LEONARDO EVOLUTION INSTALLATION MANUAL

LEONARDO EVOLUTION

VERSION: 1.0
DATE: JANUARY 2006
LANGUAGE: ENGLISH

UNIFLAIR™

GB

VERSION**: 1.0** DATE**: JANUARY 2006**

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Contents

GENERAL INSTRUCTIONS

Information contained in the manual

The present manual describes the Leonardo Evolution conditioning units. It supplies general information and safety instructions, unit transportation and installation information, as well as necessary information about how to use the units. It is an integral part of the product.
The descriptions and illustrations in this manual are unbinding; "Uniflair S.p.A." reserves the right to make any alterations it sees fit in order to improve the product without having to update this document.
The illustrations and images in this manual are examples only and may differ from practical situations.

Symbols

The following graphic and linguistic symbols have been used in this manual:

WARNING! This message may appear before certain procedures. Failure to observe this message may cause damage to equipment.

WARNING! This message may appear before certain procedures. Failure to observe this message may cause injury to the operators and damage the equipment.

Storage

The following conditions must be respected should the unit require storing for a given period of time:
The packing must be kept intact.
The place of storage must be dry (<85% R.H.) and protected against the sun (temperature <50°C).

Storage after use

The unit must be packaged when stored for a long time.

Disposal

The unit is mainly made of recyclable materials which should be separated from the rest of the unit before it is disposed. When disposing of the gas and oil inside the refrigerating circuit, consult a specialist company.

SAFETY

General Instructions

WARNING! Removal of, or tampering with, safety devices is a violation of EUROPEAN SAFETY STANDARDS.

WARNING! During installation authorised personnel must wear individual safety devices.

Uniflair S.p.A will only consider itself responsible for the safety, reliability and performance of the machine if:

- repair work has only been carried out by authorised personnel;
- the electric installation conforms to the standards currently in force;
- the devices are used in conformity with the relative instructions.

Carefully read this instruction manual before carrying out any kind of use or maintenance work on the units.
Installation, maintenance and use must be carried out respecting all of the work safety standards.
The operator responsible for the above mentioned services must be suitably specialised and possess expert knowledge of the devices.
Uniflair S.p.A refuses all responsibility for damage to people or objects due to the inobservance of the safety standards.

Warning for lifting and transportation

Lifting and transportation of the units must be carried out by specialised personnel as described in the relative paragraphs. The load must always be solidly anchored to the bearing element of the lifting equipment and means of transport. No-one must remain near the suspended load, nor in the working area of the crane, forklift truck or any other lifting equipment or means of transport. Adopt all of the cautions provided by the relevant safety standards, in order to prevent any possible damage to people or objects.

Warnings for installation

Any type of work on the electrical installation must only be carried out by specialised technicians who are experts in this field.
Specialised technical personnel must use appropriate equipment when checking the grounding of devices.
Installation may only take place in locations where there is NO public access.

Intended use

Leonardo Evolution air conditioning units have been designed and produced to carry out air conditioning, within the limits and methods described in the present manual. The air conditioners must be used exclusively in internal environments.
No modifications may be made to the units or their parts without explicit written consent from Uniflair S.p.A.

Warnings for use

Only use the machinery for the purpose for which it was designed and manufactured.

Environmental limits for use

The environmental conditions for the use of Leonardo air conditioners are fall within the following values:

- Tmin=18°C
- Tmax=30°C
- %rHmin=30%
- %rHmax=70%

Safety during maintenance work

All repair work must be carried out by professionally qualified personnel authorised by Uniflair S.p.A.
Unplug the machine form the power supply before starting any maintenance work.
While drawing up this manual, we have considered all of the operations which are part of normal maintenance operations.

N.B. Do not carry out any work which has not been specified in this manual.

INTRODUCTION

Presentation of the system

The Leonardo Evolution™ precision air conditioners are designed for environments which are characterised by the presence of highly technologically advanced equipment: telecomms and internet centres, data processing rooms and any type of environment which is characterized by high concentrations of power.

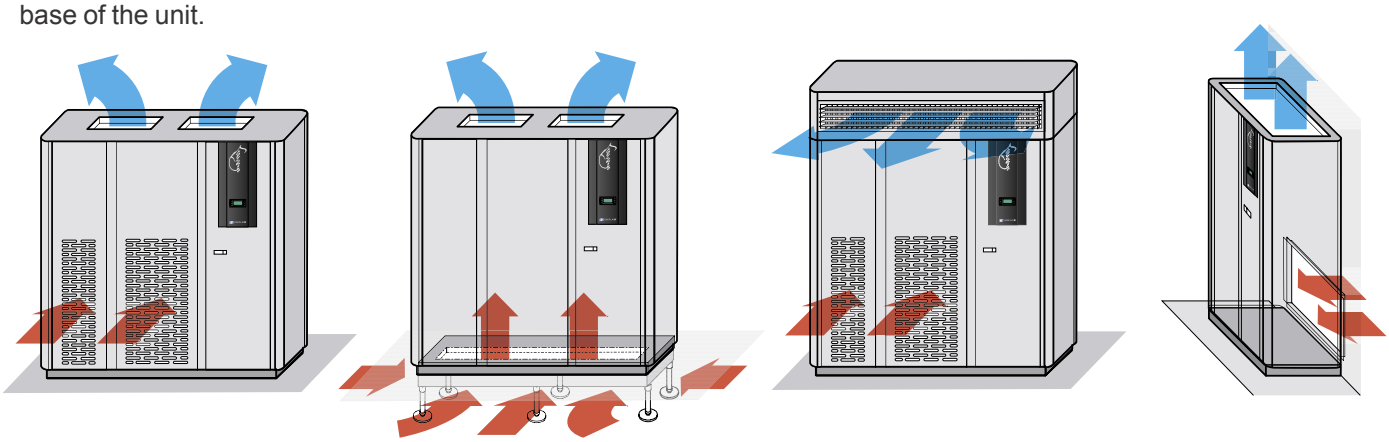
The Leonardo Evolution series consists of 4 types of conditioners:
- Direct expansion
- Chilled water
- Energy Saving
- Twin-Cool

AIR FLOW

In the LEONARDO EVOLUTION conditioners, the air can flow upwards or downwards (UPFLOW / DOWNFLOW).

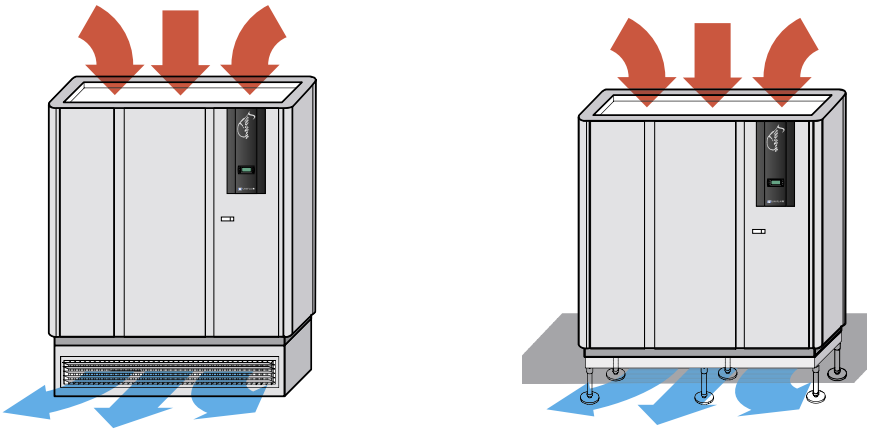
UPFLOW

Upflow units (with upwards air discharge) are designed to distribute the air through a system of ducts or by means of a false ceiling. Air intake is usually through the front of the unit, but versions are also available with air intake through the rear or the base of the unit.



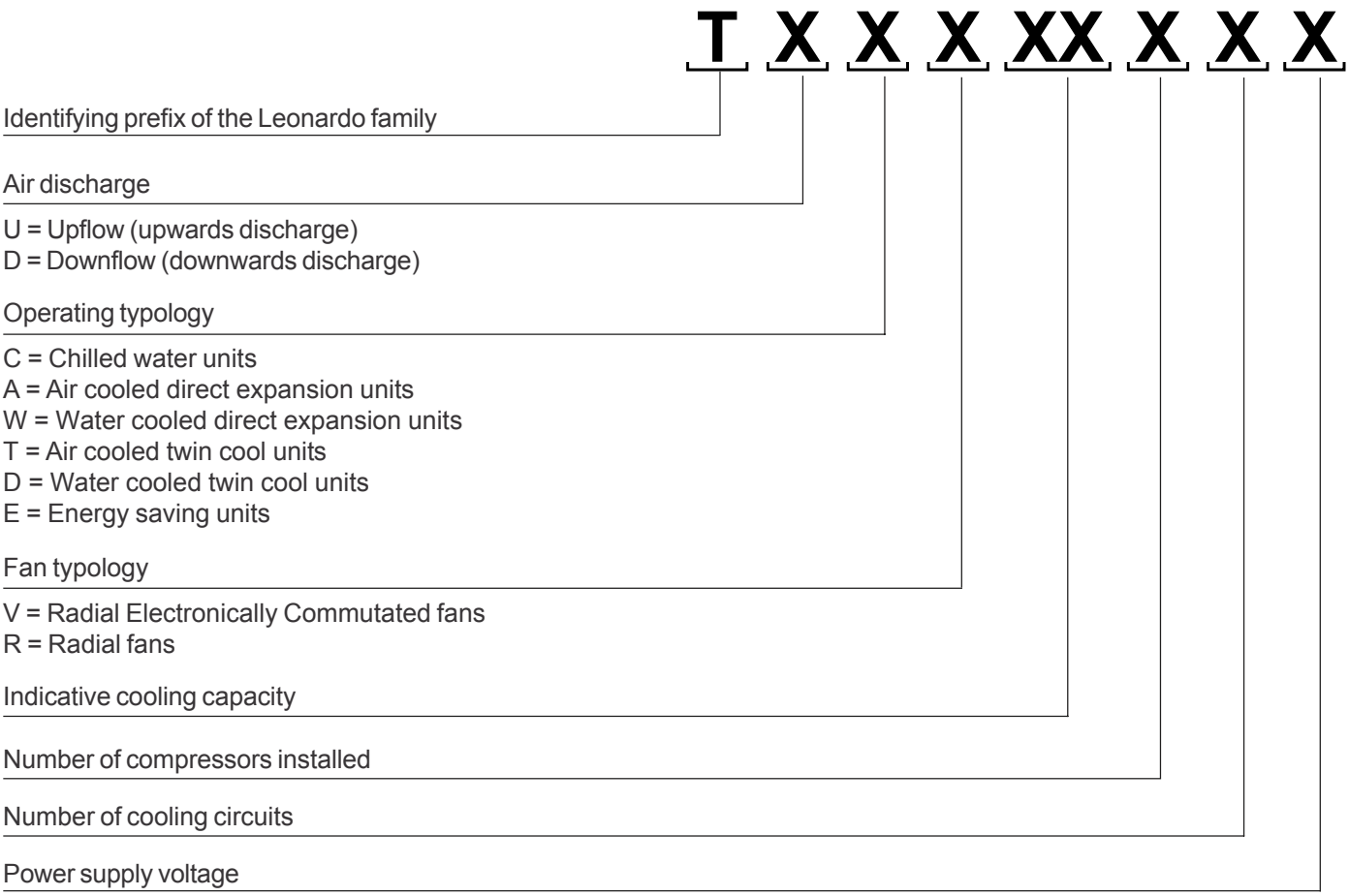
DOWNFLOW

Downflow units (with downwards air discharge) handle large volumes of air which are distributed uniformly into the environment by means of a void under a raised access floor. The air enters the unit directly from the environment, or through a ventilated or false ceiling.



MODELS

The code which distinguishes the models is composed of 4 characters:



IDENTIFICATON PLATE

The units can be identified by the identification plate which is placed in the electrical panel of the machine. The model and any eventual accessories which are installed are indicated by an "X" in the corresponding box
The plate carries the following data:

- Model and series number of the machine.
- Type of power supply.
- Power absorbed by the unit and the single components.
- Current absorbed by the unit and the single components.
- The set points of the cooling circuit pressostatic valve and safety valve.
- Type of refrigerant.
- Loading or pre-loading of each cooling circuit.

Mod. ☐ TDAV1422A(H)	☐ TDEV1422A(H)	SERIAL No.	
☐ TUAV1422A(H)	☐ TUEV1422A(H)		
☐ TDWV1422A(H)	☐ TDDV1422A(H)	☐ TDTV1422A(H)	
☐ TUWV1422A(H)	☐ TUDV1422A(H)	☐ TUTV1422A(H)	

TENS. 400V/3Ph+N/50Hz				AUX. 24		VOLT
	NO.	TENS.	OA (/1)	FLA (/1)	LRA (/1)	KW TOT
COMPRESSOR	2	400/3	11,0	14,0	98	11,7
FAN	2	400/3	4,3	5,0		5,3
HUMIDIFIER	1	400/3	9,1			6,29
☐ HEATERS STD.	3	400/3	7,2			15
☐ ENHANCED HEAT.	3	400/3	8,7			18
☐ **UNIT (STD. HEATERS) (*)**			**30,6**			**17,00**
☐ **UNIT (ENHANCED HEATERS) (*)**			**45,6**			**29,15**
☐ **UNIT (STD. HEATERS+CAL max) (*)**			**41,3+10,5x1Ph**			**28,49**
☐ **UNIT (ENH. HEATERS+CAL max) (*)**			**45,6+10,5x1Ph**			**31,49**

FAC-SIMILE

Icu=15kA (CEI EN 60947-2) / (*) in operating conditions at 400V

TSR	STOP: 320 °C	MAN. RESET	
AP1-2	STOP: 26,5 bar	MAN. RESET	
SAFETY VALVE OPENS AT:		29 bar	
CHARGE:	☐ R407C kg/circ.	☐ R22	kg/circ.
PRECHARGE:	☐ DRY NITROGEN N_2		

SYMBOLS APPLIED TO THE MACHINES

SYMBOL	MEANING
	High voltage
	Sharp edges
	Moving parts

SYMBOLS APPLIED TO THE PACKAGES

SYMBOL	MEANING
	FRAGILE: handle with care
	DO NOT STORE IN DAMP CONDITIONS: the packaged unit must be stored in a dry place
	CENTRE OF GRAVITY: shows the centre of gravity of the packaged unit
	KEEP AWAY FROM HEAT: the unit must be stored away from heat sources
	THIS SIDE UP: indicates the correct position of the packaged unit
	TEMPERATURE LIMITS: the packaged unit must be stored in a place within the indicated temperature limits
	DO NOT USE HOOKS: do not lift the packaged units using hooks
	DO NOT STACK: the packaged units must not be stacked

LEONARDO EVOLUTION - DIRECT EXPANSION

Technical characteristics

AIR COOLED DIRECT EXPANSION UNITS WITH BACKWARD CURVED BLADE FANS

Model TDAR - TUAR		511A	611A	721A	722A	921A	922A	1021A	1022A
Height	mm	1960	1960	1960	1960	1960	1960	1960	1960
Width	mm	1010	1010	1310	1310	1310	1310	1310	1310
Depth	mm	750	750	865	865	865	865	865	865
Weight	kg	280	310	430	447	430	447	430	447
Air flow	m^3/h	5740	5740	8180	8180	8180	8180	8180	8180
External static pressure	Pa	20	20	20	20	20	20	20	20
Total cooling capacity (*)	kW	19,5	22,9	26,0	26,0	31,8	31,8	35,4	35,3
Sensible cooling capacity (*)	kW	19,5	21,5	26,0	26,0	30,2	30,4	32,0	32,2
Number of refrigerant circuits		1	1	1	2	1	2	1	2
Number of compressors		1	1	2	2	2	2	2	2
Power supply voltage	V	400V/3ph+N/50Hz							

Model TDAR - TUAR		1121A	1122A	1321A	1322A	1422A	1622A	1822A
Height	mm	1960	1960	1960	1960	1960	1960	1960
Width	mm	1721	1721	1721	1721	2172	2172	2172
Depth	mm	865	865	865	865	865	865	865
Weight	kg	548	559	575	585	698	714	714
Air flow	m^3/h	11710	11710	11710	11710	15600	15600	15600
External static pressure	Pa	20	20	20	20	20	20	20
Total cooling capacity (*)	kW	38,7	38,7	42,4	42,4	51,6	58,8	65,8
Sensible cooling capacity (*)	kW	38,7	38,7	42,4	42,4	51,6	57,6	60,5
Number of refrigerant circuits		1	2	1	2	2	2	2
Number of compressors		2	2	2	2	2	2	2
Power supply voltage	V	400V/3ph+N/50Hz						

(*) Based on 24°C@50% air temperature, ESP=20Pa, condensing temperature = 48°C dew point with R407C

AIR COOLED DIRECT EXPANSION UNITS WITH EC BACKWARD CURVED BLADE FANS

Model TDAV - TUAV		721	722	921	922	1021	1022	1121
Height	mm	1960	1960	1960	1960	1960	1960	1960
Width	mm	1310	1310	1310	1310	1310	1310	1720
Depth	mm	865	865	865	865	865	865	865
Weight	kg	430	447	430	447	430	447	548
Air flow	m^3/h	8220	8220	8220	8220	8220	8220	12320
External static pressure	Pa	20	20	20	20	20	20	20
Total cooling capacity (*)	kW	26,0	26,0	31,8	31,8	35,3	35,3	39,0
Sensible cooling capacity (*)	kW	26,0	26,0	30,3	30,3	32,1	32,1	39,0
Number of refrigerant circuits		1	2	1	2	1	2	1
Number of compressors		2	2	2	2	2	2	2
Power supply voltage	V	400V/3ph+N/50Hz						

Model TDAV - TUAV		1122	1321	1322	1422	1622	1822
Height	mm	1960	1960	1960	1960	1960	1960
Width	mm	1720	1720	1720	2171	2171	2171
Depth	mm	865	865	865	865	865	865
Weight	kg	559	575	585	698	714	714
Air flow	m^3/h	12320	12320	12320	16030	16030	16030
External static pressure	Pa	20	20	20	20	20	20
Total cooling capacity (*)	kW	39,0	42,8	42,8	51,8	58,9	65,9
Sensible cooling capacity (*)	kW	39,0	42,8	42,8	51,8	58,4	61,3
Number of refrigerant circuits		2	1	2	2	2	2
Number of compressors		2	2	2	2	2	2
Power supply voltage	V	400V/3ph+N/50Hz					

(*) Based on 24°C@50% air temperature, ESP=20Pa, condensing temperature = 48°C dew point with R407C

CHILLED WATER DIRECT EXPANSION UNITS WITH BACKWARD CURVED BLADE FANS

Model TDWR - TUWR		611	921	1321	1622	1822
Height	mm	1960	1960	1960	1960	1960
Width	mm	1010	1310	1720	2171	2171
Depth	mm	750	865	865	865	865
Weight	kg	310	430	575	714	714
Air flow	m^3/h	5740	8180	11710	15600	15600
External static pressure	Pa	20	20	20	20	20
Total cooling capacity (*)	kW	22,9	30,3	41,7	58,8	65,2
Sensible cooling capacity (*)	kW	21,5	29,6	41,7	57,6	60,3
Number of refrigerant circuits		1	1	1	2	2
Number of compressors		1	2	2	2	2
Power supply voltage	V	400V/3ph+N/50Hz				

(*) Based on 24°C@50% air temperature, ESP=20Pa, condensing temperature = 48°C dew point with R407C

CHILLED WATER DIRECT EXPANSION UNITS WITH EC BACKWARD CURVED BLADE FANS

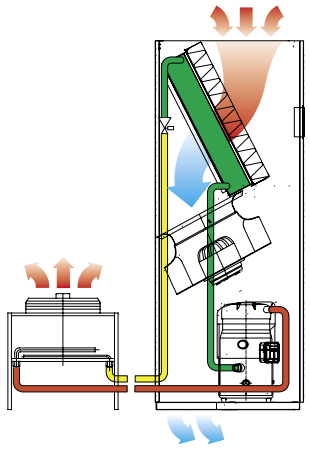
Model TDWV - TUWV		921	1321	1622	1822
Height	mm	1960	1960	1960	1960
Width	mm	1310	1720	2171	2171
Depth	mm	865	865	865	865
Weight	kg	430	575	714	714
Air flow	m^3/h	8220	12320	16030	16030
External static pressure	Pa	20	20	20	20
Total cooling capacity (*)	kW	30,3	42,0	58,9	65,5
Sensible cooling capacity (*)	kW	29,7	42,0	58,4	61,1
Number of refrigerant circuits		1	1	2	2
Number of compressors		2	2	2	2
Power supply voltage	V	400V/3ph+N/50Hz			

(*) Based on 24°C@50% air temperature, ESP=20Pa, condensing temperature = 48°C dew point with R407C

Operating description

AIR COOLED DIRECT EXPANSION UNITS (DXA)

The air cooled DX units extract heat from the room and transfer it to the outside using air cooled refrigerant heat exchangers (condensers). The room unit and external condenser form an autonomous sealed circuit once installed. The UNIFLAIR remote condensers used with LEONARDO units include a precise electronic system to regulate the fan speed to ensure trouble-free operation throughout the year under a wide range of external air temperatures. Special attention has been paid to the acoustic design of the condensers to minimise noise levels. A wide range of combinations is available to meet different site requirements.



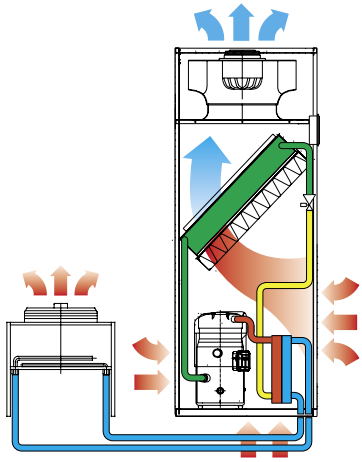
WATER COOLED DIRECT EXPANSION UNITS (DXW)

In the DX water cooled units, the heat extracted from the room is transferred to water via a stainless steel brazed plate exchanger within the unit.

The cooling water may be fed from the mains supply, a cooling tower or a well (open circuit), or recycled in a closed loop cooled by external coolers.

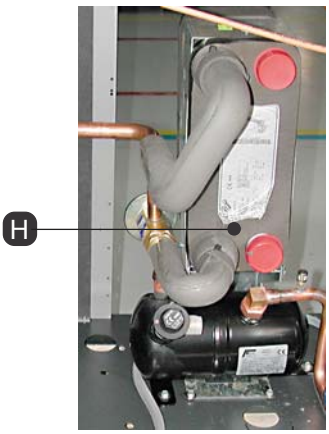
In the latter case, an anti-freeze mixture of water and ethylene glycol is normally used.

The water cooled units have the advantage that the refrigerant circuits are charged and sealed in the factory. This makes installation extremely simple, eliminating the need for any site-installed refrigerant pipework.



Name and description of the principle components

A User terminal
B Electrical panel door
C Cover panels
D Electrical panel
E Filters
F Fans
G Cooling circuit
H Brazed plate heat exchanger (present in chilled water models)



Description of the components

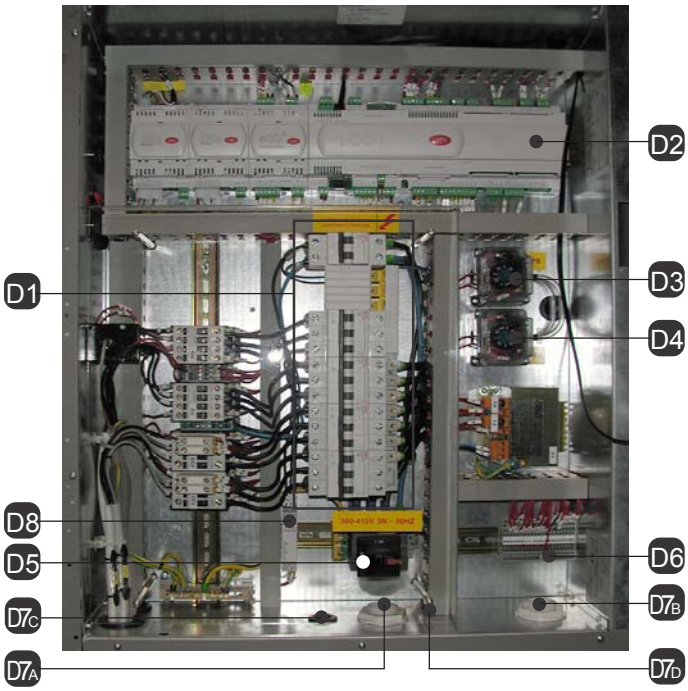
A - User terminal

Allows the unit to be turned on or off and the configuration and visualization of the condition of the machine.

- A1 LCD Display
- A2 **ALARM** key: visualization and reset of alarms; when the alarm is activated, it flashes red.
- A3 **PRG** key: access to the configuration menu
- A4 **ESC** key : exit from the screens
- A5 **UP** key : scroll through the menu
- A6 **ENTER** key : confirm
- A7 **DOWN** key: scroll through the menu

B - Electrical panel door

Allows access to the electrical panel of the machine.



C - Cover panels
Allow access to the internal components of the machine.

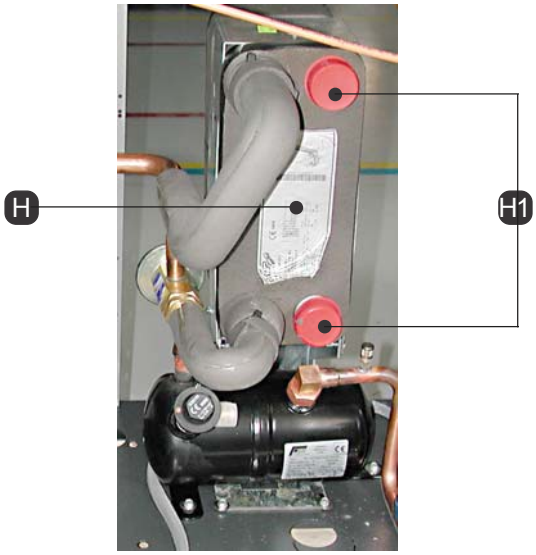
D - Electrical panel
- D1 Magnetothermic
  - auxiliary
  - heater (optional)
  - humidifier (optional)
  - fans
  - compressors
- D2 Interface board
- D3 Dirty filter sensor
- D4 Air flow sensor
- D5 Main switch
- D6 Terminal board
- D7A Input/output electrical supply cables
- D7B Input/output electrical auxiliary cables
- D7C Input/output condensing unit supply
- (optional) - Only on units with air cooling
- D7D Entrance/exit signal cables (RS485 and/or LAN)
- D8 Phase sequence relay

E - Filters
Filter the air released into the environment

F - Fans
Allow the diffusion of air into the room
- F1 ATR Transformer: allows the setting of the fan rotation speed

G - Cooling circuit
- G1 Compressor
- G2 High pressure switch
- G3 Schrader Valve
- G4 Safety Valve
- G5 Shut -off valve
- G6 Circuit Exit
- G7 Circuit entrance
- G8 Liquid receiver
- G9 Dehydration filter
- G10 Flow sight glass
- G11 Electronic thermostatic valve

- G12 Evaporating coil



H - Brazed plate heat exchanger (present on water cooled units)

- H1 Input/output hydraulic circuit

Checks to be made on delivery

WARNING! Dispose of the packaging in appropriate collection points.

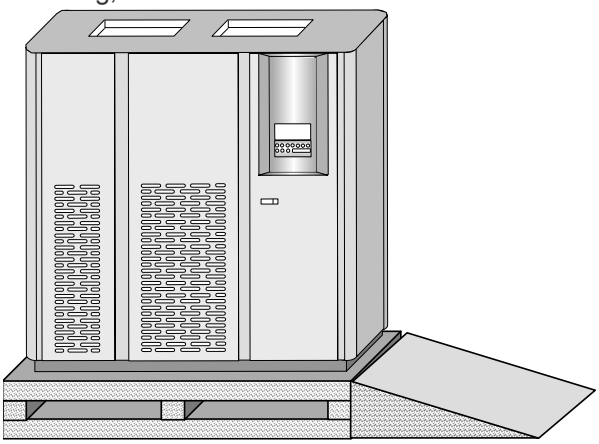
The Leonardo Evolution units are packaged in wooden crates or anchored to a pallet and covered in cardboard.
Check that the delivery is complete and inform the carrier of any damage to the unit which may be attributed too careless or inappropriate transportation. In particular, check any eventual damage to the panel in which the user terminal is mounted.
Lifting and moving the unit must be carried out by a mechanical lifter.
The following must be contained within the packaging:

- The Leonardo Evolution unit;
- Leonardo Use and Installation Manual;
- Leonardo unit electrical diagrams;
- Leonardo unit cooling circuit diagrams;
- Leonardo unit installation diagrams;
- List of spare parts;
- CE declaration with a list of the European standards to which the machine must conform;
- guarantee conditions

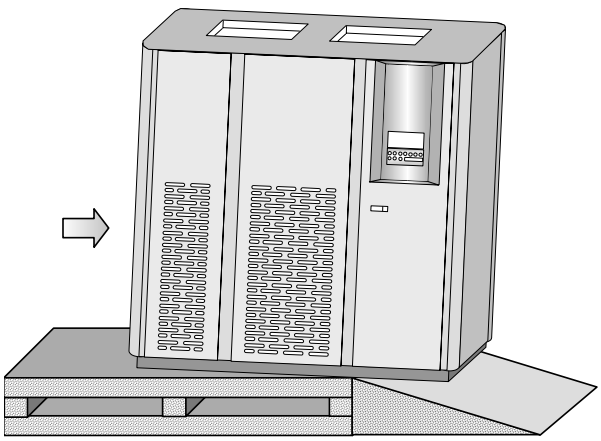
Unloading the unit

To unload the unit from the pallet, carry out the following procedure:

- move the pallet as near as possible to where the unit is to be installed;
- not tilt or turn the unit upsidedown;
- use a ramp to avoid any damage to the unit during unloading;



- remove the blocking screws which fix the unit to the pallet;
- carefully push the unit along the ramp until it reaches the floor.

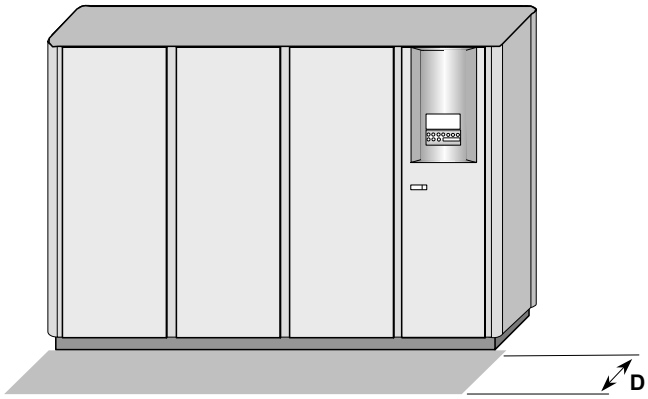


Characteristics of the installation area

WARNING! The unit must be installed internally and protected from adverse conditions.

The unit is predisposed for installation on raised access flooring using mounting frames or appropriate floor stands supplied on request from Uniflair. However, the upflow units (upwards air flow) with air intake through the rear or front can also be installed on floors which are not raised.
The area of installation must have the following characteristics:

- to facilitate maintenance, leave a clearance (distance D) of at least 700mm free in front of the unit. Check that the air intake and discharge connections are not blocked in any way, not even partially;



- a horizontal and even floor;
- the electrical energy distribution system has been produced in respect of CEI standards, suitable for the characteristics of the unit;
- a cold water distribution implant (if a humidifier is to be installed);
- implant for connection to the condensing unit;
- external air outlet (if a fresh air intake is to be installed);
- if or the refrigerating gas drain see paragraph "Connection to gas drain";
- drainage system.

WARNING! The preparation of the installation area must be carried out as indicated in the installation drawing attached to the machine documentation.

Positioning of the unit

WARNING! If the surface where the unit is placed is not even and horizontal, there is a risk of an overflow from the condensation tray. A maximumheight difference of 5mm between the ends of the unit is allowed.

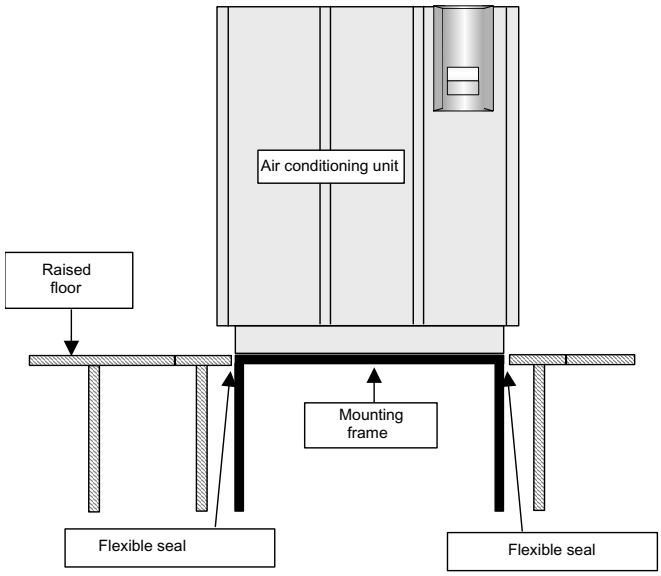
Installation on raised access flooring

Installation on raised access flooring occurs by means of a mounting frame. The frame enables the installation of the unit before the raised floor is installed, increased absorption of noise and vibrations and the facilitation of connecting ipes and cables.
The upflow models (upwards air flow) with rear or frontal air intake may be installed without using the mounting frame.

Installation of the mounting frame

To install the unit on raised flooring using the mounting frame, carry out the following procedures:

- a flexible seal at least 5 mm thick should be fitted between the raised floor panels and the mounting frame which should also be isolated from the metallic floor structure;
- position the unit of the mounting frame and fix it using the M8 screw inserts found on the base of the unit.



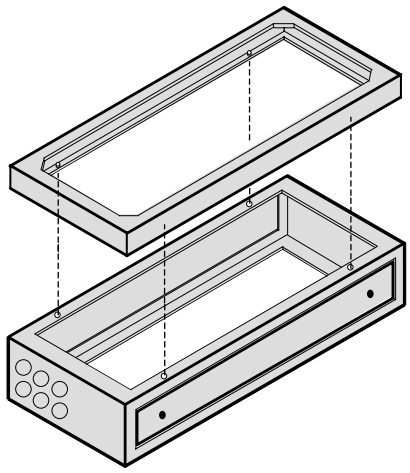
Installation on flooring which is not raised

Installation on flooring which is not raised can occur without using bases, but only on upflow models
(upwards air flow) with rear or frontal air intake. Installation on this type of floor does not require any additional operation besides that of normal positioning.

Installation of the floor stand

To install the unit on the floor stand, carry out the following procedures:

- position the unit on the floor stand;
- fix the unit to the floor stand using the M8 screw inserts found on the base of the unit.

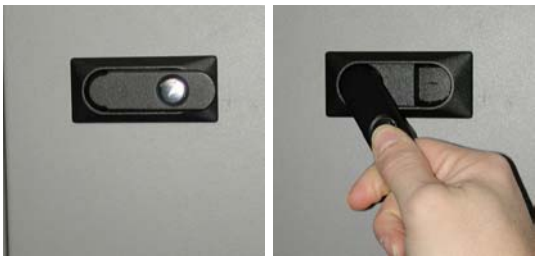


Door opening and removal of the panels

Door opening

To open the door of the unit, carry out the following procedure:

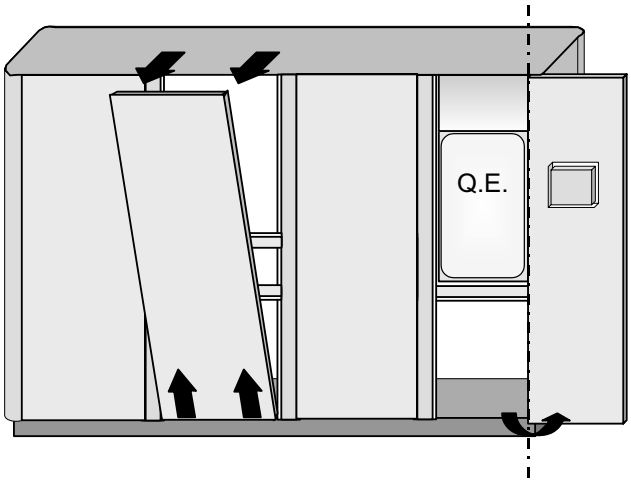
- push the button and pull the handle lightly outwards;
- turn the handle downwards until the door opens.



Removal of the front and side panels

To remove the front and side panels, carry out the following procedure:

- firmly hold the panel;
- lift and incline the panel outwards until it is completely removed.

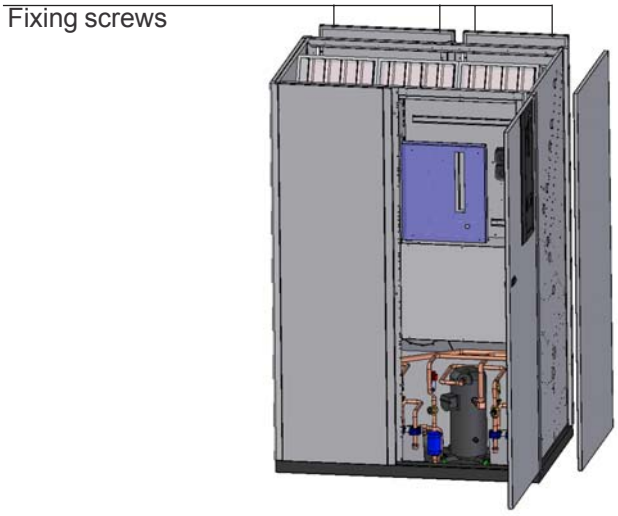


NOTE: After having removed the side panels, the non-removable protective panel, blocks accessibility to the inside of the machine.

Removal of the rear panels

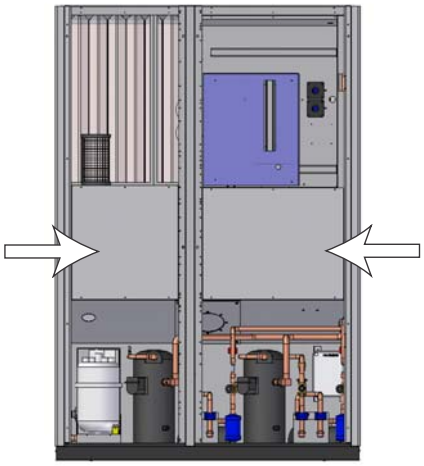
To remove the rear panels, carry out the following procedure:

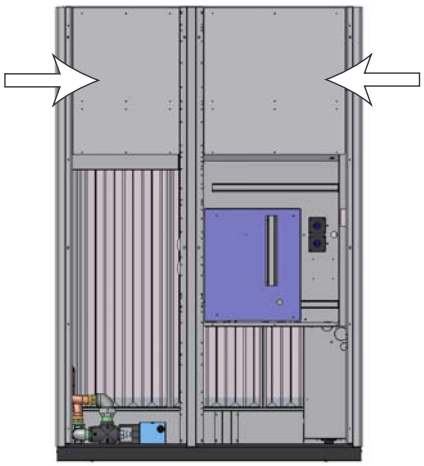
- unscrew, using a star screwdriver, the screws which fix the panel at the top of the machine;
- firmly hold the panel;
- lift and incline the panel outwards until it is completely removed.



Internal protection panels

The technical compartment, the electric heaters and the autotransformer fans are protected by internal protection panels for safety reasons and to allow the opening of the external panels without triggering the unit's safety alarms. In the figures below, the different types of internal protection panels are shown on various types of machines.





Before removing the internal protection panels, disconnect the power supply by turning the main isolating switch D5 to position "O", then wait until the fans stop and the electrical heaters cool down.

Electrical connections

WARNING! Electrical connection of the machine to the power supply must ONLY be carried out by a qualified electrician.

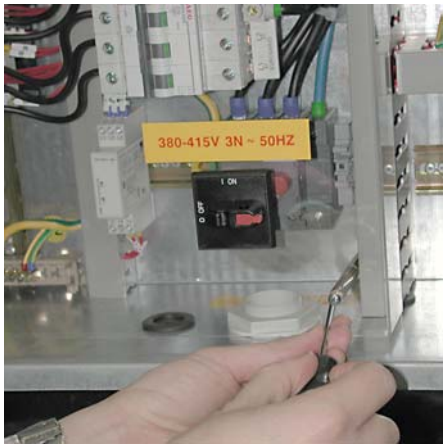
WARNING! Electrical lines must be established in full respect of CEI standards.

WARNING! Before establishing the electrical connection, make sure that the power supply is off. Also ensure that it is not possible to reconnect the power during the operation.

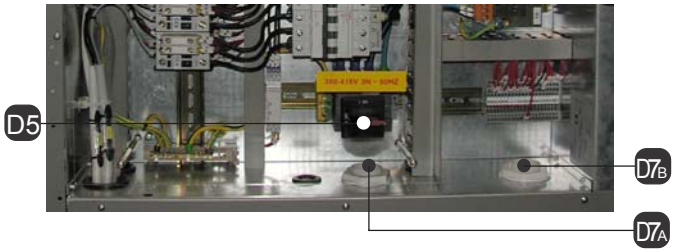
WARNING! The power supply voltage must be ± 10%

To carry out the electrical connections of the machine to the power supply, carry out the following procedures:

- use suitable equipment to check the efficiency of the grounding system;
- check that the voltage and network frequency correspond to those of the machine (see identification label);
- open the door of the electrical panel;
- remove the plastic screen of the electrical panel using a star screwdriver;

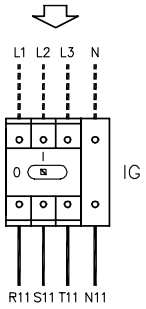


- pass the cables inside using the power supply cable inlet D7A which connects to the main switch D5;



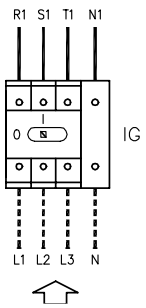
- refer to the wiring diagram and connect the cable to the main switch D5.

POWER SUPPLY CABLE
(at customers at care)



TD./TU.A–W–E–D–T (R)
0511A–0611A

400V/3Ph+N/50Hz



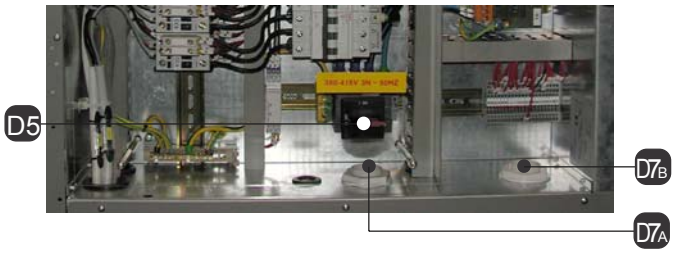
TD./TU.A–W–E–D–T (R;V)
0721A–0722A–0921A–0922A–1021A–1022A
1121A–1122A–1321A–1322A–1422A–1622A–1822A

400V/3Ph+N/50Hz

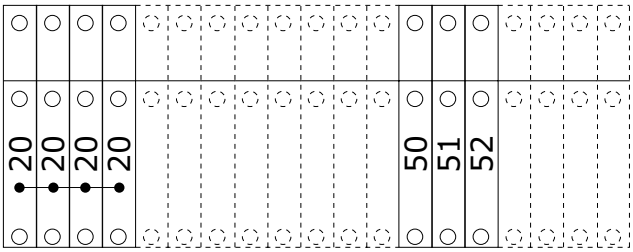
POWER SUPPLY CABLE
(at customers at care)

To connect the auxiliary connections to the terminal board, carry out the following procedures:

- pass the cables through the power supply cable inlet D7B;



- refer to the wiring diagram and carry out the connection to the terminal board.



DIGITAL CONFIGURABLE INPUTS

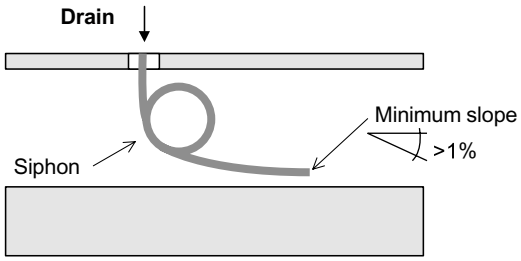
Terminal board 51-20
- User
- ON - OFF Remote
- Flooding sensor (SAS)
Terminal board 52-20
- User
- ON-OFF Remote
- Fire-smoke (SFF)
Terminal board 50-20
- User
- ON-OFF Remote
- Tools (ATA-BTA-AUA-BUA)

Connection to the drains

The condensed water drains from the tray through a siphoned flexible tube fitted in the unit.
If the conditioner is fitted with a humidifier, the condensate drain tray and the humidifier drain connection must be connected to the drains of the building.

Direct connection to the drains of the building

Connect the drainage tube of the unit to the drains of the building using a rubber or plastic tube with an internal diameter of 25 mm.
The external drainage tube must be siphoned in order to avoid unpleasant odours. Maintain a minimum slope of 1% downstream of the siphon.

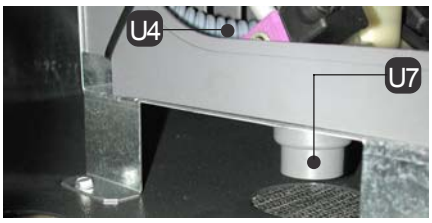


Once the connections have been made, pour water into the condensate drain until the siphon inside the unit is full.

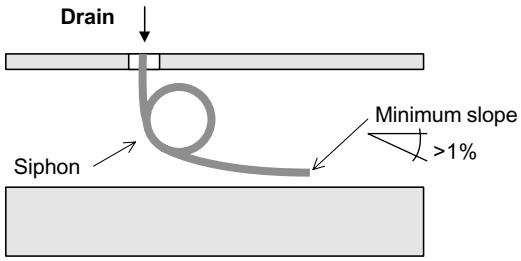
Connection to the humidifier (optional) and to the drains of the building

WARNING! The water discharged from the humidifier is at a very high temperature. The drainage tube has to withstand high temperatures (at least 100°C) and must be kept away from electrical cables.

Connect the drainage tube of the unit to the collection tray (U4) of the humidifier.
Connect the drainage tube of the humidifier (U7) to the drains of the building using a rubber or plastic tube, which is resistant to high temperatures (minimum 100 °C) with an internal diameter of 22 mm.



The external drainage tube must be siphoned to avoid unpleasant odours and an overflow of the water from the tray of the humidifier. Maintain a minimum slope of 1% downstream of the siphon.



Once the connections have been made, pour water into the condensate collection tray of the Leonardo unit and in the condensate collection tray of the humidifier until both siphons are full.

Connection to the gas drain

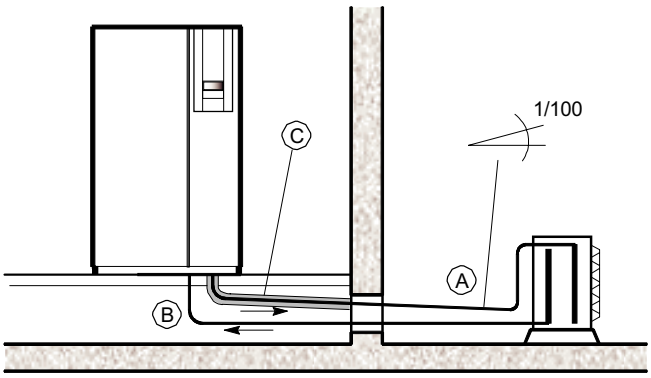
The cooling circuit is equipped with a safety valve for the discharge of the refrigerant gas.
The intervention of the valve pressurises the discharge of the refrigerant fluid, possibly also to high temperatures; in the case of installation in a closed environment, where there is the risk of causing damage to people nearby, a conveying tube must be used from the discharge to outside the room; this must be done in such a way that the operation of the valve is not affected: it must not create a full flow, a counter-pressure higher than 10% of the pressure of the calibration. Where it is not possible to install a conveying tube it is good practice to create adequate aeration of the environment, and indicate, through specific signs, the presence of the drain. Also check that the discharge of the valve does not take place behind the electrical boards or electrical equipment.

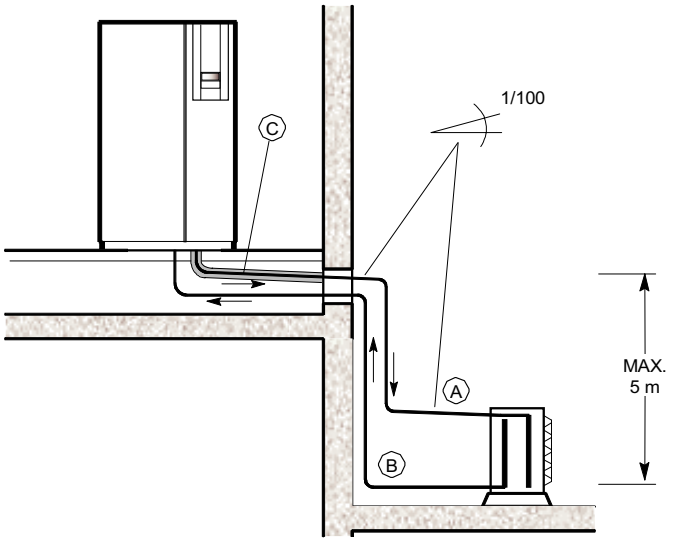
SAFETY VALVE OUTLET

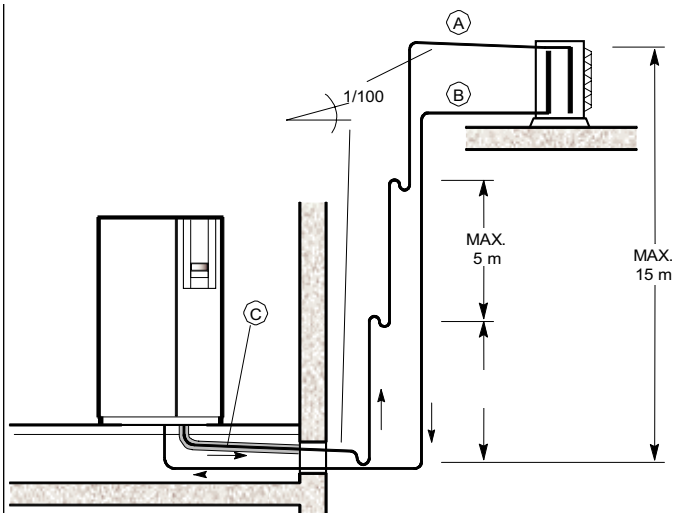
Refrigerant connections on air cooled units

Installation guide

WARNING! The pipes must always be protected from the sun.





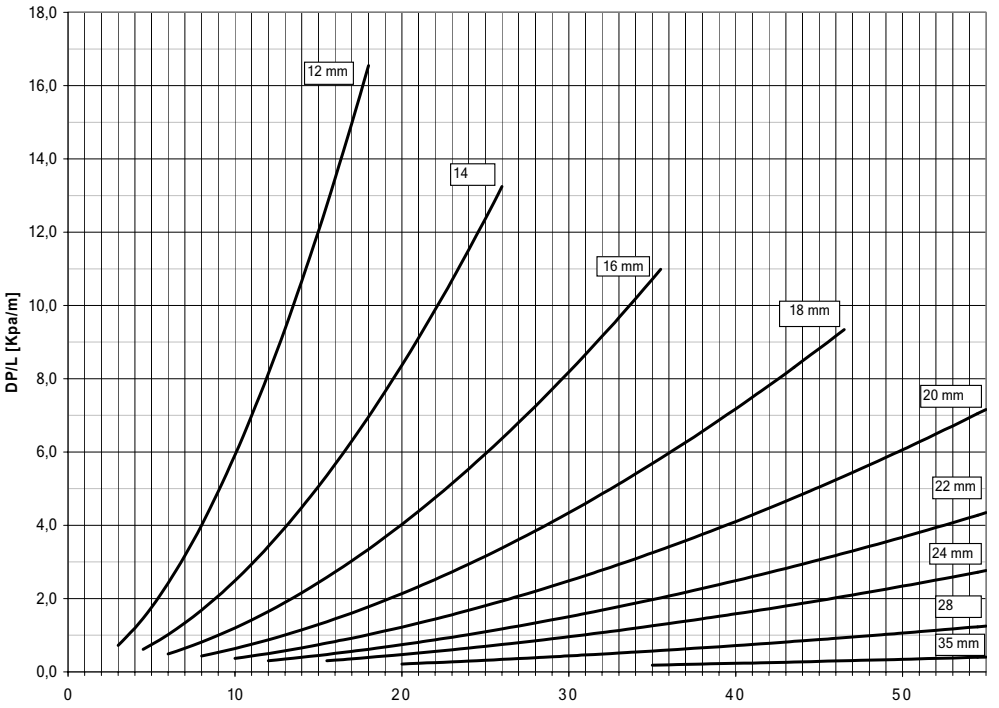


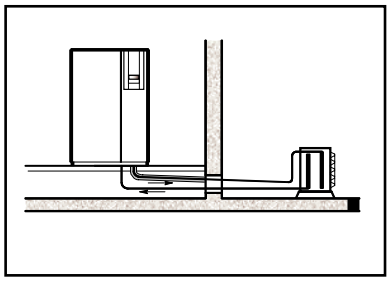
Choosing the diameter of the discharge tube

The discharge line must be sized in such a way that it guarantees the flow of oil, in particular when operating at partial load, avoiding the return of the condensate refrigerant to the head of the compressor and prevent excessive vibration and noise due to the pulsations of hot gas, vibrations of the compressor, or both.
Even if it would be preferable to have low losses of the load along the line, an oversized discharge line is necessary to reduce the speed of the refrigerant so that it does not provoke a reduction in its speed and therefore reduce the flow of oil. Moreover, when the machine uses more compressors for the cooling circuit, the discharge line must transport the oil at all operating levels.
The minimum diameters needed to guarantee the flow of oil can be found in Graphics 1 -2 for the horizontal and vertical lines respectively.
In the installation of machines which have more compressors per circuit, the vertical discharge line, sized in order to guarantee the flow of oil at minimum load, may cause excessive loss of load when operating at its maximum level; in this case it is possible to use pipes with a larger diameter together with an oil separator.
The loss of load along the discharge line causes an increase in the condensing temperature and therefore a decrease in the cooling capacity of the conditioner. Please note that each percentage point of decrease in the cooling capacity corresponds to a decrease of 1°C of the maximum operating temperature. Normally the systems are sized in such a way that the loss of load from the discharge line does not cause a decrease in the efficiency of the machine of more than -3%.
The responsibility of establishing the refrigerant line between the condensing unit and the external unit lies with the installer.

Graphic 1

Discharge tube - horizontal line (External diameter)

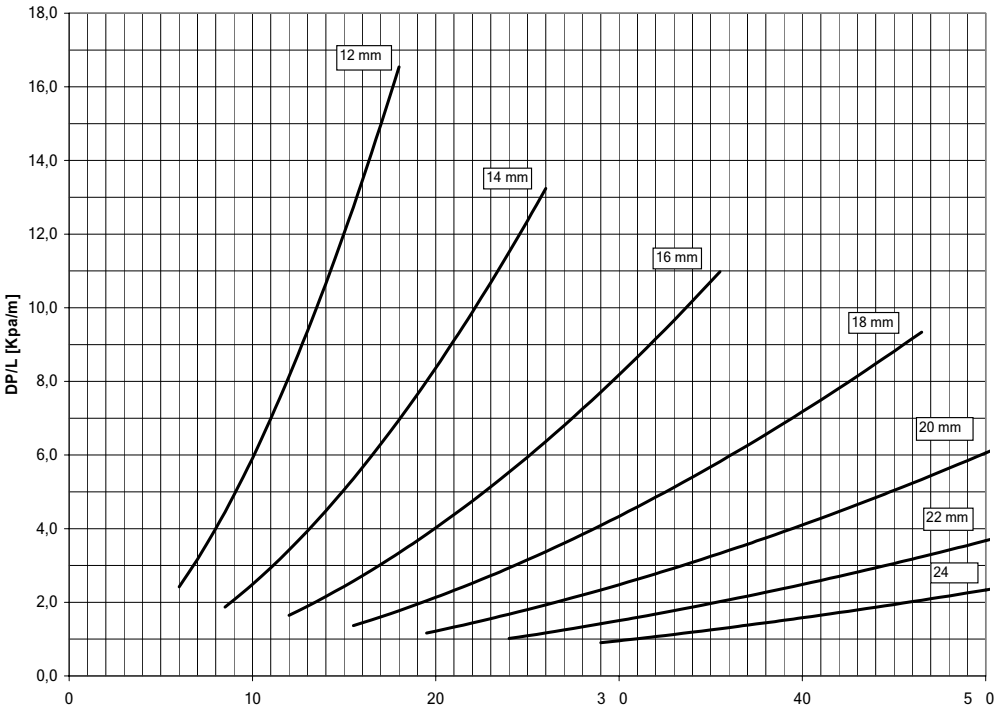


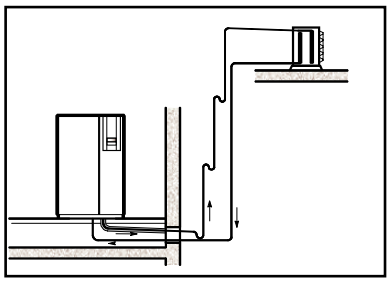


Cooling capacity / circuit [KW]

Graphic 2

Discharge tube - vertical line (External diameter)

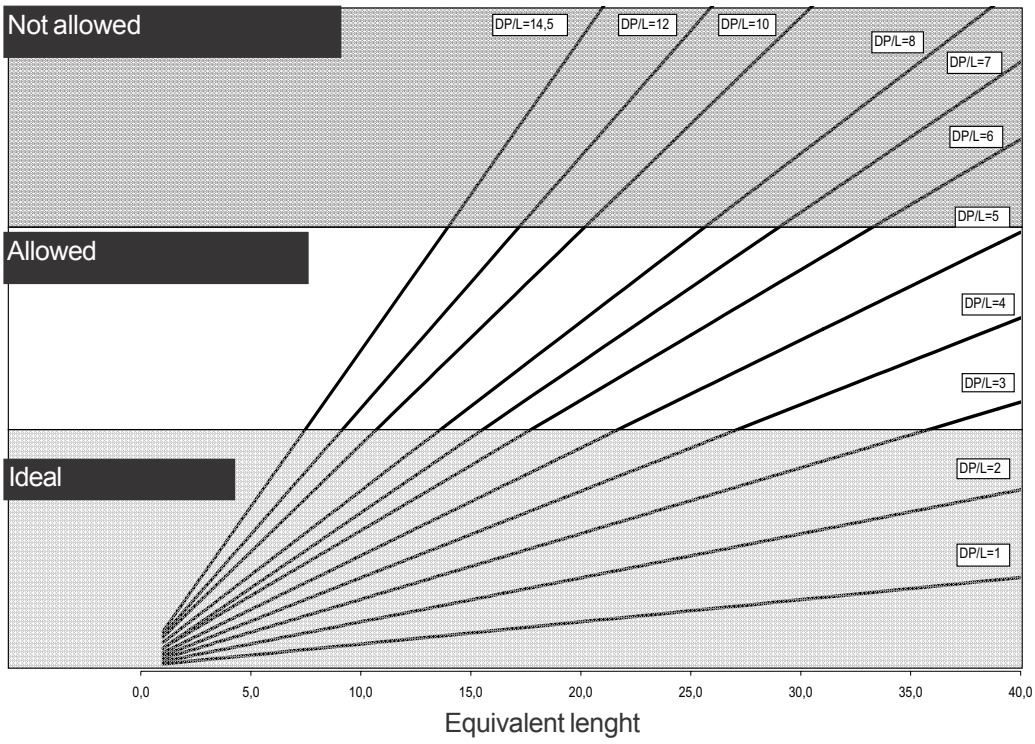


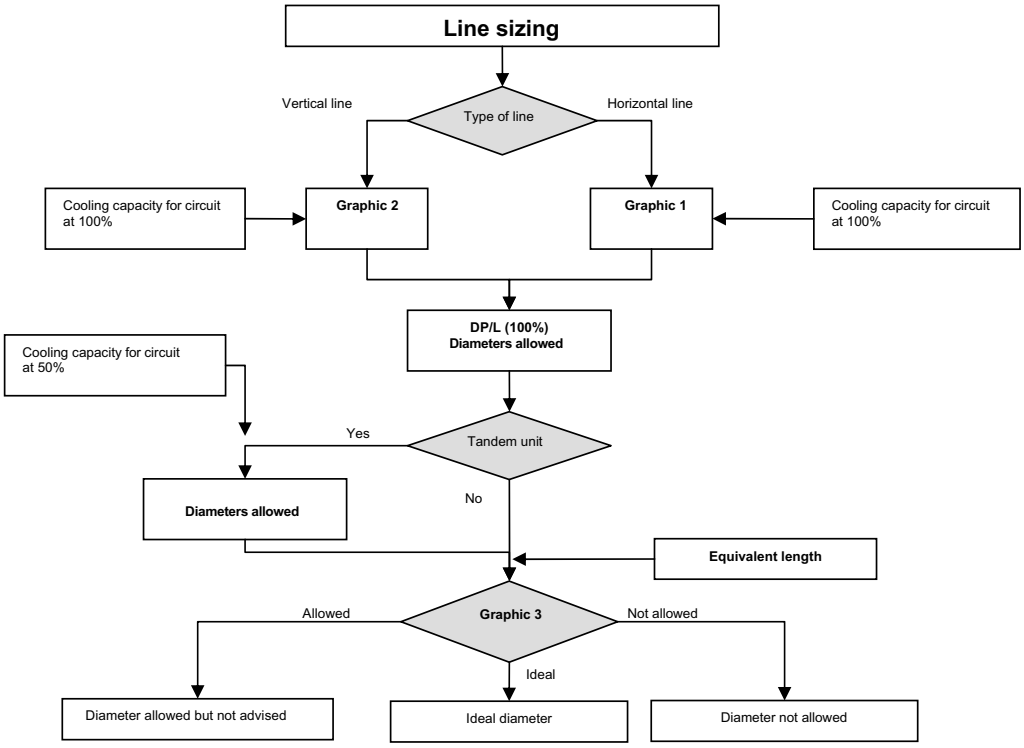


Cooling capacity / circuit [KW]

DP/L :Load loss per meter calculated by R407C (Condensing temperature 50°C dew point)

Graphic 3





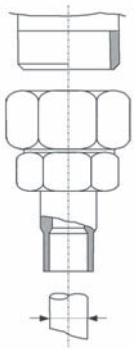
EXAMPLE - Choosing the diameter of the discharge tube

Conditioner selected: TDAR0721A
Cooling capacity per circuit: 24 Kw
Discharge line: vertical
Equivalent length of the line: 20 m
1) Graphic 2:
Operating at 100% (2 compressors - cooling capacity per circuit = 24KW):
possible diameters:
20mm DP/L= 1,8 Kpa/m
18mm DP/L= 3,0 Kpa/m
16mm DP/L= 6,0 Kpa/m
14mm DP/L= 11,5 Kpa/m
Operating at 50% (1 compressor - cooling capacity per circuit = 12 KW): possible diameters:
16mm DP/L= 1,7 Kpa/m
14mm DP/L= 3,4 Kpa/m
2) Graphic 3:
Operating at 100% (2 compressors)
Diameter 16mm 6,0 Kpa/m Allowed Diameter 14mm 11,5 Kpa/m Not allowed
The advised diameter is 16 mm

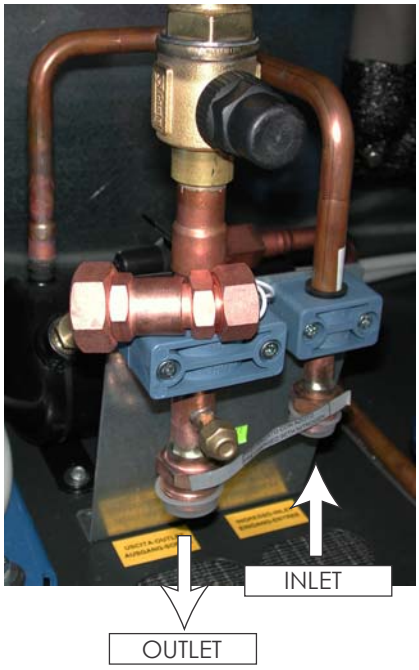
WARNING! The laying of the lines and the refrigerant connections must be carried out by a qualified refrigerant circuit technician.

The refrigeration circuit must be connected to the condensing unit with copper pipes.
The diameter of the pipes must be chosen according to the length of the refrigerant line itself (preferably less than 30 m) therefore it is possible that the internal diameter of the rotalock valves supplied by Uniflair will not coincide with the diameter of the pipes. To connect the refrigeration circuit to the condensing unit, carry out the following procedure:

- check that the diameter of the rotalock valves coincides with the diameter of the connecting pipe;



- weld the rotalock valve to the inlet and outlet pipes of the condensing unit;
- using the teflon gaskets screw the rotalock valves to the inlet and outlet pipes of the refrigeration circuit of the conditioner.



Evacuation of the refrigeration circuit and charging of refrigerant

WARNING! The charging and maintenance of the refrigeration circuit must only be carried out by a qualified hydraulic technician.

The refrigeration circuit is pre-charged with nitrogen.
To load the refrigerant, carry out the following procedure:

R22

- open any shut-off valves present in the machine to ensure that all of the components will be evacuated;
- connect a pump to empty the schrader connections efficiently, or to the 1/4" SAE connections present on the intake and delivery sides of the compressors;
- connect the refrigerant cylinder to the loading connections;
- create a vacuum within the lines while maintaining the pressure below 100 Pa absolute (0,7 mm Hg) for a long time in order to evacuate the air as well as any traces of humidity. It is preferable that the vacuum is reached slowly and maintained for a long period of time;
- wait for a build up period of 100 seconds and check that the pressure has not exceeded 200 Pa absolute. Generally, in the case of suspicion of strong hydration of the circuit or an extremely extensive system, it will be necessary to break the vacuum with anhydrous nitrogen and then repeat the evacuation procedure as described;
- break the vacuum by performing a preload from the R22 coolant cylinder;
- after having started the compressor, slowly complete the loading phase until the pressure within the lines has been stabilised and the gaseous bubbles have disappeared from the flow sight glass;
- the loading process must be controlled in environmental conditions with a delivery pressure of approximately 18 bar (equivalent to a saturated temperature of 48 °C); in the case of units with ON/OFF condensation controls, avoid switching the condenser fan on and off, which may partially obstruct the intake surface. It is wise to check that the sub-cooling of the liquid at the entry of the thermostatic valve is between 3 and 5 °C below the condensation temperature read on the scale of the pressure gauge and that the overheating of the vapour at the exit of the evaporator is equal to 5-8 °C.

R407C

- open any shut-off valves present in the machine to ensure that all of the components will be evacuated;
- connect a pump to empty the schrader connections efficiently, or to the 1/4" SAE connections present on the intake and delivery sides of the compressors;
- connect the refrigerant cylinder to the loading connections;
- create a vacuum within the lines whilst maintaining the pressure below 10 Pa absolute (0,07 mm Hg) for a long time in order to evacuate the air as well as any trace of humidity. It is preferable that the vacuum is reached slowly and maintained for a long period of time;
- wait for a build up period of 100 seconds and check that the pressure has not exceeded 200 Pa absolute. Generally, in the case of suspicion of strong hydration of the circuit or an extremely extensive system, it will be necessary to break the vacuum with anhydrous nitrogen and then repeat the evacuation procedure as described;
- break the vacuum by performing a preload in liquid phase from the R407C coolant cylinder;
- after having started the compressor, slowly complete the loading phase until the pressure within the lines has been stabilised and the gaseous bubbles have disappeared from the flow sight glass;
- the loading process must be controlled in environmental conditions with a delivery pressure of approximately 18 bar (equivalent to a dew temperature of 48 °C and a bubble temperature of 43 °C); in the case of units with ON/OFF condensation controls, avoid switching the condenser fan on and off, which may partially obstruct the intake surface. It is wise to check that the sub-cooling of the liquid at the entry of the thermostatic valve is between 3 and 5 °C below the condensation temperature read on the scale of the pressure gauge and that the overheating of the vapour at the exit of the evaporator is equal to approximately 5-8 °C.

Type of oil recommended with COPELAND compressors

R22 (Mineral oil)	Suniso 3 GS	Texaco WF 32	Fuchs KM
R407C (POE)	Mobil EAL Arctic 22 cc	ICI EMKARATE RL 32S	

Type of oil recommended with MANEUROP compressors

R22 (Mineral oil)	Maneurop 160 P - Mineral / ISO 32
R407C (POE)	Maneurop 160 SZ

Type of oil recommended with SANYO compressors

R22 (Mineral oil)	SAY - 56T
R407C (PVE)	FV68S

Connection for water cooled units

WARNING! The laying of the lines and hydraulic connections must only be carried out by a qualified plumber.

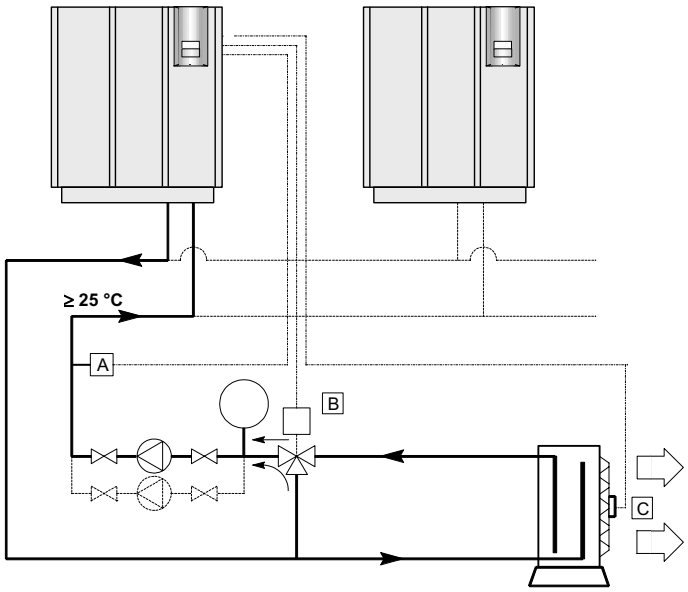
WARNING! The chilled water must contain a percentage of ethylene glycol (of the passive type, which is therefore not corrosive) according to the minimal external temperature predicted (see the table below).

Percentage of ethylene glycol	10%	20%	30%	40%	50%
Freezing temperature	-4°C	-10°C	-17°C	-25°C	-37°C

If the temperature of the chilled water is not checked it may fall to under 25°C, therefore it is necessary to use a pressostatic valve (available as an optional) for each condenser; in this case the pressure of the supply must not be less then 200 kPa (2 bar).

WARNING! Do not use chilled water with an evaporating tower because the condensers will quickly become encrusted with limescale.

The condenser must be connected to the chilled water distribution network, paying attention to the direction of the water inlet and outlet.
The condensers are supplied by water pumped in a closed circuit and chilled by external refrigerators; check that the section of piping and the characteristics of the circulation pump are suitable: an insufficient flow of water can have a negative effect on the capacity of the conditioner.
The chilled water temperature must be checked to ensure that it does not fall to below 25°C, preferably according to the plan indicated in the figure.
The microprocessor control system is predisposed for measuring the temperature of the water using probes (A) and modulating the servomotor of the valve (B) or by driving the fans (C) of the external refrigerators.



If the water temperature falls to below the dew point of the air conditioner, isolate the piping with closed cell material (e.g.: Armaflex or equivalent) to avoid condensation; the isolation must allow the accessibility of the valves and the three piece joints. Seal the piping holes through the base of the conditioner to avoid a bypass of air.

WARNING! The water cooled pressure must not be above 6 bar.

Table of condenser fitting dimensions

	0511 0611	0721 0921 1021 1121 1321 1411 1421	0722 0922 1022 1122 1322 1422 1622 1822
Water condenser inlet	1"	1.1/4"	2x1.1/4"
Water condenser outlet	1"	1.1/4"	2x1.1/4"

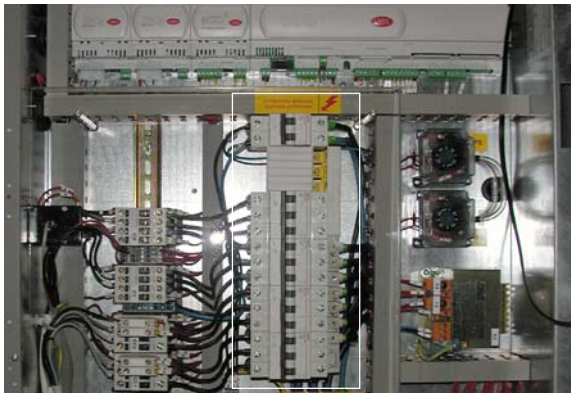
Once the connections have been made to the hydraulic circuit, the system can be filled.

MANUAL START UP AND SHUT DOWN OF THE UNIT

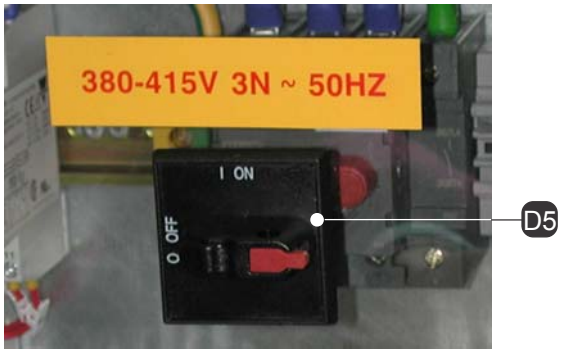
WARNING! Check that the refrigerant circuit has been filled.

To start up the unit, carry out the following procedure:

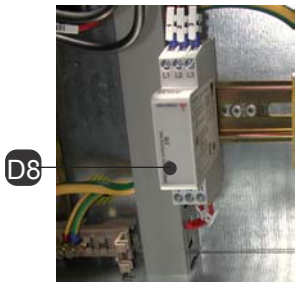
- open the door of the electrical panel and the front panels;
- position the automatic switch of the auxiliary circuit to "I" (on);
- position all of the automatic switches on the electrical board to "I" (on);

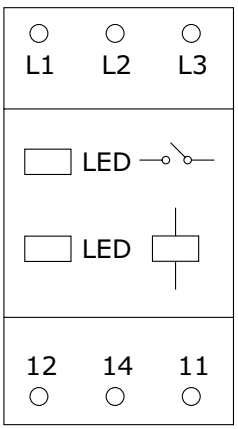


- fuel the unit by positioning the main switch to "I" (on);



- check that both of the led RSF sequence phases (D8) are lit up; the green led indicates that the power is on, the yellow led indicates that the phase sequence is correct. In the event of incorrect phase sequence, invert 2 of the 3 phases of power supply following the instructions indicated in the paragraph "electrical connections" and return to the start up procedure;





WARNING! During prolonged breaks a spontaneous migration of the refrigerant may occur in the casing of the compressor, which may cause foaming of the oil and consequent damage by the lack of lubrification. It is recommended that the main switch is not turned off during weekly breaks.

- wait at least 12 hours before start up so that the oil in the compressors warms up sufficiently;
- open the shut off valves (I5) of the refrigerating circuits;

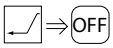
- check that the remote condensers are powered (on air cooled models);
- check that the external dry coolers are powered and check the presence of the water flow for condensation (on water cooled models);
- check that the tracts of siphoned corrugated pipe, both internal and external to the conditioner, have been filled with water in the installation phase;
- close the door and the front panels;
- wait for the oil in the compressors to heat (12 hours for compressors equipped with heaters);
- press the ENTER key (A6) of the user terminal; a sliding bar and a ventilator icon will appear on the display;

- if an alarm is indicated, consult the user interface manual UG40;

To shut down the unit carry out the following procedure:

WARNING! During prolonged breaks a spontaneous migration of the refrigerant may occur in the casing of the compressor, which may cause foaming of the oil and consequent damage because of the lack of lubrification. It is recommended that the main switch is not turned off during weekly breaks.

- on the first screen of the user terminal, press keys A5 or A7 until the SWITCH OFF UNIT screen appears;
- press the ENTER key to confirm;
- the following icons will appear



Press the ENTER to confirm

SETTING AND ADJUSTMENT
Selecting the power supply of the fans

WARNING! Before establishing the electrical connection, make sure that the power supply is off. Also ensure that it is not possible to reconnect the power during the operation.

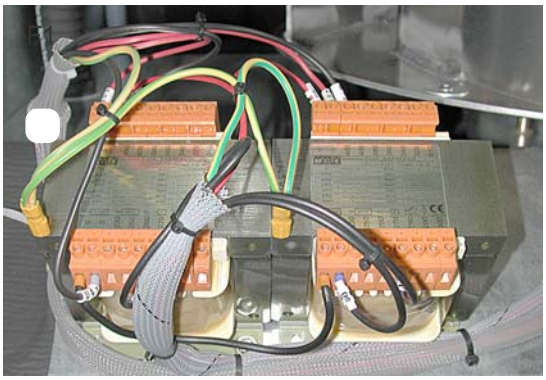
WARNING! In the case of a unit with ducts, the load loss from the exhaust duct must be less than 100 Pa.

In the following table the voltage levels for each model working in the standard version are given:

Models	V
0511 - 0611	176
0721 - 0722 - 0921 0922 - 1021 - 1022	260
1121 - 1122 - 1321 - 1322	250
1422 - 1622 1742 - 1822 - 1842	260

MODELS WITH AN AUTOTRANSFORMER

In the TD*R and TU*R units, the speed of the fan rotation can be varied by using the ATR transformer (F1).



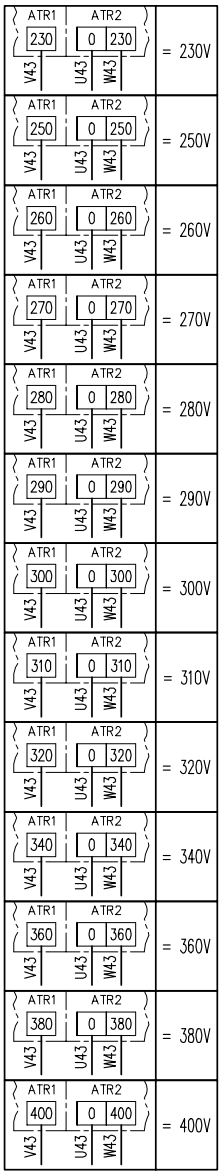
To obtain the required prevalence of the implant, it is possible to vary the voltage by selecting one of the following levels: 230V - 250V - 260V - 270V - 280V - 290V - 300V - 310V - 320V - 340V - 360V - 380V - 400V.

In the following table the maximum pressure available (expressed in Pa) for each voltage level of the transformer is indicated. The values are given for the maximum air flow (expressed in m3/h).

T*AR T*WR	0721 0722 0921 0922 1021 1022	1121 1122 1321 1322	1422 1622 1822
FA[m³/h=]	8180	11710	15600
V	Pa	Pa	Pa
230	0	0	0
250	0	13	0
260	24	43	11
270	50	72	40
280	75	102	70
290	101	131	99
300	127	160	129
310	152	190	158
320	178	219	188
340	229	278	247
360	280	337	305
380	332	396	364
400	383	455	423

After having selected the voltage level, carry out the connection in the following way:

- with the unit turned off, open the front panels and the door of the electrical panel and the internal protection panels;
- select the supply voltage by positioning the main switch to "0" (D5);
- following the diagram found here on the side (ATR digaram), connect the two electric wires which come from the fans or from the connector block, identified with V43 and W43 to the corresponding clamps of the ATR transformer.



MODELS WITH A PHASE CONTROL VOLTAGE REGULATOR

To obtain the required prevalence of the implant in models with a phase control voltage regulator, it is possible to vary the voltage percentage through the use of the user terminal (A).

To select the voltage percentage to be applied, carry out the following procedures:

- on the user terminal press the PRG button;
- using the UP or DOWN key select SERVICE MENU and confirm using the ENTER key;
- enter the password (see the envelope attached to the manual);
- using the UP or DOWN key select HARDWARE SETTING and confirm using the ENTER key;
- using the UP or DOWN key select EVAPORATING FAN and confirm using the ENTER key;
- set the amount and confirm using the ENTER key.

In the following table the maximum pressure available (expressed in Pa) for each voltage level of the transformer is indicated. The values are given for the maximum air flow (expressed in m3/h).

T*AR T*WR	0511	0611
FA[m³/h=]	5740	5740
%	Pa	Pa
40	0	0
50	0	0
55	25	25
60	64	64
70	129	129
80	156	156
90	174	174
100	190	190

T*AV T*WV	0721 0722 0921 0922 1021 1022	1121 1122 1321 1322	1422 1622 1822
FA[m³/h=]	8220	12320	16030
%	Pa	Pa	Pa
50	0	0	0
55	0	0	0
60	0	0	0
65	0	29	0
70	20	103	0
75	101	180	62
80	193	262	153
85	287	347	246
90	383	436	341
95	482	530	439
100	582	620	535

Setting the regulation and safety devices

After starting up the unit, set the following set points (see the microprocessor control manual):

- Room temperature (cooling and heating set point);
- Relative room humidity (humidification and dehumidification set point);
- Dirty filter differential pressure switch: see paragraph "Setting the dirty filter sensor".

The settings of the safety devices must not be modified.

Code	Description	Opening	Differential	Re-set
AP1-AP2	High pressure switch	26.5 bar (opening)	-	Manual Reset
TSR	Safety thermostat (T and H)	320 °C (opening)	-	Manual Reset
VS	Safety valve	29 bar	-	-

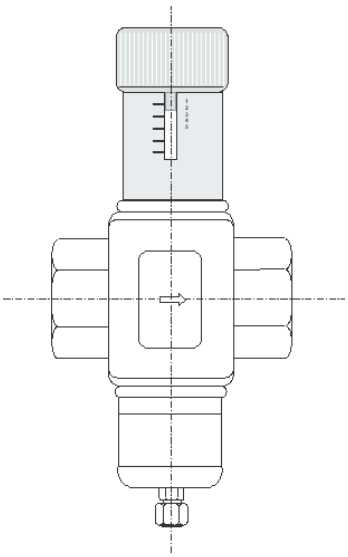
Maximum and minimum water temperatures

The maximum and minimum water temperatures for chilled water circuits and for hot water re-heat circuits are: 5°C ÷ 90°C.

The accepted maximum amount of ethylene glycol is 50%.

Setting the pressostatic valve (optional on chilled water cooled models only)

The pressostatic valve, by controlling the water flow, prevents the condensing pressure falling too low and at the same time minimises water consumption. When necessary, set the pressostatic valve by turning the regulation knob (the pressure increases when turning it clockwise) until the condensation pressure stabilizes to recommended value of 17 bar (equivalent to a saturation temperature of approximately 45 °C in the case of R22) checking the pressure with a gauge fitted to the pressure tapping of the compressor discharge valve.



Setting the air flow sensor

The FS differential pressure switch intervenes if the fan (or one of the fans) stops working.
The factory set point of the FS differential pressure switch is at 0.5 mbar (= 50Pa).
As the difference in pressure between the suction and discharge of the fans depends on the air flow, it may be necessary to calibrate the instruments after installation, checking that the contact closes when the fans are in operation.
To set the FS pressure switch, carry out the following procedure:

- simulate a fan fault by stopping a fan; check that the pressure switch intervenes;
- if the pressure switch does not intervene, gradually increase the setting until the pressure switch switches off:
  - using an adjustment screw, set the differential pressure switch on a scale (from 0.5 to 4.0 mbar - from 50 to 400 Pa).

Setting the dirty filter sensors

The PFS differential pressure switch is set according to the loss of load dependent on the dirt inside the filters and the air flow.
The PFS differential pressure switch must be set at 3 mbar (=300 Pa).
To set the PFS pressure switch, carry out the following procedure:

- gradually cover the surface of the air filter and check that the pressure switch intervenes when the filter is about 50-60 % covered;
- if the pressure switch does not intervene, gradually lower the setting, if it cuts in too soon, increase the setting:
  - using a star screw driver turn the regulation screws of the pressure switch to the desired value.

MAINTANENCE

Weekly checks

Carry out the following checks weekly:

- check that the room conditions on the control panel display are normal;
- check the refrigerant charge and make sure that no gas bubbles are present in the flow sight glass (the presence of a few bubbles is, however, normal);
- check that the noise level emitted by the compressor and by the fans is normal;
- check that the air filters are not clogged; clean or change the filters when the relative alarm comes on (see paragraph "Cleaning and replacing the filters");
- check the supply voltage.

Monthly checks

Carry out the following checks monthly:

- check that the cylinder and the feed and drain valves of the humidifier are not clogged (if present); replace the cylinder when the relative alarm comes on (see the microprocessor control manual);
- check the water flow of the condensate to the main drain is free;
- check that the remote condensers or dry-coolers are not clogged, removing any foreign objects (leaves, seeds, dust) with a blast of compressed air.

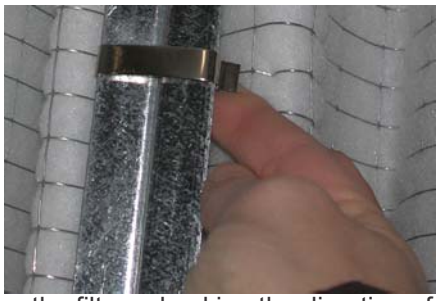
Annual checks

- check that the evaporating and condensing pressure and saturation temperatures are correct;
- check that the electrical terminals are tightened and in good condition;
- check that the ethylene glycol level is correct (chilled water cooled units).

Cleaning and repalcing the filters

To clean and replace the filters carry out the following procedures:

- open the front panels of the machine;
- remove the filter blocking supports;



- remove the filters checking the direction of the air flow indicated on the label of each filter;

- clean them using a blast of compressed air or replace them;
- reposition the filters in the unit checking the direction of the air flow which was previously noted;
- reposition the filter blocking supports.

Troubleshooting

Troubleshooting is made easier by the indications on the control panel display: when an alarm signal is displayed, consult the control panel instruction manual. If necessary, call the nearest Service Centre describing the nature of the fault and its possible cause displayed on the control.

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
THE UNIT DOES NOT START	A) No power supply to the unit's electrical panel.	Check that the power is on and the unit main switch on the electrical panel is closed.
	B) No power to the auxiliary circuits.	1) Check that the IM automatic circuit breaker on the AUX circuit is set.
		2) Check the fuse on the main board.
	C) The control panel does not start the unit.	Check that the control panel connectors are correctly located in their sockets.

TEMPERATURE CONTROL

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
THE ROOM TEMPERATURE IS TOO HIGH	A) The parameter settings on the control panel are not correct.	See control panel instruction manual
	B) The air flow is low or absent.	See "LACK OF / ABSENT AIR FLOW".
	C) The temperature sensor is not working.	Check the electrical connections and the control configuration.
	D) The thermal load is higher than expected.	Check the room's thermal load.
	E) The three-way valve is not working.	Check the electrical connections of the servomotor valve.
		Open the valve by means of the manual control knob.
	E) Valvola a tre vie non funzionante.	Check the chilled water supply; check that the shut-off valves are open.
	F) There is an insufficient chilled water flow.	Check the chilled water funtion.
	G) The chilled water temperature is too high.	See "THE COMPRESSOR(S) DOESN'T / DON'T WORK".
ROOM TEMPERATURE TOO LOW	A) The parameter settings on the control are not correct	See the microprocessor control manual.
	B) There is insufficient power supply to the elcttric heaters or the heaters are not working	1) Check that the IM of the heating element is armed.
		2) Check the electric feeding circuit of the heaters.
		3) If there is a heater alarm, remove the cause and re-set the safety thermostat.
	C) The hot water coil is not working.	1) Check the hot water capacity and temperature.
		2) Check the function of the regulation valve (see valve and servomotor).
	D) The hot gas coil is not working during dehumidification with re-heat.	1) Check the hot gas 3 way valve function.
		2) Check the function of the compressor serving the re-heat. See "THE COMPRESSOR(S) DOESN'T / DON'T WORK".
	E) The three way valve of the chilled water circuit is blocked open.	Close the valve using the manual control knob and replace the servomotor.

HUMIDITY CONTROL

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
ROOM HUMIDITY TOO HIGH	A) The parameter settings on the control panel are not correct.	See control panel instruction manual.
	B) The latent load is higher then expected.	Check the latent load, fresh air conditions and volume; external air infiltration.
	C) The compressor does not function during dehumidification.	See "THE COMPRESSOR(S) DOESN'T / DON'T WORK".
	D) The chilled water is not sufficiently cold for the dehumidification function (in energy saving and twin cool units).	Lower the chilled water temperature until condensate is present on the surface of the coil.
ROOM HUMIDITY TOO LOW	A) The parameter settings on the control panel are not correct.	Check the room humidity settings (see control panel instruction manual).
	B) The latent load is lower than expected.	Check the quantity of latent heat.
	C) The humidifier doesn't work.	1) Check the water supply pressure.
		2) Check the function of the manual control system and of the steam production group (see panel instruction manual).
	D) The control system does not work.	See the control panel instruction manual; check that the control panel and/or sensors work properly.

FANS

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
ABSENT OR LOW AIR FLOW	A) There is no power to the fans.	Check the power supply to the fans
	B) The air filters are clogged (dirty filter alarm enabled).	1) Shake the dust out of the cartridge and clean with a vacuum cleaner. Replace the filter if it is completely blocked.
		2) Check the correct setting of the dirty filter pressure switch PFS.
	C) The air flow is obstructed.	Check that the air flow is not obstructed, not even partially.
	D) The fans' thermal protection intervenes.	Check the resistance of the fan motor windings. Re-set then measure the voltage and absorption.
	E) (In TD*R, TU*R units with backward curved blade fans). The power supply to the fans is insufficient.	Change the power supply voltage to the fans. (See paragraph. 'Setting and adjustment).
	F) The air distribution output pressure is too high.	Check the air pressure distribution (ducts, ceiling or floor plenum, grilles).

ELECTRIC HEATER

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
ELECTRIC HEATER SAFETY THERMOSTAT INTERVENES	A) There is insufficient air flow.	See "LACK OF / ABSENT AIR FLOW".
	B) The thermostat connection wire is interrupted	Check the connection between the safety thermostat and the control system.
	C) The thermostat is faulty.	Replace the thermostat.

REFRIGERANT CIRCUIT

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
HIGH COMPRESSOR DISCHARGE PRESSURE	A) There is non-condensable air or gas in the refrigerant circuit, with bubbles in the flow sight glass; excessive sub-cooling.	Evacuate the refrigerant circuit and recharge.
	B) The air flow to the remote heat exchanger is insufficient or too warm.	1) Check the fan operation and rotation direction in the remote heat exchanger.
		2) Check to see if the exchanger is dirty and if necessary remove any obstructing material (leaves, paper, seeds, dust, etc.) with a blast of compressed air or a brush;
		3) In the external unit check for obstructions in the air flow and in the recirculation of the cooling air.
		4) Check that the temperature of the cooling air is within the planned limits.
	C) The water flow to the condenser is insufficient or too warm.	1) Check the condenser water flow, pressure and temperature in the closed circuit water system.
		2) Check the setting and function of the pressostatic regulation valve.
	D) There is too much refrigerant in the circuit; the condenser is partially flooded. The refrigerant subcooling is too high at the condenser outlet	Remove some refrigerant from the circuit.
	E) The discharge valves are partially closed	Check the opening of the valves.
AP HIGH PRESSURE SWITCH INTERVENES (high compressor discharge pressure)	A) The condensing pressure control system is not functioning efficiently.	1) Check the fan function of the condenser and of the relative protection; re-set or replace the faulty fans.
		2) Check the setting and function of the fan speed regulator of the remote condenser.
	B) The system discharge pressure is too high	See "HIGH COMPRESSOR DISCHARGE PRESSURE".
LOW COMPRESSOR DISCHARGE PRESSURE	A) The condensing pressure control system is not functioning efficiently (see control panel manual).	Check the setting and function of the condenser fan pressure switch or speed regulator.
	B) The water flow to the condenser is too high or too cold.	1) Check the condenser water flow and temperature;
		2) Check the setting and function of the pressure regulating valve (if fitted).
		3)Fit a pressure regulating valve to control the water pressure according to the condensing pressure.
	C) The suction pressure is too low.	See "LOW COMPRESSOR SUCTION PRESSURE".
HIGH COMPRESSOR SUCTION PRESSURE	A) The thermal load is too high.	Check the room's thermal load; check in case of over dehumidification, check the air flow and conditions of external air, check the external air infiltration.
	B) The discharge pressure is too high.	See "HIGH COMPRESSOR DISCHARGE PRESSURE".
	C) There is an overcharge of refrigerant in the circuit.	Remove some refrigerant from the circuit.
	D) There is a return of liquid refrigerant to the compressor intake	Check that the super heat setting of the thermostatic valve is correct.

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
LOW COMPRESSOR SUCTION PRESSURE (and possible freezing of the coil)	A) The room temperature is too low.	See "ROOM TEMPERATURE TOO LOW".
	B) The air flow is too low or is absent.	See "LOW AIR FLOW".
	C) The liquid line solenoid valve is not completely open.	Check the valve opening.
	D) The refrigerant filter is obstructed.	Check the refrigerant filter.
	E) The thermostatic valve is incorrectly calibrated or defective.	Check the super heat setting of the thermostatic valve; check that the sensor bulb has not lost its charge and is well positioned, fixed and insulated.
	F) There is an insufficient refrigerant charge.	Check the sub-cooling of the refrigerant liquid at the condenser outlet;check to see if there are any leaks and re-charge the unit.

COMPRESSORS

PROBLEM	POSSIBLE CAUSE	CHECK/CORRECTIVE ACTION
THE COMPRESSOR(S) DOESN'T/DON'T WORK	A) The short circuit protection has intervened.	Re-set the automatic switch and check the cause of the short circuit.Before re-starting the compressor, check the resistance and continuity of the compressor motor windings.
	B) The contactor is not working.	Check the contacts and the contactor coil.
THE COMPRESSOR'S INTERNAL PROTECTION INTERVENES	A) A phase is missing.	Check the resistance of the compressor motor windings. After re-setting, measure the voltage and current absorption of the three phases.
	B) The motor is overloaded.	Check that the unit pressure operates within the planned limits.
	C) The power supply voltage is too high or too low.	Check that the voltage is within -10% and +10% of the nominal value.
	D) The rotor is blocked.	Replace the compressor.
THE COMPRESSOR IS NOISY	A) The compressor is damaged.	Call the nearest Service Centre in order to replace the compressor.
	B) There is liquid return to the compressor.	Check the setting and function of the thermostatic valve.

LEONARDO EVOLUTION - CHILLED WATER

Technical characteristics

CHILLED WATER UNITS WITH BACKWARD CURVED BLADE FANS

Model TDCR - TUCR		600B	700B	600A	700A	1000A
Height	mm	1960	1960	1960	1960	1960
Width	mm	1010	1010	1010	1010	1310
Depth	mm	750	750	750	750	865
Weight	kg	210	220	210	220	306
Air flow	m^3/h	5990	6060	5990	6060	10200
External static pressure	Pa	20	20	20	20	20
Total cooling capacity (*)	kW	23,7	27	23,7	27,0	33,9
Sensible cooling capacity (*)	kW	22,7	25,4	22,7	25,4	33,2
Chilled water flow (*)	l/h	4080	4646	4080	4646	5850
Total cooling capacity (**)	kW	16,4	18,8	16,4	18,8	26,0
Sensible cooling capacity (**)	kW	16,4	18,6	16,4	18,6	25,5
Chilled water flow (**)	l/h	2830	3240	2830	3240	4480
Electric supply voltage	V	400V/3ph+N/50Hz		400V/3ph+N/50Hz		

Model TDCR - TUCR		1200A	1700A	2000A	2500A
Height	mm	1960	1960	1960	1960
Width	mm	1310	1721	2172	2172
Depth	mm	865	865	865	865
Weight	kg	314	395	443	458
Air flow	m^3/h	10420	14920	18680	18680
External static pressure	Pa	20	20	20	20
Total cooling capacity (*)	kW	43,6	57,2	69,3	87,6
Sensible cooling capacity (*)	kW	41,4	55,1	67,0	81,5
Chilled water flow (*)	l/h	7510	9660	11950	15090
Total cooling capacity (**)	kW	31,2	36,8	47,8	61,8
Sensible cooling capacity (**)	kW	30,6	36,8	47,8	60,3
Chilled water flow (**)	l/h	5370	6340	8240	10650
Electric supply voltage	V	400V/3ph+N/50Hz			

(*) Based on 24°C@50% air temperature, ESP=20Pa, chilled water 7/12°C, ethylene glycol 0%
(**) Based on 24°C@50% air temperature, ESP=20Pa, chilled water 10/15°C, ethylene glycol 0%

CHILLED WATER UNITS WITH EC BACKWARD CURVED BLADE FANS

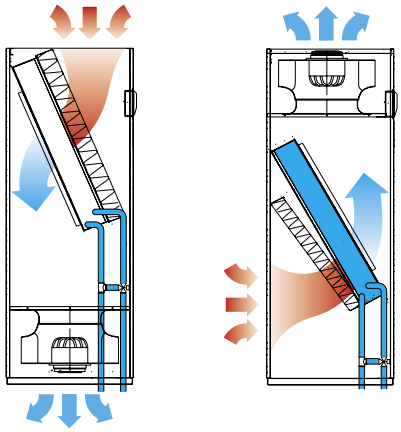
Model TDCV - TUCV		1000A	1200A	1700A	2000A	2500A
Height	mm	1960	1960	1960	1960	1960
Width	mm	1310	1310	1721	2172	2172
Depth	mm	865	865	865	865	865
Weight	kg	306	314	395	443	458
Air flow	m^3/h	10000	10000	14000	18680	18880
External static pressure	Pa	20	20	20	20	20
Total cooling capacity (*)	kW	33,4	42,2	59,1	69,3	88,4
Sensible cooling capacity (*)	kW	32,7	40,0	57,7	67,0	82,2
Chilled water flow (*)	l/h	5750	7270	9210	11950	15230
Total cooling capacity (**)	kW	22,3	29,0	35,1	47,8	62,3
Sensible cooling capacity (**)	kW	22,3	29,0	35,1	47,8	60,8
Chilled water flow (**)	l/h	4420	4990	6060	8240	10740
Electric supply voltage	V	400V/3ph+N/50Hz				

(*) Based on 24°C@50% air temperature, ESP=20Pa, chilled water 7/12°C, ethylene glycol 0%
(**) Based on 24°C@50% air temperature, ESP=20Pa, chilled water 10/15°C, ethylene glycol 0%

Operating description

CW CHILLED WATER UNITS

The CW uses the availability of chilled water to control the room conditions. This version of LEONARDO has a relatively simple construction and gives outstanding reliability.
The microprocessor controls the modulating action of the 3 way (or optional 2 way) chilled water valve to give accurate control.
Careful sizing of the heat exchanger coils allows a high sensible to total cooling ratio under most operating conditions.



Name and description of the principle components

A User terminal
B Electrical panel door
C Cover panels
D Electrical panel
E Filters
F Fans
G Chilled water valve

Description of the components

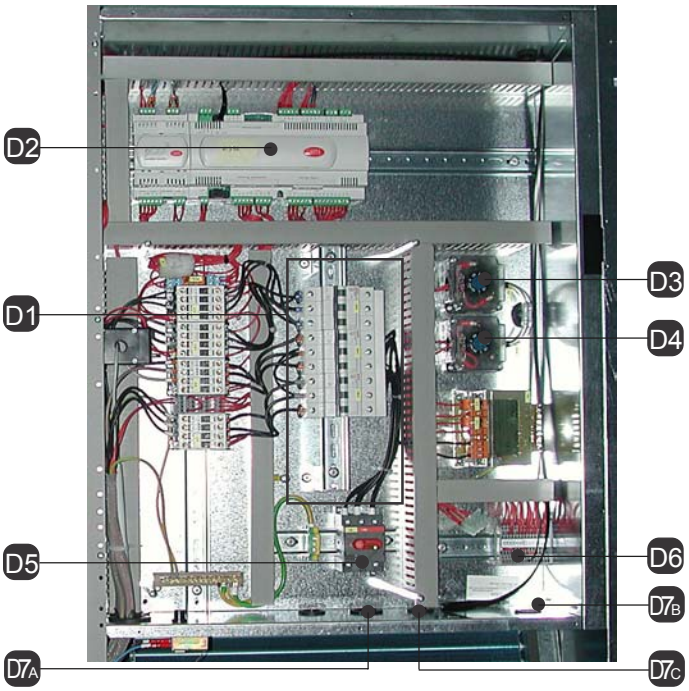
A - User terminal

Allows the unit to be turned on or off and the configuration and visualization of the condition of the machine.

- A1 LCD Display
- A2 ALARM key: visualisation and re-set of alarms; when the alarm is activated, it flashes red.
- A3 PRG key : access to the configuration menu
- A4 ESC key : exit from the screens
- A5 UP key : scroll through the menu
- A6 ENTER key : confirm
- A7 DOWN key: scroll through the menu

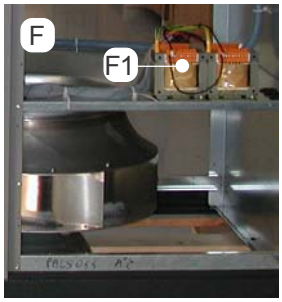
B - Electrical panel door

Allows access to the electrical panel of the machine



C - Cover panels
Allow access to the internal components of the machine.

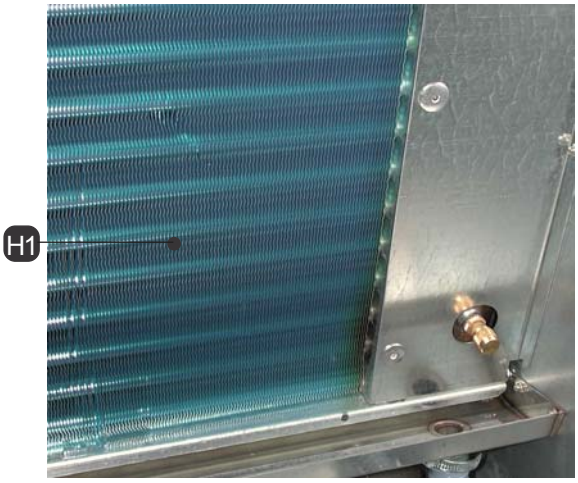
D - Electric panel
- D1 Magnetothermic
  - auxiliary
  - heater (optional)
  - humidifier (optional)
  - fans
- D2 Interface board
- D3 Dirty filter sensor
- D4 Air flow sensor
- D5 Main switch
- D6 Terminal board
- D7A Input/output electrical supply cables
- D7B Input/output electrical auxiliary cables
- D7C Input/output signal cables (RS485 and/or LAN)



E - Filters
Filter the air released into the environment

F - Fans
Allow the diffusion of air into the room
- F1 ATR Transformer: allows the setting of the fan rotation speed of the TD*R and TU*R units.

G - Chilled water valve
- G1 Servomotor
- G2 Manual control knob
- G3 Valve stem



H - Cooling coil