



THERMO-TEC®
KLIMAGERÄTE



BEDIENHANDBUCH

Rackkühler

HRCC

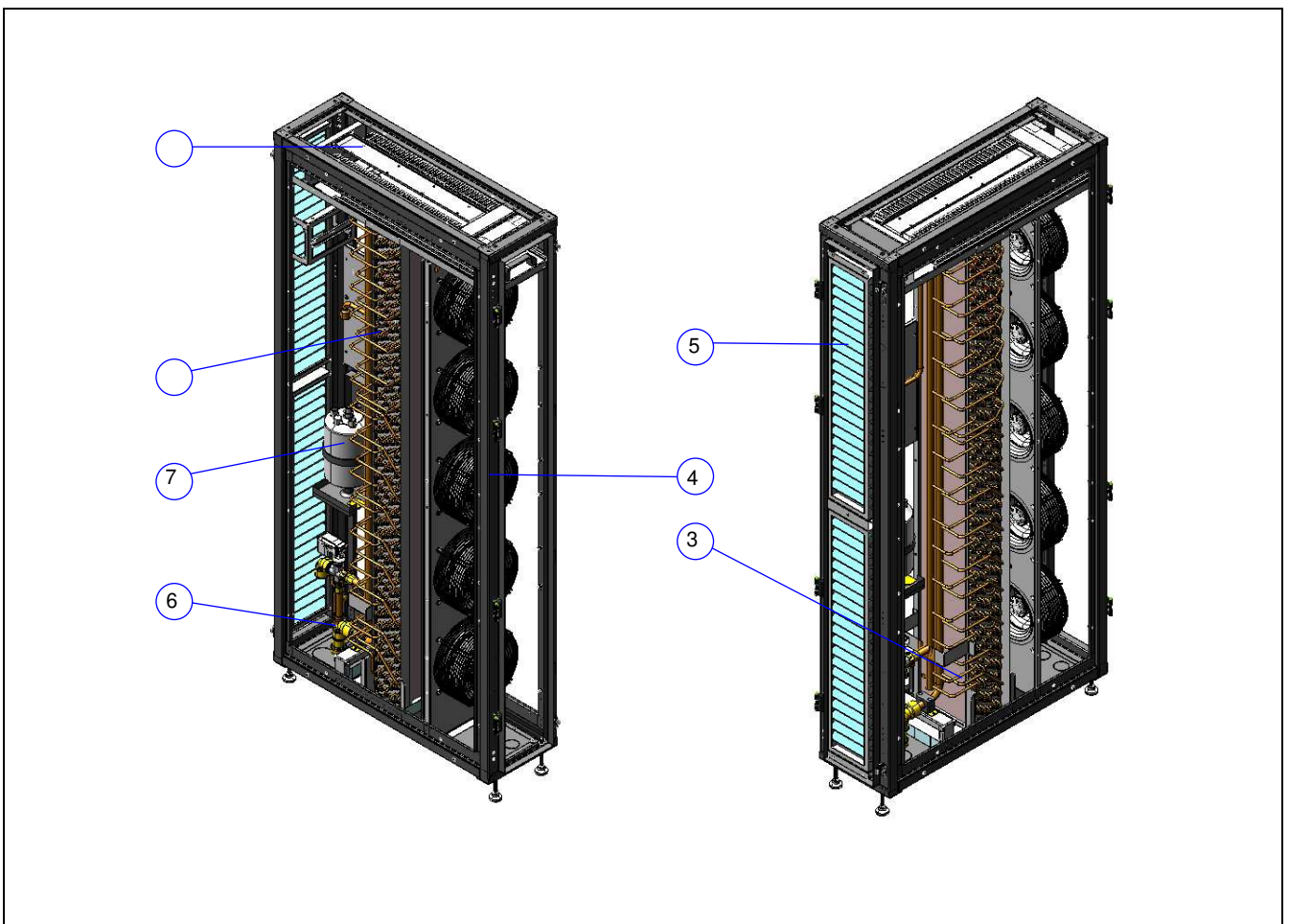
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1 General Description

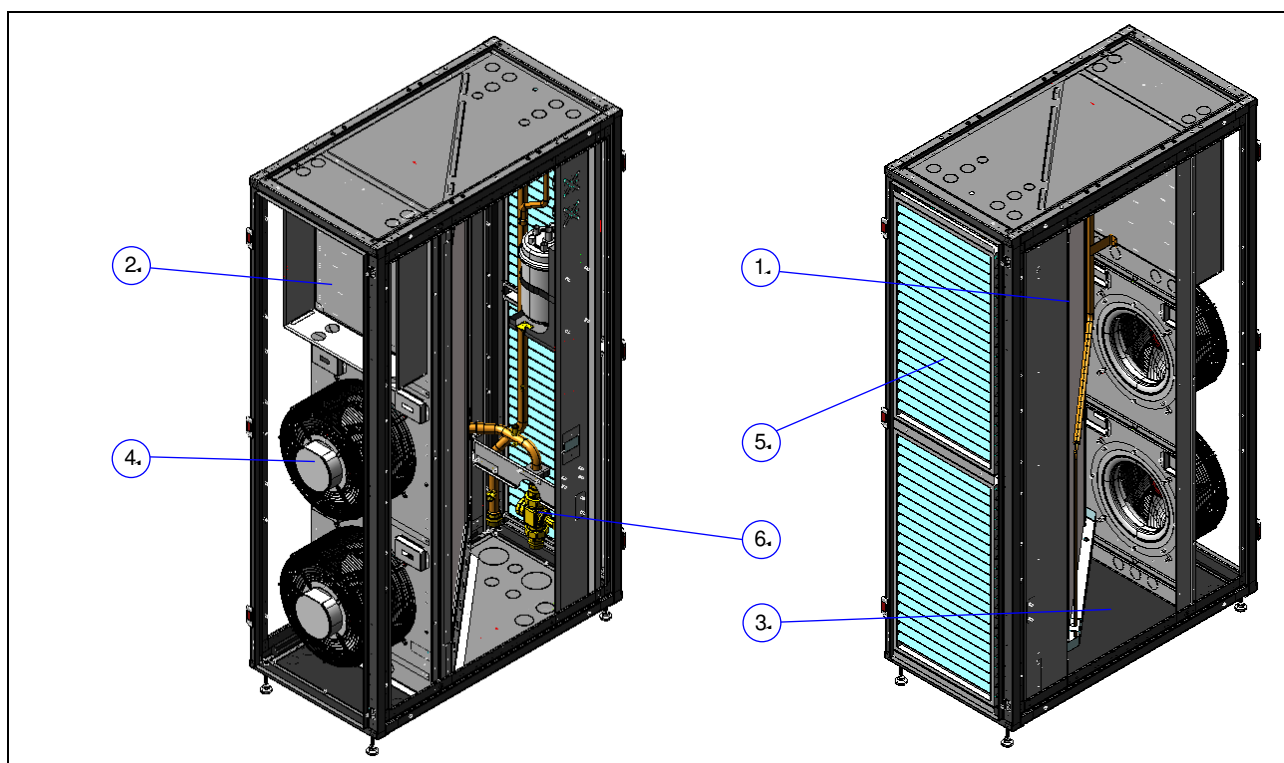
HRCC “CCAC” self-contained units are specially designed for installation in technological environments where a spot cooling is needed . **HRCC** units represent the state of the art between technology and design as well as all **HiRef S.p.A.** products: The depth of 1200 or 1000 mm, allows the compatibility with standard server rack: furthermore the innovative design and the high tech selected colours make **HRCC** units complementary to the last generation of IT devices. The internal design of the units in firstly made looking to efficiency and reliability but don't losing accessibility: all components, including fans, valves, electrical components, etc. can be maintained from the front . The exclusive use of primary brands components and a fully integrated development process (CAD + CAM, CAE) stands for highest possible quality level regarding efficiency, reliability, maintenance time, pre and after sales support.

Fig. 1 HRCC0200 - 0250



Rif.	Descrizione	Rif.	Descrizione
1	Chilled water coil	5	Air filter
2	Electrical panel (reclaining for access to the fans)	6	Water valve
3	Double stainless steel drain pan	7	Humidifier
4	Fan		

Fig.2 HRCC0450 - 0510



Rif.	Descrizione	Rif.	Descrizione
1	Chilled water coil	5	Air filter
2	Electrical panel	6	Water valve
3	Double stainless steel drain pan	7	Humidifier
4	Fan		

1.1 Structure

HRCC units are designed with a self supporting frame and all components are produced using sophisticated computer driven machines and special tools. All sheet metals are galvanized and all external panels are powder coated RAL 7016 giving to the units the image and the quality like last generation of IT devices. The shape of the units is characterized with the curved edges with variable radius as for all **HiRef** products: this feature is obtained using special tools and gives both a good aesthetic and advantages against injuries. All fixing elements are made in stainless steel or in non corroding materials. The drain pan is made in stainless steel in order to ensure long time operation without damages.

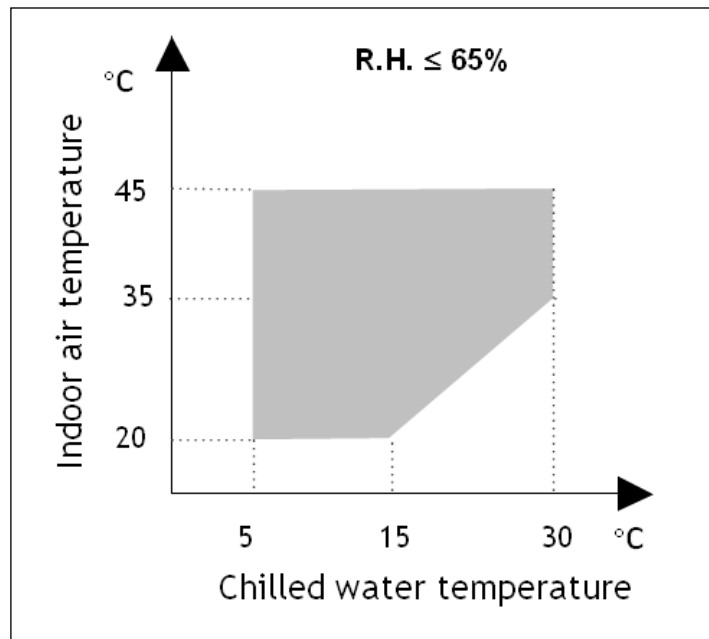
All panels are thermally insulated with a polyurethane foam class 1 according UL 94 norms: this material, thanks to the open cells, gives good performances in sound absorption.

1.2 Application limits

Tab. 2 Operation limits
Power supply limits and storage conditions

Model	HRCC0200_0250	HRCC0450_0510
Power supply	230 Vac \pm 10%	400 Vac \pm 10%/ 3+N/ 50Hz
Storage conditions	from	-10 °C / 90 % R.H.
	to	+50 °C / 90 % R.H.

Fig. 3 Application limits



1.3 Components

Electric control board

Electric control board: The electric control board is constructed and wired in accordance with Directives 73/23/EEC and 89/336/EEC and related standards. The board may be accessed through a door after the main switch has been turned off.

All the remote controls use 24 V signals powered by a safety transformer situated in the electrical panel.

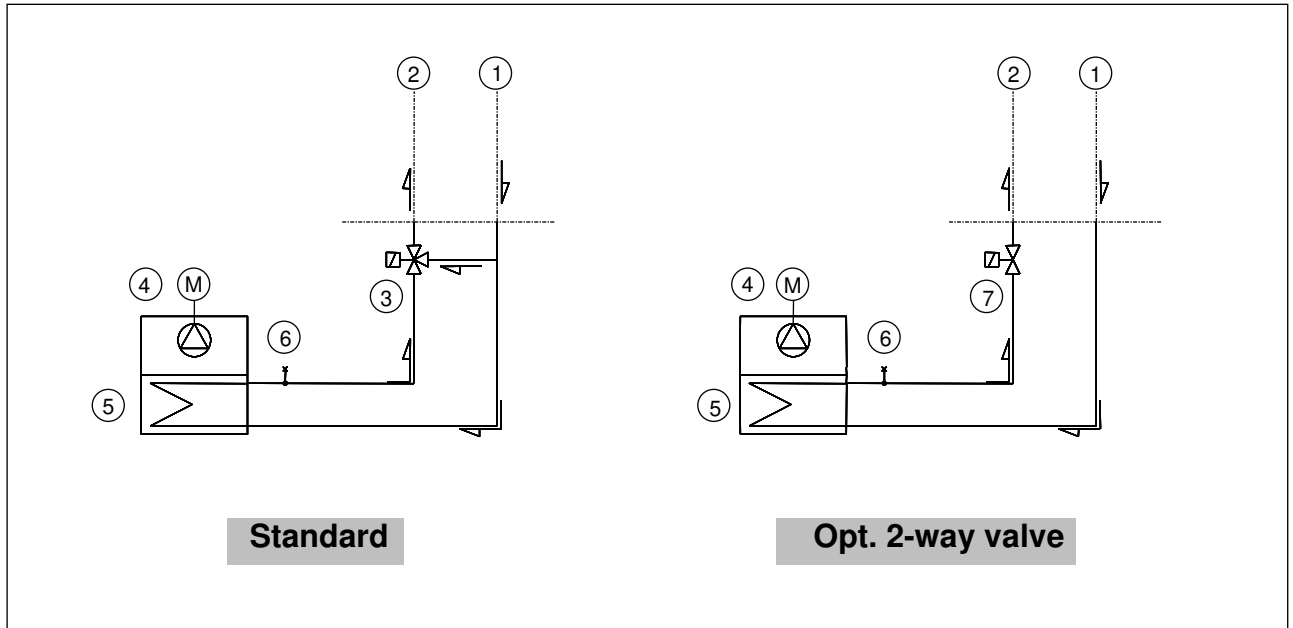
Microprocessor control

The microprocessor built into the unit allows the different operating parameters to be controlled from a set of pushbuttons situated on the electric control board:

- Water valve modulation to maintain the temperature set point
- Alarm management :
 - High / Low temperature;
 - Dirty filters alarm (optional);
 - Air flow alarm.
- Alarm signalling.
- Display of operating parameters.

See microprocessor control chapter for further details.

Fig.4 Basic cooling circuit



Pos.	Description	Pos.	Description
1	Chilled water inlet	5	Coil heat exchanger
2	Chilled water outlet	6	Breather valve
3	3-way valve	7	2-way valve (Opt.)
4	Plug fan	-	

Water Valve

Modulating valves allow an high precision in controlling the rack temperature

- 3 way for constant flow systems
- 2 way valve for variable flow. In this case Free cooling application range will be extended thanks to the increase of return water T once the load descreases.

Valves' technical data:

Model	HRCC0200_0250	HRCC0450_0510
PN valve	16	16
Dimension (inch)	1 1/4"	2 1/4"

All HRCC units are supplied with 3 or 2 way valve with 0 ÷ 10 V signal regulation.

1.4 Installation warnings

General rules

- When installing or servicing the unit, you must strictly follow the rules provided in this manual, comply with the directions on the units themselves and take all such precautions as are necessary.
- The fluids under pressure in the cooling circuit and the presence of electrical components may cause hazardous situations during installation and maintenance work.



All work on the unit must be carried out by qualified personnel only, trained to do their job in accordance with current laws and regulations.

- Failure to comply with the rules provided in this manual or any modification made to the unit without prior authorisation will result in the immediate invalidation of the warranty.



Warning: Before performing any kind of work on the unit, make sure it has been disconnected from the power supply.

2 Inspection / Transport / Positioning

2.1 Inspection on receipt

On receiving the unit, check that it is perfectly intact: the unit left the factory in perfect conditions; immediately report any signs of damage to the carrier and note them on the "Delivery Slip" before signing it.

HiRef S.p.A. or its agent must be promptly notified of the entity of the damage. The Customer must submit a written report describing every significant sign of damage.

2.2 Lifting and transport

While the unit is being unloaded and positioned, utmost care must be taken to avoid abrupt or violent manoeuvres. The unit must be handled carefully and gently; avoid using machine components as anchorages or holds and always keep it in an upright position.

The unit should be lifted using the pallet it is packed on; a transpallet or similar conveyance means should be used.



Warning: In all lifting operations make sure that the unit is securely anchored in order to prevent accidental falling or overturning.

2.3 Unpacking

The packing must be carefully removed to avoid the risk of damaging the unit. Different packing materials are used: wood, cardboard, nylon etc.

It is recommended to keep them separately and deliver them to suitable waste disposal or recycling facilities in order to minimise their environmental impact.

2.4 Positioning

Bear in mind the following aspects when choosing the best site for installing the unit and the relative connections:

- positioning and dimensions of the coupling flanges;
- location of power supply;
- solidity of the supporting floor.

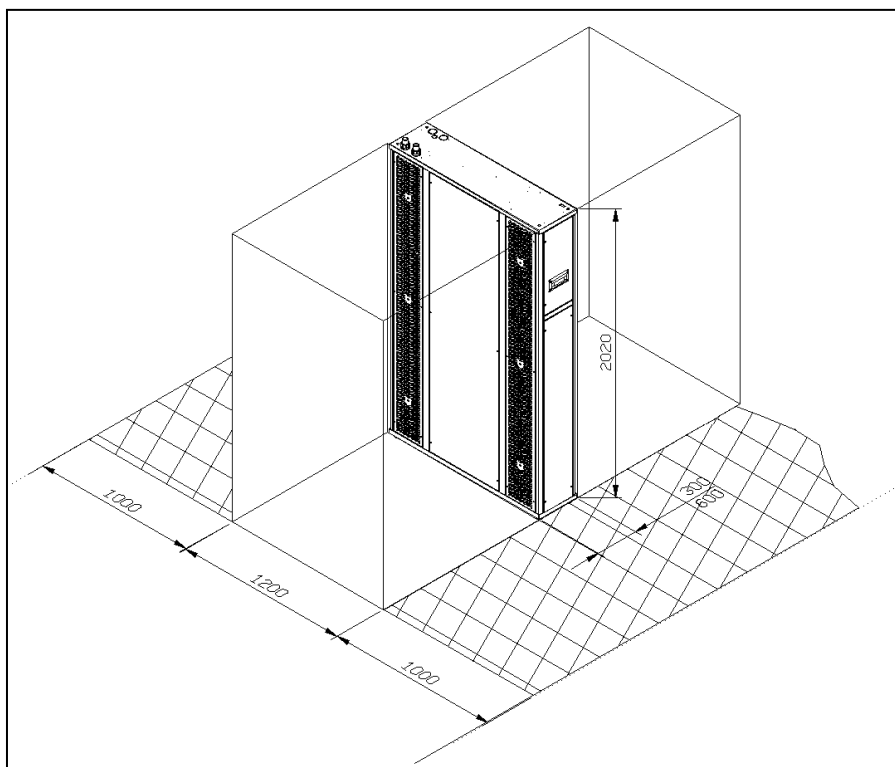
It is recommended to first prepare holes in the floor/wall for passing through the power cables and for the air outlet (down flow units).

The dimensions of the air outlet and the positions of the holes for the screw anchors and power cables are shown in the dimensional drawing (see the documentations delivered together with the unit)

3 Installation

The **HRCC** air-conditioning unit is suitable for all environments except aggressive ones. Do not place any obstacles near the units and make sure that the air flow is not impeded by obstacles and/or situations causing back suction.

Fig. 5 Service area



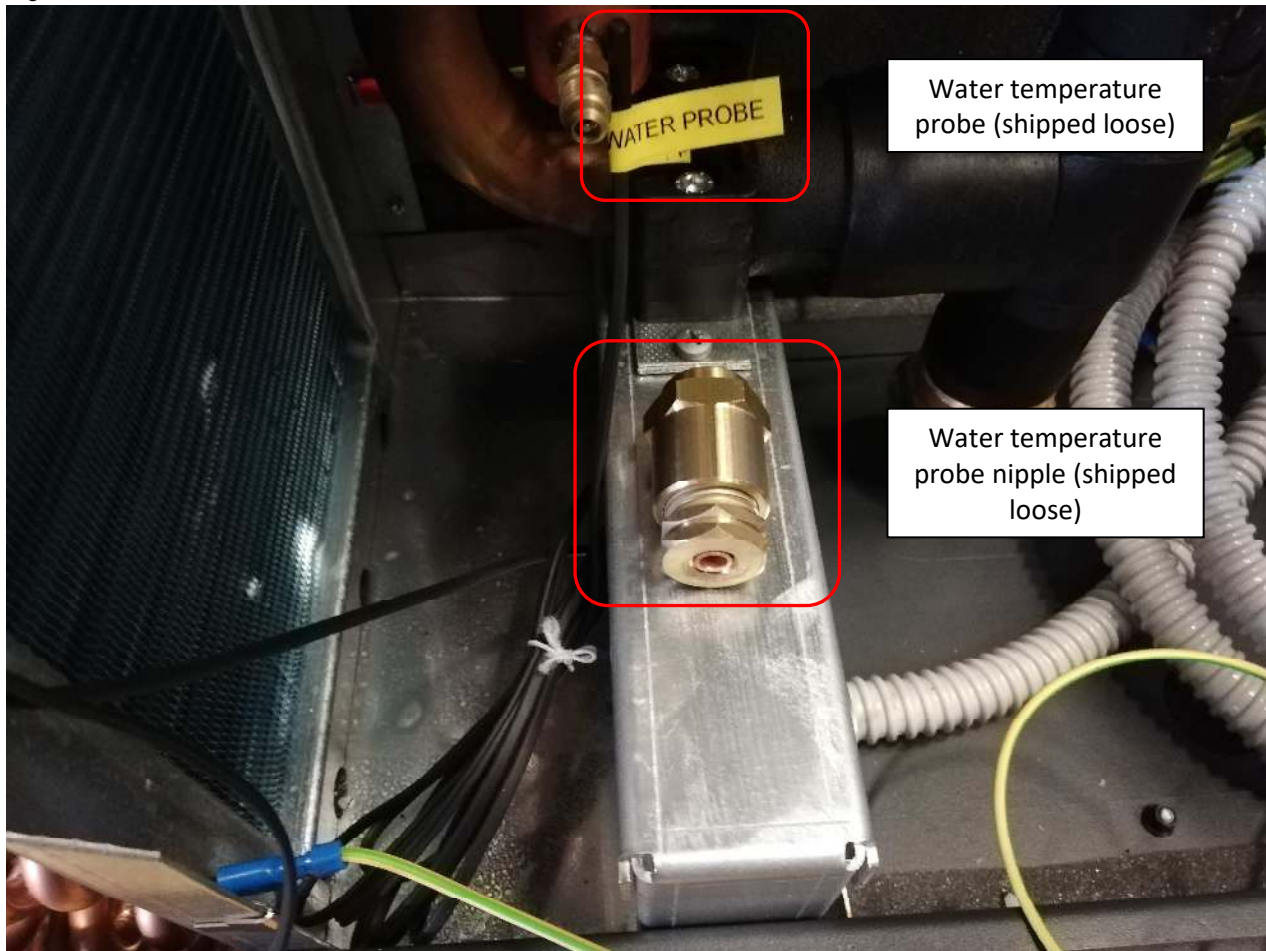
The following steps should be carried out to ensure proper installation:

- Apply a anti-vibration rubber lining between the unit and the bottom.
- Position the unit on the floor

3.1 Water temperature probe installation

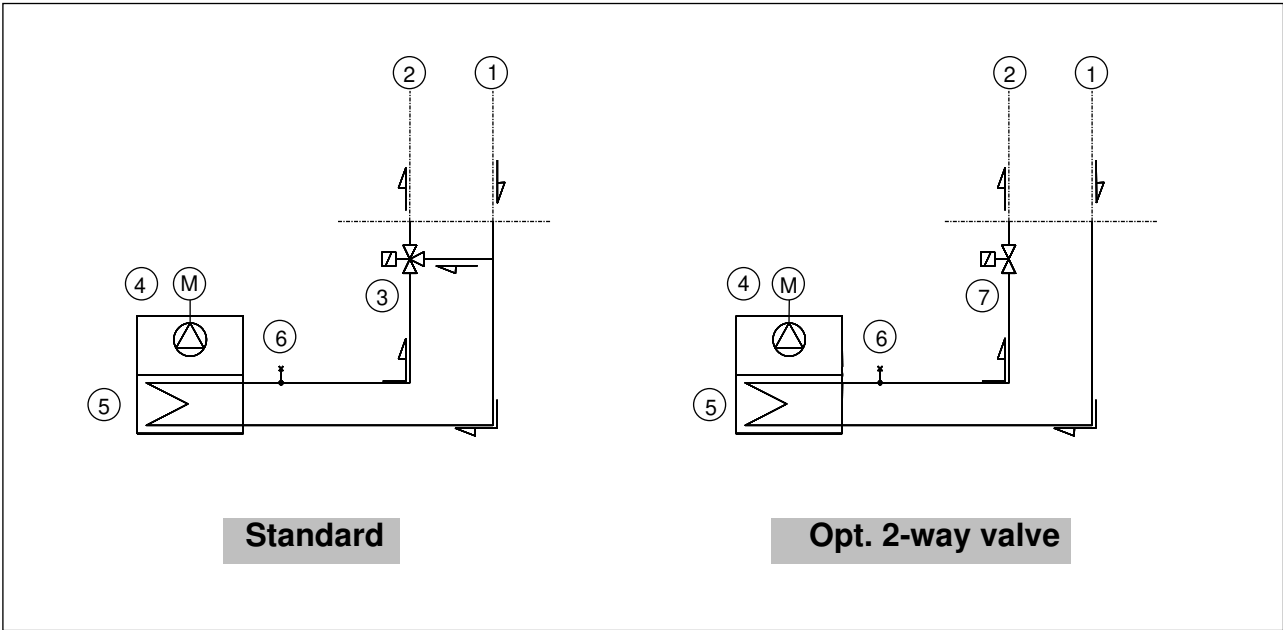
The HRCC units are supplied with the probes for measuring the inlet and outlet water temperature, when they are required, The temperature probes (identified by a yellow label with the inscription 'WATER PROBE') and the relative probe nipples will be shipped loose.

Fig. 6



The customer will have to place the probe nipple in the pipe of its inlet water line **(1)** before the unit water connection, and then place the inlet water temperature probe there.

The customer will have to place the probe nipple in the pipe of its outlet water line **(2)** after the unit water connection, and then place the outlet water temperature probe there.



Pos.	Description	Pos.	Description
1	Chilled water inlet	5	Coil heat exchanger
2	Chilled water outlet	6	Breather valve
3	3-way valve	7	2-way valve (Opt.)
4	Plug fan	-	

4 Water properties

The quality and chemical composition of the cooling and heat transfer medium have a great influence on the Lifetime and on heat transfer and thus on the performance of the specific unit.

Basically, avoid all types of floating matter in the cooling and heat transfer medium.

When the suspended matter accumulates in the heat exchanger the heat transfer and thus the performance of the unit deteriorate.

Below are the values of the dissolved substances and the water properties recommended by the manufacturer listed.

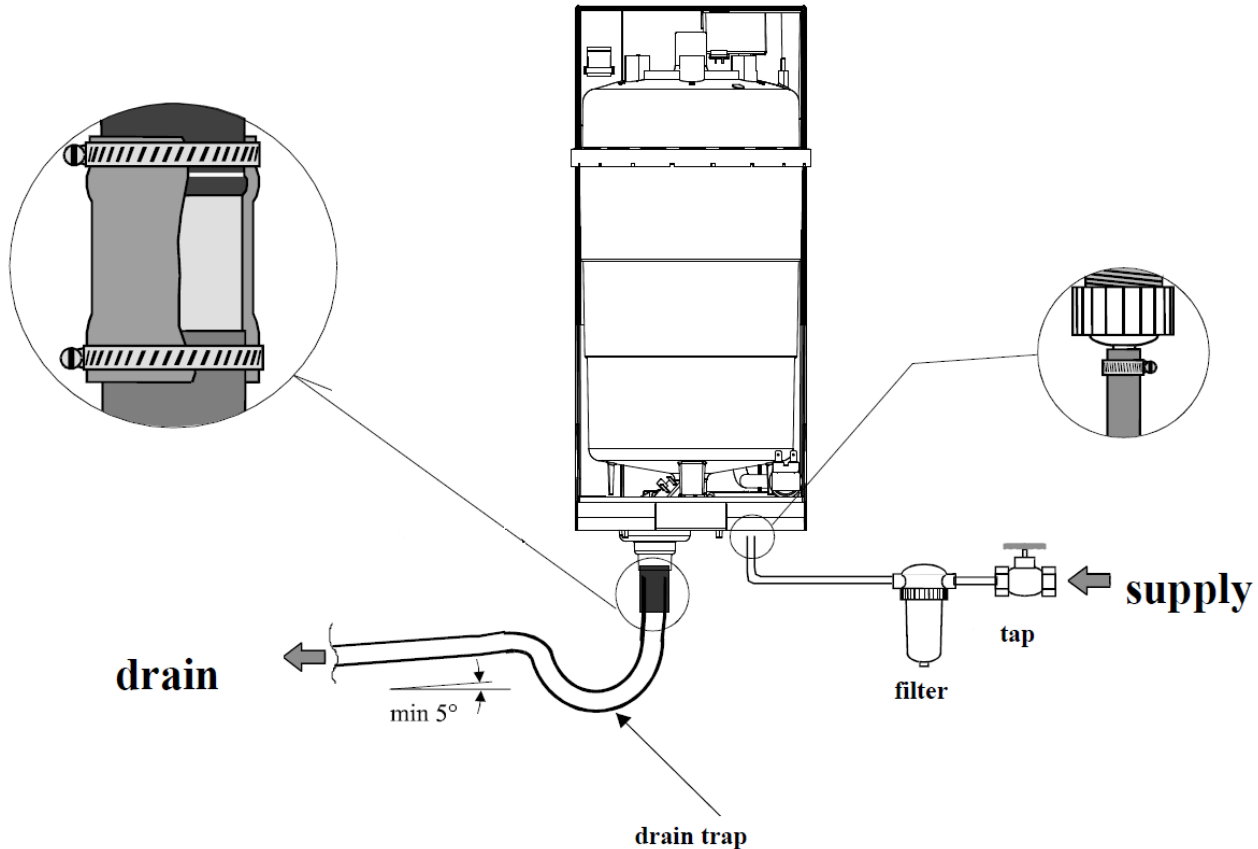
The information refers to the use of exchangers made of copper.

If the concentration of some components will be out of range, the customer has to introduce a correction, otherwise the system will be out of warranty.

WATER CONTENT	CONCENTRATION
Alkalinity (HCO ₃ ⁻)	70 - 300 ppm
Sulphate (SO ₄ ²⁻)	< 70 ppm
HCO ₃ ⁻ / SO ₄ ²⁻	> 1.0 ppm
Electrical conductivity	10 - 500 µS/cm
pH*	7.5 - 9.0
Ammonium (NH ₄ ⁺)	< 2 ppm
Chloride (Cl ⁻)	< 30 ppm
Free chlorine (Cl ₂)	< 0.5 ppm
Hydrogen sulphide (H ₂ S)	< 0.05 ppm
Carbon dioxide (CO ₂)	< 5 ppm
Total hardness (°dH)	4.5 - 8.5
Nitrate (NO ₃ ⁻)	< 100 ppm
Iron (Fe)**	< 0.2 ppm
Aluminium (Al)	< 0.2 ppm
Manganese (Mn)**	< 0.05 ppm
Calcium carbonate (CaCO ₃)	< 200 ppm
Phosphate (PO ₄ ³⁻)	< 2 ppm
Ammonia (NH ₃)	< 0.5 ppm
Temperature (°C)	< 65 °C
Oxygen content	< 0.1 ppm
*Generally a low pH value (less than 6) increases the risk of corrosion and a high pH (above 7.5) decreases the risk of corrosion	
**Fe ³⁺ and Mn ⁴⁺ are powerful oxidants and may increase the risk of localized corrosion on stainless steel	

5 Humidifier

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



To simplify installation, it is recommended to use hose with an inside diameter of 6 mm and an outside diameter of 8 mm and the revolving 3/4" G connection, either straight or 90°.

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

The drain water is connected using a section of rubber or plastic hose resistant to 100°C, with a recommended inside diameter of 32 mm.

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

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

The following conditions represent correct water connection:

- installation of a shut-off tap in the supply water line;
- presence of a mechanical filter in the supply water line;
- water temperature and pressure within the allowed values;
- drain hose resistant to temperatures of 100°C;
- minimum inside diameter of the drain hose of 25 mm
- minimum slope of the drain hose greater than or equal to 5°;

- electrically **non-conductive** sleeve.
- presence of a drain trap in the drain hose

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

SUPPLY WATER

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

- pressure between 0.1 and 0.8 MPa (1 to 8 bar, 14.5 to 116 psi);
- temperature between 1 and 40°C;
- instant flow rate not lower than the rated fill solenoid valve flow rate (0.6 l/min)
- connection type 3/4" G male.

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

	Symbol	Unit	Min	Max
Hydrogen ions	pH		7	8.5
Specific conductivity at 20°C	$\sigma_{R, 20^{\circ}C}$	$\mu\text{S/cm}$	300	1250
Total dissolved solids	TDS	mg/l	(1)	(1)
Dry residue at 180°C	R ₁₈₀	mg/l	(1)	(1)
Total hardness	TH	mg/l CaCO ₃	100(2)	400
Temporary hardness		mg/l CaCO ₃	60(3)	300
Iron + Manganese		mg/l Fe + Mn	0	0.2
Chlorides		ppm Cl	0	30
Silica		mg/l SiO ₂	0	20
Residual chlorine		mg/l Cl ⁻	0	0.2
Calcium sulphate		mg/l CaSO ₄	0	100
Metallic impurities		mg/l	0	0
Solvents, diluents, soaps, lubricants		mg/l	0	0

(1) Values depending on specific conductivity; in general: TDS \cong 0.93 * σ_{20} ; R₁₈₀ \cong 0.65 * σ_{20}

(2) Not lower than 200% of the chloride content in mg/l of Cl⁻

(3) Not lower than 300% of the chloride content in mg/l of Cl⁻

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

	Symbol	Unit	Min	Max
Hydrogen ions	pH		7	8.5
Specific conductivity at 20°C	$\sigma_{R, 20^{\circ}C}$	$\mu\text{S/cm}$	125	500
Total dissolved solids	TDS	mg/l	(1)	(1)
Dry residue at 180°C	R ₁₈₀	mg/l	(1)	(1)
Total hardness	TH	mg/l CaCO ₃	50(2)	250

Temporary hardness	mg/l CaCO ₃	30(3)	150
Iron + Manganese	mg/l Fe + Mn	0	0.2
Chlorides	ppm Cl	0	20
Silica	mg/l SiO ₂	0	20
Residual chlorine	mg/l Cl ⁻	0	0.2
Calcium sulphate	mg/l CaSO ₄	0	60
Metallic impurities	mg/l	0	0
Solvents, diluents, soaps, lubricants	mg/l	0	0

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

(2) Not lower than 200% of the chloride content in mg/l of Cl⁻

(3) Not lower than 300% of the chloride content in mg/l of Cl⁻

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

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

Avoid:

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

DRAIN WATER

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

6 Electrical Connections

6.1 Generalities



Before carrying out any job on electrical parts, make sure the power supply is disconnected.

Check that the mains electricity supply is compatible with the specifications (voltage, number of phases, frequency) shown on the unit rating plate.



The size of the cable and line protections must conform to the specifications provided in the wiring diagram.

The supply voltage may not undergo fluctuations exceeding $\pm 10\%$ the rated values indicated on the nameplate



The above operating conditions must always be complied with: failure to ensure said conditions will result in the immediate invalidation of the warranty.

The electrical connections must be made in accordance with the information shown in the wiring diagram provided with the unit and with current and local regulations. An earth connection is **mandatory**. The installer must connect the earthing wire using the earthing terminal situated on the electric control board (yellow and green wire). The power supply to the control circuit is taken from the power line through an insulating transformer situated on the electric control board. The control circuit is protected by suitable fuses or automatic breakers depending on the unit size.

The recommended sizes for the power cables are shown in the electrical diagram attached on the unit documentation.



When the motor runs independently due to air flowing through or if it continues to run down after being turned off, dangerous voltages of over 50V can arise on the motor internal connections through operation of the generator.



Even after disconnecting the mains voltage, life-threatening charges can appear between the protective ground "PE" and the mains connection. The protective earth is conducting high discharge currents (dependent on the switching frequency, current source voltage and motor capacity). Earthing in compliance with EN specifications shall therefore be observed even for testing and trial conditions (EN 50 178, Art.5.2.11).

Regarding the differential protection that needs to be installed upstream, it is necessary to use a type A switch that is sensitive to direct currents. It is mandatory for it to have the following features:

1. **Calibratable operation threshold**
2. **Calibratable operation delay**

7 Operating Diagrams

Changing the side, frontal and rear panels it's possible to modify the air flow configuration as in the following pictures.

Fig. 8 HRCC0200 - 0250

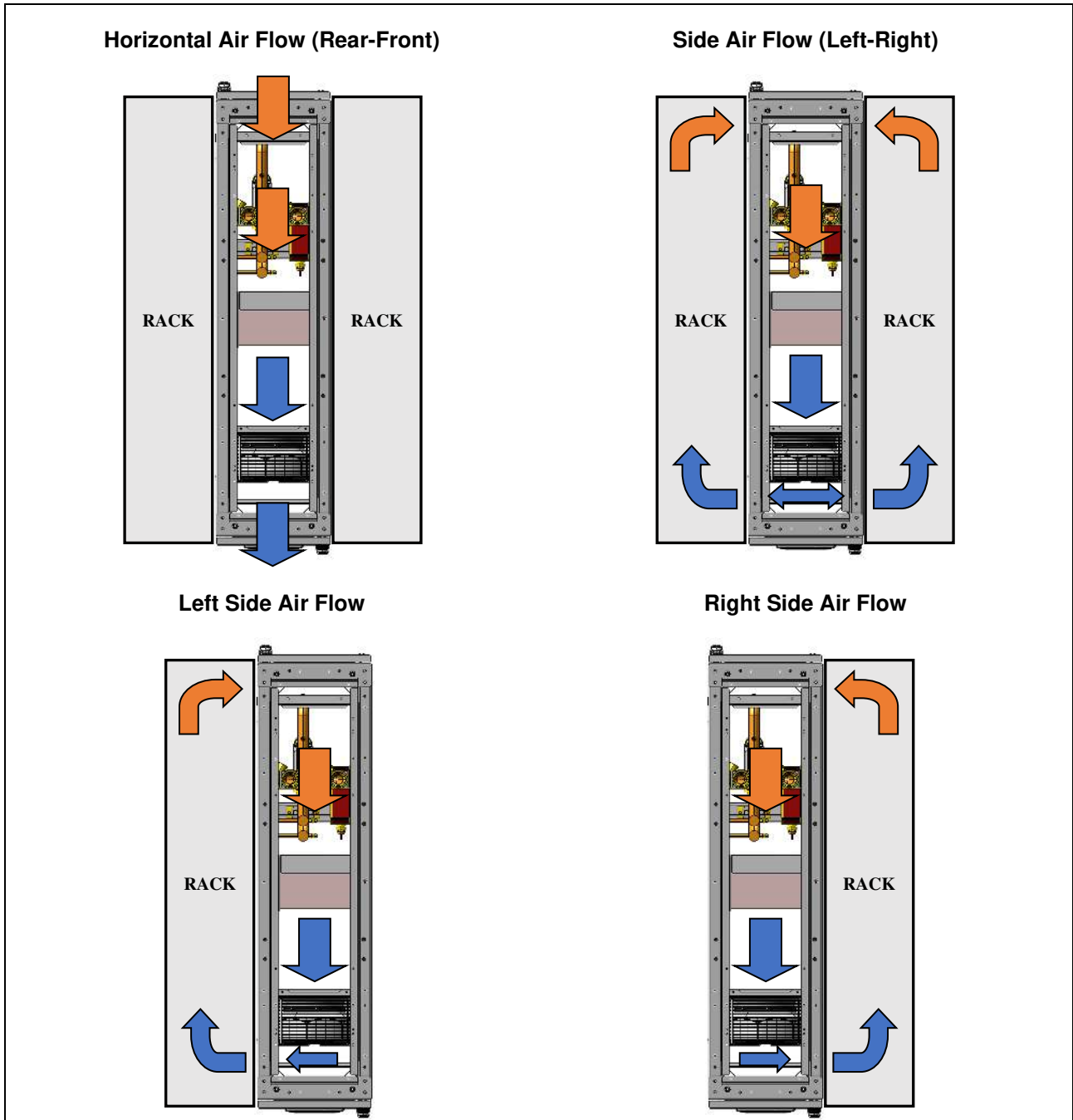
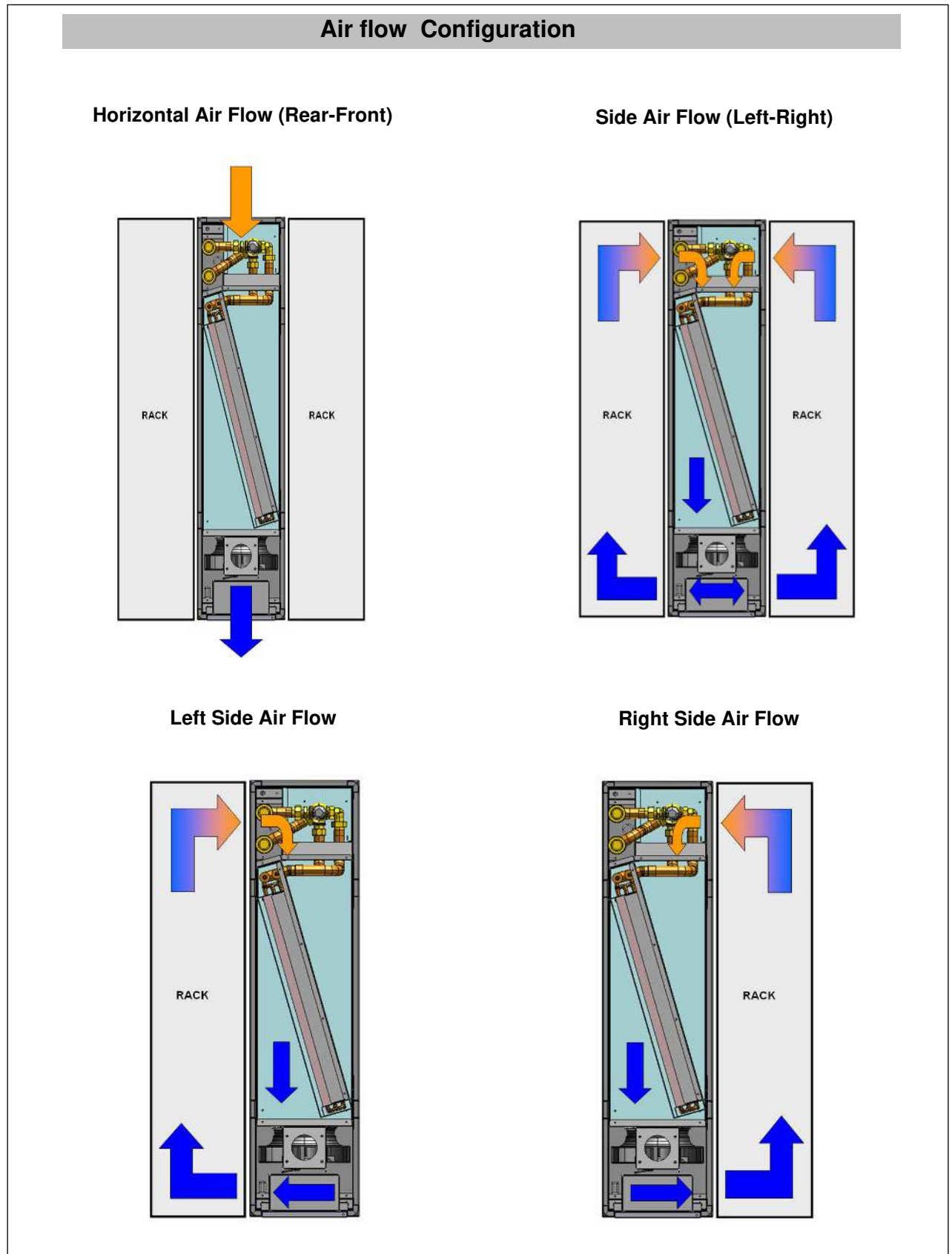


Fig. 9 HRCC0450 - 0510



8 Start-Up

8.1 Preliminary checks

Check that the electrical connections have been made properly and that all the terminals **are securely tightened**. This check should also be included in a periodic six-month inspection.

8.2 Starting operations

Before starting the unit, turn the main switch on, select the operating mode desired from the control panel and press the "ON" button on the control panel.

If the unit fails to start up, check if the service thermostat has been set according to the nominal values provided.



You should not disconnect the unit from the power supply during periods when it is inoperative but only when it is to be taken out of service for a prolonged period (e.g. at the end of the season).



Never attempt to modify internal electrical connections: any undue modifications will immediately invalidate the warranty.

9 Setting Operating Parameters

9.1 Generalities

All the control devices are set and tested in the factory before the unit is dispatched. However, after the unit has been in service for a reasonable period of time you can perform a check on the control devices. The settings are shown in Tab. 5.



All servicing of the equipment is to be considered extraordinary maintenance and may be carried out BY QUALIFIED TECHNICIANS ONLY: incorrect settings may cause serious damage to the unit and injuries to persons.

The operating parameters and control system settings configurable by means of the microprocessor control are password protected if they have a potential impact on the integrity of the unit.

Tab. 5 Setting of control devices

Control device		Set point	Differential
Differential air pressure switch (air flow)	Pa	50	30
Differential air pressure switch (dirty filter)	Pa	70	20

Values to be calibrated depending on the application.

10 Maintenance

The only operations to be performed by the user are to switch the unit on and off. All other operations are to be considered maintenance work and must thus be carried out by qualified personnel trained to do their job in accordance with current laws and regulations.

10.1 Warnings



All the operations described in this chapter MUST ALWAYS BE PERFORMED BY QUALIFIED PERSONNEL ONLY.



Before carrying out any work on the unit or accessing internal parts, make sure you have disconnected it from the mains electricity supply.



Be especially careful when working in proximity to finned coils since the 0.11 mm-thick aluminium fins can cause superficial injuries due to cuts.



After completing maintenance jobs, always replace the panels enclosing the units and secure them with the fastening screws provided.

10.2 Generalities

To guarantee a constantly satisfactory performance over time, it is advisable to carry out routine maintenance and checks as described below. The indications are related to standard tear and wear.

Tab. 7 Routine maintenance

Operation	Frequency
Check the efficiency of all the control and safety devices.	Once a year
Check the terminals on the electric control board to ensure that they are securely tightened. The movable and fixed contacts of the circuit breakers must be periodically cleaned and replaced whenever they show signs of deterioration.	Once a year
Check the efficiency of the differential air pressure switch and dirty filter differential pressure switch.	Every 6 months
Check the condition of the air filter and replace it if necessary.	Every 6 months

Fig. 10 Inspecting the air filter

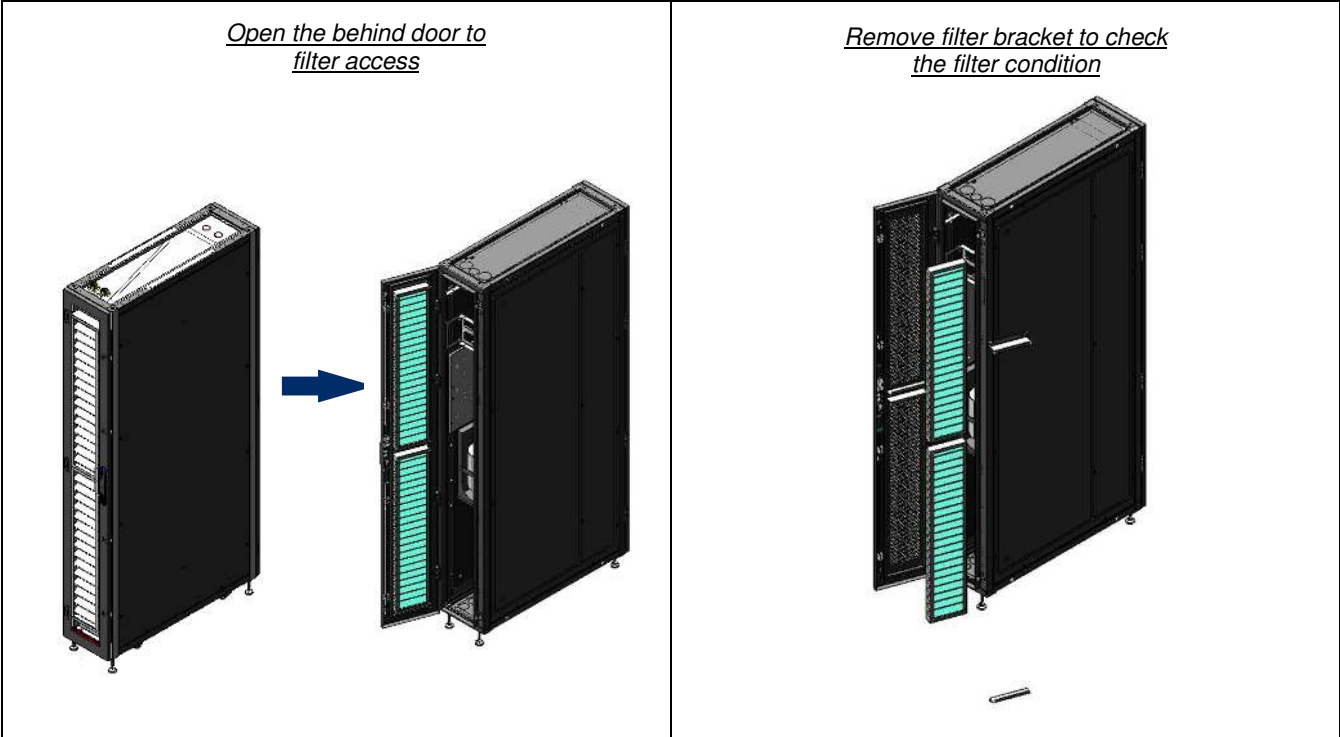
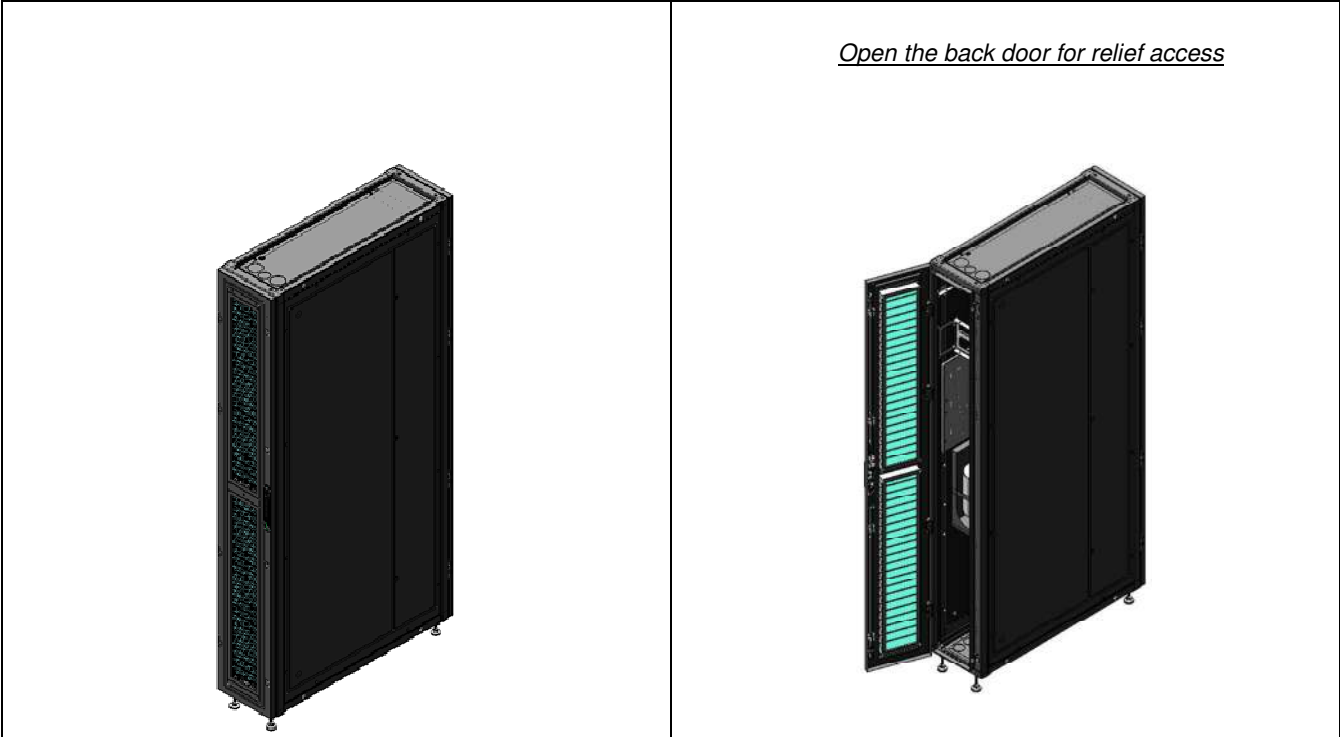


Fig. 11 Purging the air out of the water coil



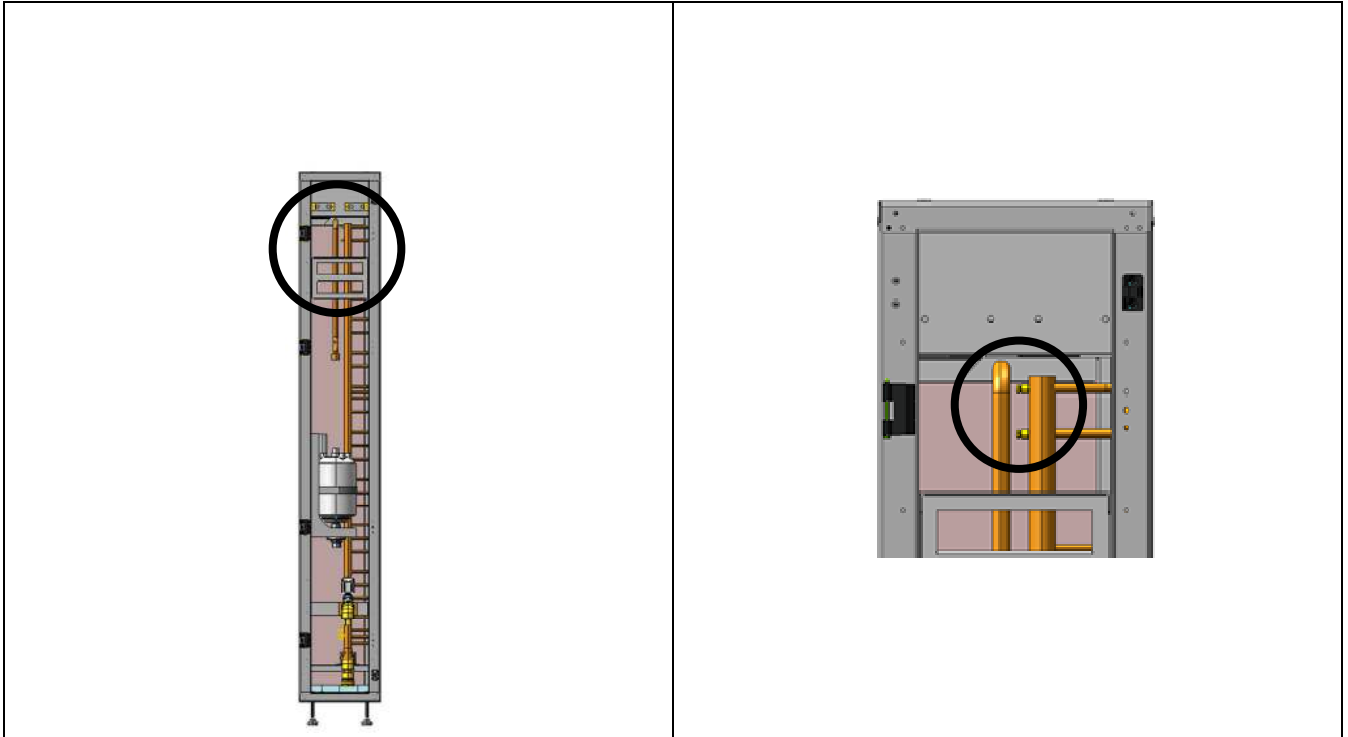
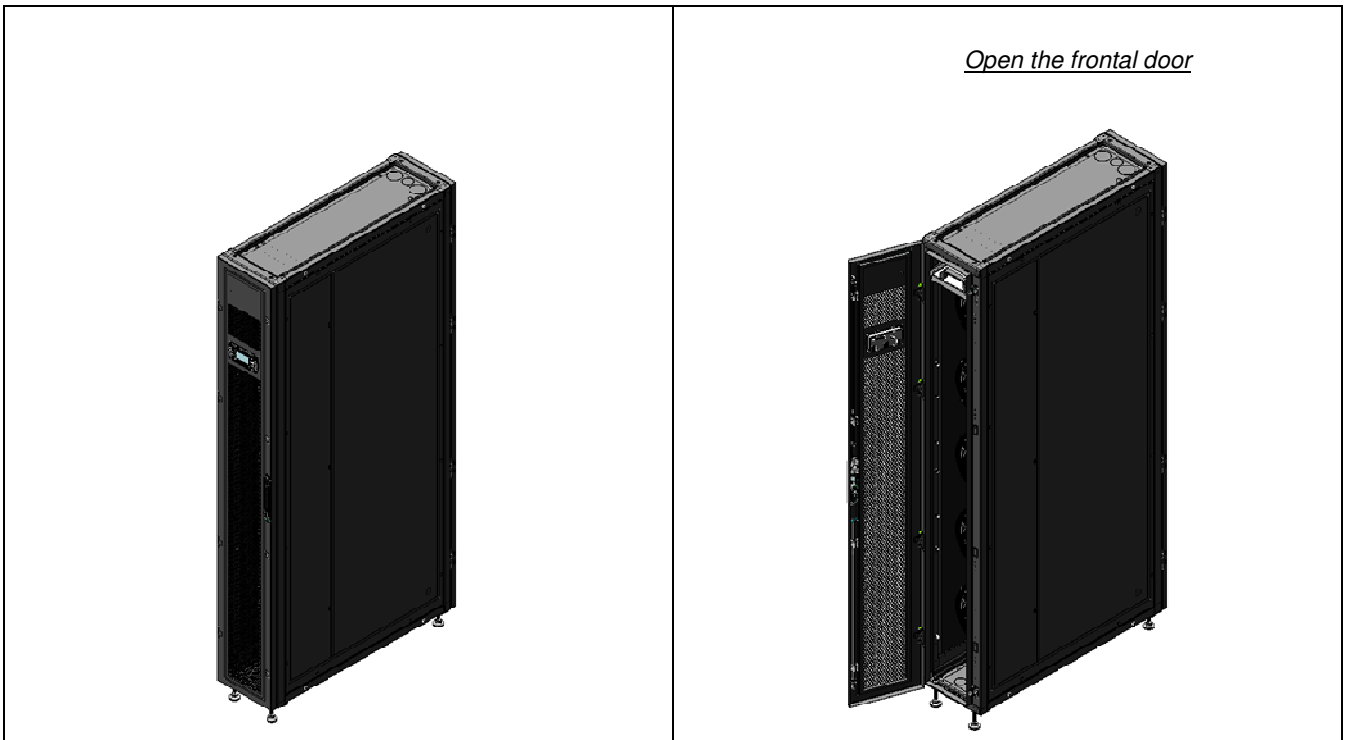
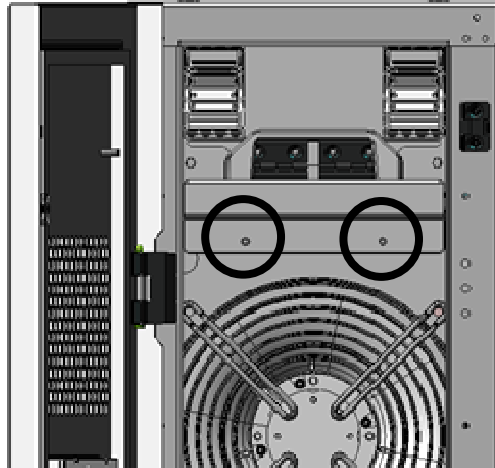


Fig. 12 Electrical box access (HRCC0200-HRCC0250)



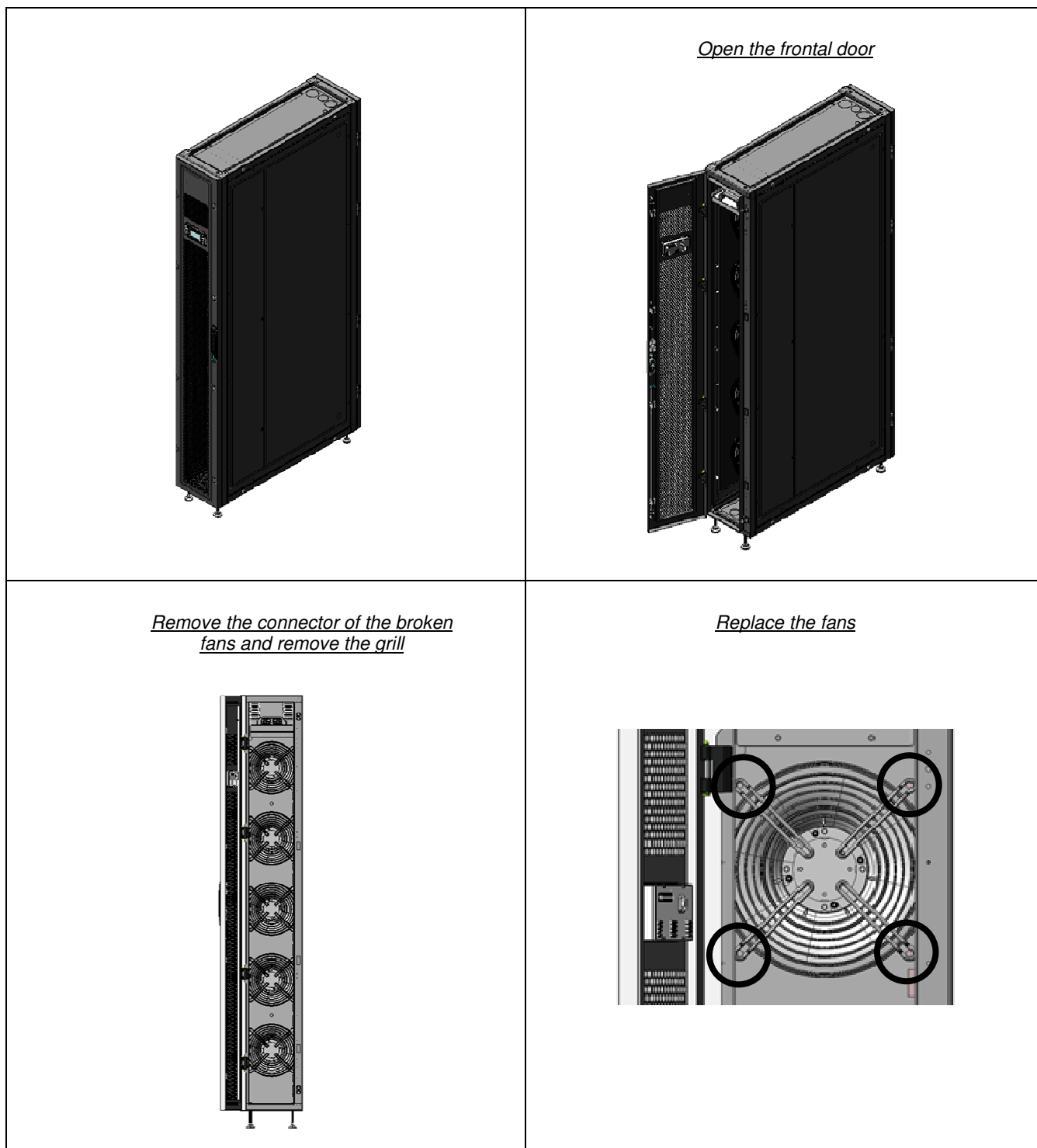
Remove the brackets to
electrical box access



Move it in vertical position



Fig.13 Sostituzione dei ventilatori



11 Troubleshooting

On the next pages you will find a list of the most common reasons that may cause the package unit to fail or any malfunction. This causes are broken down according to easily identifiable symptoms.



You should be extremely careful when attempting to implement any of the possible remedies suggested: overconfidence can result in injuries, even serious ones, to inexperienced individuals. Therefore, once the cause has been identified, you are advised to contact the manufacturer or a qualified technician for help.

Tab. 9 Fault - Causes - Corrections

FAULT	POSSIBLE CAUSES	CORRECTIVE ACTIONS
The unit does not start	No power supply.	Check if power is being supplied both to the primary and auxiliary circuits.
	The electronic card is cut off from the power supply.	Check the fuses.
	Alarms have been released.	Check whether any alarms are signalled on the microprocessor control panel, eliminate the causes and restart the unit.
Air in the hydraulic circuit	During external connections.	Open the valve positioned on the right side over the top of the coil.
Water out from the unit	The drain pan hole is closed.	Open the front panels, remove the sheet metal just below the e-panel (down flow units) and clean it.
	The siphon is missing.	Check for the presence and provide for a new one.
	The air flow is too high.	Reduce the fan speed up to reaching the nominal air flow.

Konformitätserklärung

Dieses Produkt trägt das CE-Kennzeichen. Dieses Produkt wurde in Übereinstimmung folgender Richtlinien und Normen gefertigt:

- Maschinenrichtlinie 2006/42/EG
- Sicherheit von Maschinen-Mindestabstände zur Vermeidung des Quetschens von Körperteilen EN 349-04
- Sicherheit von Maschinen - Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen EN ISO 13857
- Richtlinie Elektromagnetische Kompatibilität 2004/108/EG
- Sicherheit der Maschinen - Elektrische Ausrüstung für Maschinen EN 60204-1
- Niederspannrichtlinie 2006/95/EG
- Elektromagnetische Verträglichkeit - Anforderungen an Haushaltsgeräte, Elektrowerkzeuge und ähnliche Elektrogeräte EN 55014-1
- Sicherheit von Maschinen EN ISO 12100-1,2
- Sicherheit von Maschinen - Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen EN ISO 13857



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