressure within the allowed values;
- drain hose resistant to temperatures of 100°C;
- minimum inside diameter of the drain hose of 25 mm or 36 mm for the 25 to 45kg/h models;
- minimum slope of the drain hose greater than or equal to 5°;
- electrically **non-conductive** sleeve.
- presence of a drain trap in the drain hose

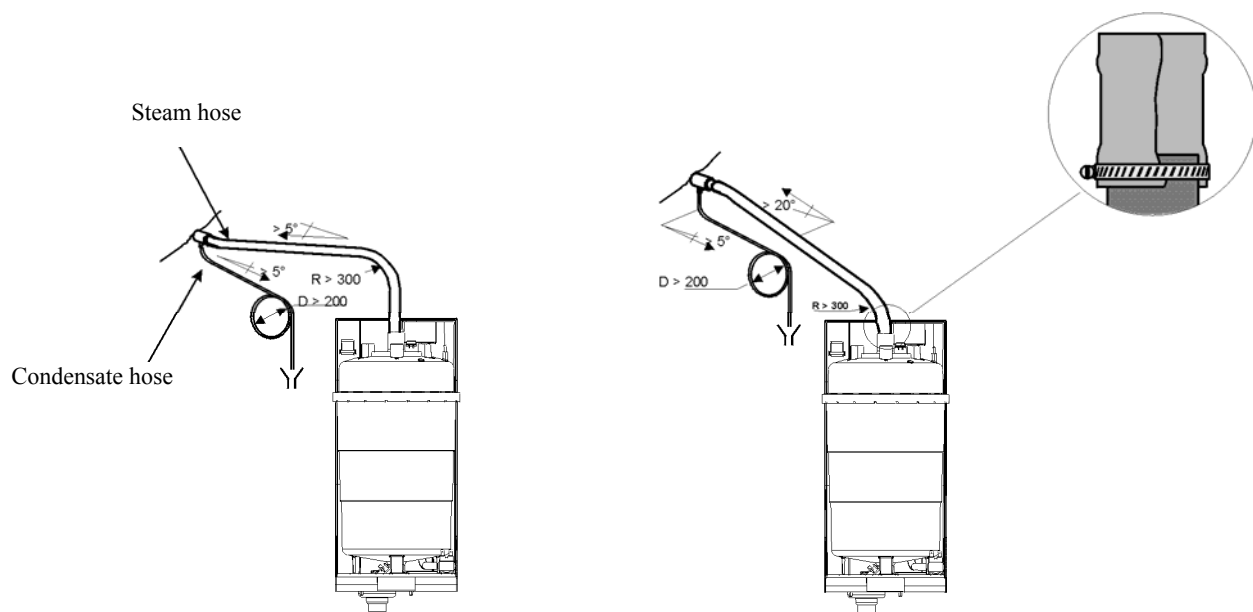
IMPORTANT WARNING: when installation is completed, flush the supply hose for around 30 minutes by piping the water directly into the drain without sending it into the humidifier. This will eliminate any scale or processing residues that may block the fill valve or cause foam when boiling.

2.6 Installation of the steam hose and condensate return hose

- The connection between humidifier and distributor must be made using a pipe suitable for this purpose, such as the CAREL hose.
- Avoid the formation of pockets or traps where the condensate may accumulate.
- Make sure that the hose is not choked due to tight curves or twisting.
- Fasten the ends of the hose with screw clamps.



The pipe may run according to either of the two following solutions:



IMPORTANT WARNING: the length of the steam pipe should not exceed 4 m.

To allow the drain trap in the steam condensate hose to operate properly, it must be filled with water before starting the humidifier.

2.7 Characteristics of the water

2.7.1 Supply water

The humidifier must be supplied with mains water, with the following characteristics:

- pressure between 0.1 and 0.8 MPa (1 to 8 bar, 14.5 to 116 psi);
- temperature between 1 and 40 °C;
- instant flow rate not lower than the rated fill solenoid valve flow rate (refer to table 2.4.1);
- connection type 3/4" G male.

LIMIT VALUES FOR THE SUPPLY WATER WITH MEDIUM-HIGH CONDUCTIVITY IN AN IMMERSSED ELECTRODE HUMIDIFIER

LIMITS	
Min	Max

Hydrogen ions	pH	-	
Specific conductivity at 20°C	$\sigma_{R, 20^\circ C}$	-	$\mu S/cm$
Total dissolved solids	TDS	-	mg/l
Dry residue at 180°C	R_{180}	-	mg/l
Total hardness	TH	-	mg/l $CaCO_3$
Temporary hardness		-	mg/l $CaCO_3$
Iron + Manganese		-	mg/l Fe + Mn
Chlorides		-	ppm Cl
Silica		-	mg/l SiO_2
Residual chlorine		-	mg/l Cl^-
Calcium sulphate		-	mg/l $CaSO_4$
Metallic impurities		-	mg/l
Solvents, diluents, soaps, lubricants		-	mg/l

7	8.5
300	1250
(¹)	(¹)
(¹)	(¹)
100(²)	400
60(³)	300
0	0.2
0	30
0	20
0	0.2
0	100
0	0
0	0

(¹) Values depending on specific conductivity; in general: $TDS \cong 0.93 * \sigma_{20}$; $R_{180} \cong 0.65 * \sigma_{20}$

(²) not lower than 200% of the chloride content in mg/l of Cl^-

(³) not lower than 300% of the chloride content in mg/l of Cl^-

Table 2.7.1.1

LIMIT VALUES FOR THE SUPPLY WATER WITH MEDIUM-LOW CONDUCTIVITY IN AN IMMERSSED ELECTRODE HUMIDIFIER

LIMITS	
Min	Max

Hydrogen ions	pH	-	
Specific conductivity at 20°C	$\sigma_{R, 20^\circ C}$	-	$\mu S/cm$
Total dissolved solids	TDS	-	mg/l
Dry residue at 180°C	R_{180}	-	mg/l
Total hardness	TH	-	mg/l $CaCO_3$
Temporary hardness		-	mg/l $CaCO_3$
Iron + Manganese		-	mg/l Fe + Mn
Chlorides		-	ppm Cl
Silica		-	mg/l SiO_2
Residual chlorine		-	mg/l Cl^-
Calcium sulphate		-	mg/l $CaSO_4$
Metallic impurities		-	mg/l
Solvents, diluents, soaps, lubricants		-	mg/l

7	8.5
125	500
(¹)	(¹)
(¹)	(¹)
50(²)	250
30(³)	150
0	0.2
0	20
0	20
0	0.2
0	60
0	0
0	0

(¹) Values depending on specific conductivity; in general: $TDS \cong 0.93 * \sigma_{20}$; $R_{180} \cong 0.65 * \sigma_{20}$

(²) not lower than 200% of the chloride content in mg/l of Cl^-

(³) not lower than 300% of the chloride content in mg/l of Cl^-

Table 2.7.1.2

Warning: no relation can be demonstrated between water hardness and conductivity.

IMPORTANT WARNING: do not treat water with softeners! This could cause corrosion of the electrodes or the formation of foam, leading to potential operating problems or failures.

Avoid:

1. using well water, industrial water or water drawn from cooling circuits; in general, avoid using potentially contaminated water, either from a chemical or bacteriological point of view;
2. adding disinfectants or corrosion inhibitors to water, as these substances are potentially irritant.

2.8 Drain water

Inside the humidifier the water boils and is transformed into steam, without the addition of any substances. The drain water, as a result, contains the same substances that are dissolved in the supply water, yet in greater quantities, depending on the concentration in the supply water and the set draining cycles, and **may reach temperatures of 100°C**. Not being toxic, it may be drained into the sewage system. The drain connector has an external diameter of 32 mm.

3. OEM WITH FRAME

3.1 Introduction

This is a special OEM version fitted on a frame, with a pre-wired control board, switch and drain button.

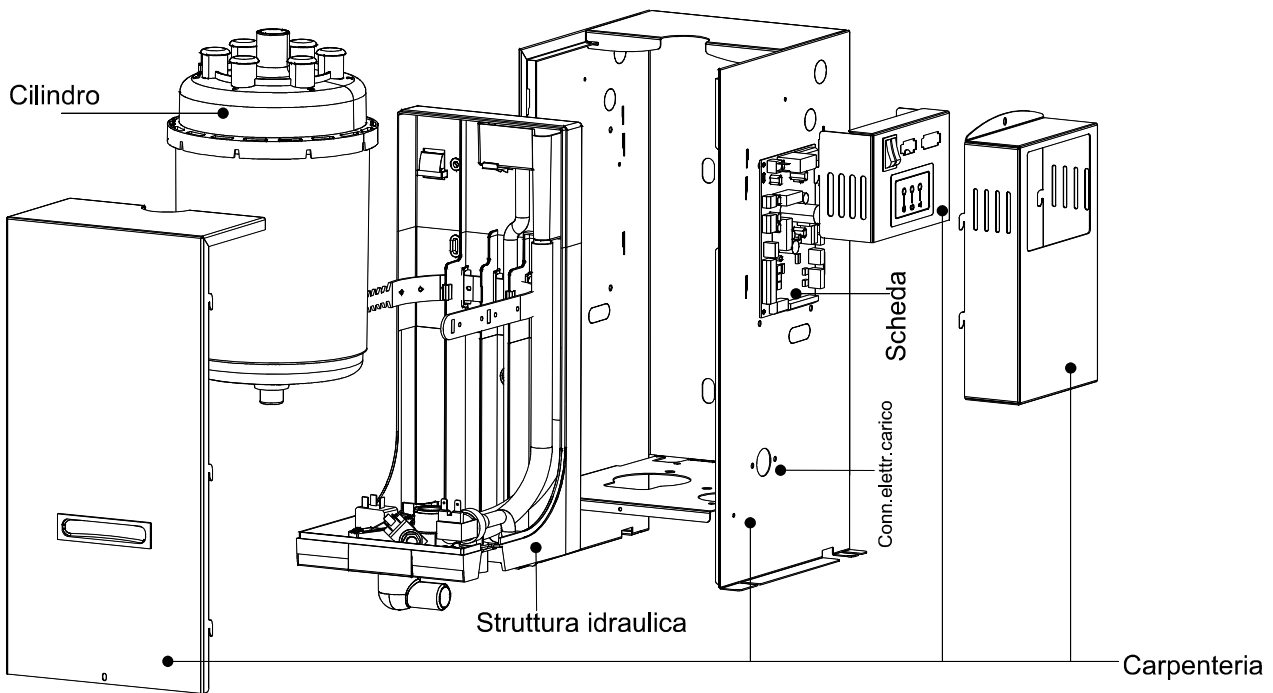


Fig. 3.1.1

Italian	English
Cilindro	Cylinder
Struttura idraulica	Water circuit support structure
Conn. elett. carico	Fill elect. conn.
Scheda	Board
Carpenteria	Frame

3.2 Frame

The humidifiers are supplied with a compact, openable, hot galvanised metal frame, complete with handle and screw closing. The frame includes a case for housing the control board

3.3 Control board

The controller used for these OEM units is the CP4 with microprocessor, complete with software for immersed electrode humidifiers.

Type of configuration, ON/OFF or 0 to 10 V proportional.

Built-in current sensor

24 Vac power supply

AFS antifoam algorithm

Possibility of remote ON/OFF (AB-AB)

Outputs: 1 x 250 Vac relay, 5 Amp (2 Amp) for electrode power supply

1 x 250 Vac relay, 5 Amp (2 Amp) for alarm output

Possibility of RS485 serial connection (optional TACP485000)

Can be configured using the HUMISSET000 programming kit

3.4 Water fill

The fill solenoid valve with $\frac{3}{4}$ "G male connector is located on the right side of the frame, with the measurements shown in table 2.1.1 (LC3, LC4), so as to make this accessible for cleaning the filter on the solenoid valve when the unit is installed.

3.5 Drain

Drain assembly made up of a manifold and drain solenoid valve with 90° connector and 32 mm diameter fitting, with the possibility to replace the drain with a straight pipe, supplied.

3.6 Water circuit

Water circuit with supply tank plus conductivity meter and cylinder fill, drain and overflow hoses.

3.7 Structure

Back made from polypropylene reinforced with fibreglass, cylinder secured by convenient strap closing system.

3.8 Switch and manual drain button

The humidifier is fitted with a switch from turning the unit on/off and a button for the manual drain function.

3.9 External connections

The unit can be managed externally via 2 connectors:

- a four pin connector used to control a phase of the power supply to the external power contactor coil (terminals 1,2) and for the 24 Vac power supply to the auxiliary circuits (terminals 3, 4);
- the second 3 pin connector is used for the connection to the probe (see diagram 4.7).

3.10 Power cable

The power cable is 3 metres long, is flame retardant and is supplied with a rubber cable gland. One end has special cable terminals for connection to the cylinder, and the other end is free.

3.11 Current transformer (TAM)

This is fitted on the control board, and monitors one of the phases of the power supply to measure the current.

3.12 LED panel

The operation the humidifier is displayed using a panel fitted with coloured LEDs, with the following meanings

green: power present

yellow: steam production in progress

red: alarm signal

These events are indicated by sequences of flashes; for the meanings see the instruction sheet +050003755

3.13 Technical specifications

Steam production, weights and dimensions see Chap. 2, page 7

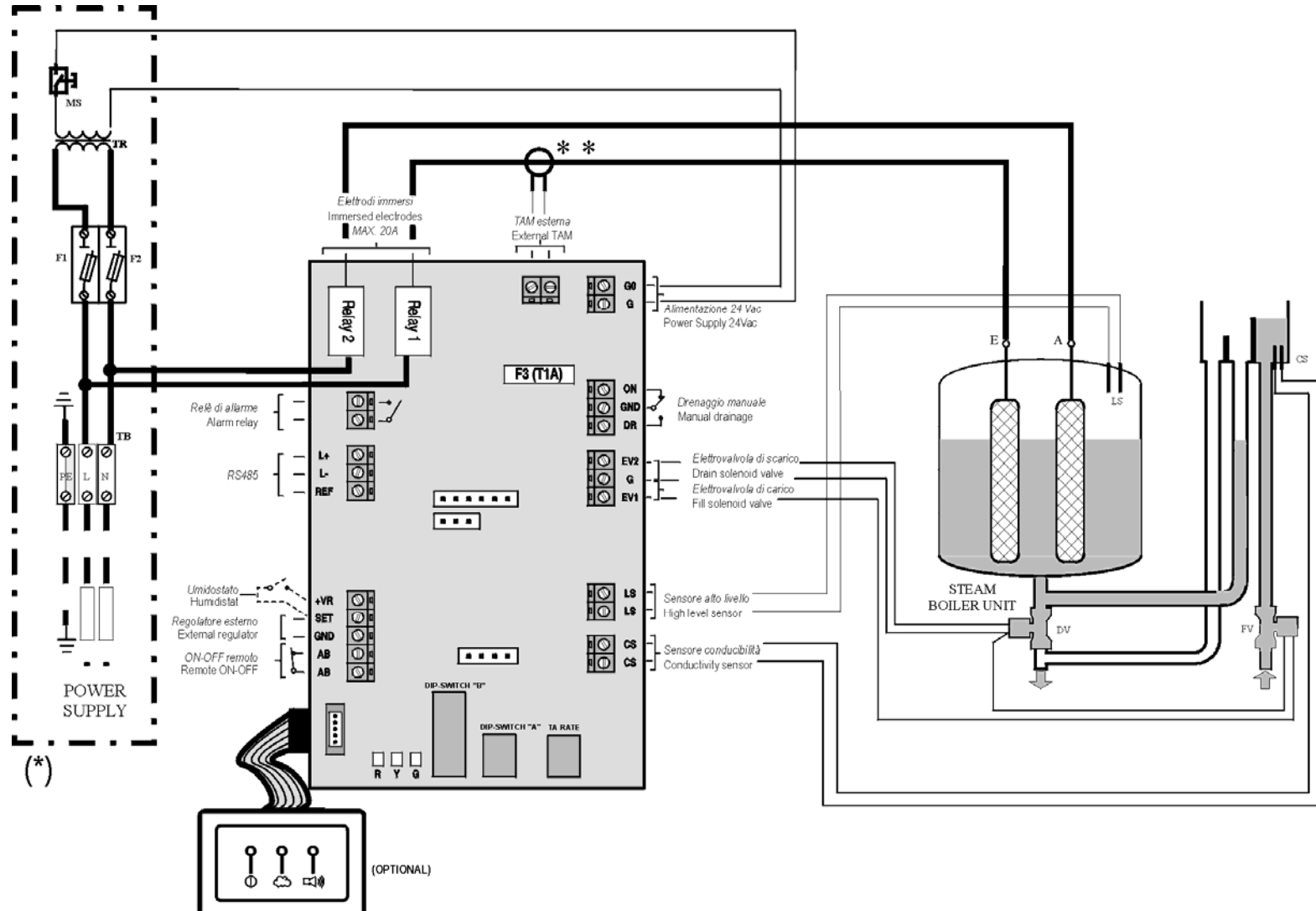
The index of protection is IP20.

4. ELECTRICAL CONNECTIONS (with CAREL controller, model CP)

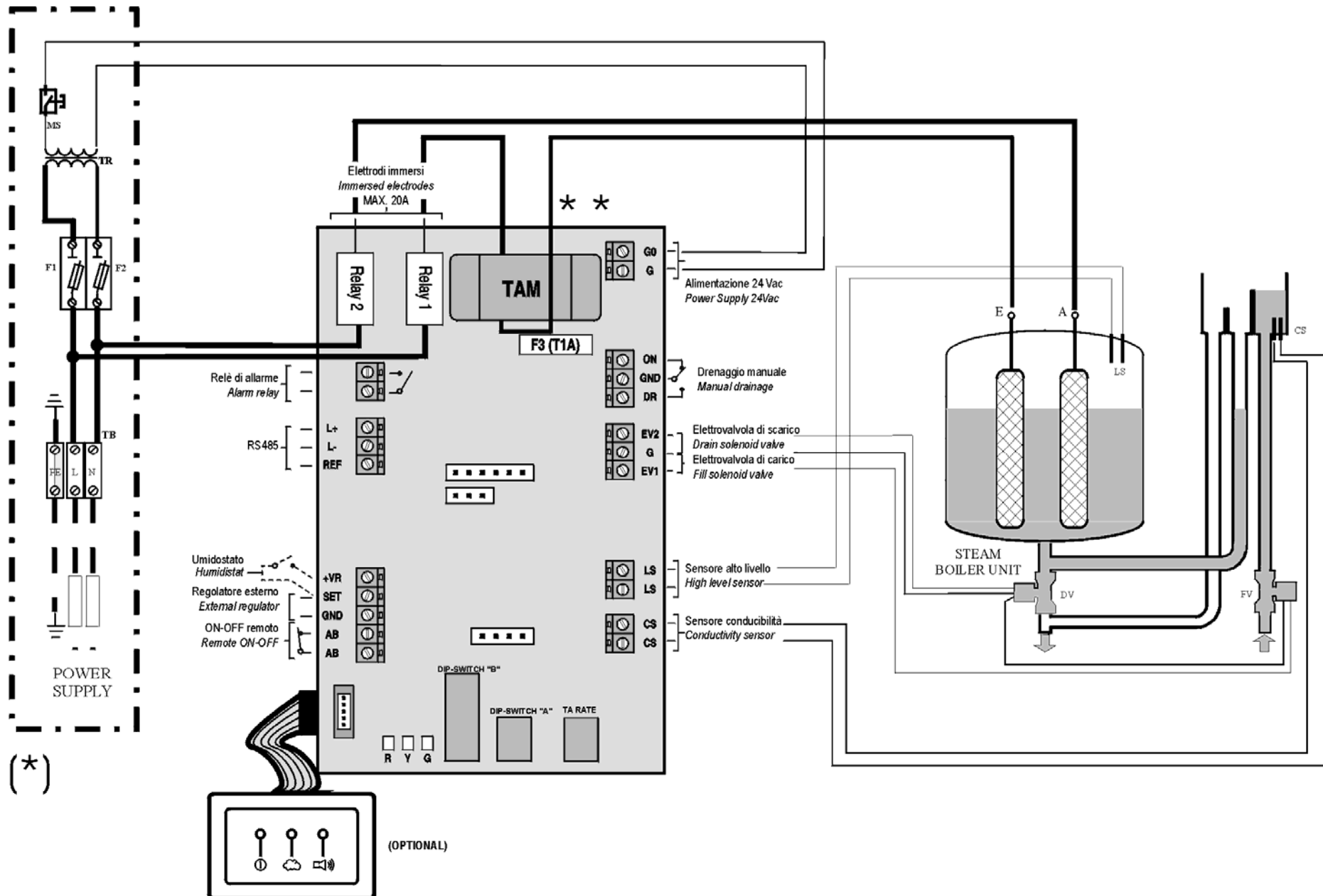
Before making the connections, make sure that the unit is disconnected from the mains power supply.

For further information on the controller, refer to the corresponding instruction sheet.

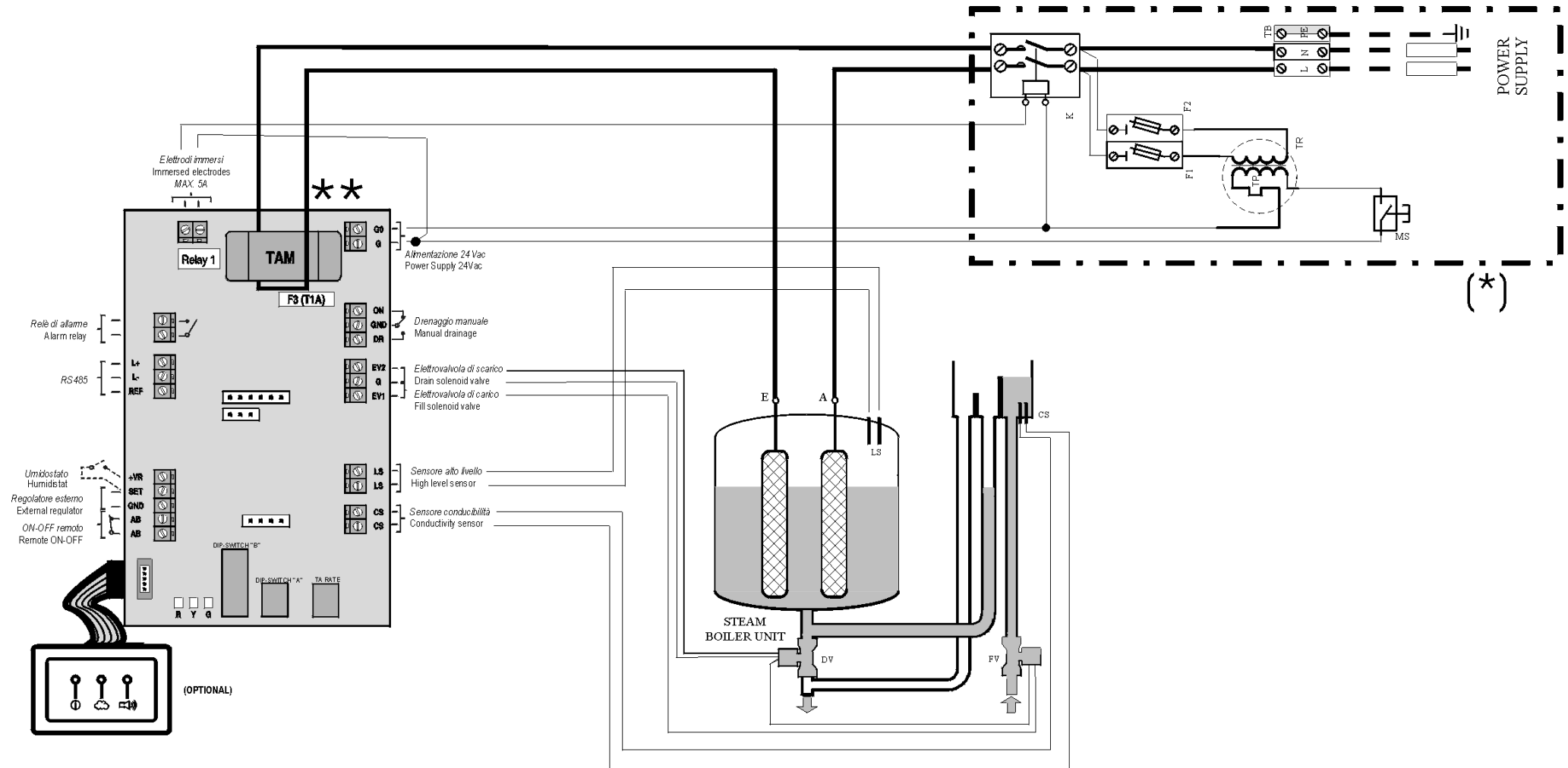
4.1 Single-phase wiring diagram, EXTERNAL TAM (CP1 *)



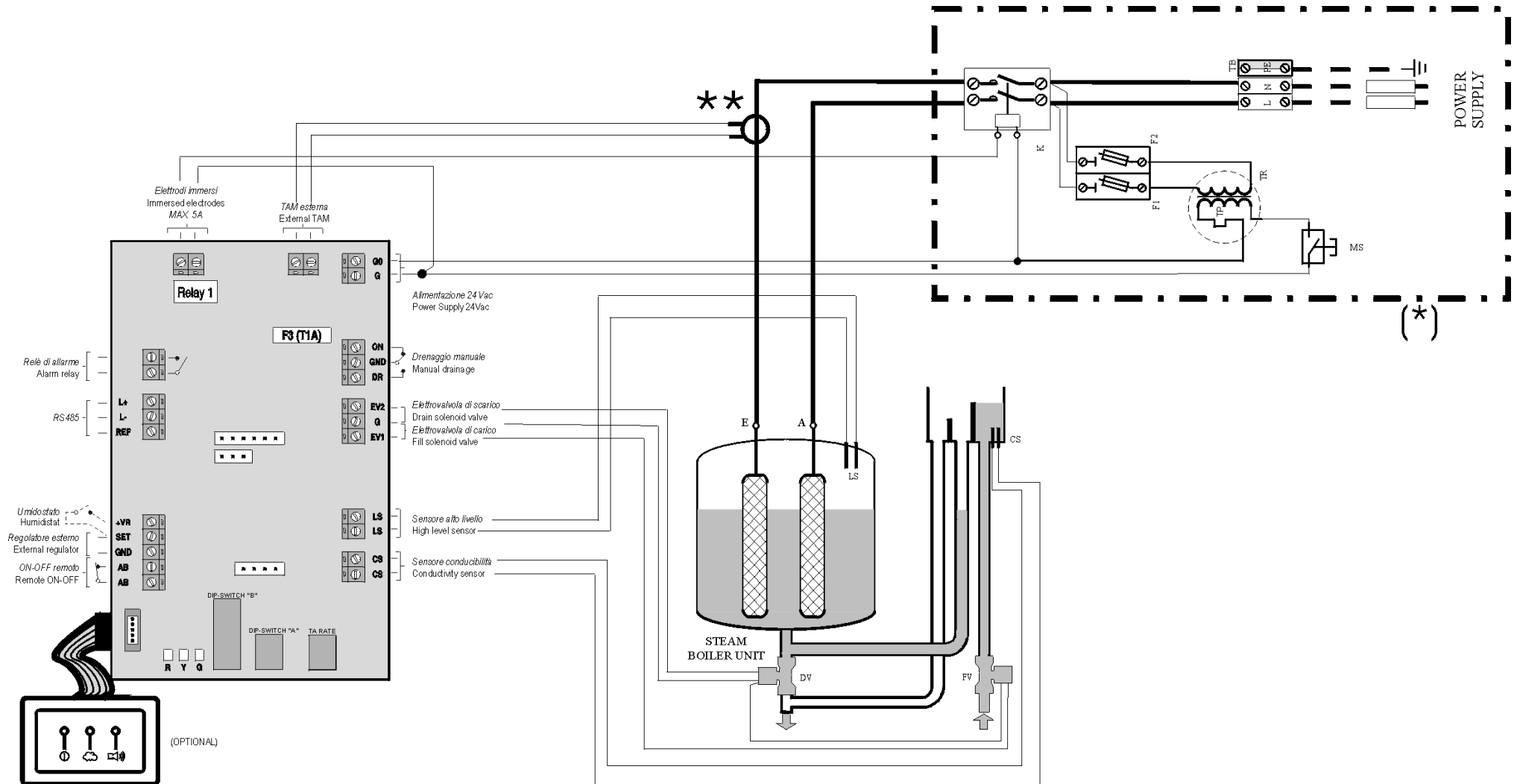
4.2 Single-phase wiring diagram, INTERNAL TAM (CP2 *)



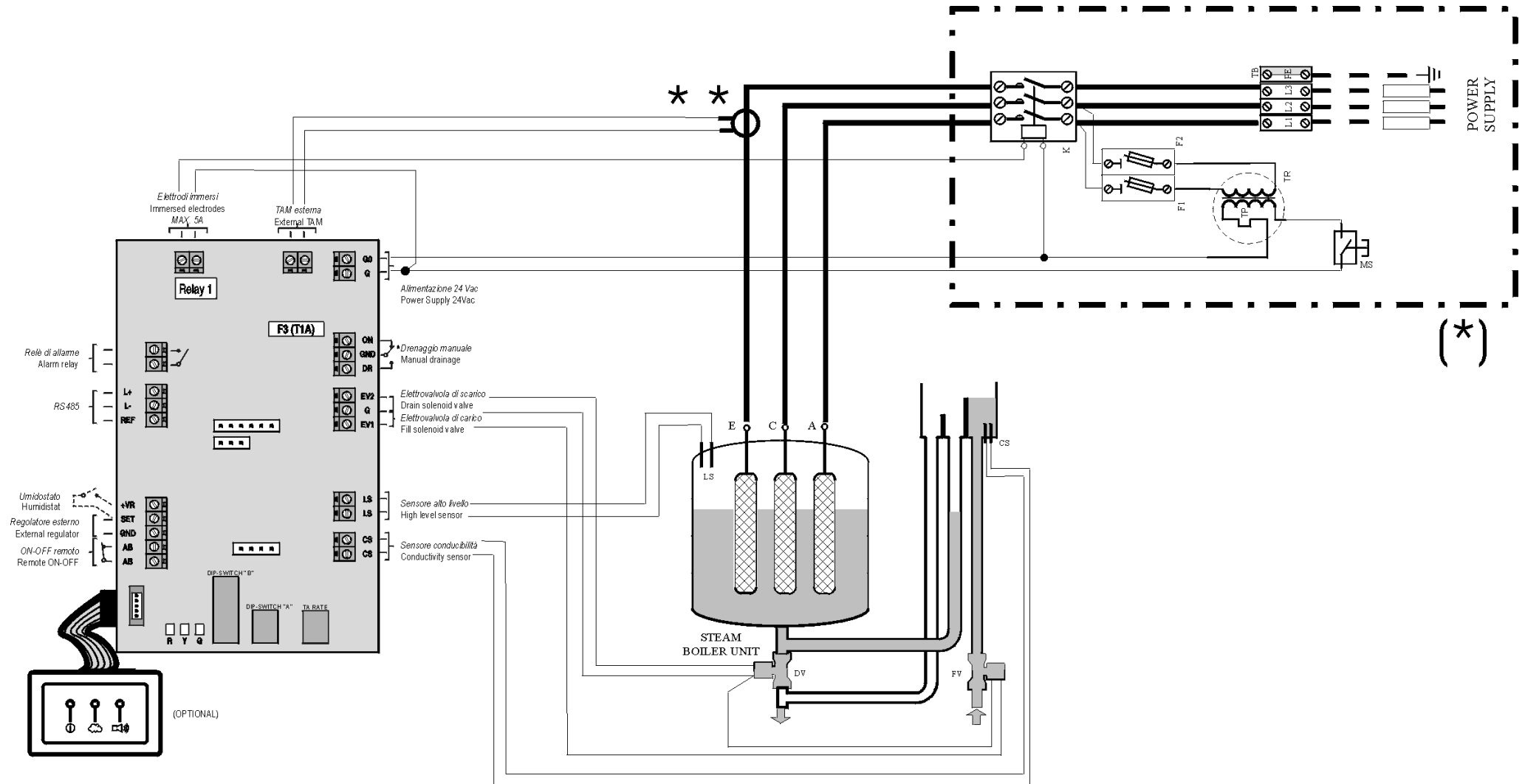
4.3 Single-phase wiring diagram, INTERNAL TAM with contactor (CP4 *)



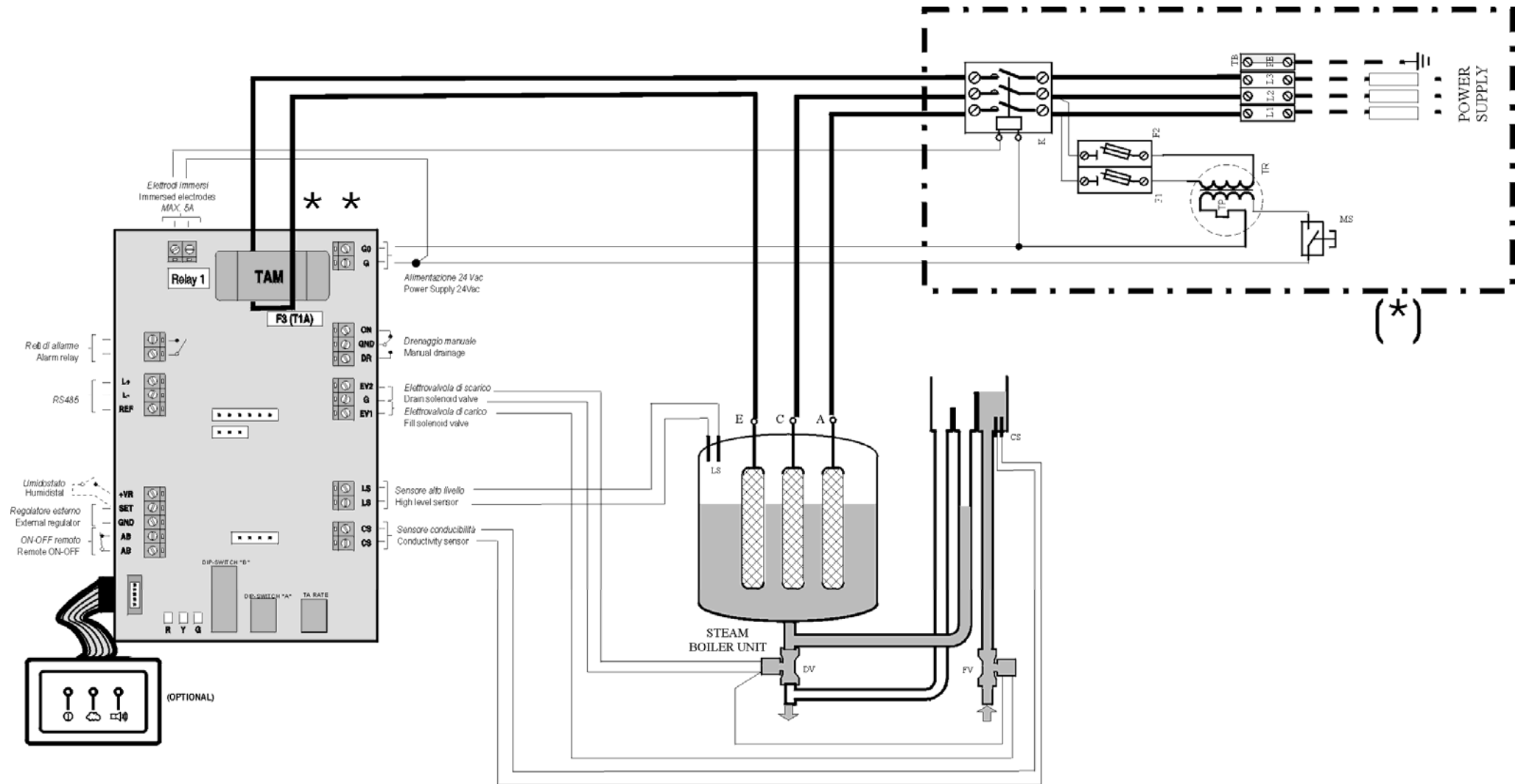
4.4 Single-phase wiring diagram, EXTERNAL TAM with contactor (CP3 *)



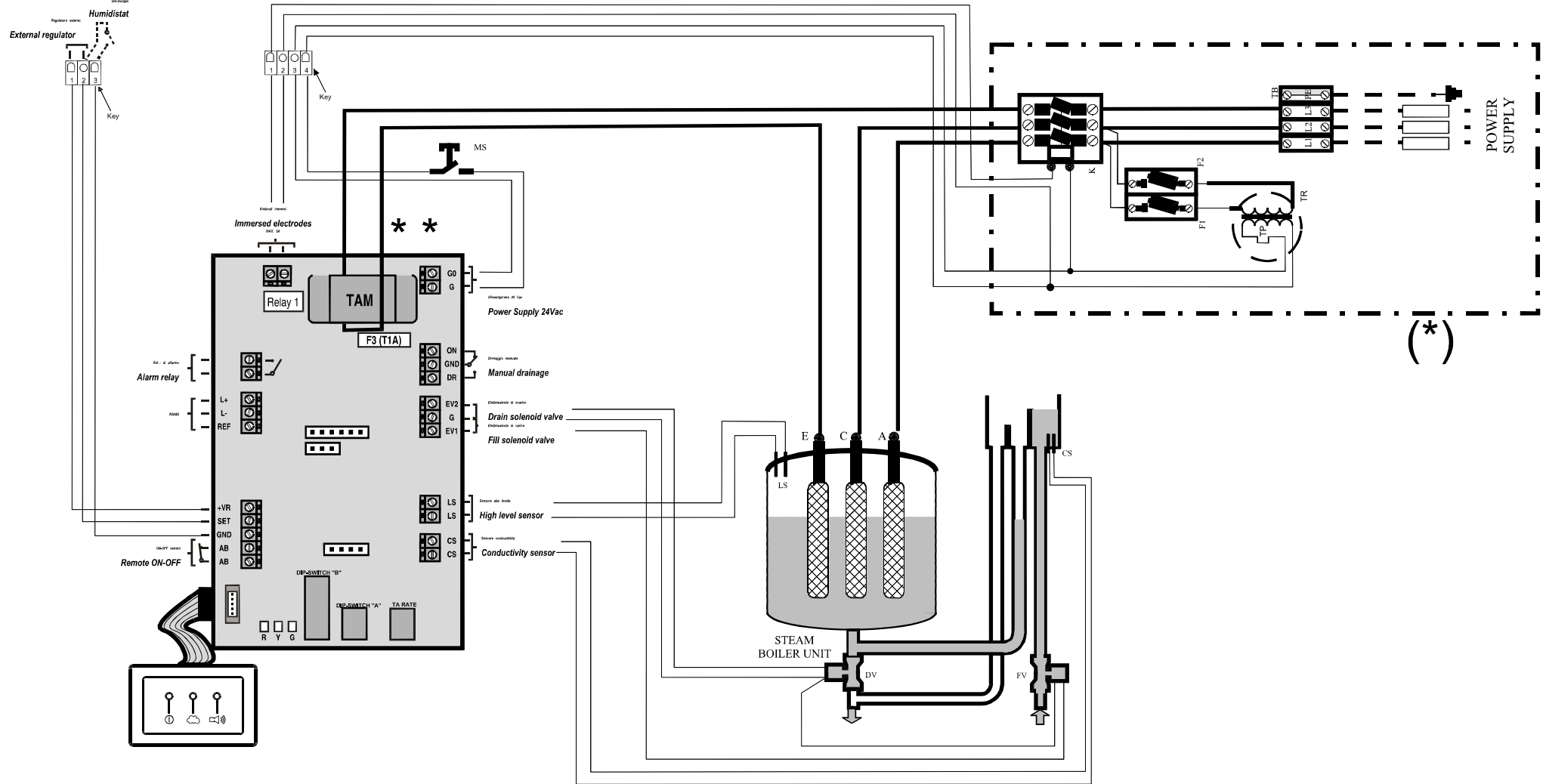
4.5 Three-phase wiring diagram, EXTERNAL TAM with contactor (CP3 *)



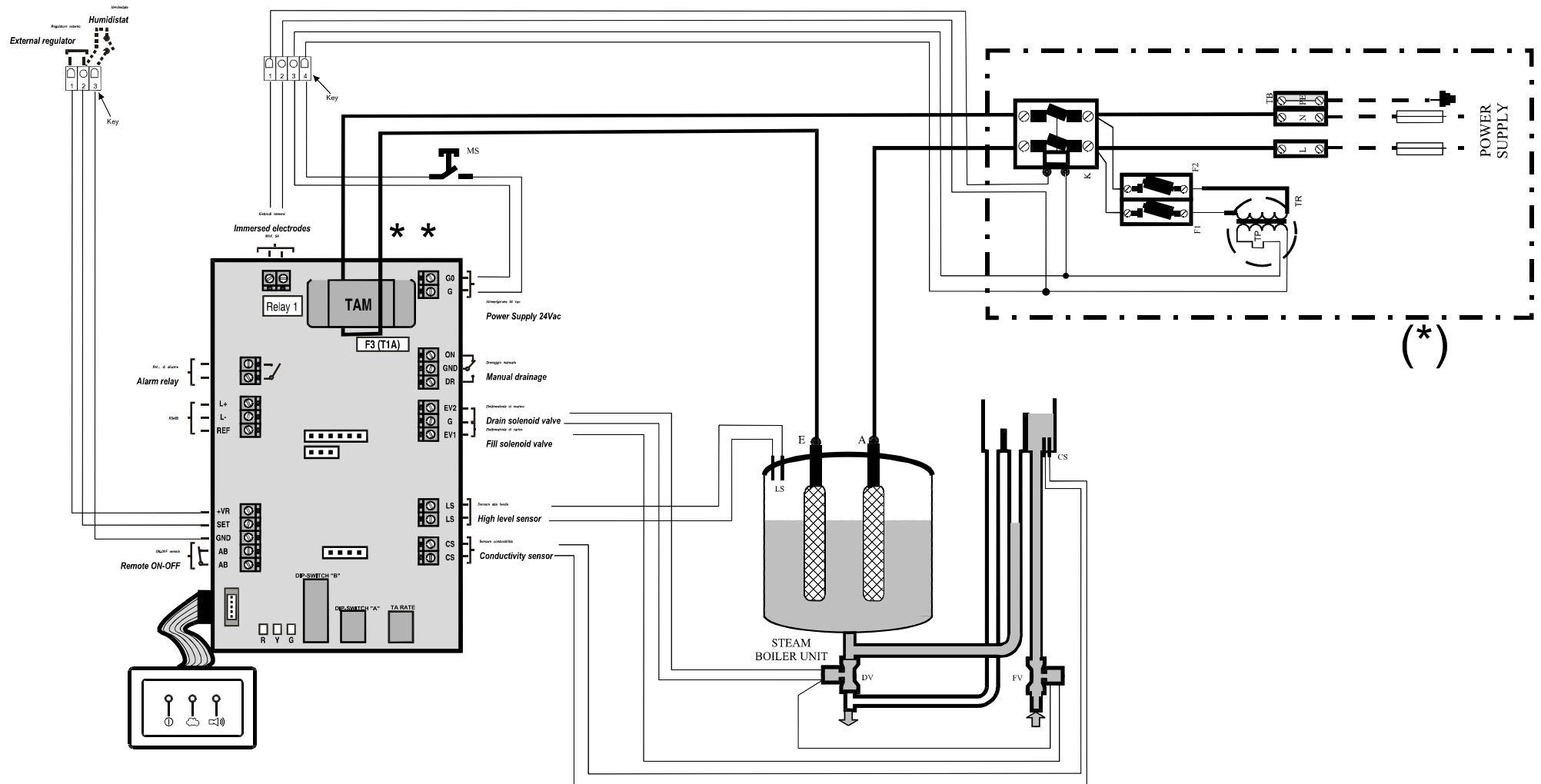
4.6 Three-phase wiring diagram, INTERNAL TAM with contactor (CP4 *)

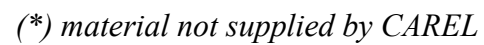


4.7 Three-phase wiring diagram, KUE with frame, INTERNAL TAM with contactor (CP4 *)



4.8 Single-phase wiring diagram, KUE with frame, INTERNAL TAM with contactor (CP4 *)





5. STARTING, CONTROL AND SHUTDOWN

IMPORTANT WARNINGS:

1. Before starting the unit, check that the humidifier is in good condition, that there are no water leaks and that the electrical parts are dry.
2. Do not power the appliance if it is damaged or even partially wet!

When installation is completed, flush the supply hose for around 30 minutes by piping the water directly into the drain without sending it into the humidifier. This will eliminate any scale or processing residues that may block the fill valve or cause foam when boiling.

5.1 Preliminary checks

Before starting the humidifier, check that:

- the water and electrical connections and the steam distribution system have been completed according to the instructions contained in this manual;
- the water shut-off tap to the humidifier is open;
- the line fuses are installed and intact;
- terminals AB on the CP control board are jumpered or connected to the remote ON/OFF contact; also check that the ON/OFF contact is closed;
- the steam outlet pipe is not choked.

5.2 Starting

5.2.1 Starting with an empty cylinder

This phase will be performed automatically when the unit is started: the rated production will be reached after a certain time (this time depends considerably on the conductivity of the supply water and may last a number of some hours).

6. MAINTENANCE AND SPARE PARTS

6.1 Replacing the cylinder

IMPORTANT WARNING: the cylinder may be hot. Allow it to cool before touching it or use protective gloves.

To access the cylinder:

- completely drain the water contained in the cylinder;
- turn the appliance off and open the mains power disconnecting switch (**safety procedure**);
- open and remove the cover;
- remove the steam hose from the cylinder;
- disconnect the electrical connections from the top of the cylinder;
- release the cylinder from the fastening device and lift it up to remove it;
- fit the new cylinder in the humidifier by performing the previous operations in reverse.

Cylinder maintenance (refer to cylinders instruction sheet)

The life of the cylinder depends on a number of factors, including: the complete filling with lime scale and/or the partial or complete corrosion of the electrodes, the correct use and sizing of the humidifier, the output, and the quality of the water, as well as careful and regular maintenance. Due to the aging of the plastic and the consumption of the electrodes, even an openable steam cylinder has a limited life, and it is therefore recommended to replace it after 5 years or 10,000 operating hours.

Important warnings

The humidifier and its cylinder contain live electrical components and hot surfaces, and therefore **all service and/or maintenance operations must be performed by expert and qualified personnel, who are aware of the necessary precautions**. Before performing any operations on the cylinder, check that the humidifier is disconnected from the power supply; carefully read and follow the instructions contained in the humidifier manual. Remove the cylinder from the humidifier only after having drained it completely using the corresponding button. Check that the model and the power supply voltage of the new cylinder correspond to the data on the rating plate.

Periodical checks

- **After one hour of operation**

For both disposable and openable cylinders, check that there are no significant water leaks

- **Every fifteen days or no more than 300 operating hours**

For both disposable and openable cylinders check operation, that there are no significant water leaks and the general condition of the container. Check that during operation there are no arcs or sparks between the electrodes.

- **Every three months or no more than 1000 operating hours**

For disposable cylinders, check operation, that there are no significant water leaks and, if necessary, replace the cylinder; for openable cylinders, check that there are no markedly blackened parts of the container: if this is the case, check the condition of the electrodes, and if necessary replace them together with the O-rings and the cover gasket.

- **Annually or no more than 2500 operating hours**

For disposable cylinders, replace the cylinder; for openable cylinders check operation, that there are no significant water leaks, the general conditions of the container, check that there are no markedly blackened parts of the container: if this is the case, check the condition of the electrodes, and if necessary replace them together with the O-rings and the cover gasket.

- **After five years or no more than 10,000 operating hours**

For both disposable and openable cylinders, replace the cylinder.

After extended use or alternatively when using water with a high salt content, the solid deposits that naturally form on the electrodes may reach the stage where they also stick to the inside wall of the cylinder; in the event of especially conductive deposits, the consequent heat produced may overheat the plastic and melt it, and, in more severe cases, puncture the cylinder, allowing water to leak back into the tank.

As a precaution, check, at the frequency recommended further on, the deposits and the blackening of the wall of the cylinder, and replace the cylinder if necessary.

CAUTION: always disconnect the appliance before touching the cylinder in the event of leaks, as current may be passing through the water.

6.2 Maintenance of the other components in the water circuit

IMPORTANT WARNINGS:

- when cleaning the plastic components do not use detergents or solvents;
- scale can be removed using a solution of 20% acetic acid and then rinsing with water.

The steam humidifier has just one part that requires periodical replacement: **the steam production cylinder.**

This operation is necessary when the lime scale deposits that form inside the cylinder prevent the sufficient passage of current. This situation is displayed on the controller by an alarm signal. The frequency of this operation depends on the supply water: the higher the content of salts or impurities, the more frequently the cylinder will need replacing.

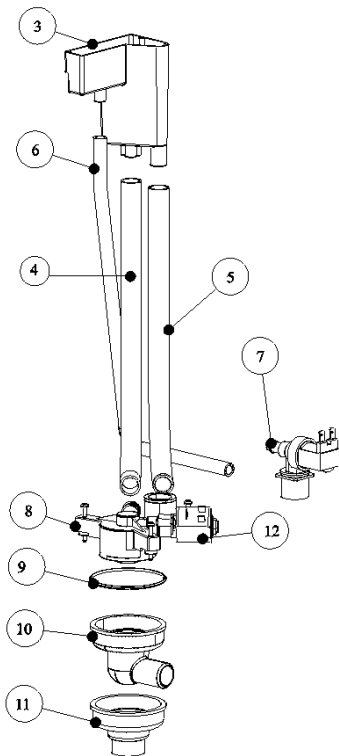
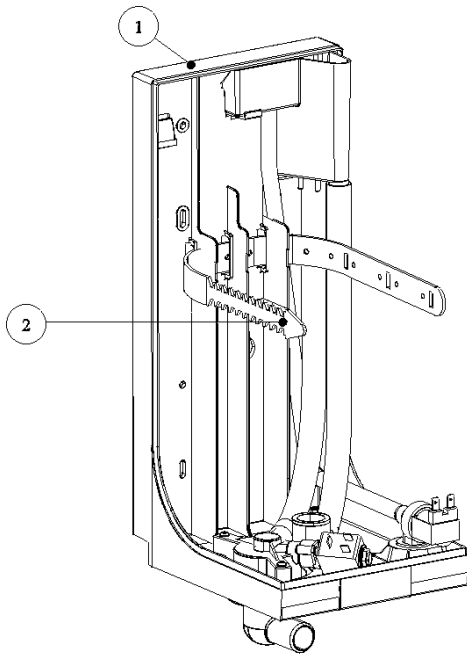


Fig. 5.2.1

no	description	Order code
1	Load-bearing frame	
2	Cylinder locking strap	18C499A006
3	Supply tank + conductivity meter	13C119A003
4	Overflow pipe	UEKT00000*
5	Cylinder fill hose	
6	Tank fill hose	
7	Fill solenoid valve	KITVC000**
8	Supply/drain assembly	13C499A030
9	Gasket	KITRACC000
10	90° drain connector	
11	Straight drain connector (supplied)	
12	Drain solenoid valve	13C499A030

Table 5.2.1

* for the complete codes see Table 5.4.1.1 and 5.4.3.1 "SPARE PARTS"

- **Fill solenoid valve** (Fig. 5.2.1 , part no. 7, 5)

After having disconnected the cables and the pipe, remove the solenoid valve and check the condition of the inlet filter; clean if necessary using water and a soft brush.

- **Supply and drain manifold** (Fig. 5.2.1, part no. 8, 2)

Check that there are no solid residues in the cylinder attachment, remove any impurities.

Check that the seal (O-ring) is not damaged or cracked; if necessary, replace it.

- **Drain solenoid valve / drain pump** (Fig. 5.2.1 , part no. 12, 4)

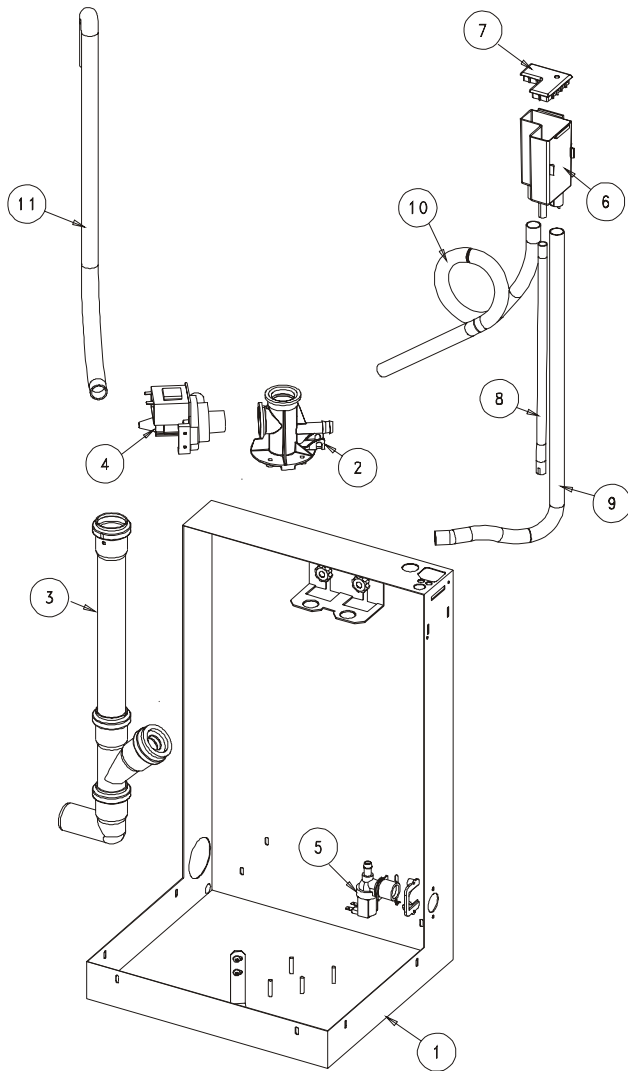
Disconnect the power supply, remove the coil, unscrew the fastening screws and remove the valve body; remove any impurities and rinse.

- **Supply tank + conductivity meter** (Fig. 5.2.1, part no. 3, 6)

Check that there are no obstructions or solid particles and that the electrodes for measuring the conductivity are clean, remove any impurities and rinse.

- **Supply, fill, overflow pipes** (Fig. 5.2.1, part no. 4, 5, 6 – 8, 9, 10, 11)

Check that these are free and do not contain impurities; remove any impurities and rinse.



no	description	Order code
1	Load-bearing frame	
2	Supply/drain manifold	18C499A001
3	Drain circuit	13C499A034
4	Drain pump	KITPS00000
5	Fill solenoid valve	KITVC00040
6	Supply tank	UEKVASC000
7	Supply tank cover	
8	Tank fill hose	UEKT0000XL
9	Cylinder fill hose	
10	Overflow pipe	13C479A001
11	Corrugated drain pipe	

Table 5.2.1

IMPORTANT WARNING: after having replaced or checked the parts in the water circuit, check that the connections have been carried out correctly and the corresponding seals have been used. Re-start the unit and perform a number of fill and drain cycles (from 2 to 4), then, applying the safety procedure, check for any water leaks.

6.3 Component replacement

6.3.1 Fuses in the auxiliary circuits

Use fuses with the ratings indicated in Table 5.3.1.

models	KUES*	KUETR*	KUET1*	KUET2*	KUET3*	KUET4*
fuses F1-F 2	1 A, GL, 10.3 x 38 in fuse carrier on DIN rail (0605319AXX)					
fuse F3 (pump)						1 A, fast-blow 10.3 x 38 in fuse carrier on DIN rail (0605319AXX)
fuse 3 ***	2 A, T, 5x20					

Table 5.3.1

***: only on the CP control board.

6.4 Spare parts

6.4.1 SINGLE-PHASE humidifiers:

Standard spare parts

	model	KUESR*	KUES1*	KUES2*	KUES3*
Water circuit					
cylinder locking strap		18C499A006	18C499A006	18C499A006	18C499A006
supply tank + conductivity meter		13C119A003	13C119A003	13C119A003	13C119A003
fill solenoid valve kit		KITVC00006	KITVC00006	KITVC00006	KITVC00012
drain solenoid valve kit		13C499A030	13C499A030	13C499A030	13C499A030
drain fittings kit		KITRACC000	KITRACC000	KITRACC000	KITRACC000
internal hose kit *		UEKT00000S	UEKT00000S	UEKT00000S	UEKT00000S

Sealed cylinders					
200 to 230 VAC 1~, conductivity 350 to 1250 µS/cm		BL0SRF00H1	BL0S1F00H1	BL0S2F00H0	BL0S3F00H0

Electronics					
control board ver. CP **		CP**			

Table 5.4.1.1

** : specify kg/h, power supply, options

* : hoses must be cut to the required size before installation

6.4.2 Spare parts for special applications

The following spare parts are supplied separately from the standard humidifier, therefore they must be ordered separately.

	model	KUESR*	KUES1*	KUES2*	KUES3*
Sealed cylinders					
200 to 230 VAC 1~, conductivity 125 to 350 µS/cm		BL0SRE00H1	BL0S1E00H1	BL0S2E00H0	BL0S3E00H0

Table 5.4.2.1

6.4.3 THREE-PHASE humidifiers:

Standard spare parts

MODEL	KUETR*	KUET1*	KUET2*	KUET3*	KUET4* 25kg/h	KUET4* 35kg/h	KUET4* 45kg/h≥400V
Water circuit							
cylinder locking strap	18C499A006	18C499A006	18C499A006	18C499A006	--	--	--
supply tank + conductivity meter	13C119A003	13C119A003	13C119A003	13C119A003	18C453A008	18C453A008	18C453A008
fill solenoid valve kit	KITVC00006	KITVC00006	KITVC00006	KITVC00012	KITVC00040	KITVC00040	KITVC00040
drain solenoid valve kit	13C499A030	13C499A030	13C499A030	13C499A030	KITPS00000	KITPS00000	KITPS00000
drain fittings kit	KITRACC000	KITRACC000	KITRACC000	KITRACC000	--	--	--
internal hose kit *	UEKT00000S	UEKT00000S	UEKT00000M	UEKT00000M	UEKT0000XL	UEKT0000XL	UEKT0000XL

Sealed cylinders							
200 to 230 VAC 3~, conductivity 350 to 1250 µS/cm	BL0TRB00H1	BL0T1B00H1	BL0T2B00H0	BL0T3B00H0	BL0T4C00H0	BL0T4B00H0	--
≥400 VAC 3~, conductivity 350 to 750 µS/cm	--	BL0T1C00H0	BL0T2C00H0	BL0T3C00H0			
≥400 VAC 3~, conductivity 350 to 1250 µS/cm	BL0TRD00H0				BL0T4D00H0	BL0T4D00H0	BL0T4C00H0

Electronics							
control board ver. CP **		CP**					

Table 5.4.3.1

** : specify kg/h, power supply, options

* : hoses must be cut to the required size before installation

6.4.4 Spare parts for special applications

The following spare parts are supplied separately from the standard humidifier, therefore they must be ordered separately.

MODEL	KUETR*	KUET1*	KUET2*	KUET3*	KUET4* (25kg/h)	KUET4* (35kg/h)	KUET4* (45kg/h≥400V)
Sealed cylinders							
200 to 230 VAC 3~, conductivity 125 to 350 μS/cm	BL0TRA00H1	BL0T1A00H1	BL0T2A00H0	BL0T3A00H0	BL0T4B00H0	BL0T4B00H0	
400 VAC 3~, conductivity 125 to 350 μS/cm	BL0TRC00H1	BL0T1A00H1	BL0T2B00H0	BL0T3B00H0	BL0T4C00H0	BL0T4C00H0	BL0T4B00H0
400 VAC 3~, conductivity 750 to 1250 μS/cm		BL0T1D00H1	BL0T2D00H0	BL0T3D00H0			
400 VAC 3~, conductivity 125 to 350 μS/cm	BL0TRC00H1	BL0T1A00H1	BL0T2B00H0	BL0T3B00H0	BL0T4C00H0	BL0T4C00H0	BL0T4B00H0
400 VAC 3~, conductivity 350 to 1250 μS/cm	BL0TRD00H1	BL0T1D00H1	BL0T2D00H0	BL0T3D00H0	BL0T4D00H0	BL0T4D00H0	BL0T4C00H0
460 VAC 3~, conductivity 125 to 350 μS/cm	BL0TRC00H1	BL0T1B00H1	BL0T2C00H0	BL0T3C00H0	BL0T4D00H0	BL0T4C00H0	BL0T4C00H0
575 VAC 3~, conductivity 125 to 350 μS/cm			BL0T2C00H0	BL0T3C00H0	BL0T4D00H0	BL0T4D00H0	BL0T4D00H0

Openable cylinders							
200 to 230 VAC 3~, conductivity 125 to 350 μS/cm	BLCTRA00W1	BLCT1A00W1	BLCT2A00W0	BLCT3A00W0	BLCT4B00W0	BLCT4B00W0	
200 to 230 VAC 3~, conductivity 350 to 1250 μS/cm	BLCTRC00W1	BLCT1B00W1	BLCT2B00W0	BLCT3B00W0	BLCT4B00W0	BLCT4B00W0	
400 VAC 3~, conductivity 125 to 350 μS/cm	BLCTRC00W1	BLCT1A00W1	BLCT2B00W0	BLCT3B00W0	BLCT4C00W0	BLCT4C00W0	BLCT4B00W0
400 VAC 3~, conductivity 350 to 750 μS/cm	BL0TRD00H1	BLCT1C00W1	BLCT2C00W0	BLCT3C00W0			
400 VAC 3~, conductivity 350 to 1250 μS/cm	BL0TRD00W1				BLCT4D00W0	BLCT4D00W0	BLCT4C00W0
400 VAC 3~, conductivity 750 to 1250 μS/cm		BLCT1D00W1	BLCT2D00W0	BLCT3D00W0			
460/575 VAC 3~, conductivity 125 to 350 μS/cm			BLCT2C00W0	BLCT3C00W0	BLCT4D00W0		
460/575 VAC 3~, conductivity 350 to 1250 μS/cm			BLCT2D00W0	BLCT3D00W0	BLCT4D00W0		
460 VAC 3~, conductivity 125 to 350 μS/cm	BLCTRC00W1	BLCT1B00W1				BLCT4C00W0	BLCT4C00W0
460 VAC 3~, conductivity 350 to 1250 μS/cm	BLCTRD00W1	BLCT1D00W1				BLCT4D00W0	BLCT4D00W0
575 VAC 3~, conductivity 125 to 350 μS/cm						BLCT4D00W0	BLCT4D00W0
575 VAC 3~, conductivity 350 to 1250 μS/cm						BLCT4D00W0	BLCT4D00W0
electrode kit (200 to 230 VAC 3~, 125 to 350 μS/cm)			KITBLCT2A0	KITBLCT3A0	KITBLCT4B0	KITBLCT4B0	
electrode kit (200 to 230 VAC 3~, 350 to 1250 μS/cm)			KITBLCT2B0	KITBLCT3B0	KITBLCT4B0	KITBLCT4B0	
electrode kit (400 VAC 3~, 125 to 350 μS/cm)			KITBLCT2B0	KITBLCT3B0	KITBLCT4C0	KITBLCT4C0	KITBLCT4B0
electrode kit (400 VAC 3~, 350 to 750 μS/cm)			KITBLCT2C0	KITBLCT3C0			
electrode kit (400 VAC 3~, 350 to 1250 μS/cm)					KITBLCT4D0	KITBLCT4D0	KITBLCT4C0
electrode kit (400 VAC 3~, 750 to 1250 μS/cm)			KITBLCT2D0	KITBLCT3D0			
electrode kit (460/575 VAC 3~, 125 to 350 μS/cm)			KITBLCT2C0	KITBLCT3C0	KITBLCT4D0		
electrode kit (460/575 VAC 3~, 350 to 1250 μS/cm)			KITBLCT2D0	KITBLCT3D0	KITBLCT4D0		
electrode kit (460 VAC 3~, 125 to 350 μS/cm)						KITBLCT4C0	KITBLCT4C0
electrode kit (460 VAC 3~, 350 to 1250 μS/cm)						KITBLCT4D0	KITBLCT4D0
electrode kit (575 VAC 3~, 125 to 350 μS/cm)						KITBLCT4D0	KITBLCT4D0
electrode kit (575 VAC 3~, 350 to 1250 μS/cm)						KITBLCT4D0	KITBLCT4D0
electrode gasket kit			KITBLCT2FG0	KITBLCT3FG0			

Table 5.4.4.1

6.5 Troubleshooting

For the alarms, see instruction sheet +050003755, which is an integral part of this manual.

PROBLEM	CAUSES	SOLUTION
the humidifier does not turn on	1. no electrical power supply; 2. controller connectors inserted incorrectly; 3. fuses blown; 4. transformer fault	1. check the protection device upstream of the humidifier and that the power supply is present; 2. check that the connectors are properly inserted in terminal block; 3. check fuses F1/F2/F3; 4. check that the voltage at the transformer secondary is 24 Vac
the humidifier does not start operation	1. remote ON/OFF contact open (relay/terminals AB – AB) on CP controller 2. control signal not compatible with the type set	1. close the ON/OFF contacts (relay/terminals AB – AB) on CP controller 2. check that the external signal is 0 to 10 V
the humidifier fills with water without producing steam	1. excessive backpressure in steam outlet; 2. cylinder inlet filter blocked; 3. lime scale in the supply tank; 4. drain solenoid valve fault	1. check that the steam outlet hose is not bent or choked; 2. clean the filter; 3. clean the supply tank; 4. check for abnormal voltage (24 Vac) at drain solenoid valve and/or replace the drain solenoid valve
the line thermal overload switch is activated	1. the thermal overload switch is undersized 2. excess current to the electrodes	1. check that the thermal overload switch is rated for a current equal to at least 1.5 times the rated current of the humidifier 2. check the operation of the drain solenoid valve, the seal of the fill solenoid valve when not energised, drain some of the water and re-start
the humidifier wets the duct	1. the steam distributor is not installed correctly (too near the top of the duct or the condensate return is blocked); 2. the system is oversized; 3. humidifier on when the fan in the duct is off	1. check that the steam distributor has been installed correctly; 2. decrease the steam production set on the controller; 3. check the connection of a device (flow switch or differential pressure switch) slaving the operation of the humidifier to the fan in the duct (terminals AB - AB) on the CP controller
the humidifier wets the floor below	1. the supply or overflow circuit has leaks; 2. the steam outlet hose is not properly secured to the cylinder	1. check the entire water circuit; 2. check that the clamp on the steam outlet is tight

Table 5.5

6.6 Alarms

For the alarms, see instruction sheet +050003755, which is an integral part of this manual.

7. OPERATING PRINCIPLE, CONTROL AND OTHER FUNCTIONS

7.1 Operating principle

In an electrode humidifier the production of humidity is obtained inside a cylinder (boiler) containing water that is heated to and then held at boiling temperature. The water that evaporates over time is automatically replaced with water from the mains supply. **The heat required to boil the water is produced by passing an electrical current through the cylinder. This is done by connecting the electrodes immersed inside the cylinder to the mains power supply.**

The quantity of current that initially flows depends greatly on the type of water supplied from the mains. Normally, a recently-started cylinder has low current; nonetheless, over time the quantity of salts inside the water increases (evaporation in fact does not carry the salts with it). This allows the level of current required by the unit to provide the quantity of steam requested to be reached.

In stable operating conditions, the level of production required is automatically achieved using the water level control on the cylinder. This is in fact reflected in higher or lower levels of current.

The salts introduced by the automatic refilling of the water are partly deposited as lime scale inside the cylinder, contributing to the progressive depletion of the cylinder, and partly remain dissolved in the water. To avoid excessive accumulation of salts, a quantity of water is periodically and automatically drained and then replaced with fresh water.

7.2 Control principles

The range of humidifiers includes the following control options.

7.2.1 ON/OFF control - CP controllers

The action is all or nothing, activated by an external contact that consequently determines the control set point and differential.

7.2.2 Proportional control - CP controllers

The steam production (quantity per hour) is proportional to the value of a signal Y coming from an external device; the type of signal can be selected – programmed via RS485 – from the following standards: 0 to 10 V (default), 2 to 10 V, 0 to 1 V. The entire range is indicated as BP (proportional band).

The maximum production, P_{max} , corresponding to the maximum value of the Y external signal, and can be programmed between 20% and 100% of the rated humidifier value (dip A3-A4).

The minimum production, P_{min} , is set to 20% of the rated value, with an activation hysteresis, given by the value hy , corresponding to 2% of the entire BP interval of the external signal Y .

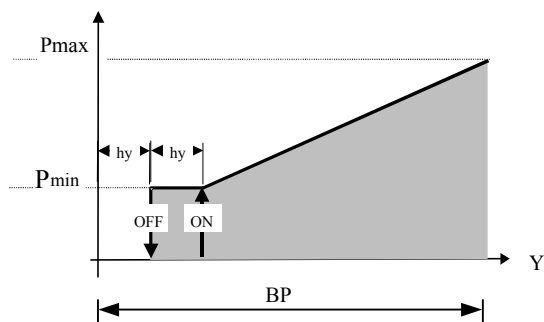


Fig. 6.2.2.1

8. TECHNICAL SPECIFICATIONS

	MODEL	KUETR*	KUESR*	KUES1*	KUET1*	KUES2*	KUET2*	KUES3*	KUET3*	KUET4*
steam										
flow-rate (kg/h)		1.5 to 3	1.5 to 3	1.5 to 3	1.5 to 3	5	5 to 8	9	10 to 15	25 to 45
connection (dia. mm)		22/30				30				40
outlet pressure limits (Pa)		0 to 500				0 to 500			0 to 600	0 to 2300

supply water			
connection	G¾		
temperature limits (°C)	1 to 40		
pressure limits (MPa)	0.1...0.8 (1 to 8 bar, 14.5 to 116 psi)		
hardness limits (°fH)	≤ 40		
instant flow-rate (l/min)	0.6	1.2	4
range of conductivity (µS/cm)	125 to 1250		

drain water										
connection (φ mm)		32								40
typical temperature (°C)		≤100								
instant flow-rate (l/min)		~ 4								22.5

environmental conditions										
ambient operating temperature (°C)		1 to 50								
ambient operating humidity (% rH)		10 to 60 (90 non-condensing)								
storage temperature (°C)		-10T70								
storage humidity (% rH)		5 to 95								
index of protection (CEI EN 60529)		IP00								

electronic controller (see CP controller instruction sheet)

type		CP1*, CP2*, CP3*, CP4*								CP3*
auxiliary voltage / frequency (V - Hz)		24VAC(-15% to +10%) / 50 - 60Hz								
maximum auxiliary power (VA)		30								
signal inputs		input impedance for 0 to 10 V, 2 to 10 V, 0 to 1 V signals: 15 kΩ								

Electrical specifications: see the instruction sheet for the CP controller, code +050003755

	MODEL	KUETR*	KUESR*	KUES1*	KUET1*	KUES2*	KUET2*	KUES3*	KUET3*	KUET4*								
Power																		
	1.5	3	1.5	3	1.5	3	1.5	3	5	5	8	9	10	15	25	35	45	
rated power supply voltage: 208V-1~N code U																		
instant steam production ⁽¹⁾ (kg/h)	1.5	3	1.5	3	1.5	3	1.5	3	5			8.7						
power input at rated voltage (kW)	1.12	2.25	1.12	2.25	1.12	2.25	1.12	2.25	3.75			6.52						
rated power supply voltage: 230V-1~N code D																		
instant steam production ⁽¹⁾ (kg/h)									5			9						
power input at rated voltage (kW)									3.75			6.75						
rated power supply voltage: 208V-3~ code W																		
instant steam production ⁽¹⁾ (kg/h)										5	8		10	15	25	35		
power input at rated voltage (kW)										3.75	6.00		7.50	11.25	18.75	26.25		
rated power supply voltage: 230V-3~ code K																		
instant steam production ⁽¹⁾ (kg/h)										5	8		10	15	25	35		
power input at rated voltage (kW)										3.75	6.00		7.50	11.25	18.75	26.25		
rated power supply voltage: 400V-3~ code L																		
instant steam production ⁽¹⁾ (kg/h)											5	8		10	15	25	35	45
power input at rated voltage (kW)											3.75	6.00		7.50	11.25	18.75	26.25	33.75
rated power supply voltage: 460V-3~ code M																		
instant steam production ⁽¹⁾ (kg/h)											5	8		10	15	25	35	45
power input at rated voltage (kW)											3.75	6.00		7.50	11.25	18.75	26.25	33.75
rated power supply voltage: 575V-3~ code N																		
instant steam production ⁽¹⁾ (kg/h)											5	8		10	15	25	35	45
power input at rated voltage (kW)											3.75	6.00		7.50	11.25	18.75	26.25	33.75

CAREL reserves the right to modify or change its products without prior notice.

Notes: _____



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