

INSTALLATION, USE AND MAINTENANCE MANUAL



INNOV@ DMREF- R

Air Conditioning Units for Close Control Application

INNOV@-DMREF-R-
IOM-0922-EN



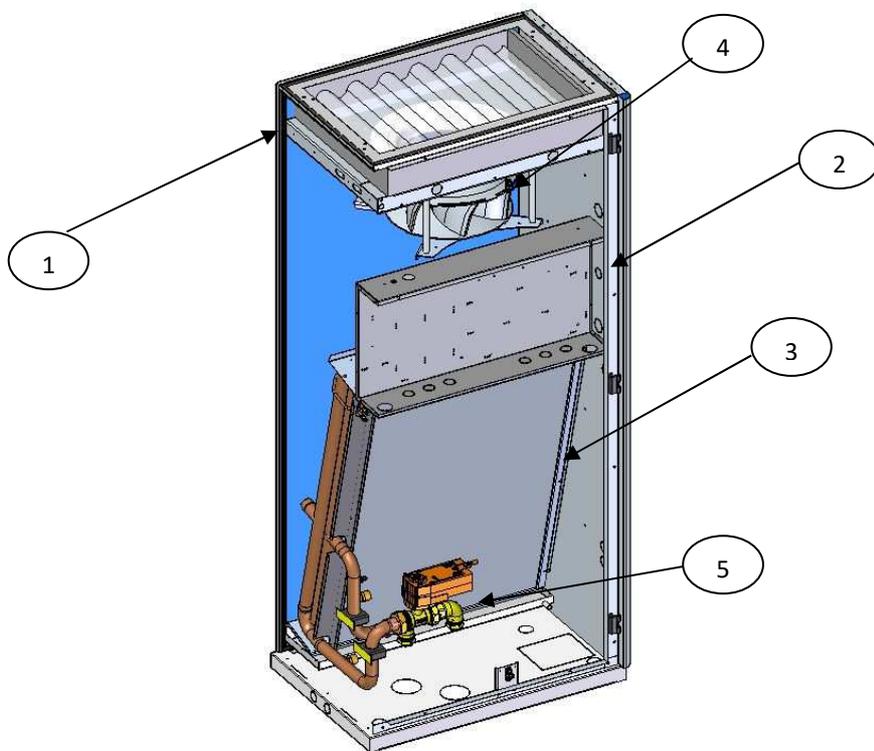
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1 General Description

NEW DMREF R "CCAC" self-contained units are specially designed for installation in technological environments such as Computer rooms, laboratories and in general where a high precision in climate control and a 24h/day operation are requested. **NEW DMREF R** units represent the state of the art between technology and design as well as all **LENNOX** products: thanks to their characteristics, **NEW DMREF R** can be installed also in offices where people are working. The depth of 600 allows the compatibility with standard electronic devices: furthermore the innovative design and the high tech selected colours make **NEW DMREF R** 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 e-heaters, fans, , valves, etc. can be maintained from the front and furthermore the door(s) are dismountable in few seconds thanks to an innovative hinge: this is very important when units are installed in small corridors. 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 Versions: CW



1	Filter	4	Radial fan
2	Electrical panel	5	Chilled water valve with servomotor
3	Coil		

1.1 Structure

NEW DMREF R” 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. Units are completely closed and only frontal access is requested. Anyway it is also possible to have side access in order to reach the steam piping and the drain pan, or simply to substitute a damaged side panel: all this problems are very rare, but with DMREF R” units it is possible to solve them. The shape of the units is characterized with the curved edges with variable radius as for all LENNOX products: this feature is obtained using special tools and gives both a good aesthetic and advantages against injuries. The compressor compartment is separated from the air flow and the special internal design allows the simple dismounting of the upper part of it ensuring an insuperable accessibility to all refrigerating components.

All fixing elements are made in stainless steel or in non corroding materials. The dray 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. As an option, sandwich panels are available: in this case mineral fibres are closed between the panel and a second sheet of metal giving the maximum in terms of internal cleaning. Double skin panels are classified between non flammable materials class A1 according DIN 4102 norms : the sound insulation is better than the standard solution, but the internal reflected sound power will increase the amount in delivery side (+2dB).

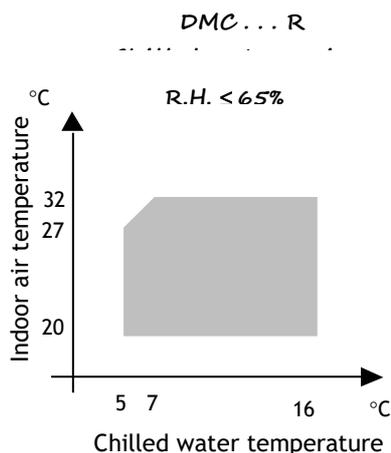
1.2 Application limits

Tab. 2 Operation limits “CW”

Power supply limits and storage conditions for “CW” version

Model		DMC...R
Power supply		400 / 3+N / 50 +/-10 %
Storage conditions	from	-10 °C / 90 % R.H.
	to	+60 °C / 90 % R.H.

Fig. 2 Application limits



1.3 Cooling circuit

The entire refrigerating circuit is assembled in our production line including all pipe work and using only primary brand for components. The workers involved in the welding and pipe work process are qualified by a third part according CEE 97/23 PED directive: it is worth to be underlined that this qualification for workers were not request, but it is our own decision taking care of the quality and/or in general to the customer satisfaction.

Cooling components

- Chilled water valve with servomotor 0-10 V

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 an insulating transformer situated on the electric control board.

- The mechanical safety devices such as the high pressure switched are of the kind that trigger directly; their efficiency will not be affected by any faults occurring in the microprocessor control circuit, in compliance with 97/23 PED.

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:

- Alarm signalling.
- Display of operating parameters.
- RS232, RS485 serial output management (optional).

See microprocessor control manual for further details, also in relation to particular customer specifications.

1.4 “CW” units hydraulic section

3-way valve

The 3-way valve used on INNOV@-R CW version units for inlet water flow regulation allowing a fundamentally maximum precision's regulation on CCAC applications.

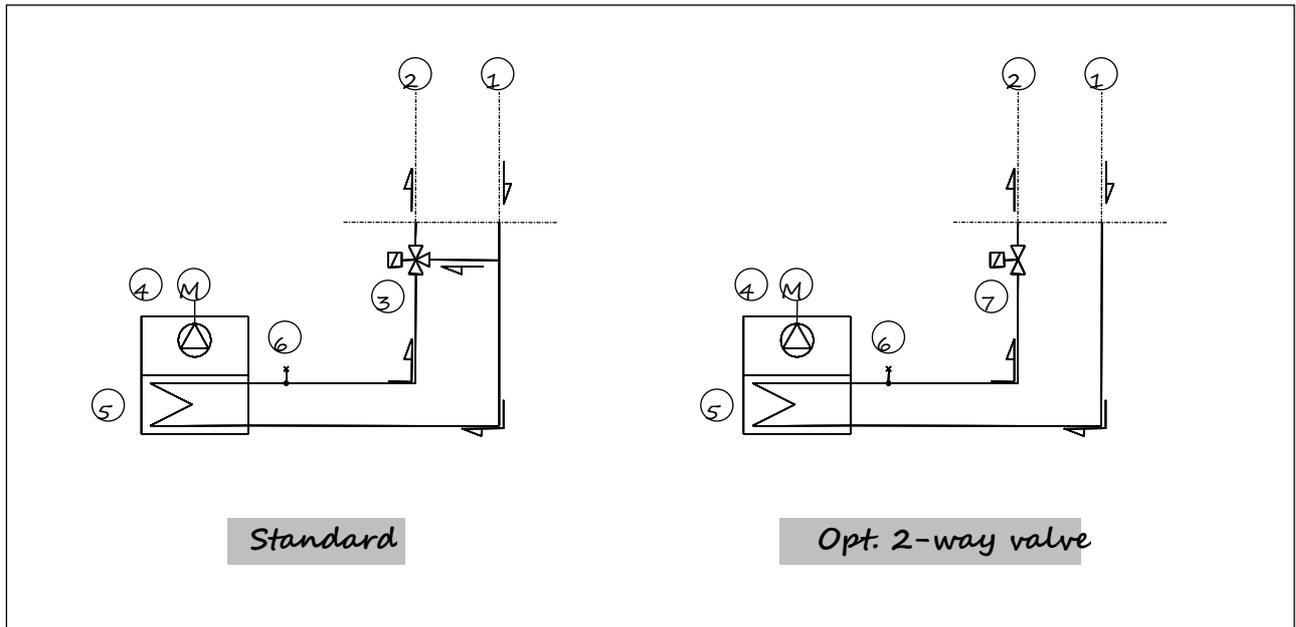
Tab. 3 Technical characteristics

	Frame 1	Frame 2
Kvs valve (m ³ /h)	6.3	16
PN valve	16	16
Connections	1"	1 ¼"

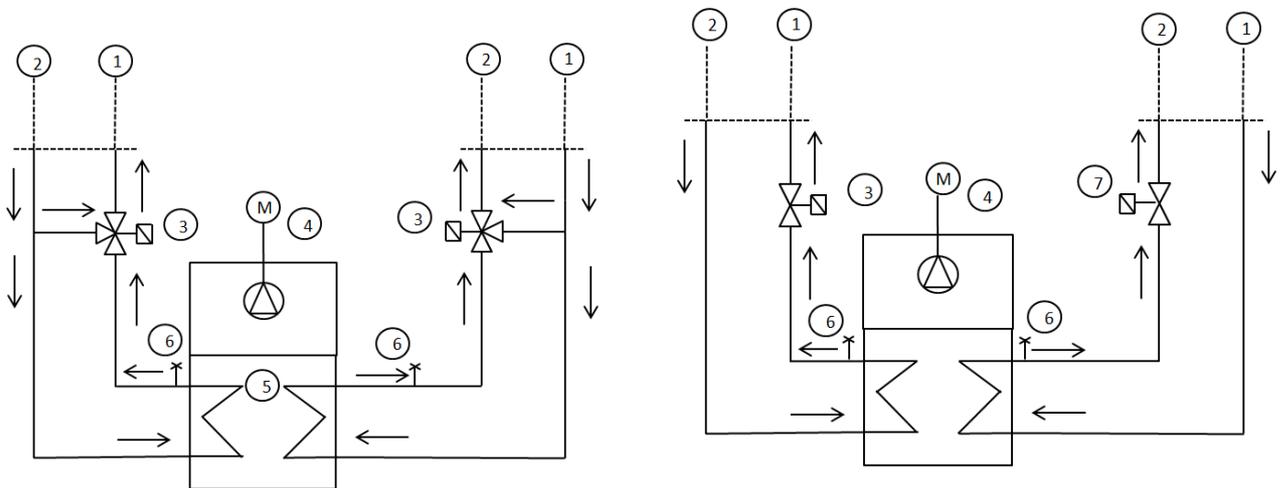
Air presence on hydraulic circuit

It is necessary to leak air from the hydraulic circuit of unit after the connection to the external circuit. To do this, open the frontal panels and remove the air filter; after this, open the small valve on the right-top side of the coil's collector (take the front side of unit in reference). Use adapted tools for the manual valve's setting.

Fig. 5 Basic cooling circuit (CW version)



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



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

1.5 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.

Lennox 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 and refrigerant connections;
- location of power supply;
- solidity of the supporting floor.

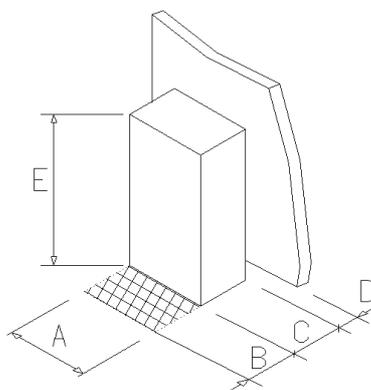
It is recommended to first prepare holes in the floor/wall for passing through the power cables and for the air outlet (down flow units).

The dimensions of the air outlet and the positions of the holes for the screw anchors and power cables are shown below:

3 Installation

The **NEW DMREF R** 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. 7 Service area



Versioni CW					
MODELLO	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)
DMCD/UR0150	600	650	600	30	1998
DMCD/UR0170	600	650	600	30	1998
DMCD/UR0210	600	650	600	30	1988
DMCD/UR0250	900	650	600	30	1988
DMCD/UR0270	900	650	600	30	1988
DMCD/UR0320	900	650	600	30	1988

Versioni CW					
MODELLO	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)
DMCXR0150	600	650	600	30	2100
DMCXR0170	600	650	600	30	2100
DMCXR0210	600	650	600	30	2100
DMCXR0250	900	650	600	30	2100
DMCXR0270	900	650	600	30	2100
DMCXR0320	900	650	600	30	2100

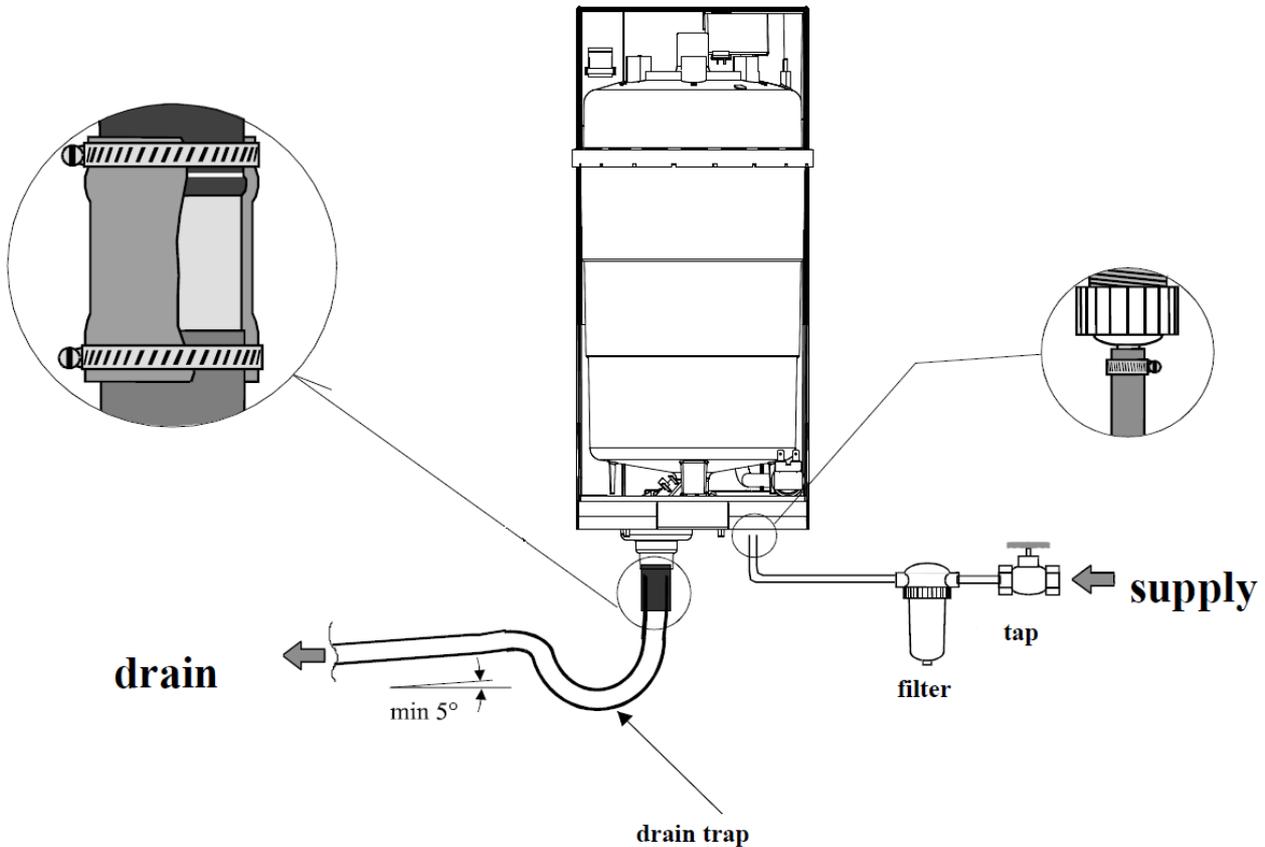
The following steps should be carried out to ensure proper installation:

- Apply a anti-vibration rubber lining between the unit and the bottom.
- Position the unit on the floor / floorstand (base frame).

The recommended sizes for the power cables and emergency line are shown in the related electrical drawings.

4 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 IMMERSSED ELECTRODE HUMIDIFIER

	Symbol	Unit	Min	Max
Hydrogen ions	pH		7	8.5
Specific conductivity at 20°C	$\sigma_{R, 20^{\circ}\text{C}}$	$\mu\text{S/cm}$	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 IMMERSSED ELECTRODE HUMIDIFIER

	Symbol	Unit	Min	Max
Hydrogen ions	pH		7	8.5
Specific conductivity at 20°C	$\sigma_{R, 20^{\circ}\text{C}}$	$\mu\text{S/cm}$	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.

5 Electrical Connections

5.1 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 power connection for single-phase loads is to be made with a three-pole cable and “N” wire at the centre of the star (optional: power supply w/o neutral).



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 $\pm 10\%$ and the unbalance between phases must always be below 2%.



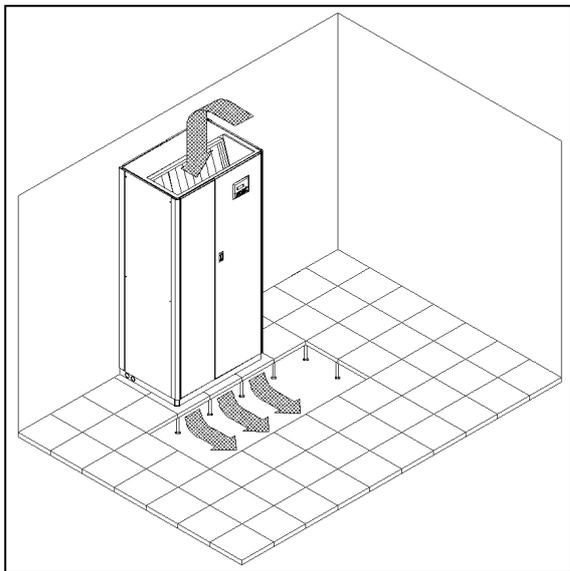
The above operating conditions must always be complied with: failure to ensure said conditions will result in the immediate invalidation of the warranty.

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.

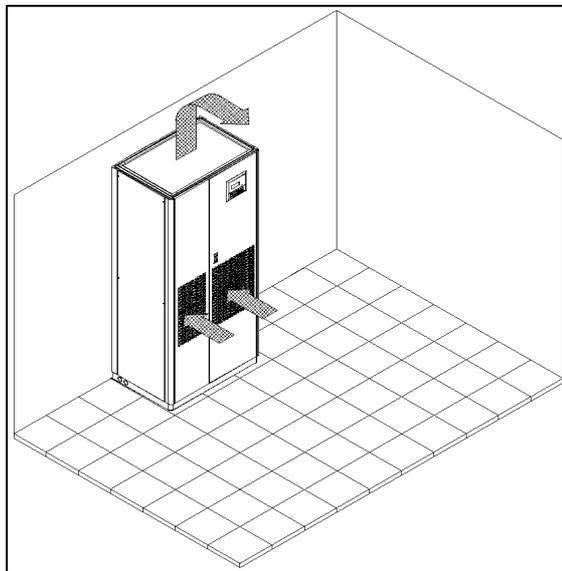
The control circuit is protected by suitable fuses or automatic breakers depending on the unit size.

6 Operating Diagrams

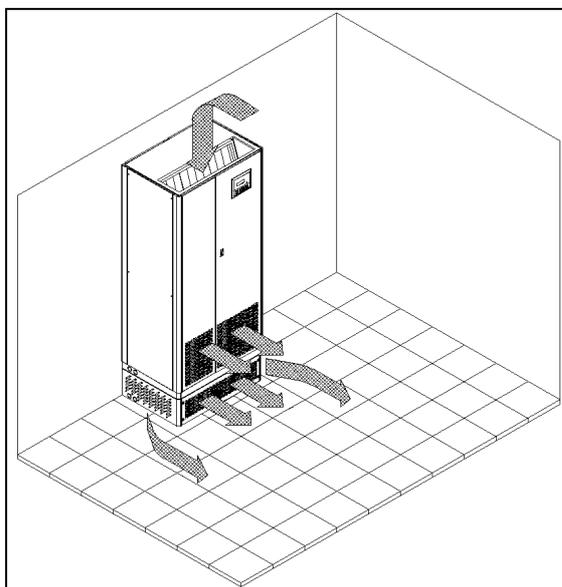
DOWNFLOW



UPFLOW



DISPLACEMENT



7 Start-Up

7.1 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.
- Check that the voltage at the RST terminals is $400\text{ V} \pm 10\%$
- Make sure there are no refrigerant leakage that may have been caused by accidental impacts during transport and/or installation.

7.2 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.



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).

8 Setting Operating Parameters

8.1 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 operating and safety devices.

The settings are shown in Tab. 5 e Tab. 6.



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

9 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.

9.1 Warnings



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 aluminum 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.

9.2 Generalities

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

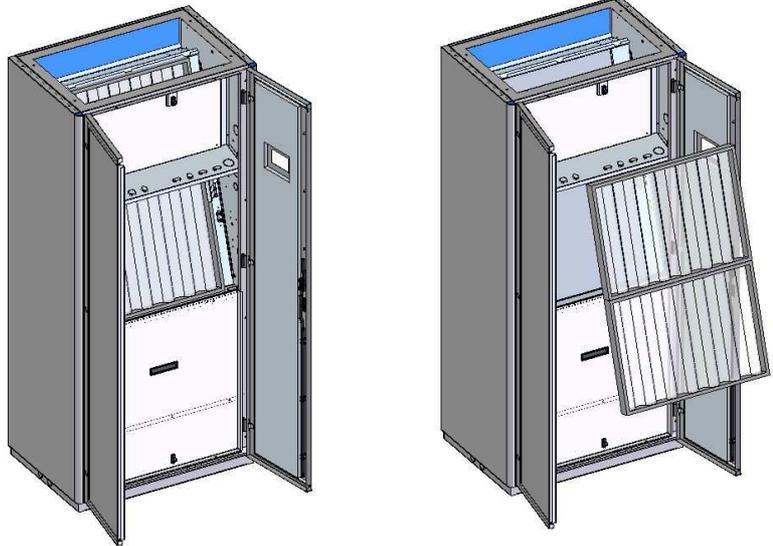
Tab. 7 Routine maintenance

Operation	Frequency
Check the efficiency of all the control and safety devices.	Once a year
Check the efficiency of the differential air pressure switch and dirty filter differential pressure switch (option).	Every 6 months
Check the condition of the air filter and replace it if necessary.	Every 6 months

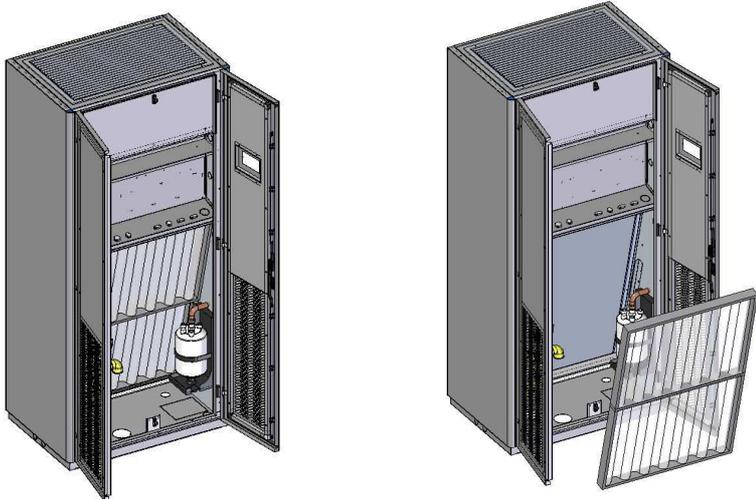
Fig. 13 Inspecting the air filter

Open the unit front panels
 Pull out the air filter
 Check the condition of the filter and
 replace it if necessary

“Down-Flow” version



“Up-Flow” version



“Displacement” version

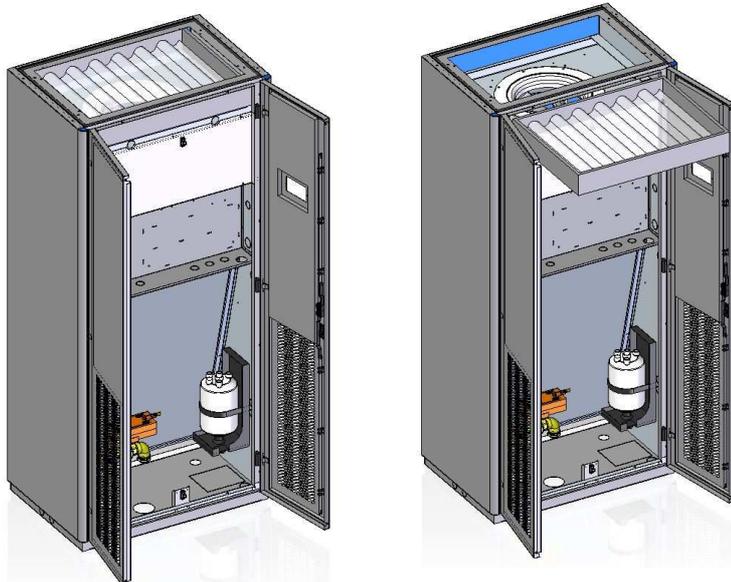
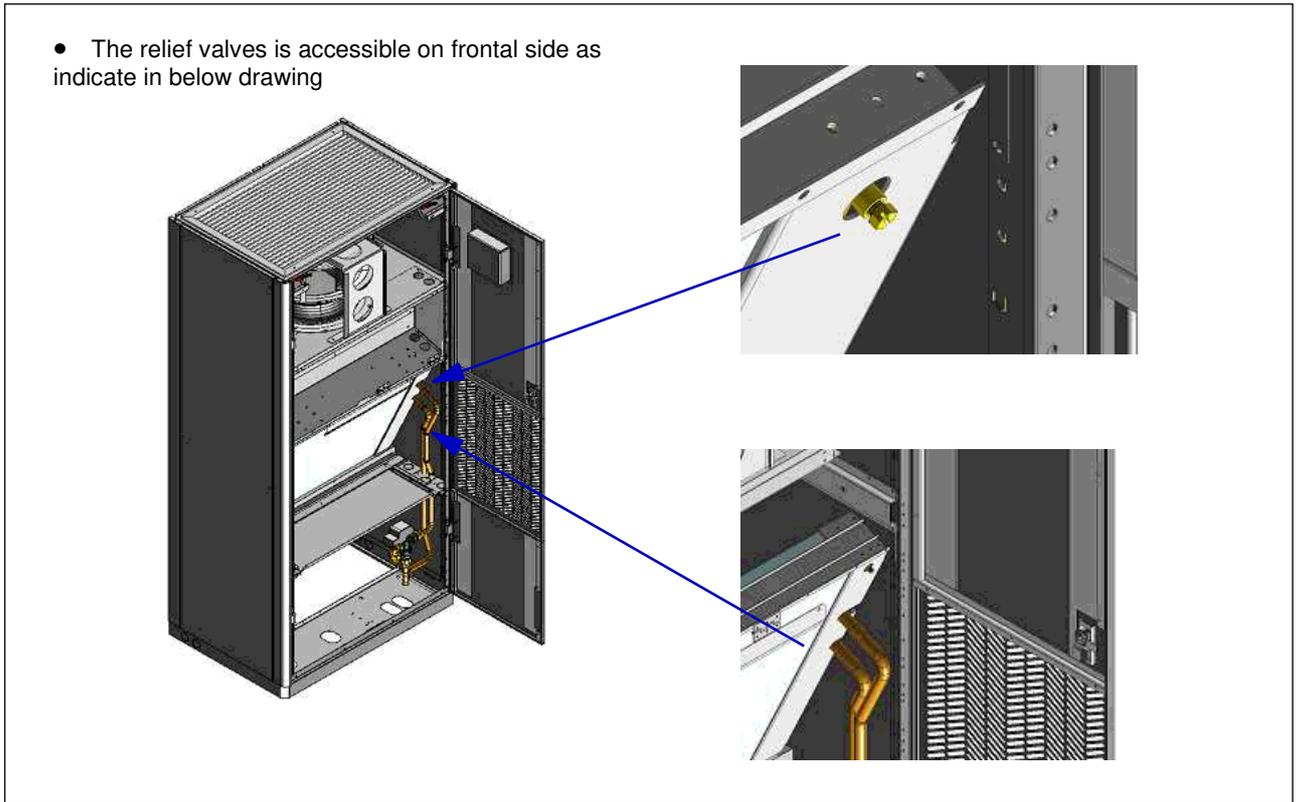
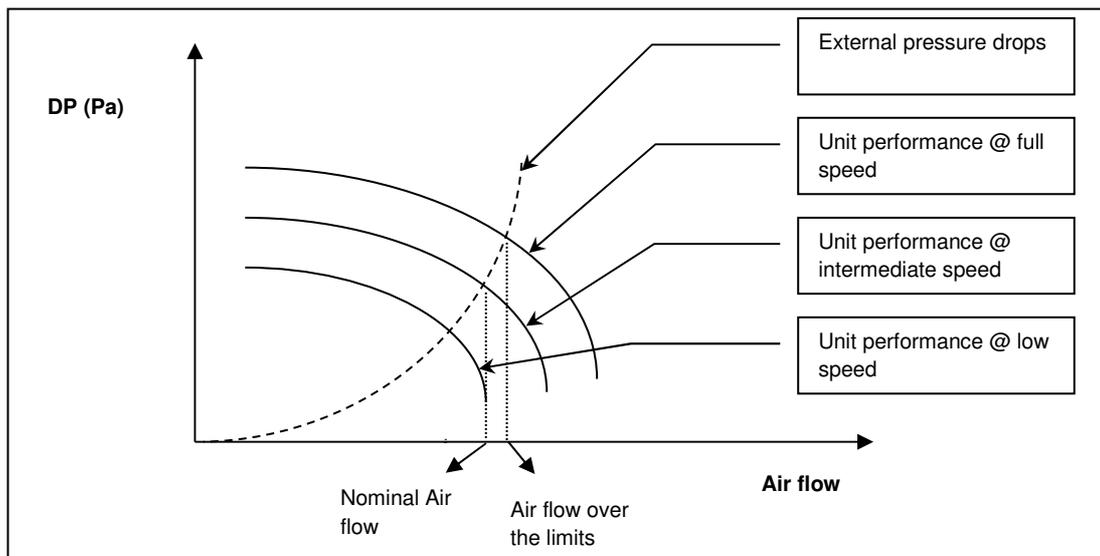


Fig. 12 Relief valves



9.3 Set the right fan speed

The adopted fans are of the backward curved blades type in combination with a 4 poles e-motor. This kind of fan has very high performances so that it's speed has to be reduced in order to match to the nominal air flow with the real external pressure drops: in case of wrong selection, the air flow may exceed the limits with possible water dragging out from the coils (down flow units) or in case of DC units. a not sufficient airflow can cause ice on the coil.



The fan speed has to be selected according to the enclosed table.

In the EC fans the rotation speeds are selected with different values of the control tension (0 - 10V). If in the unit is present the advanced control the right value of the control tension is set by the keyboard present in the advanced control.

With the basic control the control tension is set with a manual potential installed in the E-Panel. To know the tension set with the potential it is necessary to use an external tool (Voltmeter).

10 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.

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.
	Unit is not perfectly level	Place correctly the unit.

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In order to meet its commitments, Lennox makes every effort to provide the most accurate information. However, specifications, values and dimensions are subject to change without notice and without liability.

Improper installation, adjustment, modification, maintenance or servicing may cause damage to the equipment and personal injury. Installation and maintenance should be performed by a qualified installer or service technician.



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