



Liebert® PCW
High Efficiency
25-200 kW Chilled Water Room Cooling Units
L-C Version (single chilled water circuit)
X-R Version (redundant - double chilled water
circuit)

User Manual
English, Cod. 273895, rev. 04.10.2018

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This document, written in English, is the original version.

Conventions

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.

NOTICE indicates a property damage message.



NOTICE

The manual is retained for the entire service life of the machine;

The user reads the manual carefully before carrying out any operations on the machine;

The unit control must be used exclusively for the purpose which it is intended for; the manufacturer takes no liability in case of an incorrect use or a modification of the unit control



WARNING

This manual was prepared to enable the end user to carry out only the operation that can be done with the panels closed.

Only qualified personnel are allowed to carry out operations that require opening of the door or the equipment panels. The panel key supplied with the unit must be kept by a person responsible for the maintenance.



CAUTION

Before proceeding with installation, read all instructions, verify that all parts are included and check the nameplate to make sure the voltage matches available utility power.

For identification of the unit (model and serial no.) in case of the necessity for assistance or spare parts, locate the identification label on the outside of the unit.



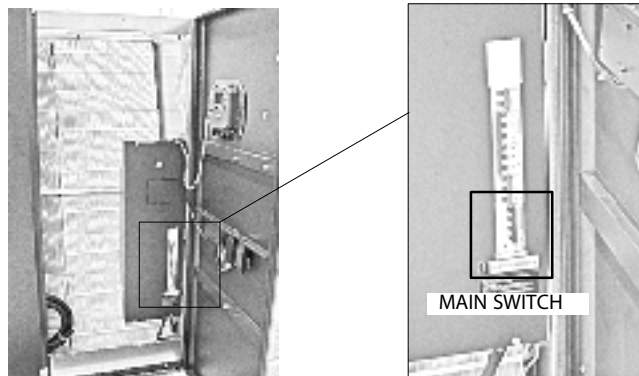
WARNING

This unit operates and restarts automatically.

If the electrical connection is live, there are residual risks: electric shock, burns, moving parts, automatic restarting from the remote control.

- **Before any operation that requires opening of the door or the equipment panels (maintenance, cleaning, etc.), disconnect the unit from the power supply.**

The ON/OFF switch on the control panel does not isolate the power from the unit, even in the "unit off" mode. To cut off the power supply, open the insulation device (main switch) which is positioned on the electrical panel cover, behind the door:



Unscrew the door and open it to access the main switch.

- After opening the door pay attention to the cable and components still energized.
- **Open the main switch to cut off the power before removing any protective cover.**



WARNING

The supply cable of the main switch contains live high-voltage.

- The manufacturer highly recommends that the final customer installs on site an external main switch, easy to reach and to facilitate a quick and easy shutdown enabling the power of the unit to be cut off. Refer to the unit electrical schematics for the installation. Follow all local codes.



CAUTION

If the unit door is open while the fans are operating, the airflow may suddenly slam the door open or close.

There is a risk of being hit by the door and hands being crushed.

- Before opening the door, switch off the unit using the local or remote control panel or the external main switch (if installed).

If small objects are left loose in the fans bay after any maintenance operation, it may result in the object ejection at the fans start-up.

There is a risk of being hit by small objects.

- Install all protection panels or a grid before starting up the fans after any maintenance operation.



WARNING

If the internal compartments are open immediately after the machine has been switched off, there might be some hazards related to:

- Components still at high temperature.
- Rotating elements (fan impellers, they might continue to rotate for a while by inertia)
- Sharp edges, splinters and exposed fasteners

Pay attention to the warning labels on the unit.



Manufactured at (28)



MODEL (30)

SERIAL N. (31)

VOLTAGE-PHASE-FREQUENCY (32)

(1)	COMPRESSOR				
	FLR	LRA (2)	CT. (3)		
(4)	FAN MOTOR				
	FLR	LRA (5)	CT. (6)		
(7)	FAN MOTOR				
	FLR	LRA (8)	CT. (9)		
(10)	EL. HEATER				
	A	STAGES (11)			
(12)	HUMIDIFIER				
	A	STEAM OUTPUT	Kg/h (13)		
(14)	TOTAL FLR ac	TOTAL FLR dc	Isk	KA (16)	
	A	A (15)	Ick	KA (17)	
(18)	REFRIGERANT TYPE				
	R				
(19)	HIGH PRESS. SWITCH-MANUAL				
	SET	Bar	RESET	Bar (20)	
(21)	LOW PRESSURE SWITCH				
	SET	Bar	RESET	Bar (22)	
(23)	OPERATING AIR TEMPERATURE				
	min	°C	max	°C (24)	
(25)	OPERATING AIR HUMIDITY				
	min	%	max	% (26)	
(27)	CIRCUIT MAX. PRESSURE				
	Bar				
	MANUFACTURING DATE				
					(29)

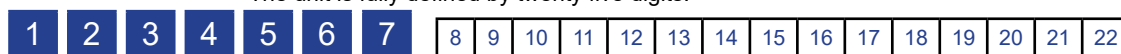


Attention: data relevant to the unit supplied is indicated on the inboard label (see the blank facsimile on the left).
Data in the manual is referred to standard conditions and can be modified without any advance notice.

POS.	DESCRIPTION
1	Not used
2	Not used
3	Not used
4	Fan Full Load Ampere [A]
5	Fan Locked Rotor Ampere [A]
6	Fan quantity
7	Not used
8	Not used
9	Not used
10	Electrical heating Ampere
11	Electrical heating steps
12	Humidifier Ampere
13	Steam production capacity
14	Max. unit AC Ampere
15	Not used
16	Rated peak withstand current
17	Rated short- time current
18	Not used
19	Not used
20	Not used
21	Not used
22	Not used
23	Min. room operation temperature
24	Max. room operation temperature
25	Min. room operation humidity
26	Max. room operation humidity
27	Max. hydraulic circuit pressure
28	Manufacturing plant
29	Manufacturing date
30	Model
31	Serial number
32	Power input

Digit Nomenclature

The unit is fully defined by twenty five digits.



Digit 1 and 2
PH Liebert PCW

Digit 3, 4 and 5
 Unit Model

Digit 6 - Air Discharge

- U** Upflow
- H** Downflow Frontal
- D** Downflow Up
- E** Downflow Down

Digit 7 - System Type

- L** Chilled Water Extended Height
- C** C Chilled Water Standard Height
- X** Dual Source CW Extended Height
- R** Dual Source CW Standard Height

Digit 8 - Airflow

- L** Liebert EC Fan 2.0
- 1** EC Fan Fix Speed

Digit 9 - Main Power Supply

- 3** Single 400V / 3 ph / 50 Hz + N

Digit 10 - Valve

- 2** CW Two way Valves Standard Pressure
- 3** CW Three way Valves Standard Pressure
- 1** CW Two way Valves High Pressure
- T** CW Three way Valves High Pressure
- V** CW Two way Valves 0-10 V
- W** CW Three way Valves 0-10V

Digit 11 - Humidification

- 0** None
- H** Infrared Humidifier
- U** Ultra Sonic
- S** Electrode humidifier

Digit 12 - Microprocessor Control

- 2** Inner Display only T sensor
- 3** Inner Display TH sensor
- U** Small Cold fire display T sensor
- B** Small Cold fire display TH sensor
- C** Large Cold fire display T sensor
- D** Large Cold fire display TH sensor
- W** Small Cold fire display T sensor (for PHxxxDL)
- X** Small Cold fire display TH sensor (for PHxxxDL)
- Y** Large Cold fire display T sensor (for PHxxxDL)
- Z** Large Cold fire display TH sensor (for PHxxxDL)

Digit 13 - Heating & Re- Heating

- 0** None
- 1** Electric heating Std 1 Stage
- 2** Electric heating Opt. 2 Stage
- 4** Hot Water Heating
- 8** El. Heating + hot water coil

Digit 14 - Air Filter Efficiency

- 1** F5 (EU5) dust spot
- 3** F5 (EU5) dust spot + Clogged Filter

Digit 15 - Coil (and Pipes)

- H** Standard Piping Bottom
- T** Standard Piping Top
- S** Standard Piping Left

Digit 16 - Colour

- 1** Black Vertiv RAL 7021

Digit 17 - High Voltage Option

- D** Standard Power Supply
- F** Dual Power Supply Parallel
- G** Dual Power Supply Alternate Basic
- H** Dual Power Supply Alternate Premium
- 5** Standard Power Supply + Condensate Pump
- Q** Dual Power Supply Parallel + Condensate Pump
- M** Dual Power Supply Alternate Basic + Condensate Pump
- P** Dual Power Supply Alternate Premium + Condensate Pump

Digit 18 - Option Package

- 0** None
- S** Smart Aisle (Predisposition for damper, Sensors, 3 position switch)
- F** Economizer (sensors, predisposition for dampers)
- G** Smart Aisle + Economizer

Digit 19 - Monitoring

- 0** Monitoring - with IS Housing (No IS Card included)
- N** NO Intellislot Housing included
- P** Intellislot Unit Card for Modbus, BacNet, SNMP and Web
- C** Intellislot Sitescan Card (IS-485EXI)

Digit 20 - Sensors (Chilled Water Kit)

- 0** None
- W** Water Temperature Sensors IN / OUT
- V** Water Temperature Sensors & flow meter

Digit 21 - Packaging

- P** PLP And Pallet
- C** Cardboard and Wooden Crate
- S** Seaworthy

Digit 22 - Special Requirements

- A** Standard Vertiv
- X** Special Vertiv

Digit Nomenclature

Only for Extended Height Unit
The base unit is fully defined by thirteen digits



BM

Digit 1 and 2 - Fan Module

- BM** Fan Base Module
- BF** Fan Base Frame
- TP** Fan Top Plenum

Digit 3, 4 and 5 - Size: Nominal Length

- 335 - 3350 mm
- 295 - 2950 mm
- 255 - 2550 mm
- 205 - 2050 mm
- 175 - 1750 mm

Digit 6 - Air delivery (only for BM)

- S** Standard
- B** Back (fans removal from the front)
- F** Front

Digit 7 - Fans

- L** Liebert EC Fan 2.0
- 1** EC Fan Fix Speed

Digit 8 - Heaters

- 0** No heaters
- 1** 1 stage
- 2** 2 stage

Digit 9 - Packaging

- P** PLP And Pallet
- C** Cardboard and Wooden Crate
- S** Seaworthy

Digit 9 - Free

Digit 11 - Free

Digit 12 - Free

Digit 13 - Special Requirements

- A** Standard Vertiv
- X** Special Vertiv

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Enclosures

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Enclosure G.....	G - 1

1 - General Description

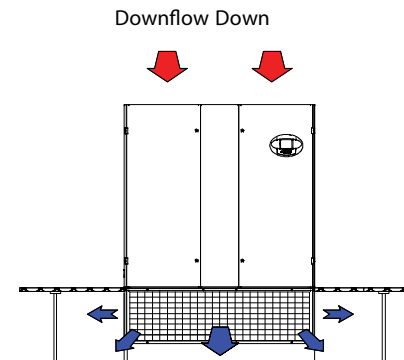
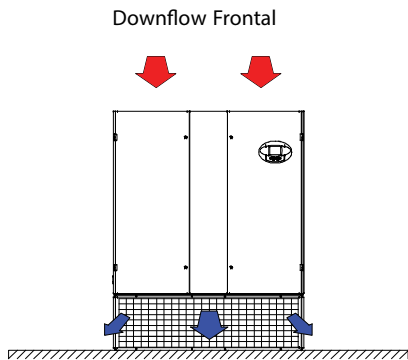
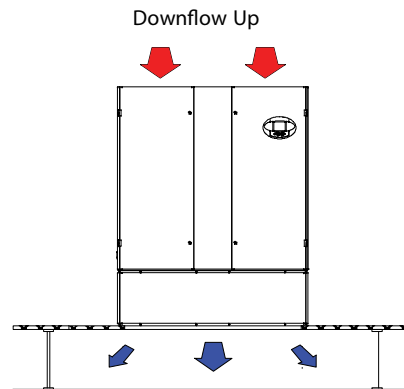
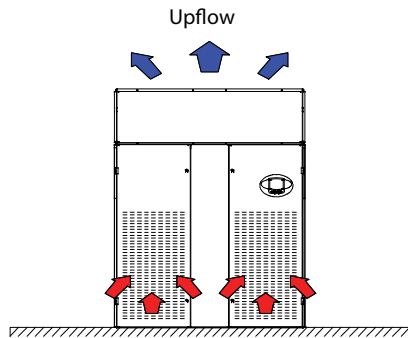
The **Liebert® PCW** is a full- featured precision air conditioner intended for data centers, network closets, technological rooms (laboratories, metrological rooms, museums), new and existing constructions, raised and non- raised floors, moderate to high density heat loads, also in combination with cold aisle containments (up to 10 kW/Rack). It provides all the necessary functions of a standard precision air conditioner, including cooling, heating, humidification, dehumidification, air filtration, condensate management, temperature control, alarm functions and data communications. **Liebert® PCW** is designed on modular concept. Every **Liebert® PCW** unit is

composed (at least) of a coil section and a base or top fan section with fan(s) installed on it.

The **Liebert® PCW** Standard Height Unit is supplied as a single unit (height 1970mm), where coil and fan sections are connected.

The **Liebert® PCW** Extended Height is supplied in two modules, the Coil Module (coil section) and the Fan Module (fan section). The two modules should be connected on the field (see chap. 3 Installation) (total height 2570 mm). The Fan Module is called Fan Base Module when placed on the raised floor, Fan Base Frame when installed in the raised floor, Fan Top Plenum when installed on the top of the cooling unit.

The units are available in the four configurations shown below.



1.1 - Single chilled water circuit - L- C versions

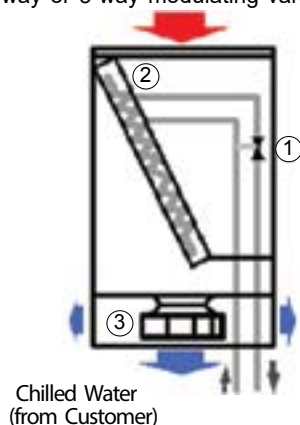
The unit is provided with a 2-way or 3-way modulating valve (1), complete with incremental motor for the control of water flow to the coil (2); the opening or closing signals, generated by the electronic controller, manage the valve actuator movement in order to maintain the desired conditions.

The room air is cooled passing through the coil (2) (air/ water heat exchanger), moved by the motor fan (3).

The iCOM Control (or CDL Graphic Display / opt.) controls all parameters.

It is possible to adjust, for instance: set points, proportional or proportional+integral temperature, integrating factor and valve characteristics.

It is also possible to manually adjust the valve with a suitable wrench.

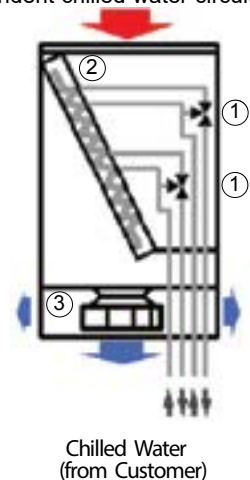


1.2 - Double chilled water circuit - X- R versions

The unit is equipped with two independent chilled water circuits in cascade to one single coil, each circuit is equipped with 3-way/2-way control valve (1), complete with incremental motors for the water flow control of each circuit.

These units can be connected to chilled water circuits coming from two independent sources. In case the first circuit failure, the second one can substitute the need for cooling capacity and provide the necessary back up.

The circuit 1 (valve located on the left side, looking from the unit's front) is before the circuit 2 (valve located on the right side, looking from the unit's front) on the air-stream.



1.3 - Operating limits

The units are designed to operate within working ranges (see Tab. a).

These limits are referred to new machines or to those that have been correctly installed and serviced.

The warranty clauses are no longer valid for any possible damage or malfunction that may occur during or due to operation outside the application values.

Tab. a - Operating limits

Room air conditions	Temperature:	From 18°C to 40° C
	Humidity ratio	From 5.5 g/kg to 11 g/kg
	Relative humidity	From 20% to 60%
Chilled water circuit		
inlet water temperature		min. 5°C
water pressure		max. 16 bar
Max. differential pressures on the modulating valve (2 or 3 ways) (see Tab. b)		
- Max. differential pressure through the closed valve: Δp_{cv}		
- Max. differential pressure across the valve for modulating service: Δp_{ms}		
Hot water circuit	inlet water temperature	max. 85°C
	water pressure	max. 8.5 bar
Storage conditions	Temperature:	From -20°C to 50° C
	Relative humidity	Max. 90% RH, preventing surface condensation.
Power supply tolerances		V \pm 10% Hz \pm 2

Tab. b - Max differential pressure on the modulating valve.

Models	Standard Pressure Valve 0- 10V valve		High pressure valve	
	Dpcv (kPa)	Dpms (kPa)	Dpcv (kPa)	Dpms (kPa)
Single chilled water circuit				
PH025	-	-	300	300
PH030	-	-	300	300
PH035	175	175	940	200
PH040	175	175	940	200
PH045	300	200	650	200
PH060	300	200	650	200
PH070	210	200	490	200
PH080	210	200	490	200
PH095	210	200	490	200
PH100	210	200	490	200
PH110	210	200	490	200
PH145	210	200	490	200
PH170	210	200	490	200
PH046	175	175	940	200
PH066	300	200	650	200
PH081	210	200	490	200
PH091	210	200	490	200
PH111	210	200	490	200
PH136	210	200	490	200
PH161	210	200	490	200
PH201	210	200	490	200
Double chilled water circuit				
PH040	175	175	-	-
PH060	300	200	650	200

Models	Standard Pressure Valve 0- 10V valve		High pressure valve	
	Dpcv (kPa)	Dpms (kPa)	Dpcv (kPa)	Dpms (kPa)
PH080	300	200	650	200
PH110	210	200	490	200
PH145	210	200	490	200
PH170	210	200	490	200
PH046	175	175	-	-
PH066	300	200	650	200
PH091	300	200	650	200
PH136	210	200	490	200
PH161	210	200	490	200
PH201	210	200	490	200

1.3.1 - Noise level limits

The sound pressure level in free field at 1.5m height and 2m in front of the air conditioner, with fan in operations, is less than 70 dBA for all models.

2 - Preliminary operations

2.1 - Safety Information



WARNING!

Risk of top-heavy unit falling over! Improper handling can cause equipment damage, injury, or death! Read all of the following instructions before attempting to move, lift, remove packaging from, or preparing unit for installation.



CAUTION!

Risk of sharp edges, splinters and exposed fasteners! Can cause personal injury! Only properly trained personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move, lift, remove packaging from the unit or prepare the unit for installation.



CAUTION!

Risk of overhead interference! Can cause unit and/or structure damage! The unit may be too tall to fit through a doorway while on the skid.

Measure the unit and doorway heights and refer to the installation plans prior to moving the unit to verify clearances.



CAUTION!

Risk of unit damage if improperly stored! Keep the unit vertically upright, indoors, and protected from dampness, freezing temperatures, and contact damage.



ATTENTION!

The conditioner must never be installed out of doors. See drawings in **Enclosures C**.

2.2 - Equipment Inspection

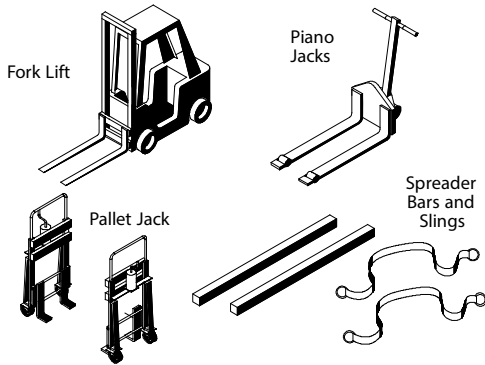
Upon arrival of the unit, and before unpacking, verify that the labeled equipment matches the Bill of Lading. Carefully inspect all items for either visible or concealed damage. Damage should be immediately reported to the carrier and a damage claim filled in with a copy sent Vertiv or to your sales representative.

2.3 - Packing material



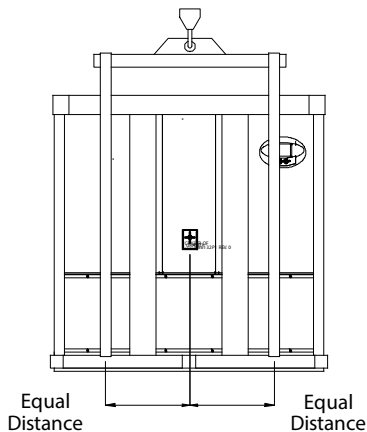
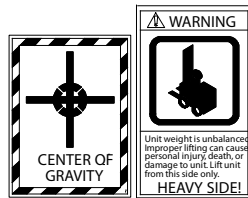
All material used to package this unit is recyclable. Please save for future use, or dispose of the material appropriately.

2.4 - Recommended Unit Handling Equipment



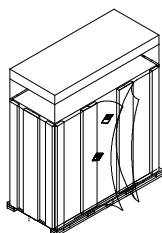
2.5 - Handling the Unit While Packaged

- Transport unit using a fork lift or pallet jack; otherwise use a crane with slings, in this case use spreader bars to avoid risk of crushing.
- If using a fork lift or pallet jack, make sure the fork (if adjustable) are spread to the widest allowable distance to still fit under the skid. Also, ensure the fork length and distance is suitable for the unit length and to ensure the unit stability.
- When moving the packaged unit with a fork lift, lift the unit from the designated side of the unit no higher than 152 mm off the ground. If circumstances require the unit to be lifted higher than 152 mm great care shall be exercised and all by-standing personnel are to be no closer than 5m to the lift point of the unit.
- Always refer to the location of the Center of Gravity indicators when lifting the unit from any other side.
- Use the center of gravity indicators on the unit panels to determine the position of the slings.
- Center of gravity varies per unit size and selected options.
- Slings shall be equally spaced on either side of the center of gravity indicator, and with the widest allowable distance.
- Be sure that the distance between slings guarantees the unit stability.
- Place the slings between the unit bottom rails and the skid.

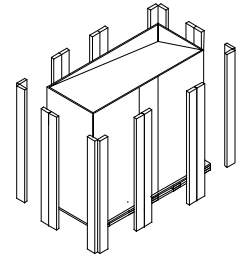


2.6 - Unpacking the Unit (Standard Height Unit, Coil Module and Fan Module)

- 1) Remove the exterior stretch wrap packaging material from around the unit, exposing the protective corner and side packaging planks.



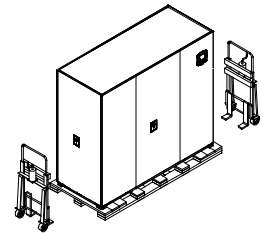
- 2) Remove the top cover, corner and side packaging planks from the unit.



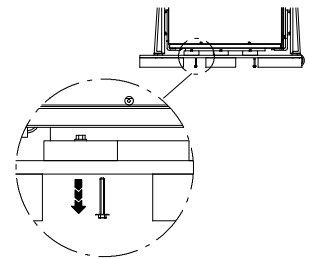
2.7 - Moving to the Installation Location with Piano Jacks

Make sure the floor can support the unit when being moved with piano jacks. Adequate support (e.g. metal plates) should be used to cover the floor to distribute the weight on the floor.

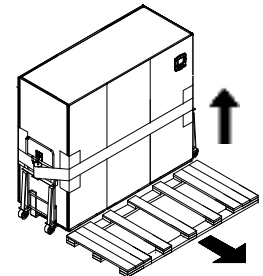
- 1) Acquire piano jacks and place them into a position so one is at each end of the unit.



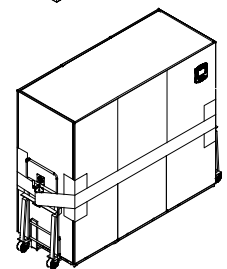
- 2) Remove 4 bolts from the pallet, two on each side. Bolts can be removed by using a 1/2" socket wrench, openend wrench or pliers.



- 3) Place a protective material between the unit and the piano jacks and straps.



- 4) Using the piano jacks, the unit can be moved to the site for installation (min. two technicians are required).



5) Piano Jacks Removal

- Place the unit as low as the piano jacks will allow
- Undo all the strapping holding the piano jacks to the unit
- Use a pry bar or a similar device to lift the unit high enough allowing the removal of the piano jacks on each side
- Remove all material used to protect the unit from the piano jacks and strapping

To move the Fan and the Coil Module of the Extended Height unit use the above instructions (point 1 to 5).

2.8 - Unit Weight

Tab. c - Unit Weight

Models	Single circuit unit [kg]	Double circuit unit [kg]	Packaging [kg]
Standard Height Unit			
PH025	310	-	19
PH030	320	-	19
PH035	356	-	23
PH040	373	396	23
PH045	481	-	28
PH060	511	552	28
PH070	582	-	31
PH080	598	627	31
PH095	680	-	42
PH100	700	-	42
PH110	740	753	42
PH145	853	866	47
PH170	955	968	58
Extended Height unit [Coil Module] ⁽¹⁾			
PH046	276	326	23
PH066	410	483	28
PH081	420	-	31
PH091	462	500	31
PH111	515	-	42
PH136	575	618	42
PH161	660	673	47
PH201	720	733	58
Extended Height unit [Fan Base Frame] ⁽¹⁾			
BF120	91		26
BF175	150		35
BF205	170		41
BF255	218		54
BF295	245		61
BF335	325		78
Extended Height unit [Fan Base Module/Fan Top Plenum] ⁽¹⁾			
BM/ TP 120	132		26
BM/ TP 175	200		35
BM/ TP 205	230		41
BM/ TP 255	286		54
BM295	340		61
BM335	405		78

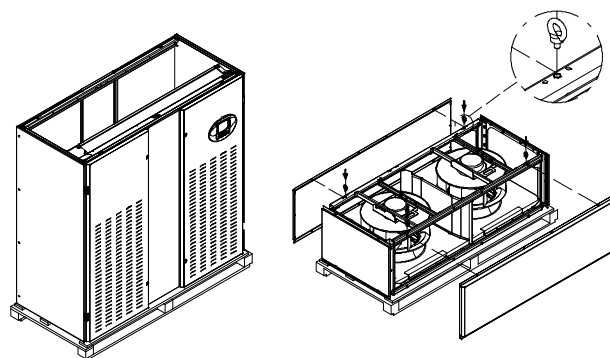
(1) For Extended Height version the total unit weight must be calculated by adding the Coil Module weight and Fan Section weight.

3 - Assembly

The **PCW Standard Height Unit** is supplied already assembled; the **PCW Extended Height** is supplied in two modules, the **Coil Module** and the **Fan Module**. The unit modules must be connected on the field close to the final working unit position. Make sure you have the space available for mounting operations. After the assembly the unit can be moved and positioned in the working site. See point 4 Positioning.

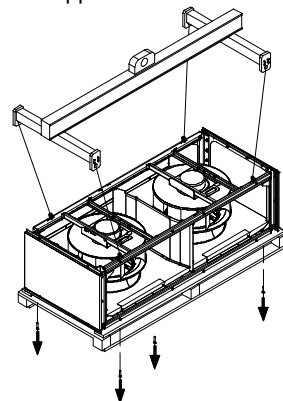
3.1 - Extended Height unit: Upflow

1) Place the two modules (coil module and fan top plenum) close to the final position.

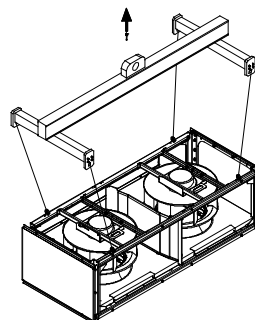


2) Remove the front and back panels from the fan top plenum. Insert 4 shackles (M8, not supplied) in the upper frame.

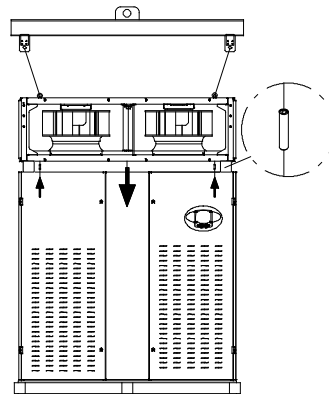
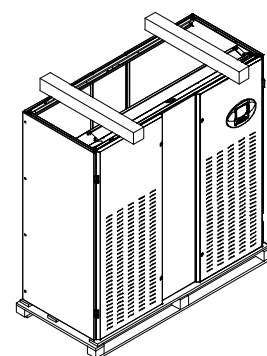
3) Remove 4 bolts from the fan top plenum pallet, two on each side, if not already done (see chapter 1.7).



4) Lift the fan top plenum using slings and a 4 point lifting bar (not supplied).



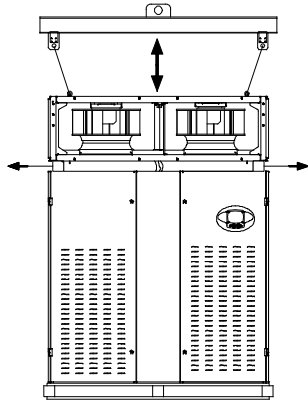
5) Put two timber pieces on the coil module and place the fan module on them.



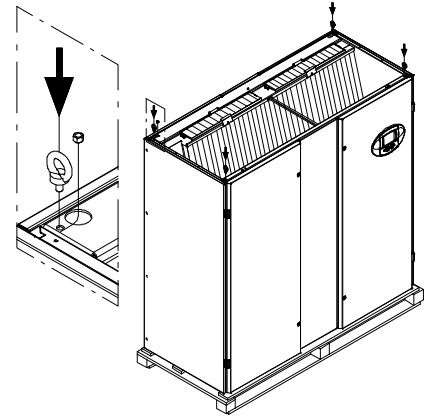
6) Insert 4 dowels (M8) in the lower frame of the fan top plenum.

7) Run the EC Fan power cable positioned in the coil module through the cable bushing to the fan module. Then run the EC Fan signal cable (and Electrical Heater cable if installed) positioned in the fan module through the cable bushing into the coil module. See chapter 6 for Electrical connection details.

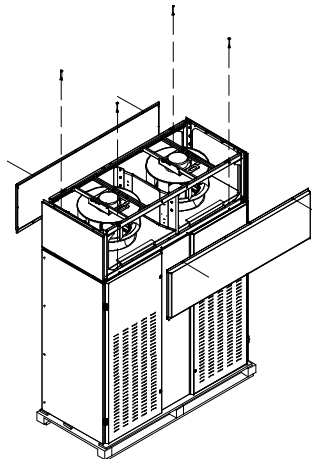
8) Lift the fan top plenum and remove the timber pieces. Place the plenum on the coil module using the 4 dowels making sure it is properly aligned. Pay attention to the cable between the two modules. To avoid damaging it pull the entire cable through the coil module.



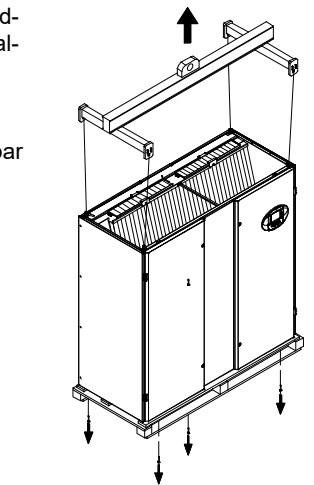
3) Attach 4 shackles and M12 nuts to the coil module (not supplied). Use appropriate shackles to lift the total assembled unit load.



9) Fix the two modules with the 4 hex head screws supplied (8 hex head screws for unit bigger than PH095).

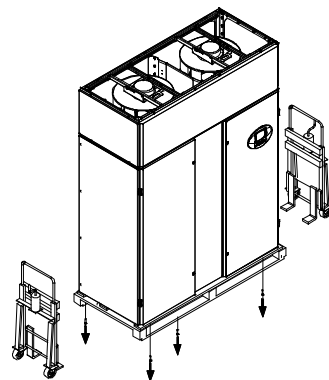


4) Remove 4 bolts from the coil module pallet, two on each side, if not already done (see chapter 1.7).

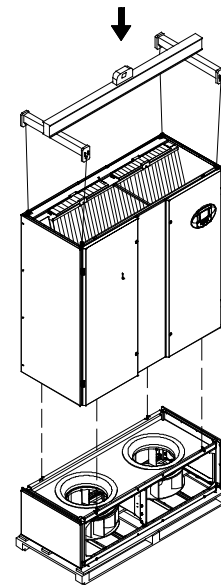


10) Mount the front and back panel on the fan top plenum.

5) Use slings and a 4point lifting bar (not supplied) to lift the coil module.



11) Use piano jacks to move the unit, as described in chapter 1.7. Place protective material between the unit and the piano jacks and straps. If not already done, remove 4 bolts from the pallet, two on each side. Secured to the piano jacks, the unit can be moved to the final position (min. two technicians are required).

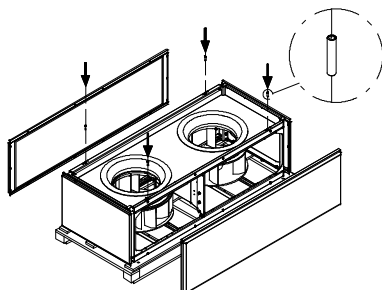


6) Place the coil module on the fan module, using the 4 dowels making sure it is properly aligned.

3.2 - Extended Height unit: Downflow Up, Downflow Down.

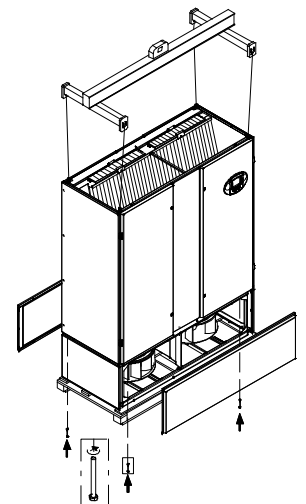
1) Place the two modules (coil module and fan base module or fan base frame) close to the final position.

2) Remove the front and back panels from the fan module. Insert 4 dowels (M8) in the upper frame.

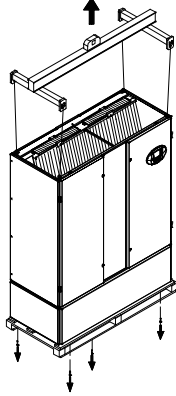


7) Fix the two modules with the 4 hex head screws supplied (8 hex head screws for unit bigger than PH095).

8) Run the EC Fan power cable positioned in the coil module through the cable bushing to the fan module. Then run the EC Fan signal cable (and Electrical Heater cable if installed) positioned in the fan module through the cable bushing into the coil module. See chapter 6 for Electrical connection details.



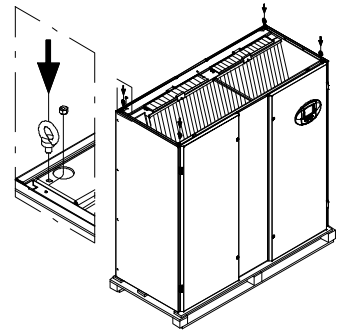
- 9) Connect the 2 pipe stubs on the fan module to the coil piping (VICTAULIC® connection).
- 10) Mount the front and back panels on the fan module.



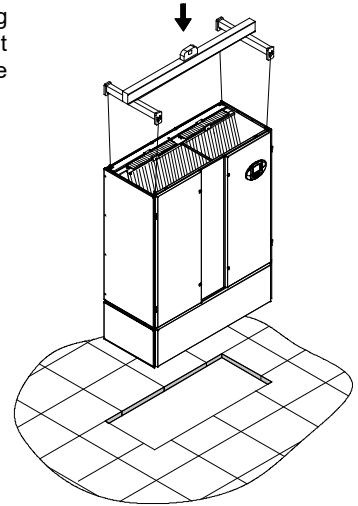
11) Remove the 4 bolts from the fan module pallet, two on each side of, if not already done (see chapter 1.7).

12) Unit is assembled and ready to be positioned. Lift the unit and move it to the final position.

- 1) Attach 4 shackles and M12 nuts to the coil module (not supplied). Use appropriate shackles to lift the total assembled unit load.



- 2) Use sling and a 4 point lifting bar (not supplied) to lift the unit and place it on the floor in the right position.



4 - Positioning

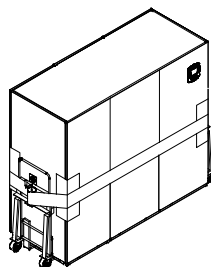
Depending on the unit air discharge configuration there are different kinds of positioning.

- Before proceeding with the installation of all units see overall dimensions and service area drawings in Enclosure C - Installation Drawings
- Make sure the floor can support the unit weight (see point 1.8 Unit weights; with Extended Height unit total weight must be considered - fan and coil modules)
- If required, accessories are available to support the unit in the final position, to help with water connection and the maintenance operation
See Enclosures E - Accessories

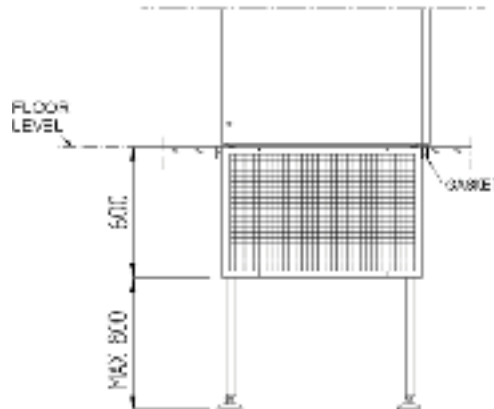
4.1 - Positioning: Upflow, Downflow Frontal, Downflow Up.

- The units have to be installed on the floor
- Downflow Up version - a raised floor with an opening below the unit is required to ensure the correct airflow under the floor. See Enclosure C
- Downflow Frontal version and Extended Height unit with the Back or Frontal Air Delivery option - the unit bottom is open; to avoid airflow leakage the floor below the unit has to be closed and the holes for the water connection have to be sealed.
- Extended Height unit with the Back Delivery option - the unit has to be installed with the air delivery ducted or with the air flow channeled below the raised floor.

- 1) To move the unit use the piano jacks. Make sure the floor can support the unit when being moved with piano jacks.
- 2) Place protective material between the unit and the piano jacks and straps.
- 3) With the unit secured to the piano jacks it can be moved to the site for installation (min. two technicians are required).



Downflow Down position



Right position of the Downflow Down unit respect the floor level.

All dimensions in mm

It is the responsibility of the customer to ensure the right support below the unit; if necessary accessories are available.

See enclosure E.

NB: Seal any gap between the unit and the floor edge with a gasket.

4.2 - Positioning: Downflow Down.

A raised floor is required for this installation. The fan section is installed completely under the floor allowing the correct airflow below the floor. See Enclosure C

5 - Water connections

5.1 - General warnings

ENSURE THAT THE TUBING DOES NOT OBSTRUCT THE AIR FLOW(Under only).

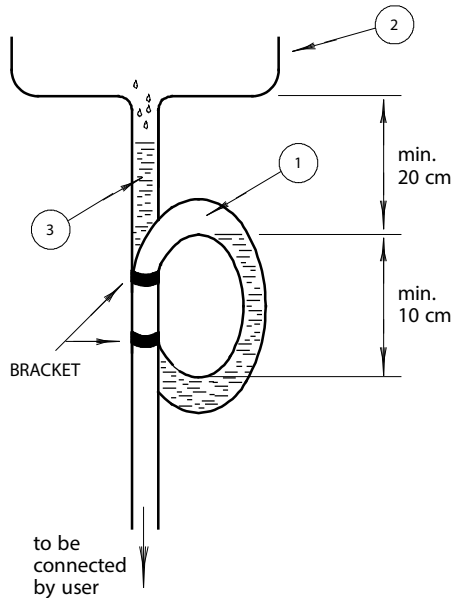
IF THE TUBING IS TO RUN OUTDOORS, ADD ETHYLENE GLYCOL TO THE CIRCUIT AS DESCRIBED IN PARA. 5.3.

5.2 - Water connections

5.2.1 - Condensate drain (for unit without condensate pump) (Fig. a):

- Use galvanized steel, PVC or flexible polythene tubing.
- Allow a 2% gradient towards the drain.
- It is necessary to make a drain trap (1) place at least 20 cm below the drain tray (2). In the Upflow configuration units the drain trap must be placed under the unit, in the false floor.
Caution: If the drain trap is done inside the fan module in the Downflow configurations attach the tube and the drain trap properly to the fan module frame using a cable tie, avoiding the risk of contact with fans.
- Fill the drain trap with water before the start- up to avoid spraying the condensate (3).

Fig. a - Condensate drain



5.2.2 - Condensate drain for the Extended Height Downflow Up and Downflow Down units

Place the condensate pipe inside the fan module before making the drain trap.

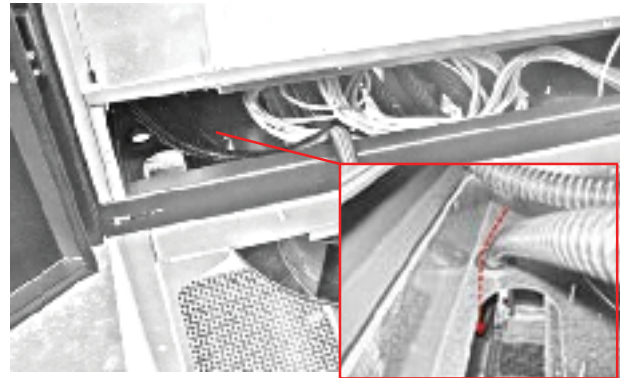


- Remove the internal bottom cover by unscrewing the two screws that hold it.



- Remove the drainpipe from the hole on the drain panel by pulling it down

- Pass the drain pipe through the cable bushing on the top of the fan module along the entire tube length.



- Reposition the internal bottom panel and fix it with the two screws.

5.2.3 - Condensate Pump.

As an option it is possible to have Upflow unit with a condensate pump that allows draining of the water up to 3m above the floor. The pump discharges both condensate water from exchange coil and drain water from humidifier (if installed).

Maximum discharge total head allowed 3m (head + hydraulic connection loss); the final drain must be able to receive 10l/min water at high temperature (max water temperature 100° C).

5.2.4 - Humidifier (optional): See Enclosure A.

5.2.5 - Hot water (optional):

- Use copper or steel (Mannesmann) tubing.
- Insulate both tubes using proper insulation.

5.3 - Chilled water connections

- The PCW units from PH070 to PH201, single chilled water circuit, and from PH110 to PH201, double chilled water circuit are supplied with VICTAULIC® connections.

The chilled water piping has to be suitable for these connections (see Victaulic connections details below). Otherwise two smooth pipe stubs are provided with the units and can be used to create the connection. Or as an option two threaded pipe stub scan be supplied on request.

See Enclosure D - "Hydraulic and Electric Connection" for dimension details.

- In case of threaded connections use hemp and paste to get a reliable pressure- tight joint.
- Use copper or steel (Mannesmann) tubing.
- Place the tubing on supporting saddles (1).
- Insulate both tubes using Armaflex insulation (2).
- Place shut- off ball valves (3) at the conditioner inlet and outlet to allow easy maintenance.
- It is useful to install a thermometer (4) and a manometer (5) on the conditioner inlet and outlet.
- Install a water drain tap (6) at the lowest point in the circuit.
- Fill the circuit with water/glycol (see Fig. b).

Fig. b - Chilled water circuit

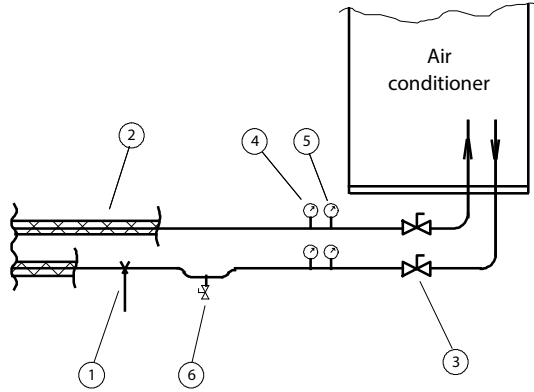
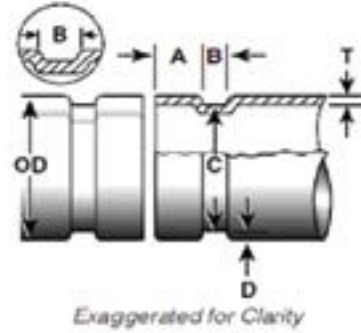


Fig. b1 - VICTAULIC® connections details.



Tab. d - VICTAULIC® connections details.

Nominal Size mm	Actual Outside Dia. mm		Gasket Seat "A" mm ± 0.8 mm	Groove Width "B" mm ±0.8/-0 mm	Groove Diameter "C" mm + 0/-0.5 mm	Groove Depth "D" mm Ref. Only	Max. Allow. Flare Diameter mm
	Min.	Max.					
54	53,93	54,07	15,87	7,62	51,50	1,25	56,41
64	63,93	64,07	15,87	7,62	61,46	1,27	66,41

Installation Instructions:



3) Install gasket over one end of the copper tubing. Make sure the gasket lip does not overhang the end of the copper tubing.

1) Check tubing ends - the outside surface of the tubing between the groove and the tubing end must be smooth and clear; all oil, grease, dirt, and cutting particles must be removed.
 2) Lubricate gasket - apply a thin coat of Victaulic lubricant or silicone lubricant to the gasket lips and exterior.



4) Join tubing ends - align and bring the two copper tubing ends together. Slide the gasket into position, and make sure it is centred between the grooves.

NOTE: Make sure no portion of the gasket extends into the grooves in the copper tubing.

5) Insert the housing - assemble and insert the unit over the gasket, hold the two parts of the housing with the two bolts loosely. Make sure the housing's keys engage the grooves properly on both sections of copper tubing.

NOTE: Make sure the gasket does not become rolled or pinched while installing the housing.

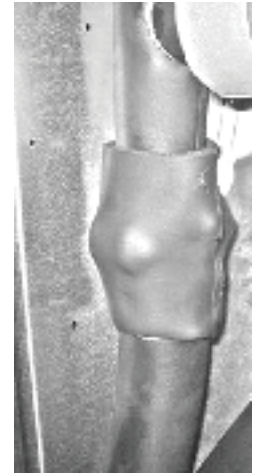
Failure to follow this instruction could cause damage to the gasket, resulting in joint leakage.



6) Tighten all nuts evenly by alternating sides until metal to metal contact occurs at the angle bolt pads. Make sure the housing keys completely engage the grooves. Make sure the offsets are equal at the bolt pads. This is necessary to ensure a rigid joint.

NOTE: It is important to tighten all nuts evenly to prevent gasket pinching.

7) Visually inspect the bolt pads at each joint to ensure metal-to-metal contact is achieved. Cover the Victaulic connection with Armaflex insulation.



5.3.1 - Pipe connection Extended Height unit.

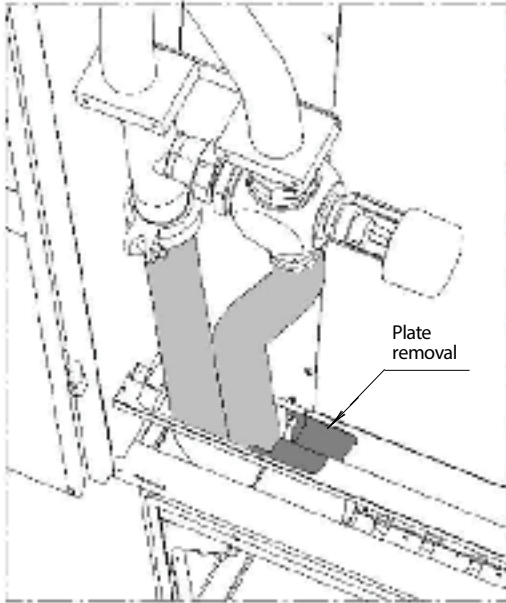
- Downflow Versions with Standard Piping Bottom
- Upflow Version with Standard Piping Top

Before connecting the water supplier pipes for these units it is necessary to connect the two pipe stubs placed inside the unit coil module.

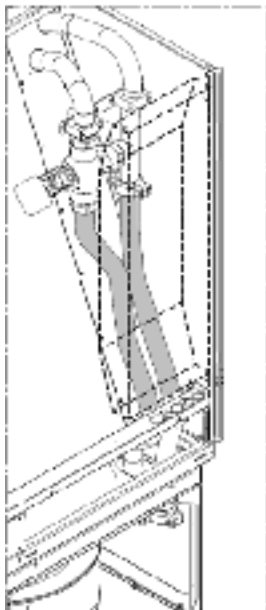
Downflow Versions with Standard Piping Bottom:

Connect the two pipe stubs to the piping end inside the unit. The piping ends are located behind the unit door. The pipe with the threaded locking ring must be connected directly to the valve outlet. Use a gasket to join the pipe to the valve threaded connection. Connect the second pipe stub directly to the water inlet pipe using the threaded connection or Victaulic connection. See Victaulic Connection Details.

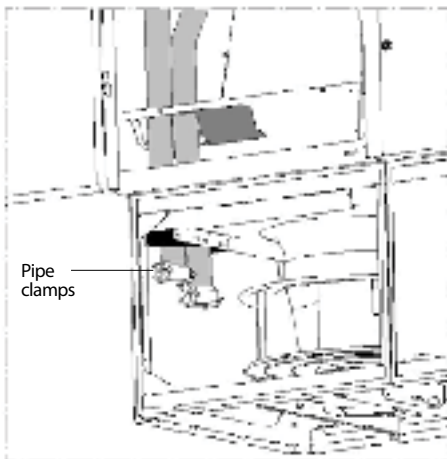
To facilitate the installation between the two unit modules it is possible to remove a plate on the drain panel by unscrewing 4 screws. Remove the closer air filter to get to all the screws (see 10.4 Air Filter check and replacement for details about Air filter removal).



For double chilled water circuit units swing the electrical panel to connect the two pipe stubs to the right chilled water valve, see para. 6.2 for electrical panel swinging details.



In the Fan Module use the pipe clamps to fix the pipe stubs.



As the pipe stubs are fixed, close the plate on the drain panel (if it has been removed). Seal any free space between tubes and drain panel to prevent air by-pass.

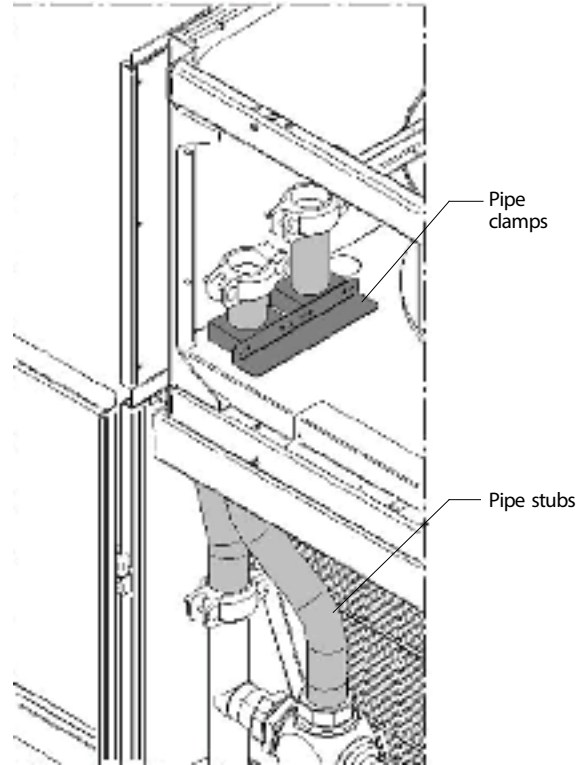
Upflow Version with Standard Piping Top

Connect the two pipe stubs to the piping end inside the unit.

The pipe with threaded looking ring must be connected directly to the valve inlet.

Use hemp and paste to get a reliable pressure-tight joint.

Connect the second pipe stub directly to the water outlet pipe using the Victaulic connection. See Victaulic Connection Details.



In the Fan Top Plenum use appropriate clamps to fix the pipe stubs. Once the pipe stubs are fixed seal any free space in the pipe passage through the upper panel to avoid air by-pass.

5.4 - Adding ethylene glycol

Tab. e - Ethylene glycol to be added to water

freezing temperature (°C)	0	- 5	- 11	- 18	- 27	- 39
ethylene glycol to add to water (% in weight of total mixture)	0	10	20	30	40	50

N.B. Values are for Shell antifreeze 402. For different brands check manufacturer's data.

NOTES:

- To avoid stratification run the circulation pump for at least 30 min. after adding any glycol.
- After adding water to the water circuit, **disconnect the unit from the sanitary water piping system**; in this way the water mixed with glycol will not return into the same piping system.
- After any topping- up of water check the glycol concentration and add any glycol if necessary.
- The hydraulic features of the system vary by adding glycol. Therefore check the head and the flow rate of the pump to be used.

See Hydraulic drawings in Enclosure D.

6 - Electrical connections

6.1 - Electrical connections

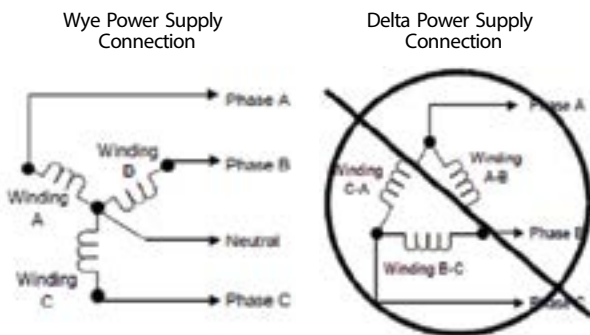
- 1) Before proceeding with the electrical connections, ensure that:
- All electrical components are undamaged;
 - All terminal screws are tight;
 - The supply voltage and frequency are as indicated on the unit.

6.2 - Wye vs. Delta Connection Power Supply for PCW

The **Liebert PCW** EC Fan Model is designed to operate with Wye-connected power. It will not operate properly with Delta connected power.

A field - supplied isolation transformer or other power solutions will be needed for proper function. The electronically commutated motors included in the **Liebert PCW** are suitable for connection to power supplies with a solidly grounded neutral.

Fig. c - Wye vs. Delta power supply connection diagram



Acceptable Power Supplies- 380V to 460V Nominal Units (TT System, TN-S System or TN-C System)

- 380V wye with solidly grounded neutral and 220V line-to-ground
- 460V wye with solidly grounded neutral and 277V line-to-ground.

Unacceptable Power Supplies-380 V to 460 V Nominal Units (IT System)

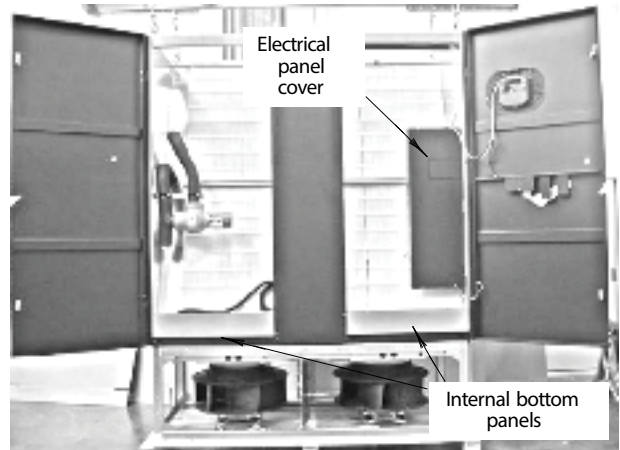
- Wye with high- resistance (or impedance) ground
- Delta without ground or with floating ground
- Delta with corner ground
- Delta with grounded center tap.

If the unit must be installed in the IT System, contact Vertiv Technical department prior to installation.

6.3 - Fan Module Electrical connections (Extended Height unit only)

Downflow Up & Downflow Frontal:

- 1) Open the front door to get access to the electrical panel and to the internal bottom panels.
- 2) Remove the electrical panel cover by unscrewing the 4 screws that hold it.
- 3) Remove the internal bottom panels by unscrewing the 2 screws that hold each panel.



- 4) Remove the frontal panels or frontal grids from the fan module and remove the electrical connections cover in the fan module.



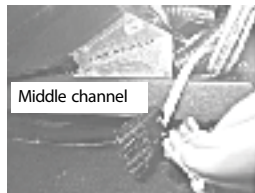
- 5) Unscrew and remove the two screws positioned on the right, pull and swing the electrical panel to access the back of the panel.



- 6) Loosen the fan power electrical cable on the back of the electrical panel and run it through the cable bushing on the drain panel.



7) Run the cable inside the unit over the middle channel of the coil module.



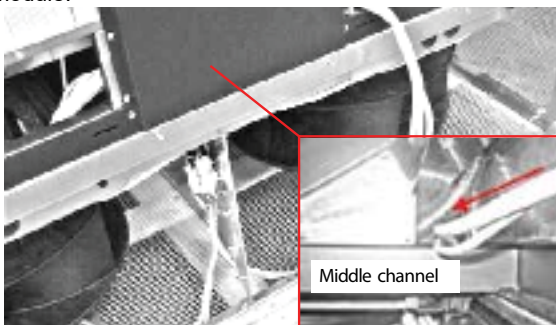
8) Run the fan power electrical cable through the cable bushing in the fan module.

9) Connect the EC Fan power cable with the EC Fan power connector.



10) Take the electrical cables: EC fan signal cables and if Electrical Heater Installed, power cables & thermostat cables from the fan module situated on the left hand side.

11) Run the cables inside the unit over the middle channel of the coil module.

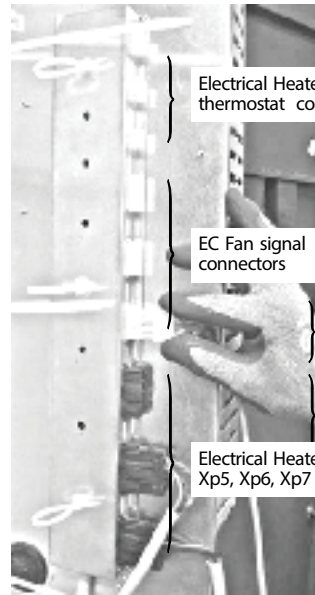


12) Run the cables through the cable bushing of the drain panel from the bottom to the top.



13) Connect all the cables to the electrical panel connectors:

- EC fan signal cables
- Electrical Heaters (if installed)
 - Std1st stage: connect the electrical heaters cables to the connector Xp5.
 - Opt.2nd stage, from PH045 to PH081: connect the electrical heaters cables to the connectors Xp5 and Xp6.
- Electrical Heater thermostats (if installed)



Electrical Heater thermostat connectors

EC Fan signal connectors

Electrical Heater connectors Xp5, Xp6, Xp7



14) Starting from the fan module fix the cable on the drain panel bottom with the opposite cables ties.

Make sure to fix all the cables, avoiding having loose cables close to the electrical heater (if installed).



15) Continue fixing the cable on the back of the electrical panel with the appropriate cables ties.



If necessary use the cable ties on the back of the electrical panel to keep the loose cables together. Do not leave loose cables in the unit



16) When all the cables are fixed, close the electrical panel. Make sure not to damage the electrical cable between the electrical panel and the unit. Use the two hand wheels to close the electrical panel.

17) Reposition all the panels removed for the cable connection:

- The electrical panel cover
- The internal bottom panels with the appropriate screws
- The fan electrical connection cover inside the fan module
- The panels or grids removed from the fan module

Make sure not to damage the electrical cable between the panels and the unit.

Upflow:

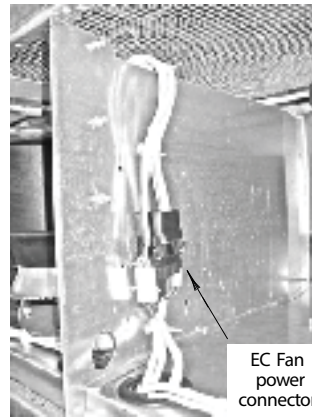
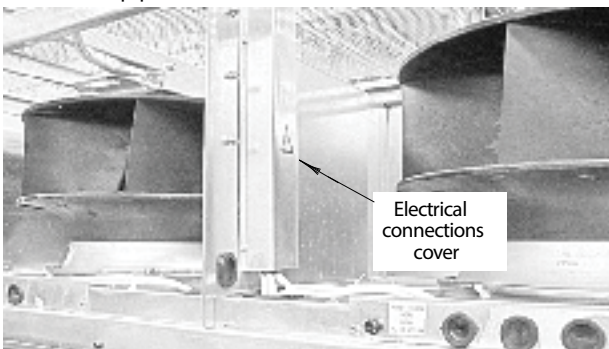
Make sure that all electrical cables are correctly run between the two modules:

- EC fan power cable from the coil module through the cable bushing into the coil module.
- EC fan signal cables from the fan module through the cable bushing into the coil module.
- If Electrical Heater Installed: power cables & thermostat cables from the fan module through the cable bushing into the coil module.

See chapter 3.2 for details.

1) Remove the upper front panel to get the access to the fan top plenum.

2) In the fan top plenum remove the electrical connections cover.



3) Connect the EC Fan power cable with the EC Fan power connector.

4) Reposition the connector cover on the fan module. Do not damage the cable between the cover and the fan module.

5) Remove the electrical panel front cover by unscrewing the 4 screws that hold it.

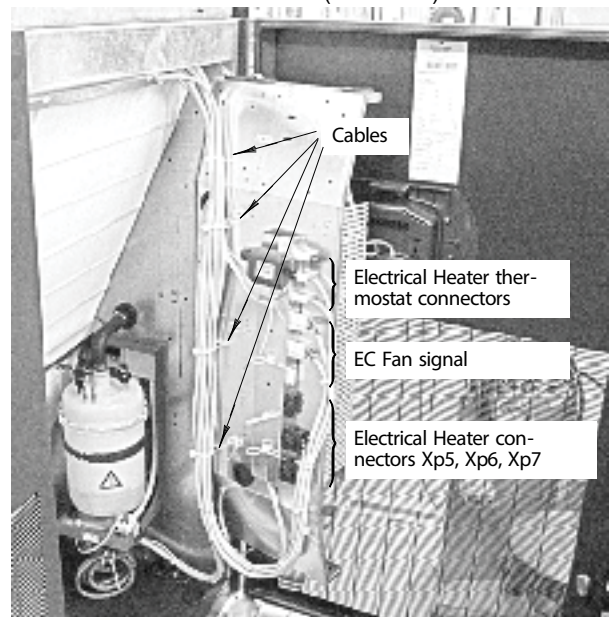


6) Unscrew the 2 screws positioned on the right inside the electrical panel.

7) Rotate the electrical panel on the right to get to the back of it.

8) Connect all the cables to the electrical panel connectors:

- EC fan signal cables
- Electrical Heaters (if installed)
 - Std 1st stage: connect the electrical heaters cables to the connector Xp5.
 - Opt. 2nd stage, from PH045 to PH081: connect the two electrical heaters cables to the connectors Xp5, Xp6.
- Electrical Heater thermostats (if installed)



9) Put together the cables on the back of the electrical panel. Use appropriate cable ties to fix them to the electrical panel.

10) Continue fixing the cable on the top front channel with the appropriate cables ties.

If necessary use the inside part of the top front channel to keep the loose cables in. Do not leave loose cables in the unit.

11) Close the electric panel. Make sure not to cut or damage the electrical cable between the electrical panel and the unit. Use the two hand wheels to close it.

12) Close the electrical panel with the electrical panel front cover using the 4 screws.

6.4 - Power supply cable connection.

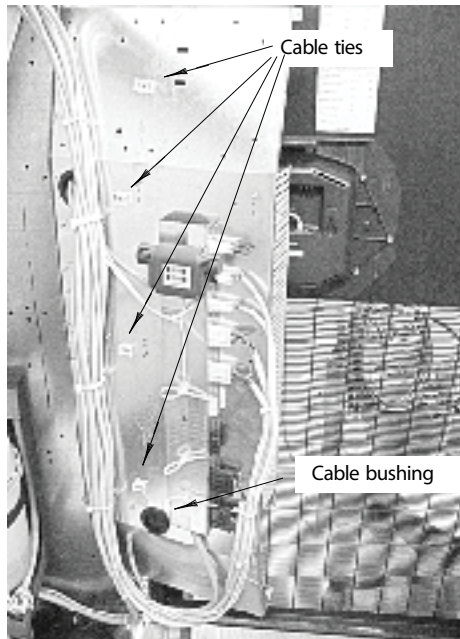
- Connect the cable to the Line inlet terminal board. See Fig C power supply cable path. For units with dual power supply option do not connect the power cable supply as illustrated in fig C; two supply cables must be arranged and connected to the additional electrical panel placed beside the main electrical panel.
- Use the cable size defined according to maximum current absorbed, the supply voltage, the installation type and the local specification. For unit with dual power supply both supply cables must be dimensioned as described above.
- Protect the supply using a back-up fuse or circuit breakers.
- Do not fit the supply cable in the raceways inside the machine electric board.
- Use multi-polar cables with sheath(CEI20-22, IEC60332) only.

See electrical data in Enclosure B: Technical data tables.



For the units (in particular if the external display isn't installed) must be provided an external main switch, easy to access, to facilitate, when necessary the unit shutdown.

Fig. d - Power supply cable connection.



- Use the cable bushing on the back of the panel to get into the electrical panel.
- Use cable tie to fix the power supply cable to the electrical panel back.

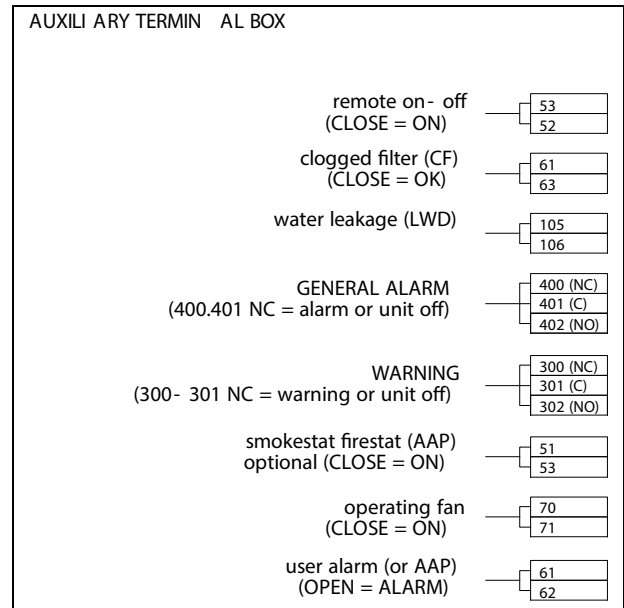
For cable entrance holes details see Enclosure E

Wiring connections (Fig. d):

- Connection for remote on- off must be done by the installer.
- The General Alarm terminals allow remote alarm signaling.

In case of short circuit, check the sticking of the involved switch and replace it.

Fig. e - Available terminals



6.6 - Protective features of EC fan

The EC fan has been provided with the following protective features:

- Over temperature of electronics
- Over temperature of motor
- Locked rotor protection
- Short circuit at the motor output

With any of these failures, the motor stops (electronically-no potential separation), the status relay is released.

NO automatic restart. To reset the alarm, power supply has to be switched off for min. 20s once motor is at standstill.

- Mains under- voltage detection: if mains voltage falls below 3ph/290Vac (typical value) for 5 s minimum, motor will be switched off (only by electronics, no potential separation), status relay is released.

If mains voltage returns to correct values, the motor will restart automatically.

- Phase failure recognition: if one phase fails for 5s minimum, motor will be switched off (only by electronics, no potential separation), status relay is released.

If all 3 phases return to correct values, the motor will restart automatically within 10- 40 s.

The power supply for an external speed setting potentiometer is short-circuit protected.

Motor is overload- protected via motor current limitation.

Warning! Leakage current of the motor is approx 7 mA.

7 - Start- up

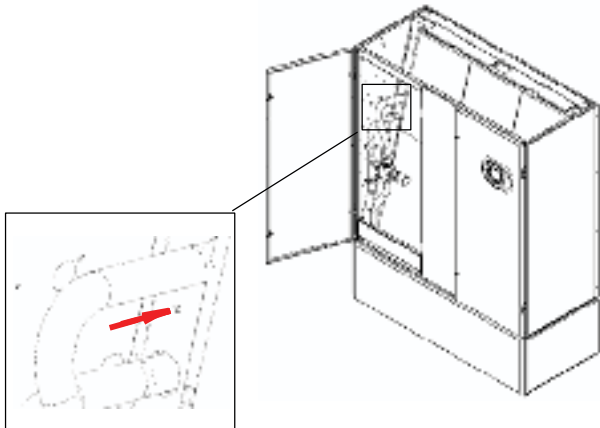
7.1 - First start - up


(or after long standstill)

Start the air conditioner as follows:

- 1) Open all valves in the water circuit according to the instruction label attached to the valve.
- 2) Check that there are no water leakages.

3) Bleed all air out of the chilled water circuit using the bleed valve on the chilled water coil (left side for single chilled water circuit, left+right side for double chilled water circuit).



- 4) Close all MCBs on the electrical panel.
- 5) Check the supply voltage on all phases.
- 6) Start the unit by pressing ON/OFF button  on the external display (on the internal display if the external display isn't installed).
- 7) Check the electrical absorption of all components (see Chap. 6).
- 8) Ensure that all control system settings are correct and that there are no alarms (see Control manual).
- 9) Verify the water flow.
- 10) Verify the Fresh Air Intake operation (if fitted).
- 11) Once the system is operating under load, check the various components, as follows:
 - Verify that the fans are operating properly.
 - Ensure that the temperature and relative humidity are being controlled, and that the humidifier (optional) and heating steps (optional) operate when required.
 - Ensure that chilled water valve operates when required.

7.2 - Starting and stopping

Turn on the unit operating on the ON/OFF button on the display. The fan starts immediately (the fan always works when the unit is ON); after 2 minutes the regulation is activated, so the cooling, heating (electric heaters), humidifying and dehumidifying devices can start.

Adjust the set- point as indicated in **Control manual**.

Stop the unit putting the ON/OFF switch in OFF.

- The main switch on the electrical panel inside the unit should be switched off if the unit is stopped for a long time.

7.3 - Automatic restart

If desired, the unit will automatically restart on the return of power after a supply interruption (see Control manual).

8 - Operation

Unit operation is completely automatic. The below sequence explains how the unit operates :

- The air, sucked in by the fan, enters the unit.

- The air is immediately filtered.
- The TEMPERATURE Sensor or HUMITEMP (temperature + rel. humidity) Sensor (check type installed), verifies the state of the inlet air, and relays this information to the control system.
- The control system compares the relayed information to the set point and proportional band values programmed: it then commands the air conditioner to treat the air as follows (see also Control manual):
- **COOLING**
Chilled water flows through the chilled water coil, thus cooling the air passing over it. The chilled water flow is controlled by a timed modulating (3- way) valve, which regulates the flow rate in order to obtain the exact amount of cooling required.
- **HEATING**
This can take one of two forms:
 - Electrical heating (optional): the heating elements heat the air passing over them.
 - Hot water heating (optional): if hot water is available, this flows through the hot water coil, thus heating the air passing over it. The hot water flow is controlled by an on- off 3- way valve.
- **Dual Power Supply - Optional**
This option allows a supply of electrical power from two different electrical sources. It is available the following solution:
 - Dual Power Supply Alternate Premium Version: all the functions provided by the basic one with addition of the following premium benefits:
 - Possibility to have together Automatic and Manual change over.
 - Faster switching between power A and power B.
 - Higher flexibility on configuration of the operation.
 - Possibility to select the preferred line.
 - Possibility to select voltage and frequency ranges to make the switch.
 - Possibility to select timing for switching.
- **DEHUMIDIFICATION - optional**
Maximum chilled water flow is requested through the coil, whose temperature drops below the dew point of the air, thus dehumidifying it.
If necessary, heating is used to reheat the air.
N.B.: If, during dehumidification, the room temperature drops below a specified level, dehumidification could be stopped (see LOW LIMIT intervention in Control manual).
- **HUMIDIFICATION - optional**
The humidifier creates steam, which is distributed into the air stream via the steam distribution pipe (see also **Enclosure A**).
- Filtered new air is injected into the air stream via the Fresh Air Intake.
- The treated air passes through the fans, which operate continuously, and is then dispersed out of the unit.
- Downflow Up and Downflow Down units only: the air passes from the underfloor into the room via air distribution outlets.
For Downflow units: switch off the machine before removal of the floor panels within a distance of 850 mm from the machine, to avoid risks of contact with rotating devices (fans) moving and with hot heating elements.

9 - Calibrations

The air conditioner has already been factory- tested and calibrated as shown in Enclosers B.

9.1 - Chilled water valve

The 3 way or 2 way valves control the chilled water flow; they are connected with different actuators according to the valve options: standard pressure valve, High pressure valve and 0 - 10V valves.

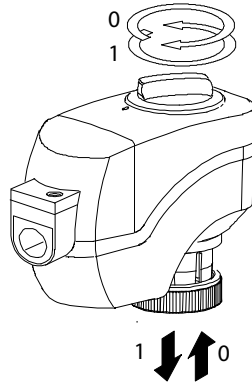
The actuator controls the valve opening by a stem. When actuator stem is completely down, the valve is open and chilled water coil is supplied.

The valve running time is set to the value specified in the Control Manual

PH025- PH046*:

- When the valve is fully open (i.e. max. chilled water flow) the actuator slot is set to '1'.
- When the valve is closed (i.e. no chilled water flow) the actuator slot is set to '0'.

In the unlikely event of control system failure, the valve can be manually controlled by means of the rotary knob. It can be used to drive the actuator into any position between 0 and 1.



* PH035- 040- 046: in the options 2 way High Pressure Valve and 3 way High Pressure Valve, consider the units as PH045- PH201.

PH045- PH201:

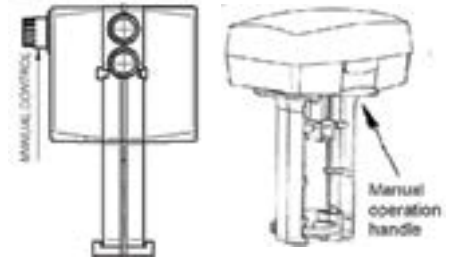
Check the actuator stem to control the valve opening.

Actuator stem full up, valve is closed (i.e. no chilled water flow).

Actuator stem full down, valve is fully open (i.e. max. chilled water flow).

In the unlikely event of control system failure, the valve can be manually controlled by means of apposite manual control on the valve.

For more details see also technical bulletin of chilled water valves and related actuators. Technical bulletins are enclosed with documentation on board of the unit.



9.2 - Water leakage sensor (Liquistat)

Due to high flooding alarm device sensitivity, to the end to avoid undesirable alarm signal because of few sporadic water drops, place the sensors at a minimum distance of 50 cm from the unit base perimeter.

This solution assures alarm intervention for real flooding risk only.

9.3 - Environment protection

A misuse or an incorrect calibration of the unit leads to increased energy consumption, resulting in an economic and environmental damage.

10 - Maintenance / Spare Parts

10.1 - Safety instructions

All maintenance operations must be carried out strictly observing the European and National accident prevention regulations. We refer especially to the accident prevention regulations concerning electrical systems, refrigerators, and manufacturing resources. Maintenance may be done to air conditioning equipment only by authorized and qualified technicians. To keep all warranties valid the maintenance must adhere to the manufacturer's regulations.



The work should be done in the system only when it is at standstill. Do this by switching off the air conditioner at the controller and the main switch. Post a warning sign saying: "DO NOT SWITCH ON." Electrical components of device have to be switched off and be checked that they are not under voltage.

Ignoring the safety instructions can be dangerous to persons as well as to the environment. Soiled parts always cause a loss of performance and for switch or control devices can lead to the break-down of a plant.

10.2 - Spare parts

Only original spare parts made by Vertiv may be used. Using third-party material can invalidate the warranty. When making inquiries always refer to the "Component List" supplied with the equipment and specify the model number, serial number and, if available, the part number as well.

10.3 - Maintenance schedule

Monthly, quarterly, biannual and annual checks to be conducted according to the following guidelines. All tasks and periods listed here are regulations from the manufacturer and need to be documented in an inspection report.



All these tasks should be carried out only by an authorized and trained technician. We recommend the Vertiv Customer Service

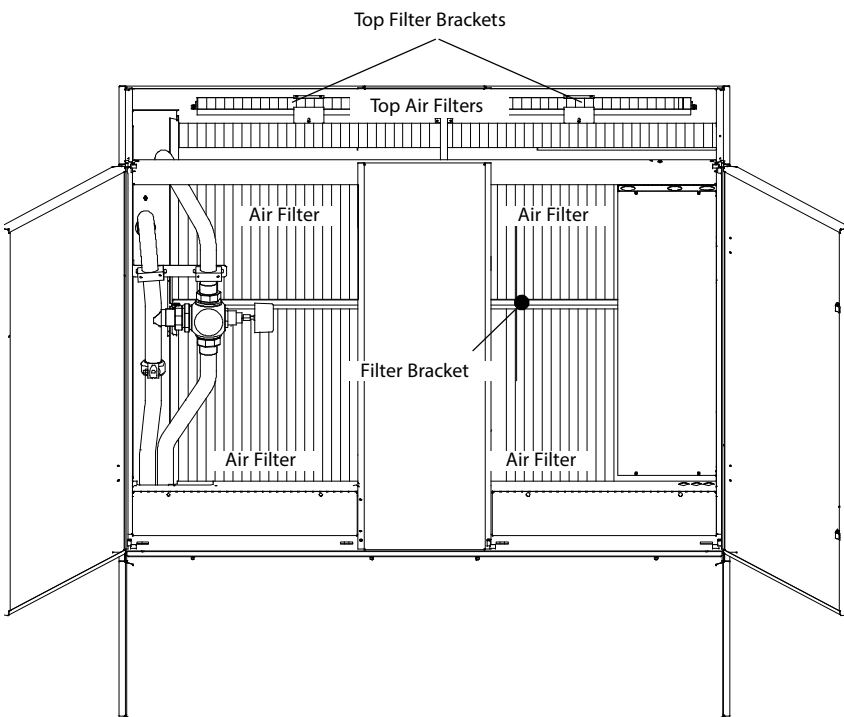
10.4 - Air filter check and replacement

It is important to check the state of the air filter every month to maintain a good efficiency of air distribution through the evaporator coil.



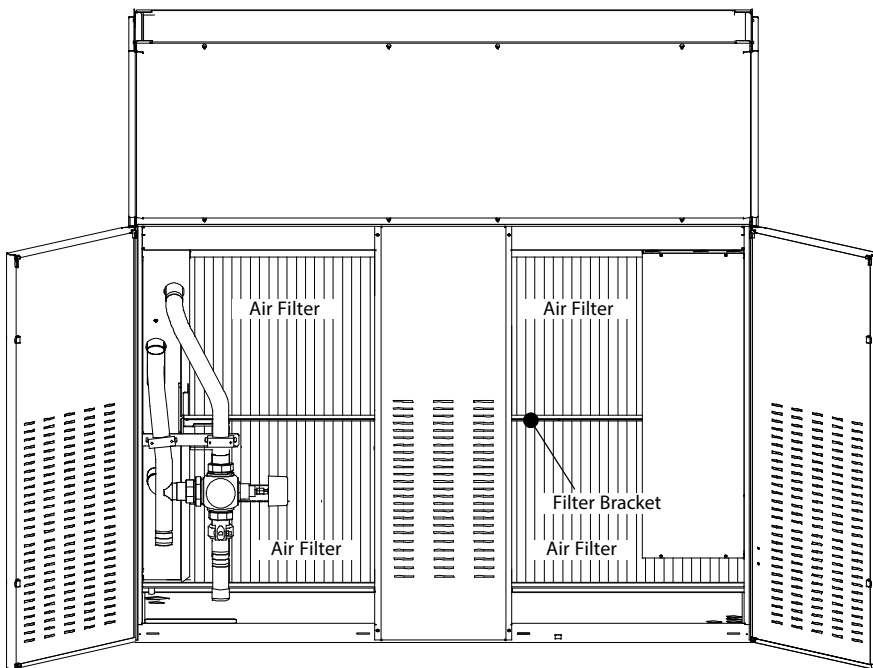
CAUTION! Sharp edges, splinters and exposed fasteners can cause personal injury! Only properly trained personnel wearing appropriate safety headgear, gloves, shoes and glasses can carry out this operation!

DOWNFLOW UNITS



1. Switch off the PCW unit and open the front panel with the key.
NB: some components inside the unit can be still at high temperature, wait a few minutes before starting the maintenance operation.
2. Unscrew two screws and remove the filter brackets.
3. Remove air filters from the coils starting from the upper filter, then proceed with the lower filter.
4. Unscrew lobe handwheels and remove the top filter brackets.
5. Remove the top air filters.

UPFLOW UNITS



1. Switch off the PCW unit and open the front panel with the key.
NB: some components inside the unit could be still at high temperature, wait a few minutes before starting the maintenance operation.
2. Unscrew two screws and loosen the filter brackets (do not remove completely).
3. Remove the air filters from the coils starting from the upper filter, then proceed with the lower filter

10.5 - EC fan replacement



WARNING!

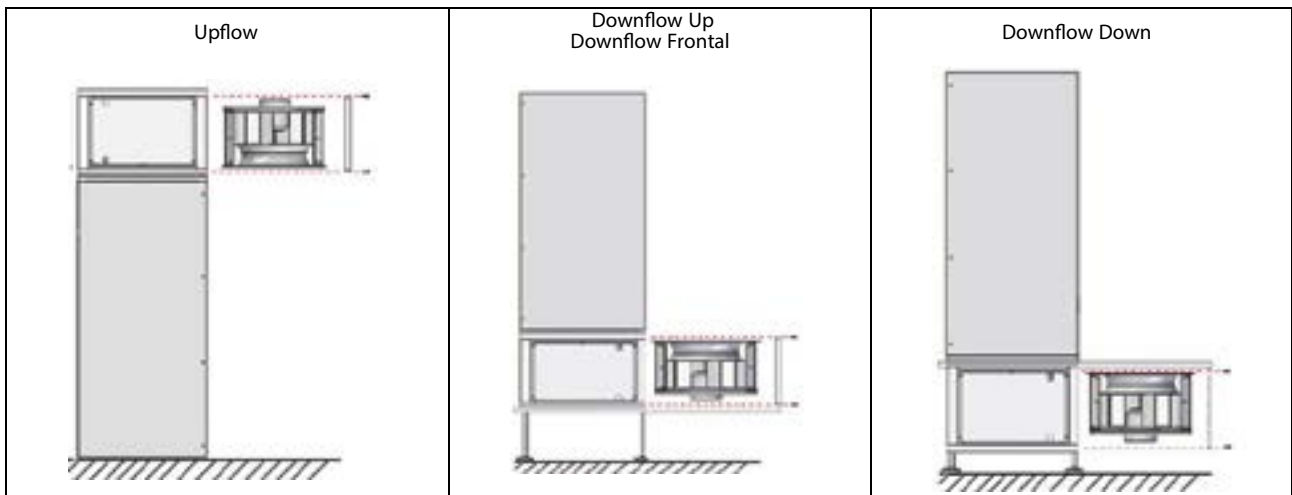
There is a risk of the fans and panel falling down and causing an injury during the replacement operation. Due to the weight of the fans (approx. 35 kg) and a panel (up to 25kg), two technicians are required to carry out the fan replacement.

BEFORE COMMENCING, ALWAYS CUT ALL THE ELECTRIC SUPPLY CIRCUITS OFF, ON THE MACHINE.

Only properly trained and qualified personnel should work on this equipment.

How to remove the fans

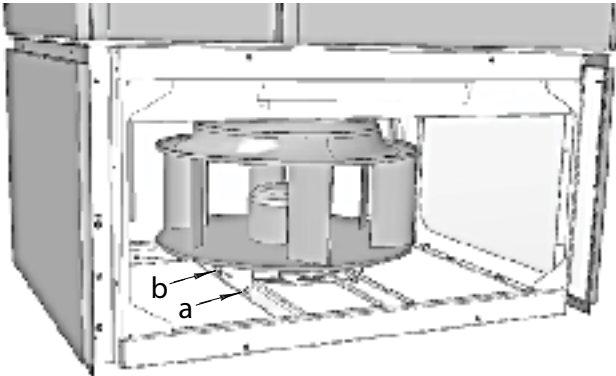
Remove the front panel (or a grid) to get the access to the fan bays (see pictures below).



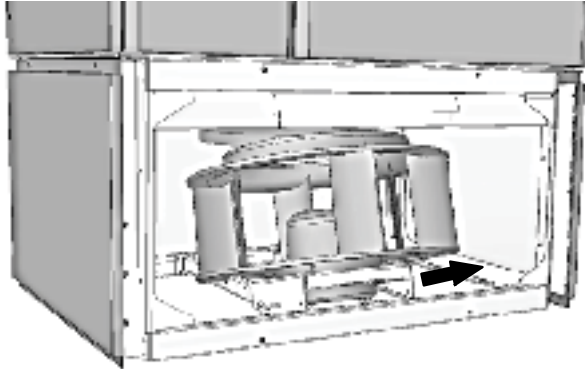
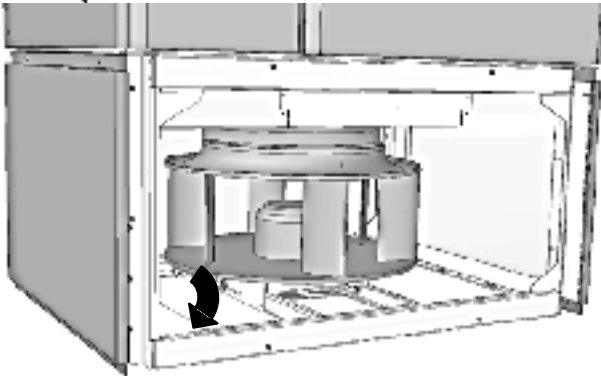
NB:

- Downflow Down - remove floor panels positioned in front of the unit to get the access to the fan section frontal grid. Remove any obstacles in front of the fans to allow the fan extraction (e.g. the raised floor structure, piping)

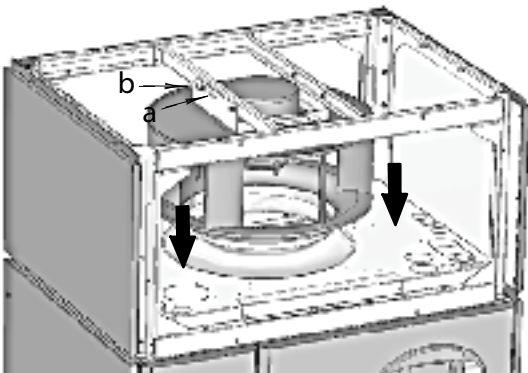
Downflow Up and Downflow Frontal versions



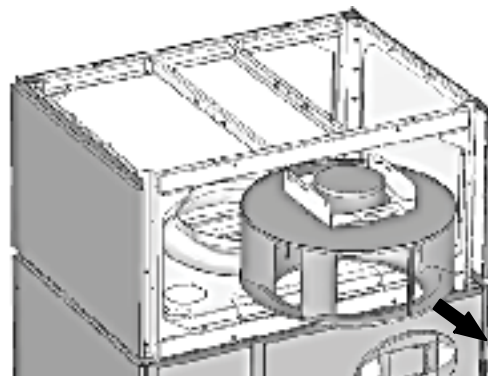
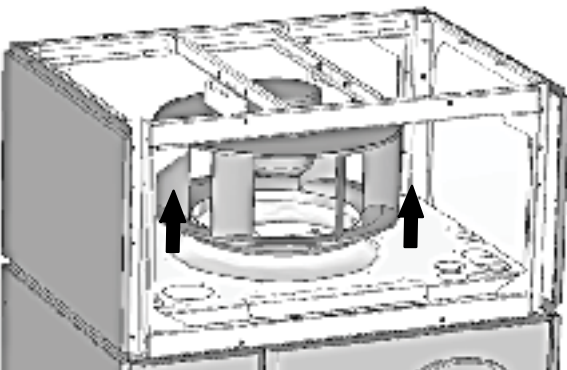
- 1) Disconnect the fan electrical cable from the connector.
- 2) Remove the 2 front screws "a" from the fan support (one screw on each side of the sliding bars)
- 3) Loosen the 2 rear screws "b" of the fan support (one screw on each side of the sliding bars)
- 4) Slide down the fan by pulling the handle.
- 5) Remove completely the 2 screws "b" on the back of the fan.
- 6) Pull the handle to slide the fan out of the bay



Upflow versions



- 1) Disconnect the fan electrical cable from the connector.
- 2) Remove the 2 front screws "a" from the fan support (one screw on each side of the sliding bars)
- 3) Remove the 2 rear screws "b" of the fan support (one screw on each side of the sliding bars) and slowly put down the fan on the Fan nozzle.
- 4) Lift the fan to move away it from the nozzle and then pull it out from the fan bay.



10.6 - Dismantling the unit

The machine has been designed and built to ensure continuous operation.

The working life of some of the main components, such as the fan, depends on the maintenance that they receive.



The unit contains substances and components potentially hazardous for the environment, such as certain electronic and electric components.

At the end of the useful life, when the unit is dismantled, the operation must be carried out by specialized refrigerating technicians.

The unit shall be delivered to suitable centers specialized for the collection and disposal of equipment containing hazardous substances according to the national and European regulations.



Maintenance schedule

COMPONENT		MAINTENANCE PERIOD EVERY			
		1 Month	3 Months	6 Months	1 Year
 FANS Attention, do not reach into the fan while the fan wheel is running.	Check for soiling, damage, corrosion, and proper fixing.	X			
	Check bearings noise.	X			
	Measure the current and power consumption.			X	
	Cleaning to preserve the function.		X		
AIR FILTERS	Check for soiling, damage, corrosion.	X			
	Check state of filter.	X			
	Clean or replace if necessary.	X			
	Carry out controls more frequently in dusty environments.	X			
NEW AIR FILTER (if installed)	see air filter. Clean or replace	X			
CONTROL SYSTEM	Check for proper and functionally correct installation and surrounding conditions.	X			
	Check the function of the LEDs of the display's control system and the alarms.		X		
	Check the connections for electrical and mechanical function.			X	
	Check the functional elements (e.g. operational controls and display devices).			X	
	Check the electrical/electronic and pneumatic input signals (e.g. sensors, remote controllers, command variable) for compliance with nominal values.			X	
	Check control function, control signals, and safety chains.			X	
	Adjust control function and control signals.			X	
 SWITCH CABINET POWER CIRCUITS Attention, electrical cables and electrical components of the air conditioner are under voltage.	Check the power supply on all phases.			X	
	Check the connections for electrical and mechanical function.			X	
	Check the power supply at all terminals.			X	
	Measure power consumption at all connected consumers.			X	
	Set, adjust, and tighten the functional elements (e.g. operational controls and display devices).			X	
	Check safety equipment, e.g. thermal switch.			X	
	Replace fuses (every 2 - 3 years)				X
	Check protective covers for completeness.				X
CHILLED WATER CIRCUIT	Make sure there is no loss of water.			X	
	Deaerate the cooling water circuit using the vent valve on the top right hand side of the cooling coil.			X	
	Check that the cold water supply is ensured.			X	
	Check the temperature and the pressure of the water on the inlet and outlet side using thermometers and manometers if installed			X	
	Check the proper function of the three - way valve.			X	
	Make sure that the system is filled with the prescribed amount of glycol and that there is no frost in the hydraulic circuit.			X	
	In case water loss needs to be refilled make sure the glycol concentration is correct.			X	
	Check that the water circulation is in perfect order.			X	

Enclosure A - Electrode Humidifier

A.1 - Electrode humidifier

The operation of immersed electrode humidifiers is based on a very simple physical principle. As common drinking water contains a certain quantity of dissolved mineral salts, and is consequently slightly conductive, applying a voltage to metal electrodes immersed in the water creates an electric current that heats the water until producing steam (Joule effect). The quantity of steam produced is proportional to the electric current, which is in turn proportional to the level of water.

In order to obtain optimum performance from the humidifier it is advisable to read this manual carefully.

Tab. 1 - Humidair specifications

HUMIDAIR MODEL	MAIN POWER SUPPLIES (V ± 10%)	SETTING [kg/h] *	ABSORBED CURRENT [A]	POWER [kW]	MAX. CYLINDER WATER VOLUME [l]	MAX. SUPPLY WATER QUANTITY [l/min.]	MAX. DRAIN WATER QUANTITY [l/min.]
KUEC2E	400V / 3ph / 50Hz	3.9...13.0	13.0	9.0	5.5	0.6	10.0

For humidifier current (FLA) and rated power, refer to electrical features in the Enclosure B.

(*) Unit is factory- set to produce about 70% of the maximum value (see iCOM manual).

A.2 - Installation

The humidifier is supplied already mounted within the air conditioner. The only necessary operations are the connections for the supply water and drain water.

Supply Water.

Only use mains drinking water with:

- Pressure between 0.1 and 0.8MPa (1 and 8 bars), temperature between 1 and 40° C and an instant flow rate no higher than the rated flow of the fill solenoid valve, the connection is R ¾ (ISO 7/1);
- Hardness no greater than 400 ppm of CaCO₃ (40 ° fH), conductivity range: 75- 1250 µS/cm;

no organic compounds. supply water characteristics	unit of measure	normal water		water with low salt content	
		min.	max	min.	max.
Hydrogen ions	(pH)	7	8.5	7	8.5
Specific conductivity at 20° C(σR, 20 ° C)	(σR, 20 ° C) S/cm	350	1250	75	350
Total dissolved solids(cR)	mg/l	(1)	(1)	(1)	(1)
Dry residue at 180° C(TH)	mg/l	(1)	(1)	(1)	(1)
Total hardness	mg/l CaCO ₃	100 (2)	400	50 (2)	160
Temporary hardness	mg/l CaCO ₃	60 (3)	300	30 (3)	100
Iron + Manganese	mg/l Fe+Mn	=	0.2	=	0.2
Chlorides	ppm Cl-	=	30	=	20
Silica	mg/l SiO ₂	=	20	=	20
Residual chlorine	mg/l Cl ₂	=	0.2	=	0.2
Calcium sulphate	mg/l CaSO ₄	=	100	=	60
Metallic Impurities	mg/l	0	0	0	0
Solvents, thinners, detergents, lubricants	mg/l	0	0	0	0

(1)= values depend on the specific conductivity; in general: CR ≈0.65 * σR, 20 ° C; R180 ≈0,93 * σR, 20 ° C

(2) = not less than 200% of the chloride content in mg/l CL-

(3) = not less than 300% of the chloride content in mg/l CL-

There is not reliable relationship between hardness and conductivity of the water

Important:

- Do not treat the water with softeners, this may cause the entrainment of foam, affecting the operation of the unit;
- Do not add disinfectants or anticorrosive compounds to the water, as these are potential irritants;
- The use of well water, industrial water or water from cooling circuits and, in general, any potentially chemically or bacteriologically contaminated water is not recommended.

Connection:

For the supply water connection see the details in Fig1. (point11- 14)

Drain Water.

- This contains the same substances dissolved in the supply water, however in larger quantities;
- It may reach a temperature of 100 ° C;
- It is not toxic and can be drained into the sewerage system, category 3, EN 1717.

Enclosure A - Electrode Humidifier

Important:

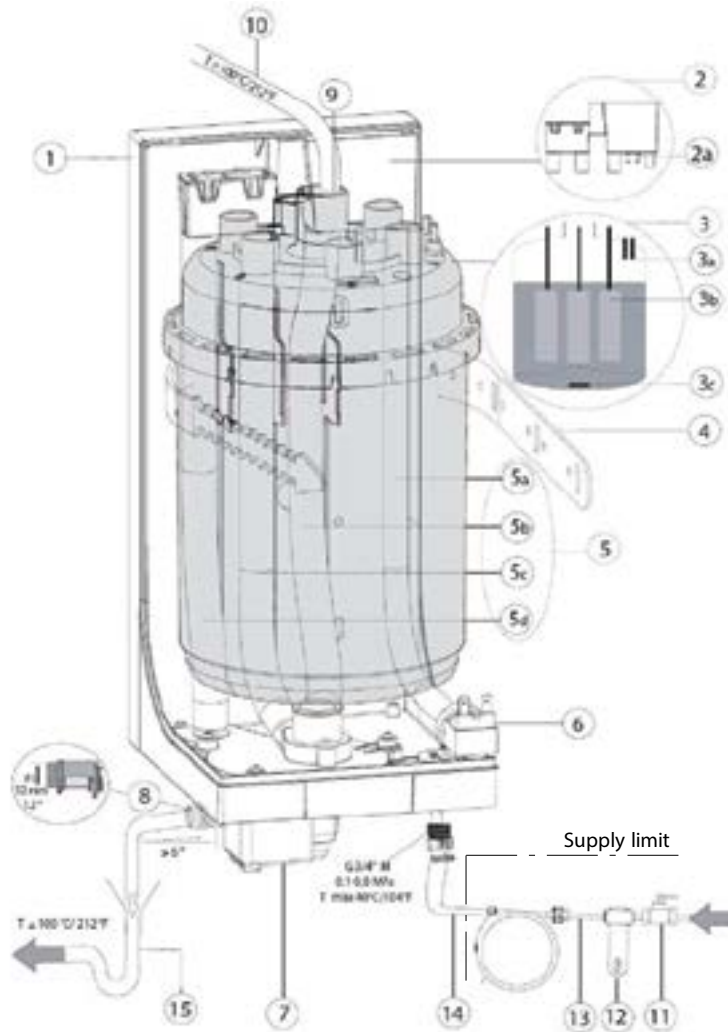
For drain water connection see details in Fig 1:

- Use a drain hose Ø32 mm, maximum length 10 m with minimum 5% gradient, don't make siphon on this hose. to avoid back pressures in the drain piping. For configuration with bigger length or high head consider the PCW option with condensate pump.
- Dispose the drain hose into an ordinary drainage network. (the drainage network should have a siphon(see fig1)and must be able to withstand temperatures up to 100° C and able to drain water flow up to 10l/min.
- Pay attention in the manual drainage of the steam cylinder if the drainage network isn't able to drain 10 l/min, risk of water overflow on the humidifier.

A.2.1 - Electrode humidifier components

- | | | | |
|----|-------------------------------------|----|---------------------------------------|
| 1 | chassis | 5d | drain hose |
| 2 | fill tank | 6 | fill solenoid valve |
| 2a | conductivity electrodes | 7 | drain pump |
| 3 | cylinder | 8 | drain connection (diameter 32 mm) |
| 3a | high level electrodes | 9 | steam outlet |
| 3b | immersed electrodes | 10 | steam distribution hose |
| 3c | filter inside the cylinder | 11 | manual valve (not supplied) |
| 4 | cylinder fastening strap | 12 | mechanical filter (not supplied) |
| 5 | hose kit | 13 | supply hose (not supplied) |
| 5a | supply hose | 14 | connection hose |
| 5b | fill hose | 15 | drain hose with siphon (not supplied) |
| 5c | drain pump and overflow outlet hose | | |

Fig. 1 - The humidifier and its components



Enclosure A - Electrode Humidifier

A.3 - Start - up and operation

A.3.1 - Start - up

Before using the humidifier, check the following:

- Supply and drain connections.
- That the cut- off tap is open.
- All wiring.
- Earthing.
- Steam hose connection between steam cylinder and distributor.

To start the humidifier simply switch on the air conditioner, which will in turn automatically start and stop the humidifier as required. The (adjustable) parameters which determine humidifier operation have already been factory- preset (see iCOM manual).

A.3.2 - Operation

Water, provided it contains even a small quantity of salts in solution, is a conductor of electricity. Therefore, if the steam cylinder is filled with water and a potential difference is applied between the electrodes, the water behaves like an ordinary electrical resistance and becomes hot, thus creating steam.

The steam production rate can be controlled by varying the water level in the cylinder; the higher the water level, the deeper the electrodes are immersed into it and the greater the steam production.

Note 1

In case of low water conductivity consult HPAC Technical Sales Support.

Note 2

When starting with an empty cylinder, the water conductivity is normally insufficient for the HUMIDIFIER STEAM OUTPUT to be reached immediately.

Therefore the humidifier produces as much steam as possible to fill the cylinder completely. Any evaporation water is immediately refilled. The drain valve is kept shut and therefore, as the steam does not contain any salts, the conductivity of the water within the cylinder slowly increases until the HUMIDIFIER STEAM OUTPUT is obtained.

The length of the start- up period depends upon the water conductivity. For very conductive water it may occur that the HUMIDIFIER STEAM OUTPUT is obtained immediately.

A.4 - Maintenance

Important: the cylinder may be hot. Let it cool down before touching it or use protective gloves.

A.4.1 - Cylinder replacement

- Completely drain the water contained in the cylinder;
- Turn the appliance off and open the disconnect switch on the mains power line (safety procedure);
- 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.

A.4.2 - Cylinder maintenance (see cylinder instruction sheet)

The life of the cylinder depends on several 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 operable steam cylinder has a limited life, and it is therefore recommended to replace it after 5 years or 10,000 operating hours.

Important: 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. Check that the model and the power supply voltage of the new cylinder correspond to the one being replaced.

A.4.3 - 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 casing. 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 on the casing: 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 on the casing; replace the electrodes 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.

Enclosure A - Electrode Humidifier

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

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

A.4.4 - Replacement and maintenance of other components

Fill solenoid valve: after having disconnected the cables and the tubing, 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: check that there are no solid residues in the cylinder attachment, remove any impurities. Check that the gasket (O- ring) not is damaged or cracked; if necessary, replace it.

Drain pump: disconnect the power supply, remove motor body unscrew the fastening three screws; remove any impurities and rinse.

Supply tank & conductivity meter : check that there are no obstructions or solid particles and that the electrodes for measuring the conductivity are clean, remove any impurities and rinse.

Hose kit: check that the hoses are free and do not contain impurities; remove any impurities and rinse.

Enclosure B - Technical data table

Tab. 1 - Electrical data

Configuration	Model	Power supply	FLA [A]	LRA [A]	RESIDUAL- CURRENT CIRCUIT BREAKERS IΔn = 0.3A (400V)*	Min/Max Cu cable size
Cooling Fan	PH 025	400 V/3 N/50 Hz + earth	5	01	16A "C"	0.75...35 mm ²
	PH 030		5	01	16A "C"	0.75...35 mm ²
	PH 035		5	01	16A "C"	0.75...35 mm ²
	PH 040		5	01	16A "C"	0.75...35 mm ²
	PH 045		5	01	16 A "C"	0.75...35 mm ²
	PH 060		10	02	16A "C"	0.75...35 mm ²
	PH 070		10	02	16A "C"	0.75...35 mm ²
	PH 080		10	02	16A "C"	0.75...35 mm ²
	PH 095		15	03	20A "C"	0.75...35 mm ²
	PH 100		15	03	20A "C"	0.75...35 mm ²
	PH 110		15	03	20A "C"	0.75...35 mm ²
	PH 145		15	03	20A "C"	0.75...35 mm ²
	PH 170		20	04	25A "C"	0.75...35 mm ²
	PH 046		5	01	16 A "C"	0.75...35 mm ²
	PH 066		10	02	16 A "C"	0.75...35 mm ²
	PH 081		10	02	16 A "C"	0.75...35 mm ²
	PH 091		10	02	16A "C"	0.75...35 mm ²
	PH 111		15	03	20A "C"	0.75...35 mm ²
	PH 136		15	03	20A "C"	0.75...35 mm ²
	PH 161		15	03	20A "C"	0.75...35 mm ²
PH 201	20	04	25A "C"	0.75...35 mm ²		
Cooling + Electrical heating Fan + electrical heaters (Electrical Heaters are available in two stages, data in brackets refer to the 1st stage)	PH 025	400 V/3 N/50 Hz + earth	16	16	20A "C"	0.75...35 mm ²
	PH 030		16	16	20A "C"	0.75...35 mm ²
	PH 035		16	16	20A "C"	0.75...35 mm ²
	PH 040		16	16	20A "C"	0.75...35 mm ²
	PH 045		16	16	20A "C"	0.75...35 mm ²
	PH 060		32 (21)	32 (21)	40 A "C" (25 A "C")	0.75...35 mm ²
	PH 070		32 (21)	32 (21)	40 A "C" (25 A "C")	0.75...35 mm ²
	PH 080		32 (21)	32 (21)	40 A "C" (25 A "C")	0.75...35 mm ²
	PH 095		48 (36)	48 (36)	63 A "C" (40 A "C")	0.75...35 mm ²
	PH 100		48 (36)	48 (36)	63 A "C" (40 A "C")	0.75...35 mm ²
	PH 110		48 (36)	48 (36)	63 A "C" (40 A "C")	0.75...35 mm ²
	PH 145		48 (36)	48 (36)	63 A "C" (40 A "C")	0.75...35 mm ²
	PH 170		53 (41)	53 (41)	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 046		16	16	20 A "C"	0.75...35 mm ²
	PH 066		32 (21)	32 (21)	40 A "C" (25 A "C")	0.75...35 mm ²
	PH 081		32 (21)	32 (21)	40 A "C" (25 A "C")	0.75...35 mm ²
	PH 091		32 (21)	32 (21)	40 A "C" (25 A "C")	0.75...35 mm ²
	PH 111		48 (36)	48 (36)	63 A "C" (40 A "C")	0.75...35 mm ²
	PH 136		48 (36)	48 (36)	63 A "C" (40 A "C")	0.75...35 mm ²
	PH 161		48 (36)	48 (36)	63 A "C" (40 A "C")	0.75...35 mm ²
PH 201	53 (41)	53 (41)	63 A "C" (50 A "C")	0.75...35 mm ²		

Enclosure B - Technical data table

Cooling + Heating + Humidity Fan + electrical heaters + electrode or infrared humidifier (Electrical Heaters are available in two stages, data in brackets refer to the 1st stage)	PH 025	400 V/3 N/50 Hz + earth	29	29	40 A "C"	0.75...35 mm ²
	PH 030		29	29	40 A "C"	0.75...35 mm ²
	PH 035		29	29	40 A "C"	0.75...35 mm ²
	PH 040		29	29	40 A "C"	0.75...35 mm ²
	PH 045		29	29	40 A "C"	0.75...35 mm ²
	PH 060		45 (32)	45	50 A "C" (40 A "C")	0.75...35 mm ²
	PH 070		45 (32)	45	50 A "C" (40 A "C")	0.75...35 mm ²
	PH 080		45 (32)	45	50 A "C" (40 A "C")	0.75...35 mm ²
	PH 095		60 (49)	60	80 A "C" (63 A "C")	0.75...35 mm ²
	PH 100		60 (49)	60	80 A "C"	0.75...35 mm ²
	PH 110		60 (49)	60	80 A "C"	0.75...35 mm ²
	PH 145		60 (49)	60	80 A "C"	0.75...35 mm ²
	PH 170		65 (44)	65	80 A "C" (50 A "C")	0.75...35 mm ²
	PH 046		29	29	40 A "C"	0.75...35 mm ²
	PH 066		45 (34)	45	50 A "C" (40 A "C")	0.75...35 mm ²
	PH 081		45 (34)	45	50 A "C" (40 A "C")	0.75...35 mm ²
	PH 091		45 (34)	45	50 A "C" (40 A "C")	0.75...35 mm ²
	PH 111		60 (39)	60	80 A "C" (63 A "C")	0.75...35 mm ²
	PH 136		60 (39)	60	80 A "C" (63 A "C")	0.75...35 mm ²
	PH 161		60 (39)	60	80 A "C" (63 A "C")	0.75...35 mm ²
PH 201	65 (44)	65	80 A "C" (50 A "C")	0.75...35 mm ²		
Cooling + Heating + Humidity Fan + electrical heaters + ultrasonic humidifier (Electrical Heaters are available in two stages, data in brackets refer to the 1st stage)	PH 045	400 V/3 N/50 Hz + earth	21	21	25 A "C"	0.75...35 mm ²
	PH 060		37 (26)	37	40 A "C" (32 A "C")	0.75...35 mm ²
	PH 070		37 (26)	37	40 A "C" (32 A "C")	0.75...35 mm ²
	PH 080		37 (26)	37	40 A "C" (32 A "C")	0.75...35 mm ²
	PH 095		53 (41)	53	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 100		53 (41)	53	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 110		53 (41)	53	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 145		53 (41)	53	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 170		58 (46)	58	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 066		37 (26)	37	40 A "C" (32 A "C")	0.75...35 mm ²
	PH 081		37 (26)	37	40 A "C" (32 A "C")	0.75...35 mm ²
	PH 091		37 (26)	37	40 A "C" (32 A "C")	0.75...35 mm ²
	PH 111		53 (41)	53	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 136		53 (41)	53	63 A "C" (50 A "C")	0.75...35 mm ²
	PH 161		53 (41)	53	63 A "C" (50 A "C")	0.75...35 mm ²
PH 201	58 (46)	58	63 A "C" (50 A "C")	0.75...35 mm ²		

* **ATTENTION** Only universal (type B, B+) RCD protective devices are permitted.

NOTES:

- * The cables have to be sized in compliance with local standards and according to the type and characteristics (e.g.Amperes) of installation.
- * The data in the tables do not consider the absorbed current from the condensate pump and for other options not explicitly described.
- * The specific power of the user- installed switch, must be lower than 300,000 A² x s.
- * Prescriptions on the differential relay required to the user:
 - * For special places (healthcare facilities, etc...) comply with the local regulations;
 - * For ordinary places, a low sensitivity is suggested (300mA) coordinated with the value of the ground heater (IEC 364): Ra ≤ 50/ Ia (Art.413.1.4.1, CEI 64- 8);
 - * In case of frequent over- voltages with mains impulse, it is advisable to install a selective differential and to evaluate the need for adopting other devices.

Enclosure B - Technical data table

Tab. 2 - EC fan connections

Configuration	Model	EC Fan signal [VDC]*	(3Ph - 400V - 50Hz)		Power factor cos φ	
			OA*	nominal power [kW] (*)		
Single chilled water circuit						
version with Liebert EC Fan 2.0	Downflow Up	PH 025	5.6	1.0	0.65	0.94
		PH 030	6.6	1.5	0.97	0.93
		PH 035	6.4	1.3	0.85	0.94
		PH 040	6.7	1.5	1.00	0.96
		PH 045	7.0	1.7	1.09	0.93
		PH 060	6.2	2.5	1.60	0.92
		PH 070	6.6	2.9	1.86	0.93
		PH 080	7.4	4.0	2.62	0.95
		PH 095	6.6	4.4	2.86	0.94
		PH 100	6.9	4.9	3.19	0.94
		PH 110	7.3	5.9	3.85	0.94
		PH 145	9.1	10.4	6.79	0.94
		PH 170	8.9	12.5	8.32	0.96
	Downflow Down	PH 046	7.6	1.9	1.23	0.94
		PH 066	5.7	1.9	1.22	0.93
		PH 081	6.7	2.8	1.80	0.93
		PH 091	6.8	3.0	1.92	0.92
		PH 111	6.5	3.9	2.53	0.94
		PH 136	7.4	5.7	3.70	0.94
PH 161		8.1	7.1	4.60	0.94	
PH 201	8.4	10.32	6.80	0.95		
version with EC Fan Fix Speed	Downflow Up	PH 025	6.4	1.2	0.80	0.96
		PH 030	7.5	2.0	1.30	0.94
		PH 035	7.0	1.6	1.02	0.92
		PH 040	7.4	1.8	1.20	0.96
		PH 045	5.5	1.7	1.10	0.94
		PH 060	6.9	3.1	2.00	0.93
		PH 070	7.4	3.7	2.38	0.93
		PH 080	8.4	5.1	3.32	0.94
		PH 095	7.8	6.3	4.09	0.94
		PH 100	8.0	6.7	4.36	0.94
		PH 110	8.4	7.7	5.02	0.94
		PH 145	9.3	13.4	8.74	0.94
		PH 170	9.5	14.6	9.52	0.94
	Downflow Down	PH 046	7.9	1.8	1.20	0.96
		PH 066	6.0	2.0	1.30	0.94
		PH 081	7.0	2.8	1.84	0.95
		PH 091	7.0	2.9	1.88	0.94
		PH 111	6.9	4.2	2.71	0.93
		PH 136	7.8	6.0	3.88	0.93
		PH 161	7.7	7.2	4.69	0.94
PH 201	9.0	12.0	7.80	0.94		

Enclosure B - Technical data table

Configuration	Model	EC Fan signal [VDC]*	(3Ph - 400V - 50Hz)		Power factor cos φ	
			OA*	nominal power [kW] (*)		
Double chilled water circuit						
version with Liebert EC Fan 2.0	Downflow Up	PH 040	7.2	1.8	1.16	0.93
		PH 060	6.8	3.12	1.96	0.91
		PH 080	7.8	4.36	2.84	0.94
		PH 110	7.4	5.85	3.78	0.93
		PH 145	9.2	10.02	6.66	0.96
		PH 170	8.9	12.44	8.24	0.96
	Downflow Down	PH 046	8.3	2.46	1.61	0.95
		PH 066	6.3	2.48	1.54	0.90
		PH 091	7.1	3.22	2.04	0.92
		PH 136	7.6	6.03	3.90	0.93
		PH 161	8.2	7.17	4.71	0.95
PH 201	8.3	10.28	6.76	0.95		
version with EC Fan Fix Speed	Downflow Up	PH 040	7.8	2	1.27	0.92
		PH 060	7.4	3.5	2.20	0.91
		PH 080	8.3	4.86	3.12	0.93
		PH 110	8	6.6	4.23	0.93
		PH 145	9.6	11.04	7.23	0.95
		PH 170	9.5	14.44	9.48	0.95
	Downflow Down	PH 046	8.8	2.7	1.74	0.93
		PH 066	6.9	2.86	1.74	0.88
		PH 091	7.6	3.52	2.20	0.90
		PH 136	8.2	6.63	4.23	0.92
		PH 161	8.7	7.8	5.01	0.93
PH 201	9	11.92	7.76	0.94		

NOTE:

The EC fan settings can be modified acting on the control display (see iCOM manual)

(*) Setting for Nominal Airflow at standard conditions: ESP: 20 Pa, Filters class F5

Enclosure B - Technical data table

Tab. 3 - Electrical data (optional components)

Component Model	ELECTRICAL HEATING				ELECTRODE HUMIDIFIER		CONDENSATE PUMP	
	Std 1st stage		Opt. 2nd Stage		FLA [A]	Nominal power [kW]	FLA [A]	Nominal power [kW]
	FLA [A]	Nominal power [kW]	FLA [A]	Nominal power [kW]				
(400V / 3Ph / 50Hz)								
PH 025 PH 030 PH 035 PH 040 PH 045 PH 046	10.8	7.5	-	-	13	9.0	1.6	0.15
PH 060 PH 070 PH 080 PH 066 PH 081 PH 091			21.6	15				
PH 095 PH 100 PH 110 PH 145 PH 111 PH 136 PH 161 PH 170 PH 201			32.5	22.5				

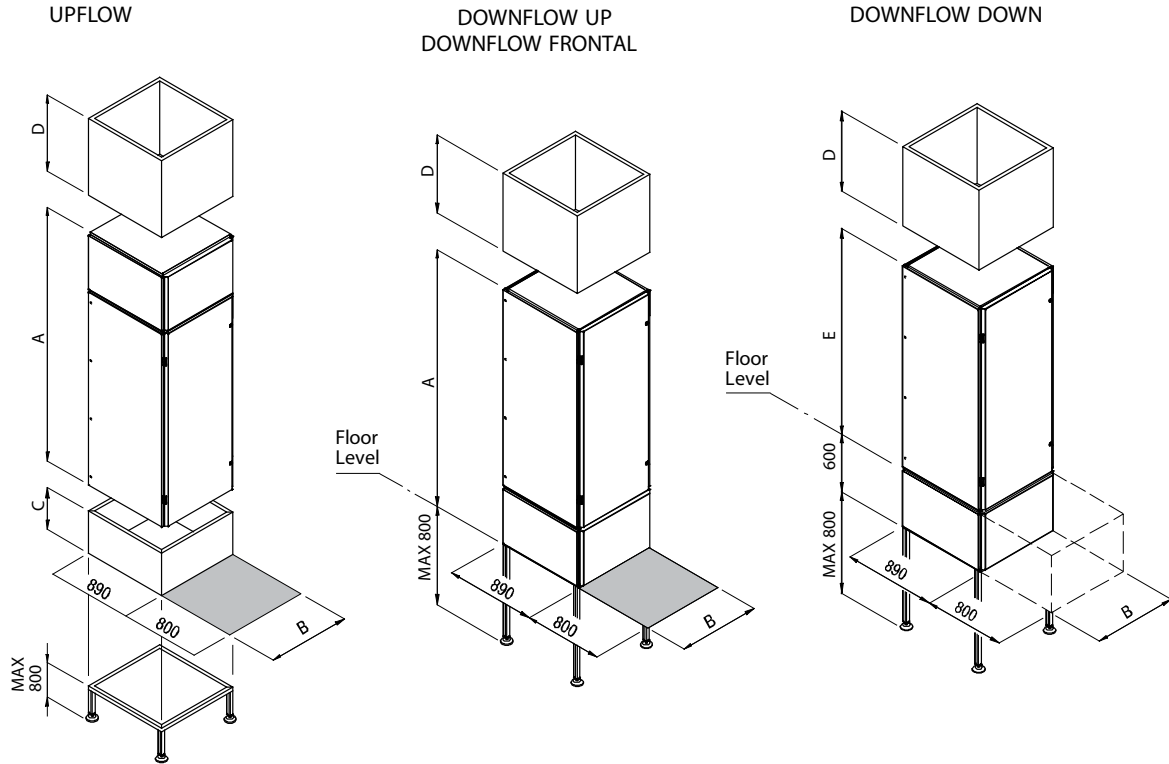
Enclosure B - Technical data table

Tab. 4 - Adjustments and calibrations of different components

Position	Component	Calibration & Operating	Application	Model	Drawing
1	Clogged filter differential pressure switch (CF) (optional)	Filters F5 = 3 mbar	Liebert PCW C PCW R	Johnson Control P2 331- 4 (0.5 - 4 mbar)	
2	Servomotor for chilled water valve	Modulating action	PH025...PH040 PH046 Standard Pressure	Siemens SSC 819	
			PH025...PH040 PH046 0- 10V	Siemens SSC 619	
			PH025...PH040 PH046 High Pressure	Controlli MVB46 or Johnson Control VA7153	
			PH025...PH040 PH046 Standard Pressure		
			PH045 PH060...PH201 Standard Pressure		
PH045 PH060...PH201 High Pressure	Controlli MVB56 or Johnson Control VA7152				
3	2 - way chilled water valve	Modulating action	PH025...PH040 PH046 Standard Pressure	Siemens VXP45.25- 10 VXP45.32- 16	
			PH025...PH040 PH046 High Pressure	Controlli VMB5 or Johnson Control ZD7281NT/ PT	
			PH045 PH060...PH201 Standard Pressure High Pressure	Controlli VM-B6/8A or Johnson Control ZD7281RT/ST	
4	3 - way chilled water valve	Modulating action	PH025...PH040 PH046 Standard Pressure	Siemens VXP45.25- 10 VXP45.32- 16	
			PH025...PH040 PH046 High Pressure	Controlli VMB5 or Johnson Control ZD7881NT/ PT	
			PH045 PH060...PH201 Standard Pressure High Pressure	Controlli VM-B6/8A or Johnson Control ZD7881RT/ST	
5	Servomotor for 3-way hot water valve	ON-OFF action	PH025...PH201	Siemens SFA71/18	
	3 - way hot water valve			Siemens VXI 469.25 1"	

Enclosure C - Installation drawings

Fig. 1. Overall dimensions Service Area

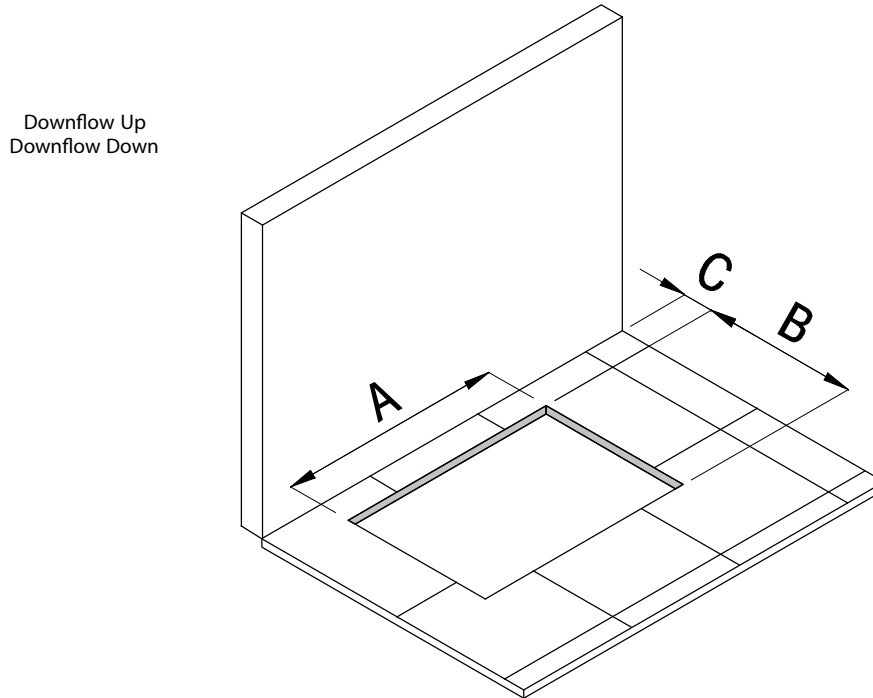


Tab. 1 - Overall dimensions - Service area (referring to Fig 1)

Models	Unit			Options					
	B [mm]	Upflow Downflow Up Frontal A [mm]	Downflow Down E [mm]	AVAILABLE PLENUM HEIGHTS: D [mm]					Base Module C [mm]
				Plenum simple	Plenum for silencing cartridges	Plenum for high efficiency filters	Plenum with frontal airflow (Upflow)	Air Economizer	
PH 025	844	1970	NA	500 - 600 - 700 - 800 900	600 - 900	600 - 900	600	850	200 Base Module 600 (Base Module with rear air intake)
PH 030									
PH 035									
PH 040									
PH 045									
PH 060									
PH 070									
PH 080									
PH 095									
PH 100									
PH 110									
PH 145									
PH 170									
PH 046			2570						
PH 066									
PH 081									
PH 091									
PH 111									
PH 136									
PH 161									
PH 201									

Enclosure C - Installation drawings

Fig. 2. Hole in the floor for Downflow versions



Tab. 2 - Hole in the floor for Downflow units, dimensions in mm.

Configuration		Unit	PH025 PH030	PH035 PH040 PH046	PH045 PH060 PH066	PH070 PH080 PH081 PH091	PH095 PH100 PH110 PH111 PH136	PH145 PH161	PH170 PH201
Downflow Up		A	744	1100	1650	1950	2450	2850	3250
		B	760	760	760	760	760	760	760
		C*	70	70	70	70	70	70	70
	With Base Frame **	A	820	1176	1726	2026	2526	2926	3326
		B	840	840	840	840	840	840	840
		C*	30	30	30	30	30	30	30
	With Legs kit **	A	NA	1156	1706	2006	2506	2906	3306
		B		820	820	820	820	820	
		C*		30	30	30	30	30	
Downflow Down		A	826	1182	1732	2032	2532	2932	3332
		B	846	846	846	846	846	846	
		C*	20	20	20	20	20	20	
	With floor tiles support kit **	A	NA	1220	1770	2070	2570	2970	3370
		B		885	885	885	885	885	
		C*		50	50	50	50	50	

* Minimal distance of the working unit from the back wall. Caution: In order to assemble and/or install accessories, a larger distance might be required. In that case, the unit can be moved in the working position after installation / assembly procedures.

** Optional accessories - see details in Enclosures E.

NA = Not Available

Enclosure D - Hydraulic and electrical connections

Tab. 1 - Hydraulic and electrical connections – Downflow versions

Unit Connection		PH025 PH030	PH035 PH040 PH046	PH045 PH060 PH066	PH070 PH080 PH081 PH091	PH095 PH100 PH110 PH111 PH136	PH145 PH161	PH170 PH201	Height from unit bottom
ICW	Chilled water inlet (single chilled water circuit)	Rp 1 ¼ ISO 7/1	Rp 1 ¼ ISO 7/1	Rp 1 ½ ISO 7/1	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø64 mm** R 2½ ISO7/1***	O.D. Ø64 mm** R 2½ ISO7/1***	O.D. Ø64 mm** R 2½ ISO7/1***	394
OCW	Chilled water ou- tlet (single chilled water circuit)	Rp 1 ¼ ISO 7/1	Rp 1 ¼ ISO 7/1	Rp 1 ½ ISO 7/1	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø64 mm** R 2½ ISO7/1***	O.D. Ø64 mm** R 2½ ISO7/1***	O.D. Ø64 mm** R 2½ ISO7/1***	344
ICW1	Chilled water inlet 1 (double chilled water circuit)	NA	Rp 1 ¼ ISO 7/1	Rp 1 ½ ISO 7/1	Rp 1 ½ ISO 7/1	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø54 mm** R 2 - ISO7/1***	394
OCW 1	Chilled water ou- tlet 1 (double chilled water circuit)	NA	Rp 1 ¼ ISO 7/1	Rp 1 ½ ISO 7/1	Rp 1 ½ ISO 7/1	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø54 mm** R 2 - ISO7/1***	344
ICW2	Chilled water inlet 2 (double chilled water circuit)	NA	Rp 1 ¼ ISO 7/1	Rp 1 ½ ISO 7/1	Rp 1 ½ ISO 7/1	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø54 mm** R 2 ISO7/1***	O.D. Ø54 mm** R 2 - ISO7/1***	394
OCW 2	Chilled water ou- tlet 2 (double chilled water circuit)	NA	Rp 1 ¼ ISO 7/1	Rp 1 ½ ISO 7/1	Rp 1 ½ ISO 7/1	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø54 mm** R 2 - ISO7/1***	O.D. Ø54 mm** R 2 - ISO7/1***	344
CD	Condensate drain	I.D. Ø20 [mm]							-
CD*	Condensate drain	I.D. Ø20 [mm]							-
HF	Humidifier feed	R ½ - ISO 7/1 (Electrode Humidifier), O.D. 6 [mm] (Infrared Humidifier)							-
HD	Humidifier drain	I.D. Ø32 [mm] (Electrode Humidifier), I.D. Ø22 [mm] (Infrared Humidifier)							-
EC	Electrical power supply	Ø 48 [mm]							-
EC aux	Low voltage cables	Ø 40 - Ø 36 [mm]							-

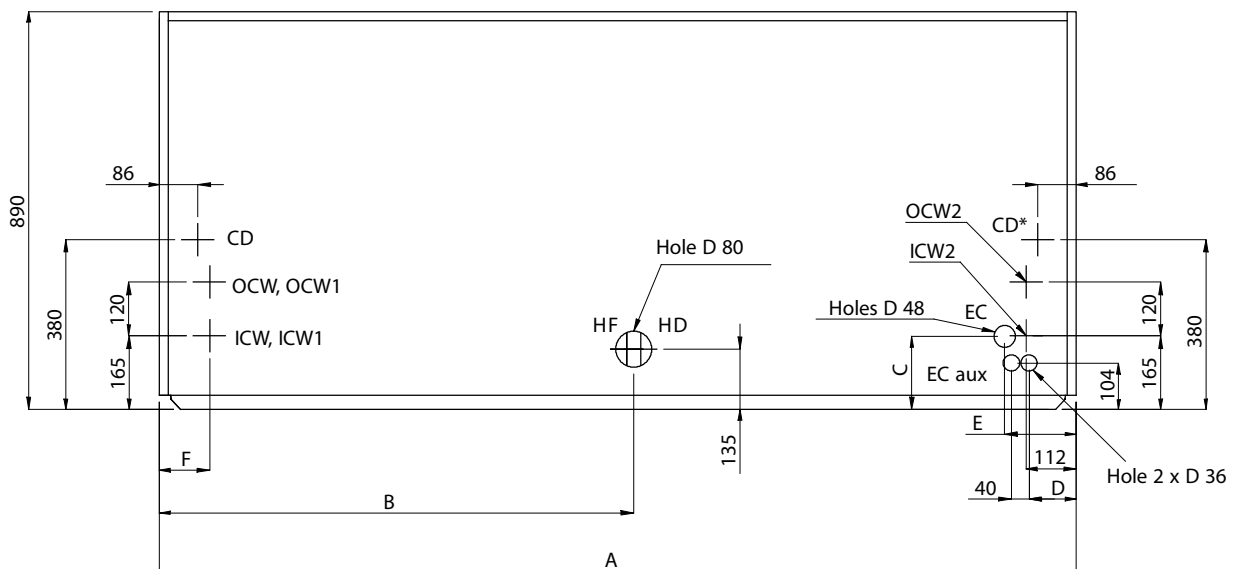
CD* only for unit from PH095 toPH201

** VICTAULIC® Connection.

*** Optional. Threaded union on request

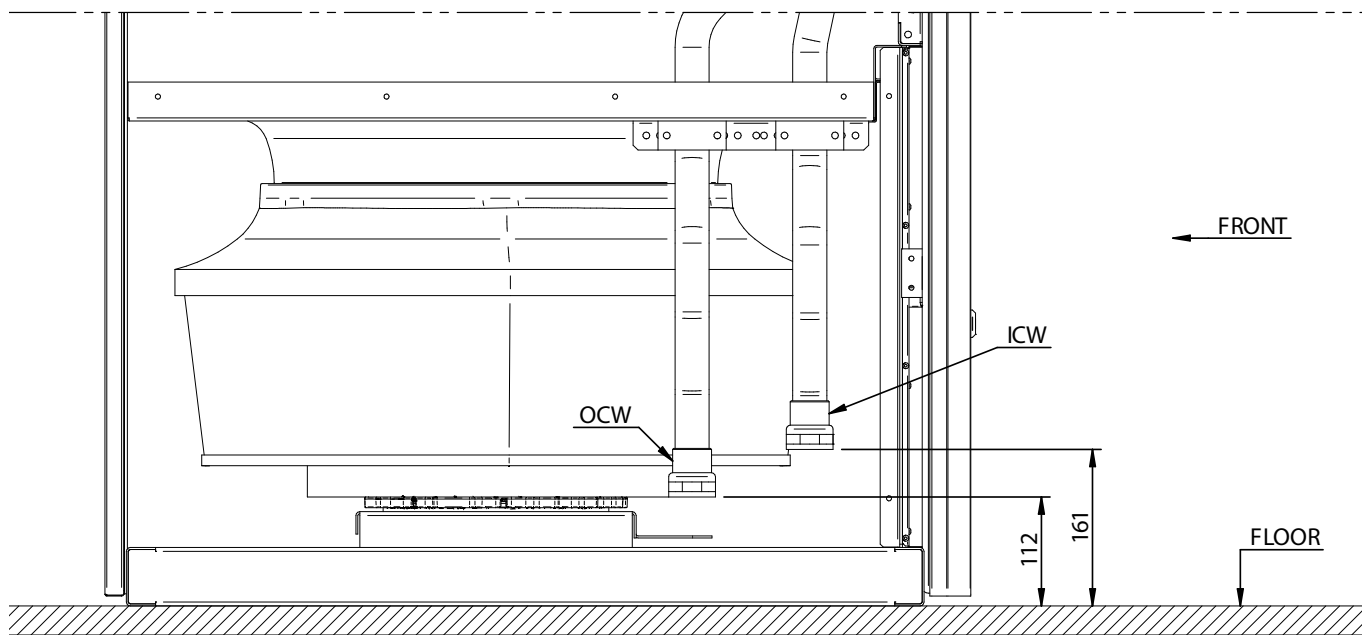
NA = Not Available

Fig. 1. Downflow units, dimensions for Piping Bottom Option (Top view)

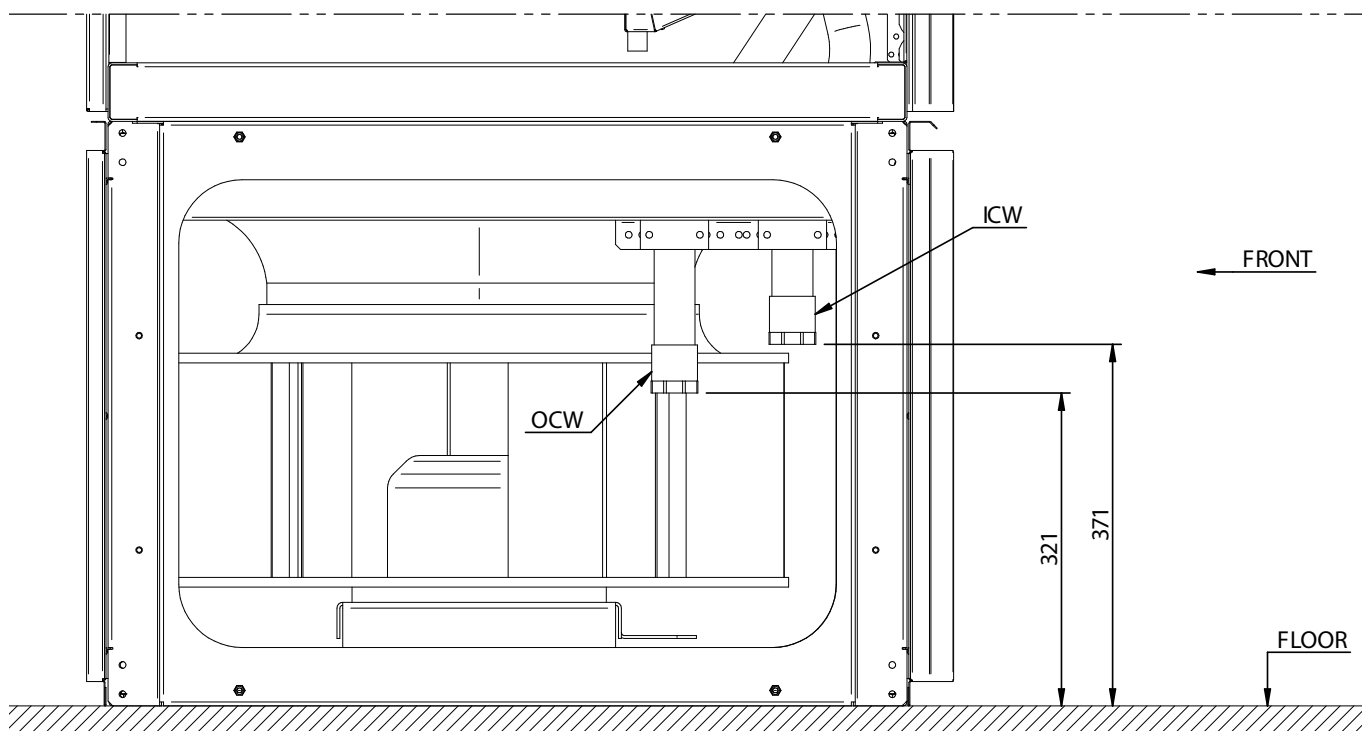


Enclosure D - Hydraulic and electrical connections

Refrigerant and water connections PH025-PH030 downflow up, side view.

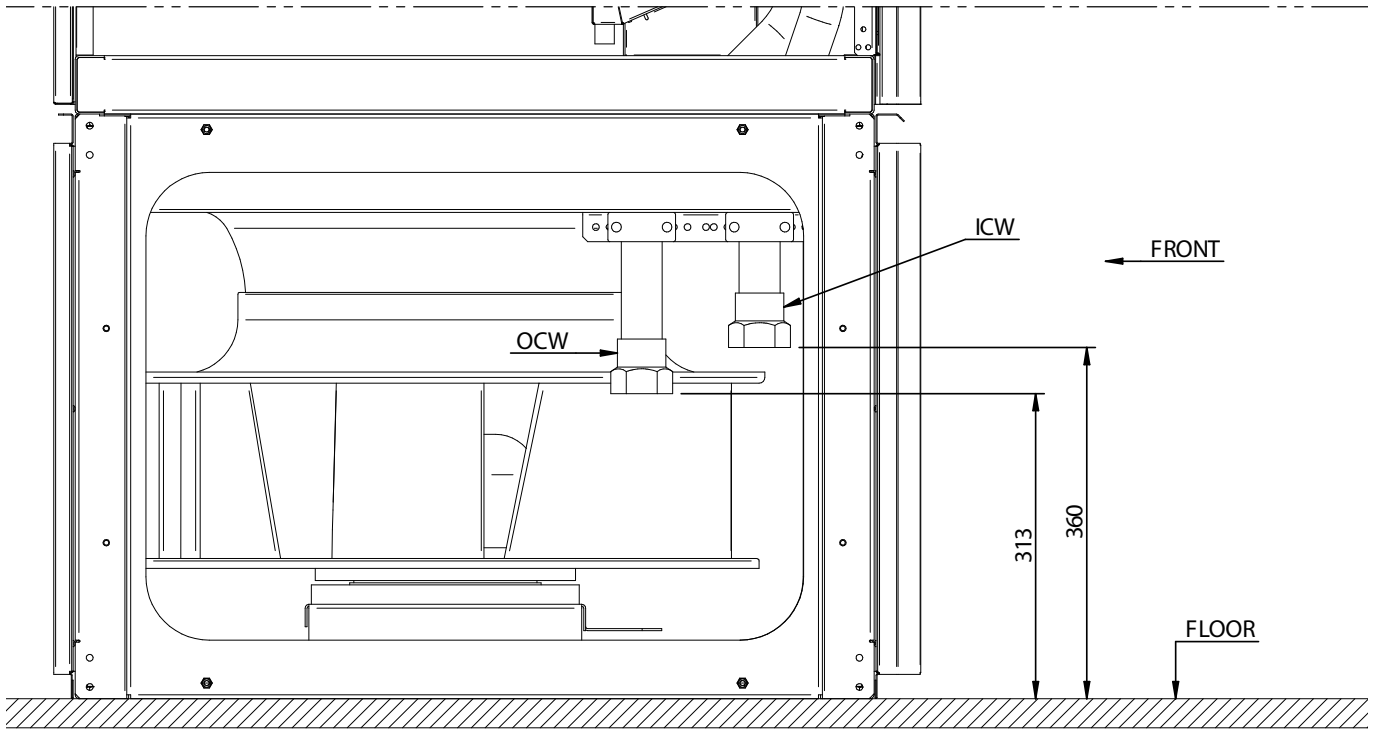


Refrigerant and water connections PH035-PH040-PH046 downflow up, side view.

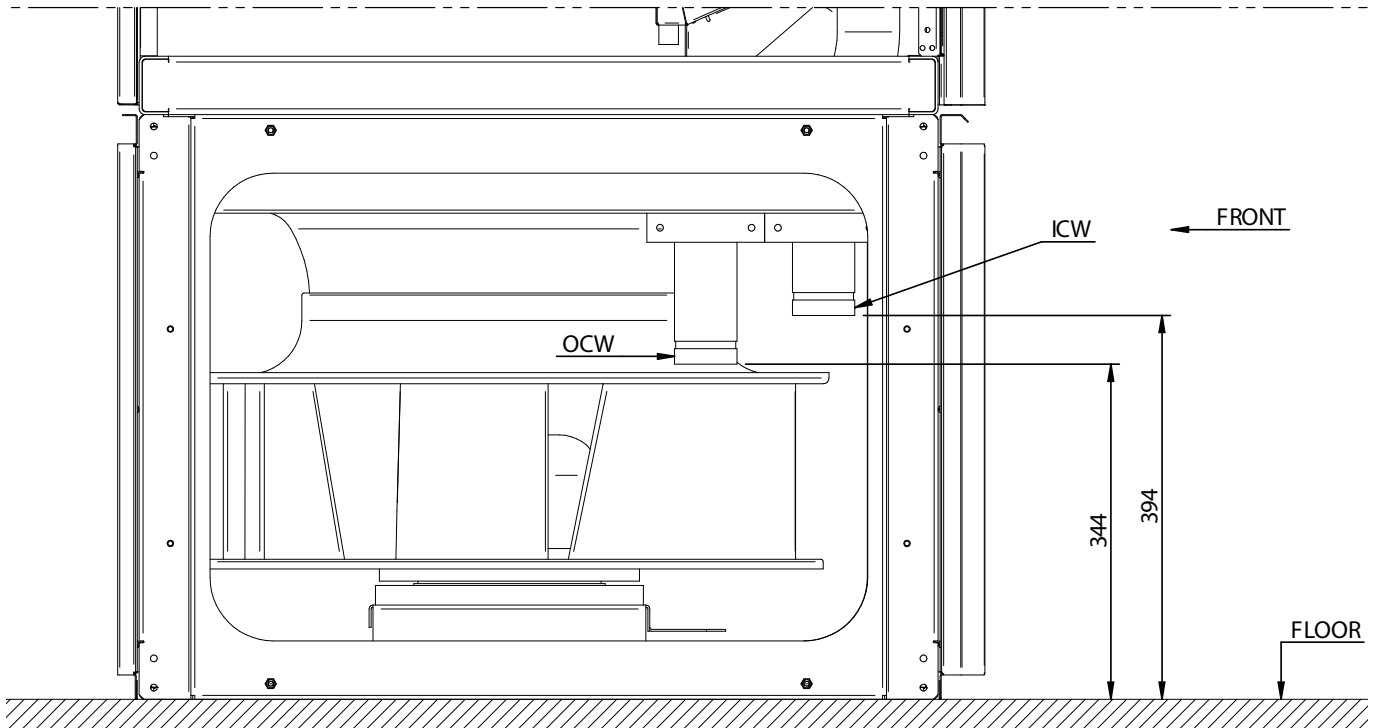


Enclosure D - Hydraulic and electrical connections

Refrigerant and water connections PH045-PH060-PH066 downflow up, side view.



Refrigerant and water connections PH070-PH080-PH081-PH91-PH95-PH100-PH110-PH111-PH136-PH145-PH161-PH170-PH201 downflow up, side view.



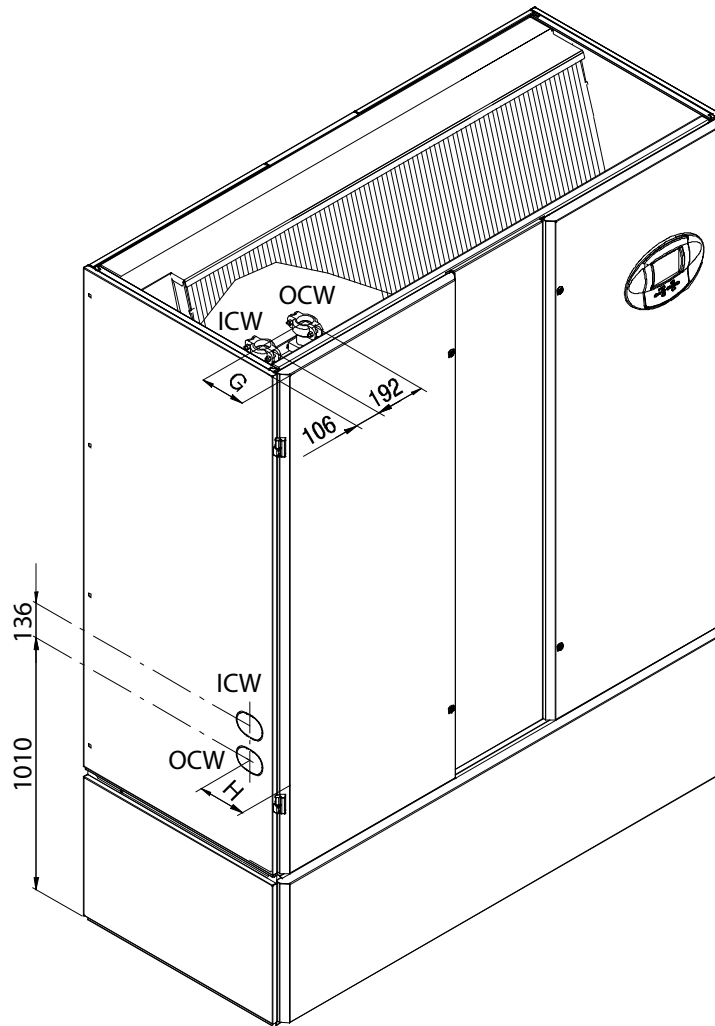
Enclosure D - Hydraulic and electrical connections

Tab. 2 - Downflow units, dimensions for Bottom, Top & Piping left Option

Unit Connection	PH025 PH030	PH035 PH040 PH046	PH045 PH060 PH066	PH070 PH080 PH081 PH091	PH095 PH100 PH110 PH111 PH136	PH145 PH161	PH170 PH201
Dimensions for Piping Bottom Option (Fig. 1.)							
A	844	1200	1750	2050	2550	2950	3350
B	95	235	910	1060	1565	1855	2385
C	125	160	160	160	150	150	150
D	140	105	105	105	150	150	150
E	100	120	120	120	115	115	115
F	76	112	112	112	112	112	112
Dimensions for Piping Top & Piping left Option (Fig. 2.)							
G	115	115	190	185	170	170	170
H	NA	135	135	135	120	120	120

NA = Not Available

Fig. 2. Downflow units, dimensions for Top & Piping left Option



Enclosure D - Hydraulic and electrical connections

Tab. 3 - Hydraulic and electrical connections – Upflow versions

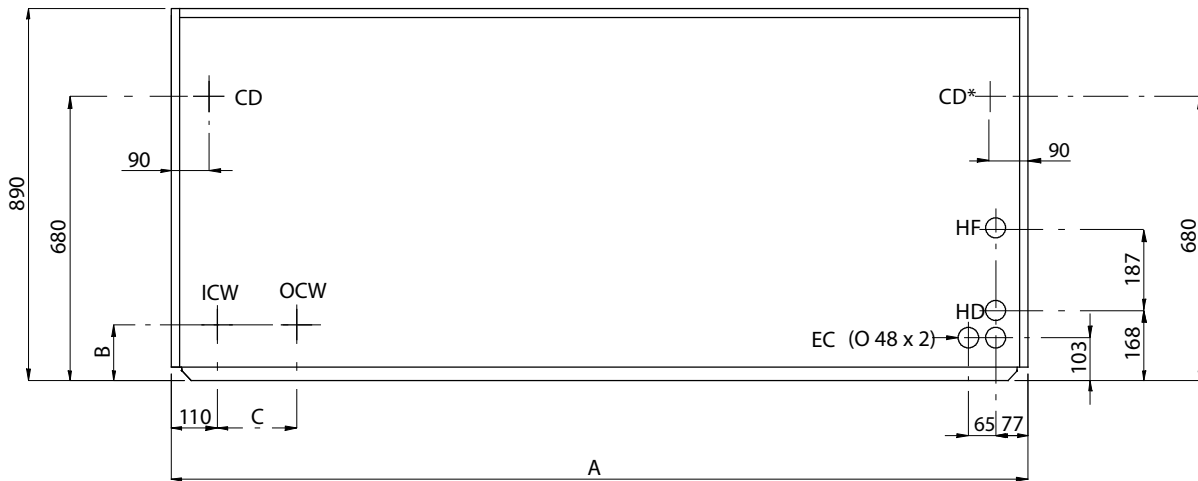
Unit Connection		PH025 PH030	PH035 PH040 PH046	PH045 PH060 PH066	PH070 PH080 PH081 PH091	PH095 PH100 PH110	Height from unit bottom [mm]
ICW	Chilled water inlet	Rp 1 ¼ - ISO 7/1	Rp 1 ¼ - ISO 7/1	Rp 1 ½ - ISO 7/1	O.D. Ø54 mm ** R 2- ISO7/1***	O.D. Ø64 mm ** R21/2 –ISO7/1***	334
OCW	Chilled water outlet	Rp 1 ¼ - ISO 7/1	Rp 1 ¼ - ISO 7/1	Rp 1 ½ - ISO 7/1	O.D. Ø54 mm ** R 2- ISO7/1***	O.D. Ø64 mm ** R21/2 –ISO7/1***	285
CD	Condensate drain	I.D. Ø20 [mm]					-
CD*	Condensate drain	I.D. Ø20 [mm]					-
HF	Humidifier feed	R ½ - ISO 7/1 (Electrode Humidifier), O.D. 6 [mm] (Infrared Humidifier)					-
HD	Humidifier drain	I.D. Ø32 [mm] (Electrode Humidifier), I.D. Ø22 [mm] (Infrared Humidifier)					-
EC	Electrical power supply	Ø 48 [mm]					-
EC aux	Low voltage cables	Ø 40 - Ø 36 [mm]					-

CD* only for unit from PH095 toPH110

** VICTAULIC® Connection.

*** Optional. Threaded union on request

Tab. 3 - Hydraulic and electrical connections – Upflow versions



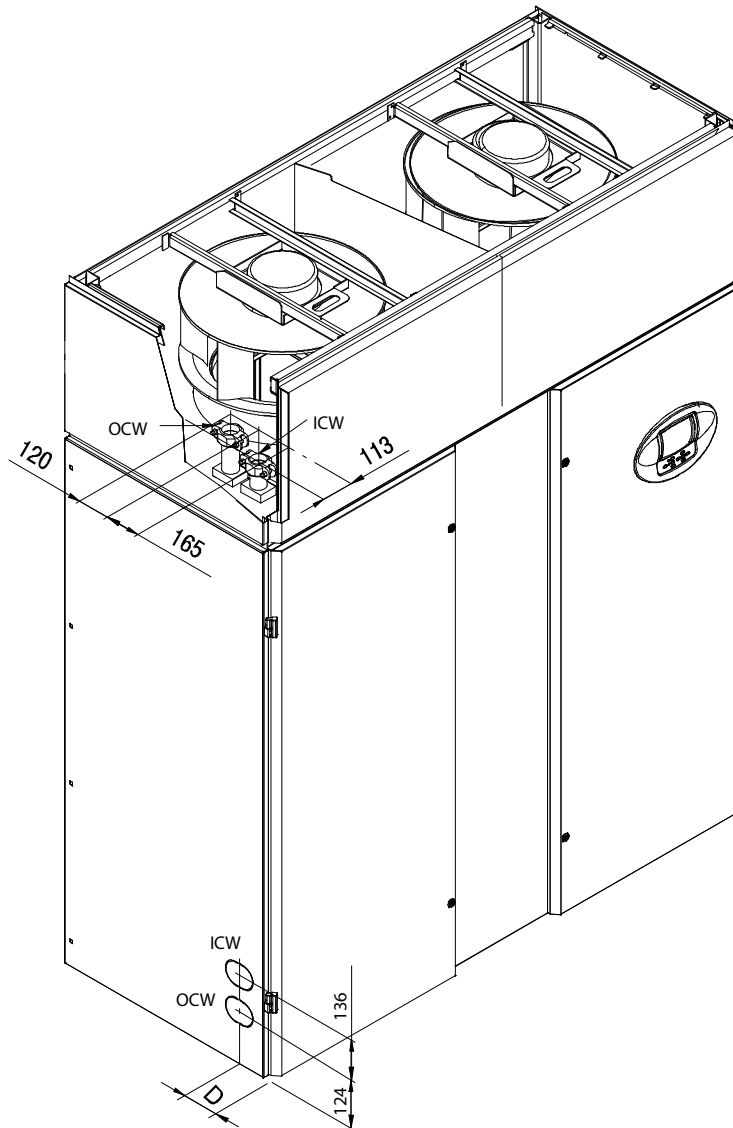
Enclosure D - Hydraulic and electrical connections

Tab. 4 - Upflow unit, Dimensions for Piping Bottom, Top & Piping left Option

Unit Connection	PH025 PH030	PH035 PH040 PH046	PH045 PH060 PH066	PH070 PH080 PH081 PH091	PH095 PH100 PH110
Dimensions for Piping Bottom Option (Fig. 3.)					
A	844	1200	1750	2050	2550
B	130	135	135	135	135
C	90	190	190	190	190
Dimensions for Piping Top & Piping left Option (Fig. 4.)					
D	NA	135	135	120	120

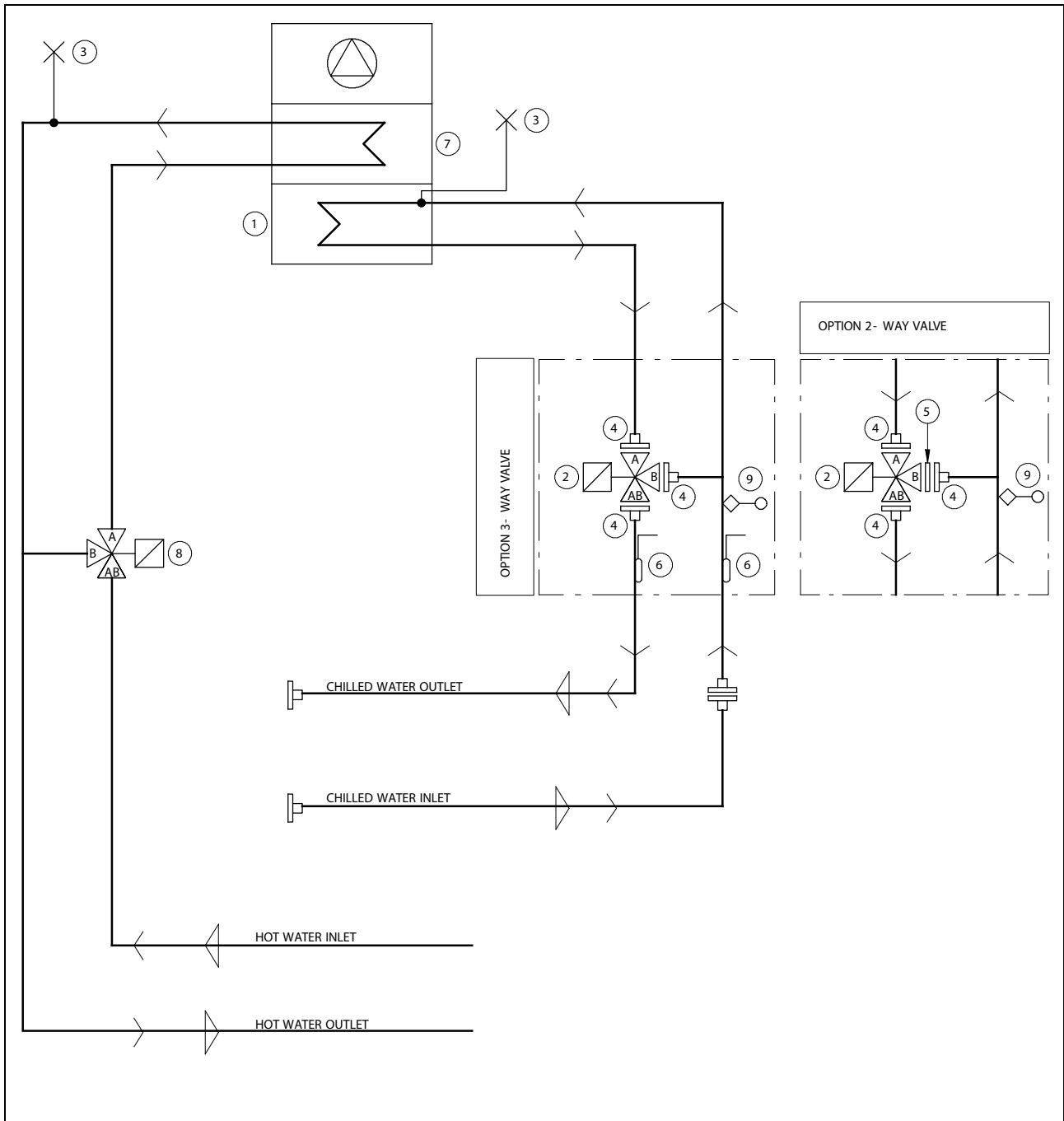
NA = Not Available

Fig. 4. Upflow unit, Dimensions for Piping Top & Piping left Option



Enclosure D - Hydraulic and electrical connections

Fig. 5. Chilled water circuit (and hot water reheating coil - opt.) PH025...PH170 (single chilled water circuit)

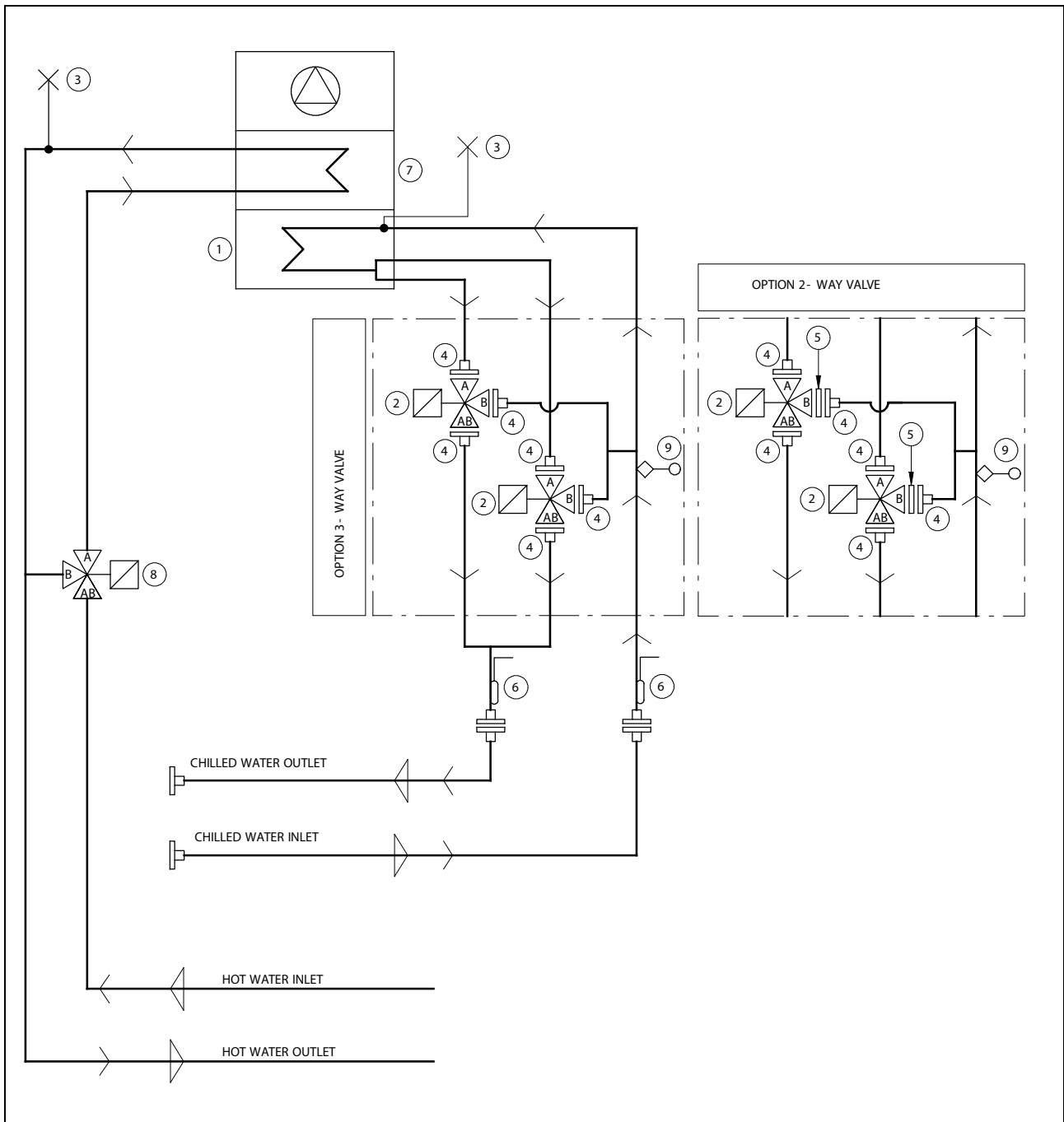


POS.	Components
1	Chilled water coil
2	Chilled water 3- way valve
3	Manual bleed valve
4	Valve fittings
5	Blind disk - only with optional 2- way valve

POS.	Components
6	Water temperature sensor (optional)
7	Reheating coil (optional)
8	On/off 3- way valve (optional)
9	Flow transmitter (optional)

Enclosure D - Hydraulic and electrical connections

Fig. 6. Chilled water circuit (and hot water reheating coil - opt.) PH201 (single chilled water circuit)

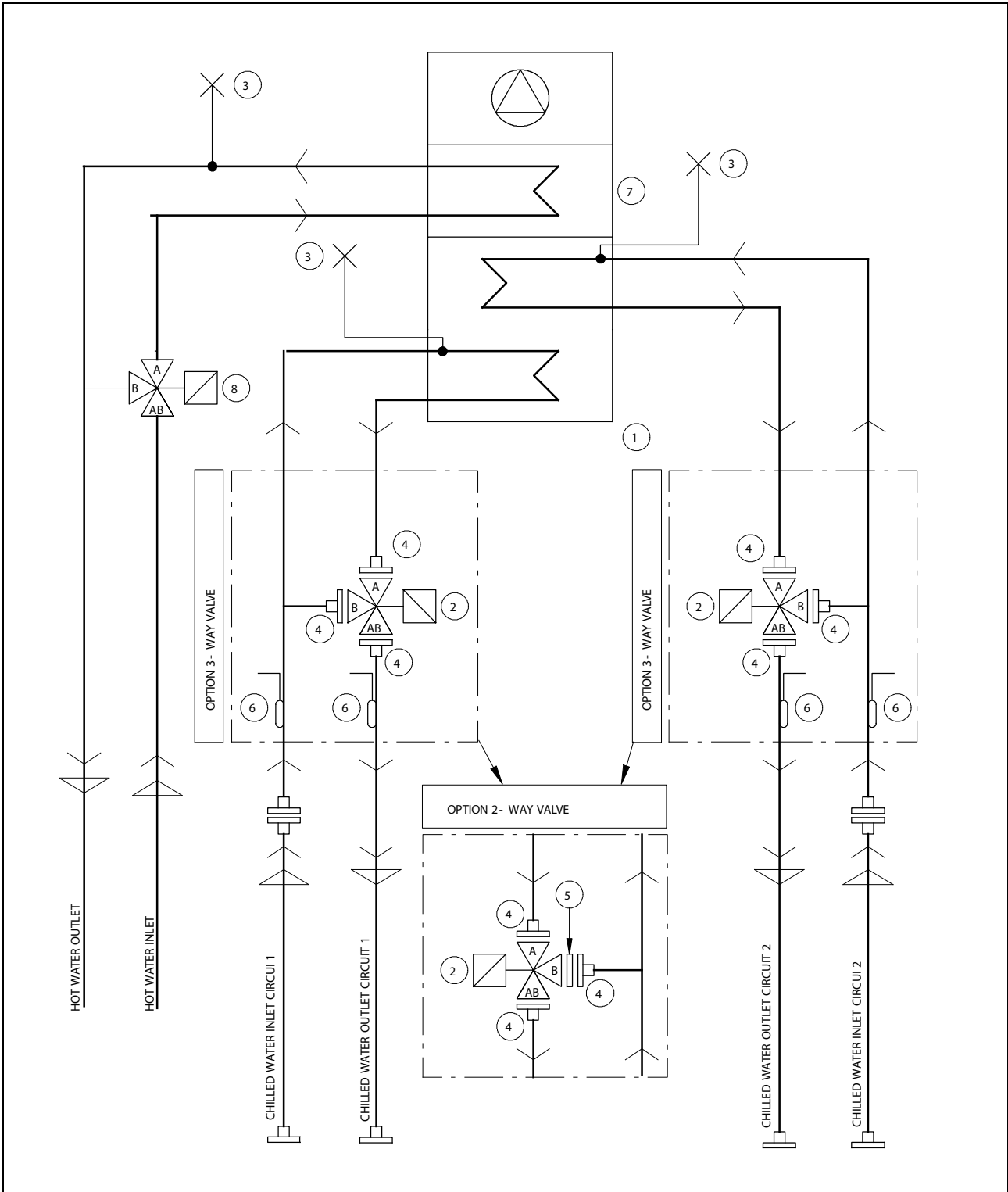


POS.	Components
1	Chilled water coil
2	Chilled water 3- way valve
3	Manual bleed valve
4	Valve fittings
5	Blind disk - only with optional 2- way valve

POS.	Components
6	Water temperature sensor (optional)
7	Reheating coil (optional)
8	On/off 3- way valve (optional)
9	Flow transmitter (optional)

Enclosure D - Hydraulic and electrical connections

Fig. 7. Chilled water circuit (and hot water reheating coil - opt.) PH040...PH201 (double chilled water circuit)

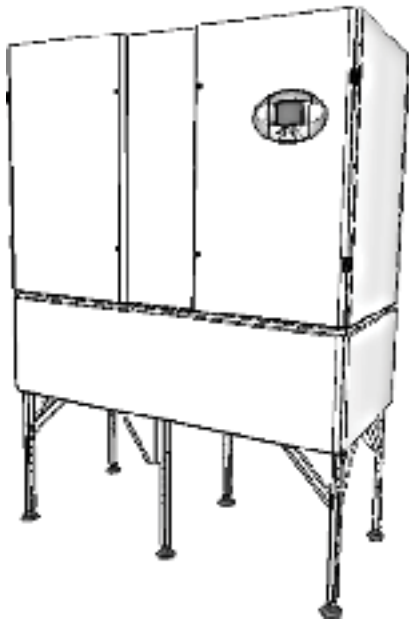


POS.	Components
1	Chilled water coil
2	Chilled water 3- way valve
3	Manual bleed valve
4	Valve fittings

POS.	Components
5	Blind disk - only with optional 2- way valve
6	Water temperature sensor (optional)
7	Reheating coil (optional)
8	On/off 3- way valve (optional)

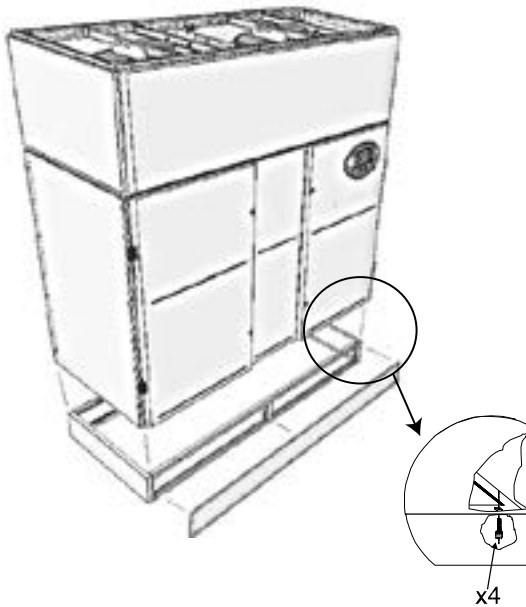
Enclosure E - Accessories

E.1. Kit Legs (Not Available for PH 025 - 030)



Legs kit can be supplied on request to support Liebert PCW when installed with a raised floor. The legs are fixed with the unit frame and allow to support the unit at different height, three kits are available with different height: adjustable in the range: h1- 30- 370 mm; h2 370- 570 mm; h3 570- 800 mm.

E.3. Base module

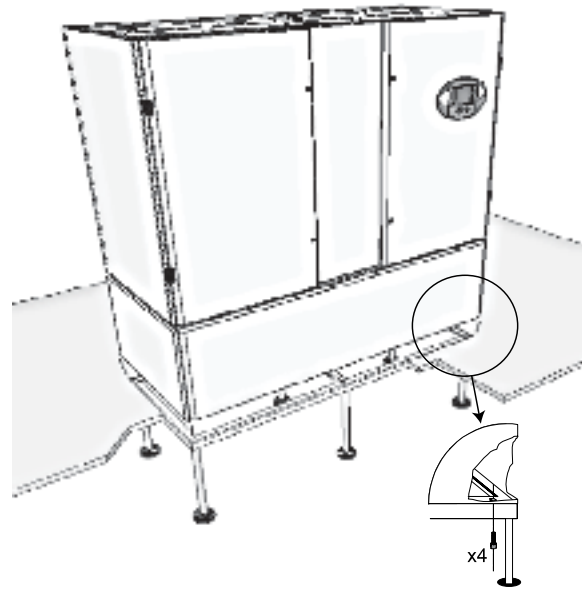


A 200 mm high base module can be supplied on request to support Liebert PCW Upflow and at the same time allow pipework to enter the base of the unit when a raised floor is not installed.



The unit must be fixed with 4 screws on the base module, the screws are not supplied with the unit.

E.2. Baseframe

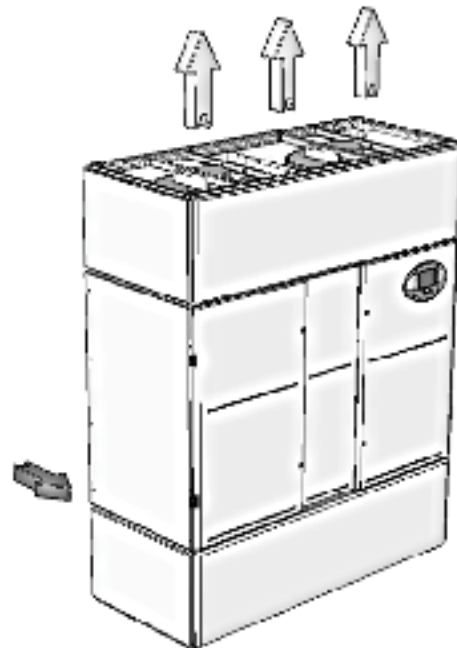


A base frame can be supplied on request to support Liebert PCW when installed with a raised floor. The frame could be regulated with a height form 120 mm to 800 mm and the unit is fixed on it.



The unit must be fixed with 4 screws on the base frame, the screws are not supplied with the unit.

E.4. Base Module h 600mm with rear air intake



A base module h 600 mm can be supplied on request to allow Liebert PCW Upflow to work with a rear air intake.

These accessory at the same time support the allowing the piping connection when a raised floor is not installed. Note that in this case the air conditioning unit must be ordered with a blind front panel.

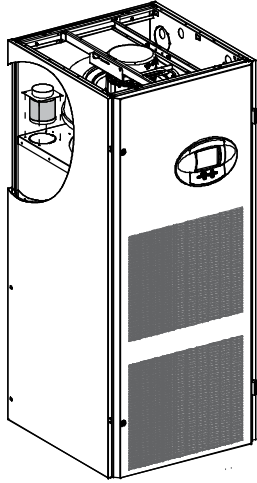
Enclosure E - Accessories

E.5. Fresh air module

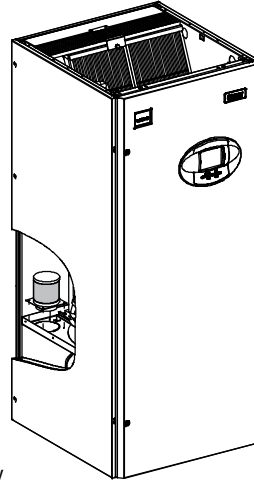
The fresh air kit, optional, has a G3 class filter installed on the intake side of the fan and is connected to the PCW unit with a 100 mm diameter plastic duct.

As the fresh air intake is positioned close to the fan suction, it will easily mix with the recirculation air.

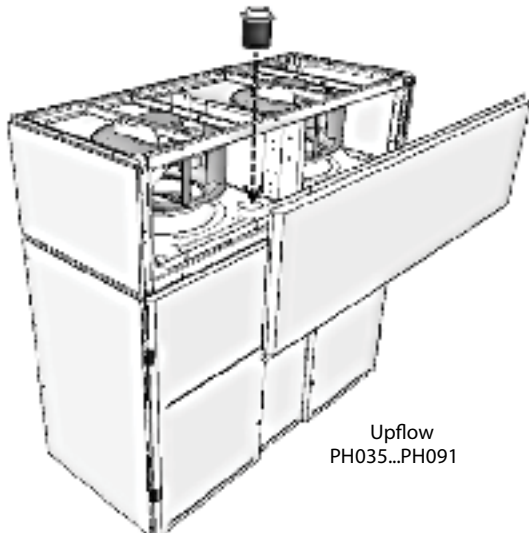
Fresh air module positions



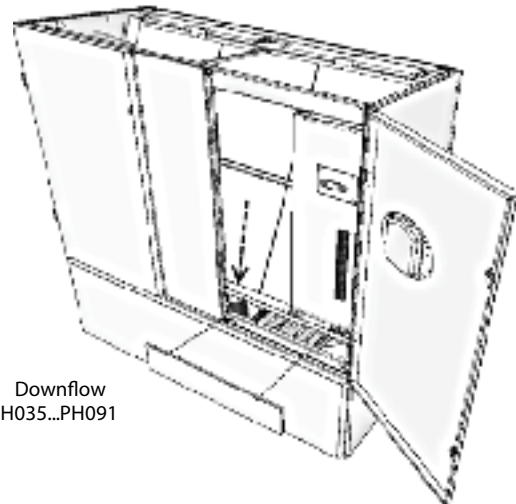
Upflow
PH025...PH030



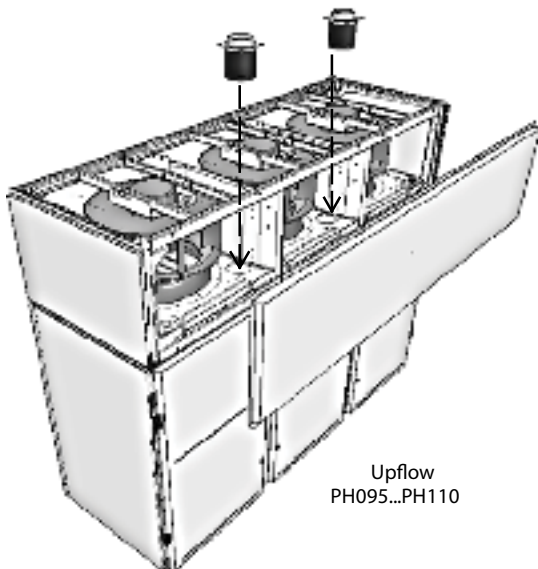
Downflow
PH025...PH030



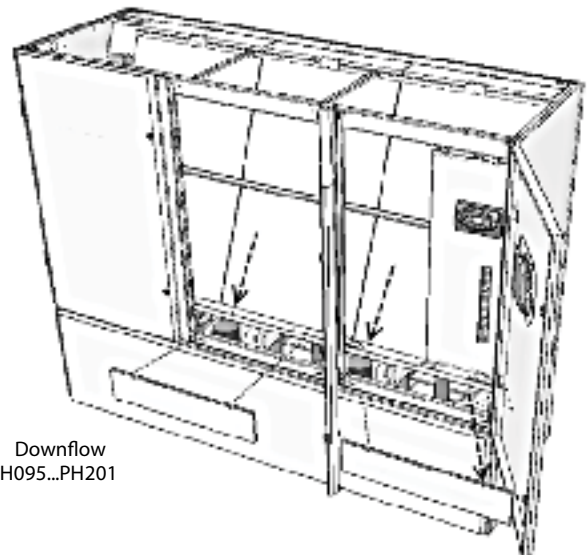
Upflow
PH035...PH091



Downflow
PH035...PH091



Upflow
PH095...PH110



Downflow
PH095...PH201

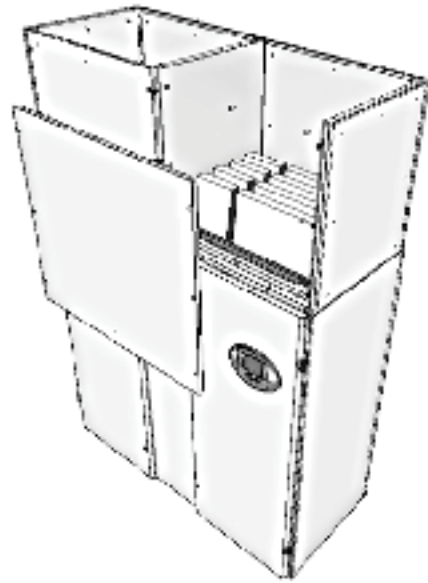
Enclosure E - Accessories

E.6. Vertical flow extension hood



An extension hood can be supplied on request and can be installed on top of the unit. It is available with different height: 500 mm; 600 mm; 700 mm; 800 mm. It has the same design as the unit and consists of sandwich panels lined with non-flammable insulation material of class 0 (ISO 1182.2), density 30 kg/m³.

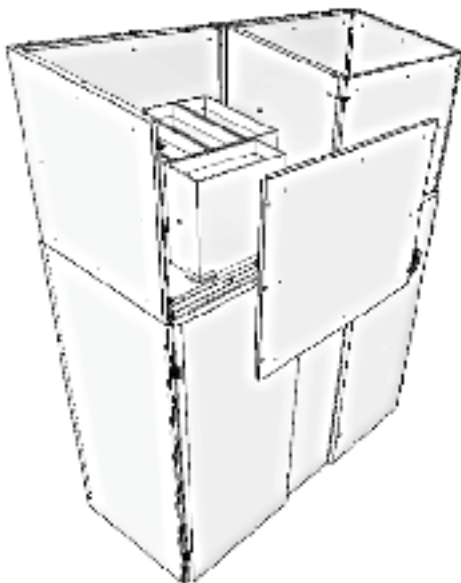
E.7. Hood with high efficiency air filter



Optional high efficiency filters, filtration class F6, F7 and F9 in accordance with the CEN EN 779 standard, are made of fiberglass filter media.

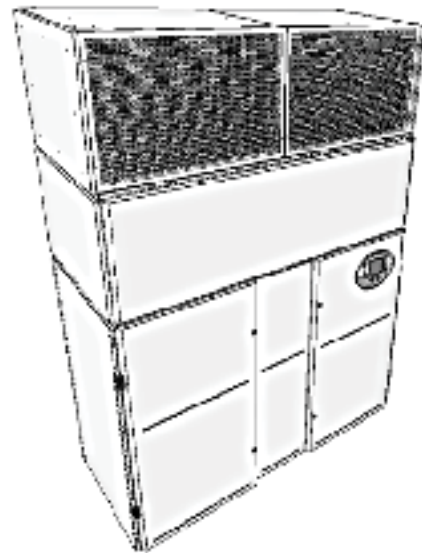
The filters are placed in "V" sections with a solid external frame in polypropylene, and can withstand remarkable pressure and flow variations. These filters will be installed within an additional duct on the unit top.

E.8. Plenum with silencing cartridges



These are special cartridges made of self-extinguishing material with a high noise attenuation capacity. They are guaranteed against disintegration and release of particles due to friction of the air. Despite a small additional pressure drop, these cartridges provide a remarkable sound power level reduction.

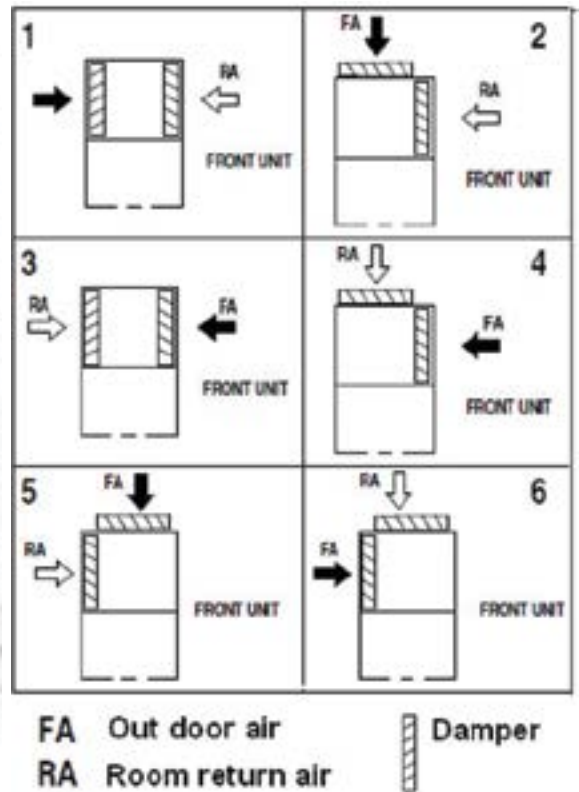
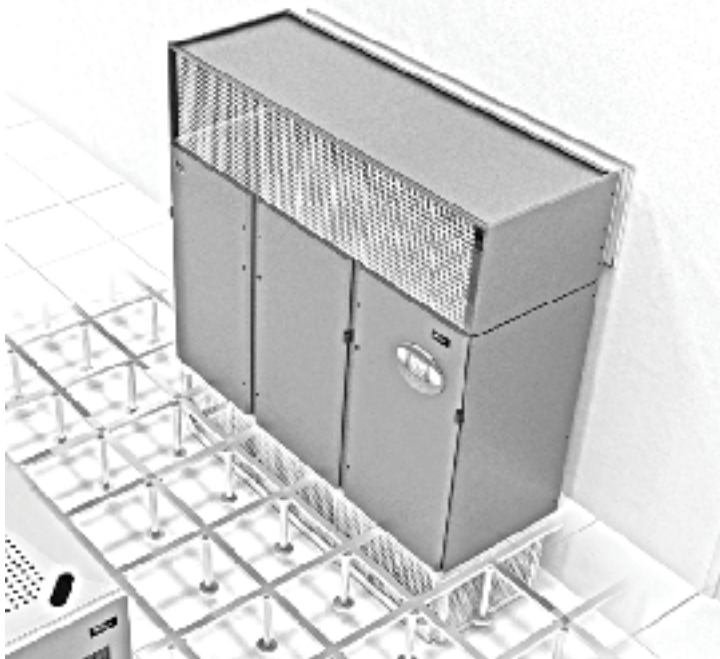
E.9. Horizontal hood with grill



A supply plenum with horizontal air flow can be installed on top of the unit. The 600 mm high plenum has the same design as the unit; it consists of sandwich panels lined with non-flammable insulation material of class 0 (ISO 1182.2), density 30 kg/m³. It is equipped with a double deflection grill.

Enclosure E - Accessories

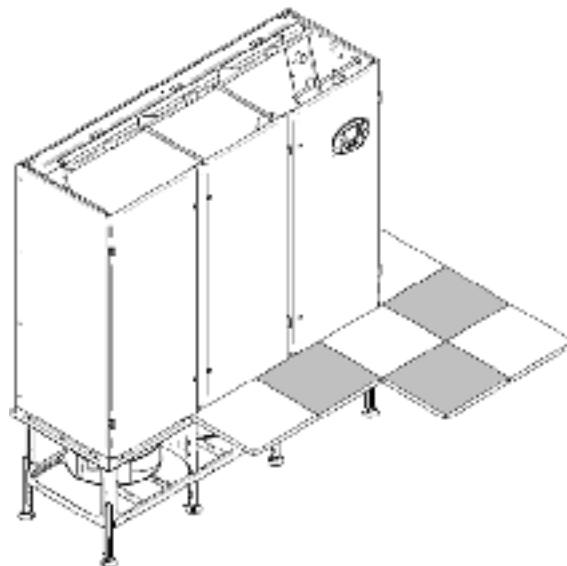
E.10. Air Economizer



The Air Economizer comprises an extension hood 860 mm height with a dampers system installable on top of the Downflow units. This system allows the free-cooling taking advantage of cool outdoor air to condition indoor space. The Air Economizer system delivers high energy savings reducing

or eliminating the cost for pumping and chilling of the water. To use the Air Economizer the building has to be equipped with suitable air ducts and the dampers system modulating permits to use different channel configurations.

E.11. Floor tiles support kit (Not Available for PH 025 - 030)



Floor tiles support kit can be supplied on request to support tiles around Liebert PCW Downflow Down, when installed with a raised floor.

Floor tiles support is fixed on the unit frame/fan module and allows to support tiles until 40 mm thickness.

With a correct installation, the maximum admitted vertical distrib-

ed load on the perimeter is 180 kg/m.

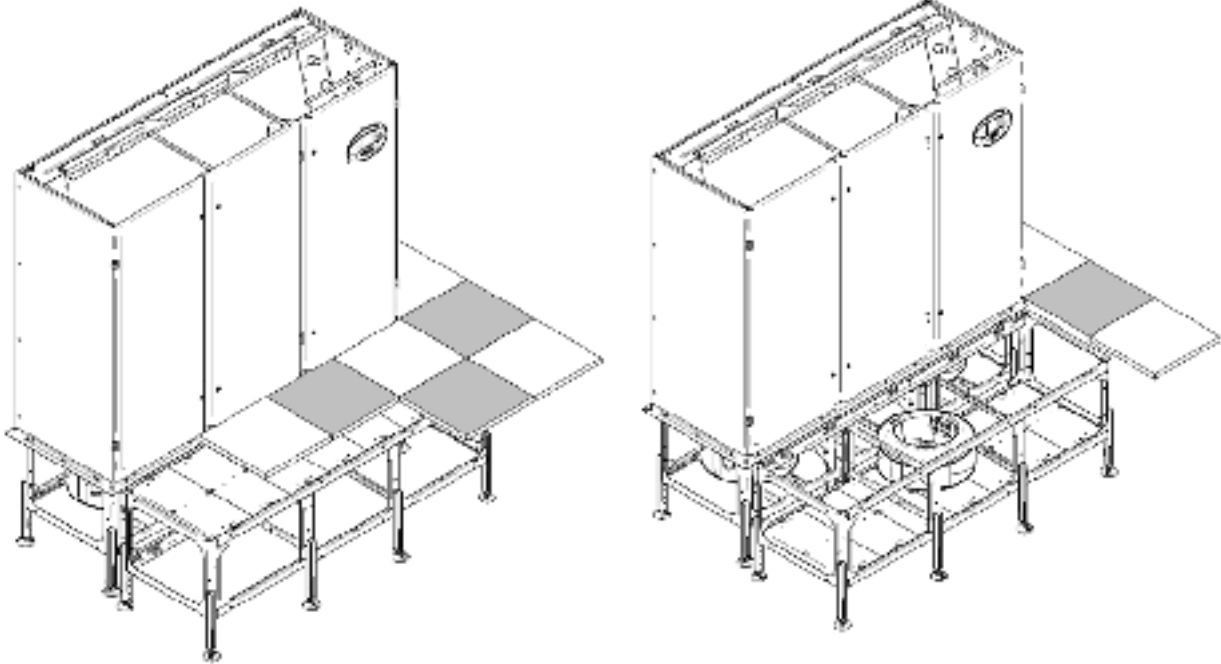
I.e.: on the lateral side, 870mm long, the maximum admitted distributed load is 157 kg.

Floor tiles support is earthed with the unit frame.

Follow local rules for system grounding.

Enclosure E - Accessories

E.12. Fans maintenance kit (Not Available for PH 025 - 030)



Fans maintenance kit can be supplied on request to support tiles on Liebert PCW Downflow Down when installed with a raised floor. Fans maintenance kit allows maintenance operations, in particular fans replacement, when the fans are installed below the floor level. Removing tiles on the frontal area, it is possible to lift some footboards, moving them on the lower level, creating a service volume in the raised floor.

With a correct installation, the maximum admitted vertical distributed load is 600 kg/m².

Footboards are designed to support distributed load as indicated above, and the maximum concentrated load is 150 kg (on the area 50x50 mm).

Fans maintenance kit must be earthed following the local rules.

Enclosure F - Infrared Humidifier

F.1 - Infrared Humidifier

The infrared humidifier design consists of quartz lamps mounted above a stainless steel water reservoir. The lamps never come in contact with the water. When humidification of room air is required, infrared rays generate water vapor-without impurities or odor, within seconds. In order to obtain optimum performance from the humidifier it is advisable to read this manual carefully.

Tab. 1 - Infrared Humidifier specifications

UNIT MODEL	PAN	MAIN POWER SUPPLIES (V ± 10%)	NOMINAL CAPACITY [kg/h]	ABSORBED CURRENT [A]	POWER INPUT [kW]
PH025...040	Stainless steel	400V / 3ph / 50Hz	5	6.4	4.8
PH045...201	Stainless steel	400V / 3ph / 50Hz	10	13.9	9.6

F.2 - Installation

The infrared humidifier is supplied already mounted within the air conditioner. The only necessary operations are the connections for the supply water and drain water.

Supply Water.

- Maximum water pressure 1000 kPa
- Size humidifier supply line for 3.8 l/min, with a minimum water pressure of 138 kPa
- Do not supply de-ionized water to the humidifier

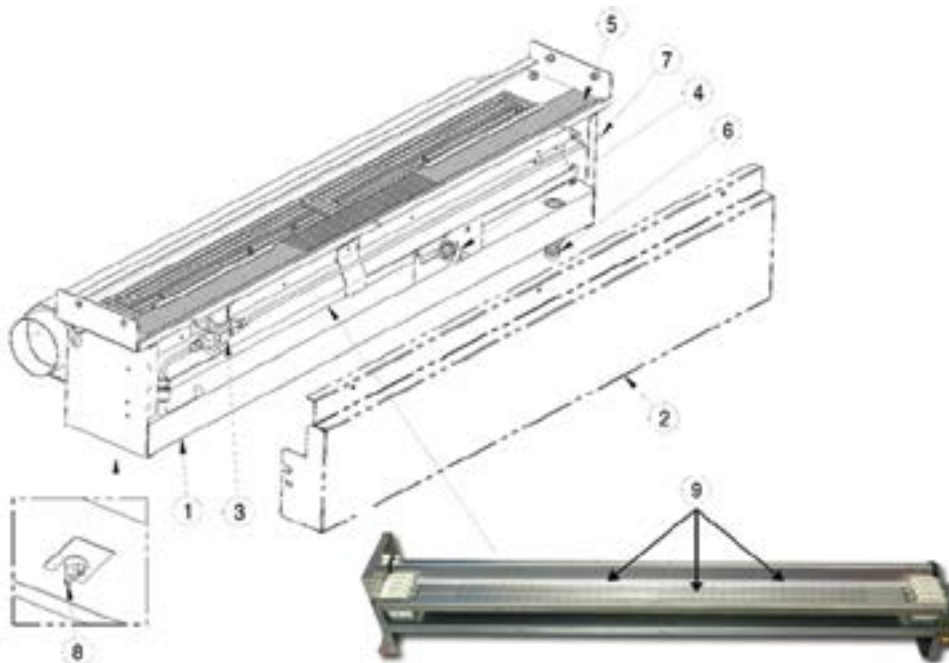
Drain Water.

- This contains the same substances dissolved in the supply water, however in larger quantities;
- It may reach a temperature of 100 ° C;
- It is not toxic and can be drained into the sewerage system, category 3, EN 1717.
- Dispose the drain hose into an ordinary drainage network. The drainage network should have a siphon and must be able to withstand temperatures up to 100° C

F.2.1 - Infrared humidifier components

- | | | | |
|---|--------------------------------|---|-------------------------|
| 1 | humidifier pan | 6 | discharge connection |
| 2 | cover | 7 | supply line |
| 3 | solenoid valve flow regulation | 8 | manual reset thermostat |
| 4 | float switch | 9 | infrared bulbs |
| 5 | humidifier air filter | | |

Fig. 1 - The infrared humidifier and its components



Enclosure F - Infrared Humidifier

F.3 - Start - up and operation

F.3.1 - Start - up

Before using the humidifier, check the following:

- Supply and drain connections.
- That the cut- off tap is open.
- All wiring.
- Earthing.

To start the humidifier simply switch on the air conditioner, which will in turn automatically start and stop the humidifier as required. The (adjustable) parameters which determine humidifier operation have already been factory- preset (see iCOM manual).

F.3.2 - Operation

During normal humidifier operation, deposits of mineral solids will collect in the humidifier pan and on the float switch. These must be cleaned periodically to ensure proper operation. Frequency of cleaning must be locally established because it depends on humidifier usage and local water quality.

A spare pan is recommended to reduce maintenance time at unit. The Liebert autoflush system can greatly increase the time between cleanings, but does not eliminate the need for periodic checks and maintenance.

F.4 - Maintenance

Important: the humidifier components may be hot. Let it cool down before touching it or use protective gloves.

The infrared humidifier 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.

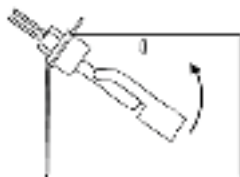
Before performing any operations, check that the humidifier is disconnected from the power supply; carefully read and follow the instructions contained in the manual.

F.4.1 - Cleaning Humidifier Pan and Float Switch

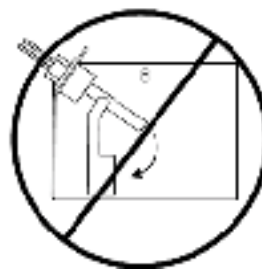
Before turning off unit:

1. With the unit operating, remove call for humidification at the Liebert iCOM control.
2. Let the blower operate 5 minutes to allow the humidifier and water to cool.
3. If the unit has a condensate pump, turn the unit Off at the Liebert iCOM control.
4. Pull out the cover from humidifier.
5. Pull out the humidifier standpipe in pan.
6. Inspect the O- ring (replace if necessary).
7. Let the pan drain and the condensate pump operate (if applicable).
8. Disconnect power from the unit.
9. Disconnect the drain coupling from the bottom of the pan.
10. Remove the thermostat from the bottom of the pan and retaining screws from sides of pan.
11. Slide pan out.
12. Loosen scale on the side and bottom of the pan with a stiff nylon brush or plastic scraper.
13. Flush with water.
14. Carefully clean the scale from the float switch (make sure to reinstall correctly; see Figure 2).
15. Reinstall the pan, thermostat, standpipe, drain coupling, cover and screws into the humidifier.
16. Operate the humidifier and check for leaks.

Fig. 2 - Correct orientation of float switch



Correct Switch Orientation



Incorrect Switch Orientation

F.4.2 - Changing Humidifier Lamps

Important: Touching quartz lamps with bare hands will severely shorten bulb life. Skin oils create hot spots on lamp surface.

Wear clean cotton gloves when handling lamps.

1. Remove the humidifier pan (see F.4.1 - Cleaning Humidifier Pan and Float Switch, Steps 1 through 11).
2. Disconnect power from the unit.
3. At the humidifier, remove the screws and cover from the high- voltage compartment.
4. Disconnect one end of the purple jumper wires.
5. Using a continuity meter, locate the burned- out lamp.
6. Remove the lamp brackets under the lamps.
7. Loosen the two screws securing the lamp lead wires to the junction block.
8. Pull the bulb straight down and discard it.

Enclosure F - Infrared Humidifier

9. Wrap the lead wires once around the new lamp's metal ends. This will support the lamp and allow for thermal expansion. Insert the lead wires into the junction block and torque the screws
10. Reassemble by reversing Steps 1 through 9.

F.4.3 - Changing Humidifier air filters

1. Disconnect power from the unit.
2. Pull out the cover from humidifier.
3. Replace humidifier air filters with new ones
4. Reassemble humidifier cover.

F.4.4 - Periodical checks

1. Check drain lines and trap for clogs
2. Check/clean pan for mineral deposits
3. Clean reflector
4. Check water make- up valve for leaks
5. Check humidifier lamps (replace if burnt out)
6. Check wire connections (inside humidifier box)
7. Check status of humidifier air filters

Tab. 2 - Infrared Humidifier-troubleshooting

Symptom	Possible Cause	Check or Remedy
No humidification	Humidifier pan not filling	Check water supply.
		Check fill valve operation
		Check drain stand pipe adjustment
		Check for clogged waterline
	Control not calling for humidity	Check monitor status
	Humidity contact not pulling in	Check visually. If contact is made, check line voltage after con- tactor and fuses or CBs.
		Check for open humidifier safety stat
Humidifier bulb burned out	Replace bulb. Loosen lead on old bulb. Trim excess lead length on new bulb to avoid shorts.	

Enclosure G - Ultrasonic Humidifier

G.1 - Ultrasonic Humidifier

Ultrasonic Humidifier operates on the principle of ultrasonic nebulization. A 48VAC voltage is rectified on an oscillator circuit and transformed into a high frequency signal of 1.65MHz.

This signal is transmitted to a transducer installed in the water which then transforms the signal into high frequency automatic vibrations. The built-in transducers - also called "thickness transducers" - change their thickness 1.65million times per second in accordance with the signal of 1.65MHz applied.

Ultrasonic Humidifier can work only with demineralized water with conductivity < 5 µS/cm (up to 20 µS/cm for a short time).

If demineralized water is not available, provide demineralizer (not supplied).

Ultrasonic Humidifier is controlled by a microprocessor-based electronic controller.

It includes control board, driver board and remote display board, all of them housed inside the humidifier electrical panel, located behind Liebert PCW right door.

The functioning logic of the Ultrasonic Humidifier is PROPORTIONAL. The controller comes complete with DSP card which allows to display and modify all the parameters of the humidifier as well as to detect any abnormal condition via alarm messages.

For safety reason and in order to obtain optimum performance from the humidifier, this manual and the HSU08RM000 manual must be read carefully.

Tab. 1 - Ultrasonic Humidifier specifications

Humidifier Model	POWER SUPPLIES (VAC)	SETTINGS [kg/h]	NUMBER OF TRANSDUCERS	ABSORBED POWER [W]
HSU08RM000	48	0...6.0	16	670

G.2 - Installation

The Ultrasonic humidifier is supplied mounted within one base module 400 mm high.

The base module with humidifier is supplied stand alone and it will be installed and connected with the air conditioner on field.

The module can be installed on the raised floor, see fig. 1, or in the raised floor, see fig. 2 (front and bottom module opened, sides and back module closed).

When installed in the raised floor it is necessary to remove the module frontal panel to have also frontal air delivery.

A base frame, available on request, is required to support ultrasonic humidifier module.

Ensure 1 meter of free space (without obstacles) on ultrasonic humidifier module outlet.

For Extended Height unit, connect the fan module above the humidifier module and then the coil module above the fan module.

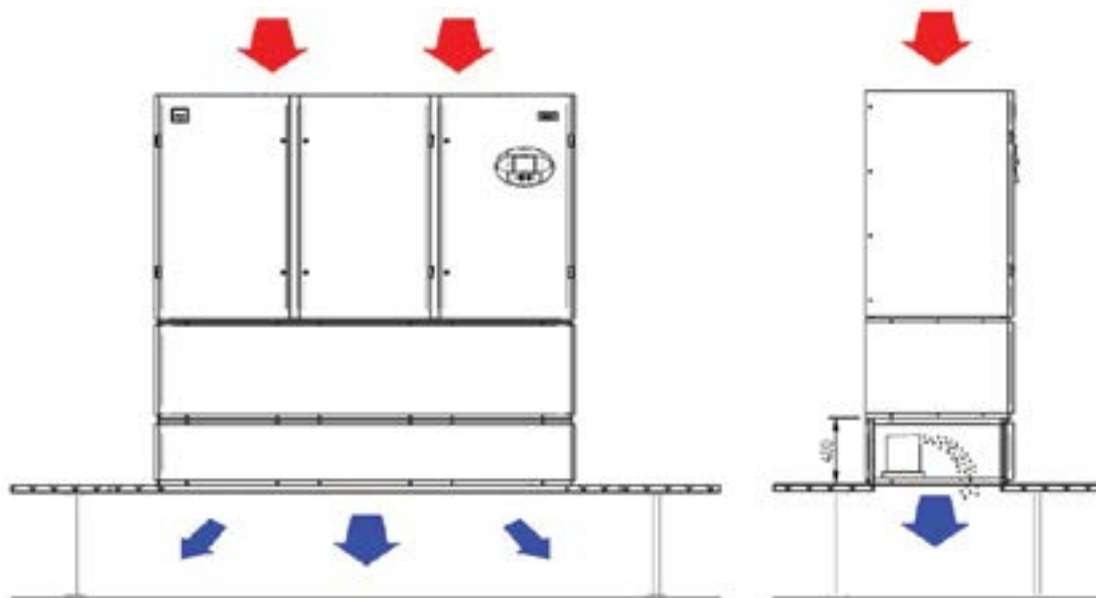
Connect humidifier electrical cable, coming from the air conditioner, to the ultrasonic humidifier.

Connect water supply, water drain, safety overflow and humidifier drain pan water drain.

The relevant piping connections shall be in material resistant to fully demineralized water.

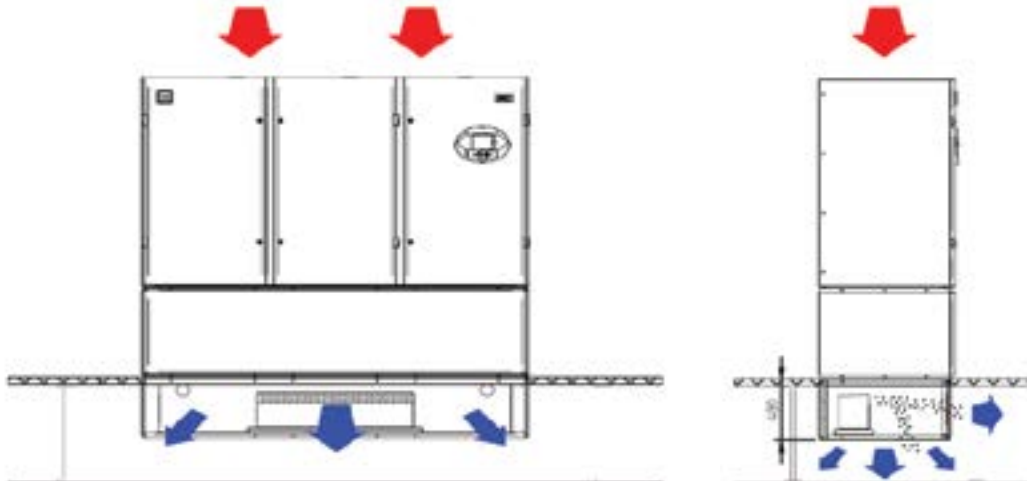
Refer to HSU08RM000 manual for details.

Fig. 1 - Ultrasonic humidifier module on the raised floor, frontal and lateral views



Enclosure G - Ultrasonic Humidifier

Fig. 2 - Ultrasonic humidifier module in the raised floor, frontal and lateral views



Supply Water.

- Supply fully demineralized water with conductivity <math>< 5 \mu\text{S}/\text{cm}</math>. If demineralized water is not available, provide demineralizer (not supplied)
 - Water pressure from 50 kPa to 500 kPa
 - Water temperature from 8° C to 40° C
 - Dust or dirt must not get into the water lines
- Refer to HSU08RM000 manual for details.

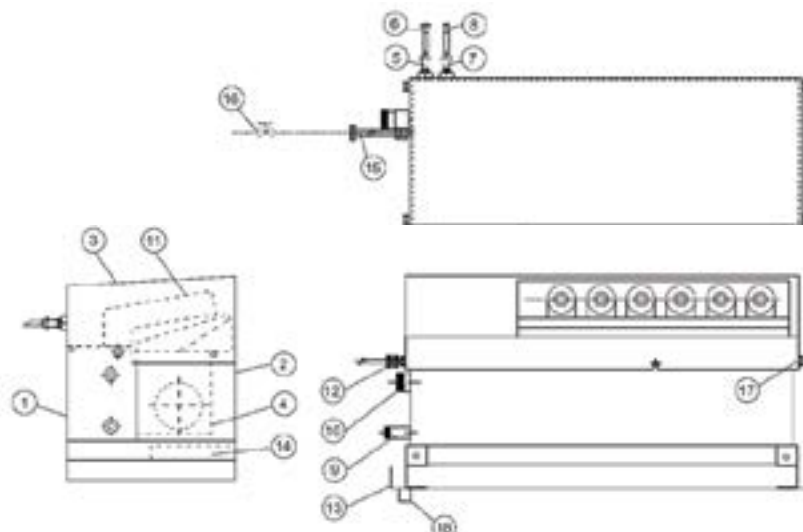
Drain Water.

- The drain water contains the same substances dissolved in the supply water, however in larger quantities;
 - It is not toxic and can be drained into the sewerage system, category 3, EN 1717.
 - Dispose the drain hose into an ordinary drainage network (the drainage network should have a siphon).
- Refer to HSU08RM000 manual for details.

G.2.1 - Ultrasonic humidifier components

- | | |
|---------------------|--|
| 1. humidifier | 10. safety overflow |
| 2. fan case | 11. mist guide pipe |
| 3. mist guide cover | 12. ring and nut |
| 4. fan | 13. humidifier drain pan |
| 5. metal plug | 14. air filter |
| 6. cable | 15. water supply connection |
| 7. metal plug | 16. check valve (to be provided by the Customer) |
| 8. cable | 17. damper |
| 9. water drain | 18. humidifier drain pan water drain |

Fig. 3 - The Ultrasonic humidifier and its components



Enclosure G - Ultrasonic Humidifier

G.3 - Start - up and operation

G.3.1 - Start - up

Before using the humidifier, check the following:

- Supply and drain connections.
- That the cut- off tap is open.
- All wiring.
- Earthing.

To start the humidifier simply switch on the air conditioner, which will in turn automatically start and stop the humidifier as required. The (adjustable) parameters which determine humidifier operation have already been factory-preset (see iCom manual). Refer to iCom manual and HSU08RM000 manual for details.

G.3.2 - Operation

Ultrasonic humidifier operates on the principle of ultrasonic nebulization.

The mist generated in the water tank by means of the transducer is blown into the room by the built-in fan. The humidifier consists of nebulization modules, solenoid valve for the control of the supply water, float switch and a case that houses the fan.

Refer to HSU08RM000 manual for details.

G.4 - Maintenance

If the humidifier is not used for a long period, the water must be drained off.

NEVER operate the humidifier without air supply.

Before performing any operations, check that the humidifier is disconnected from the power supply; carefully read and follow the instructions contained in the manual.

G.4.1 - Periodical checks

1. Check drain lines and trap for clogs
2. Check/clean pan for dust
3. Check wire connections (inside humidifier box)
4. Check status of humidifier air filters



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