VULCANIC

VULCANIC S.A.
48, rue Louis Ampère – Zone Industrielle des Chanoux
F – 93330 NEUILLY SUR MARNE (France)
Tél. : (33) 01.49.44.49.20 – Fax : (33) 01.49.44.49.41
E-mail : catalogue-vulcanic@vulcanic.com
Web : www.vulcanic.com

CE

AIR/WATER EXCHANGER USE FOR MAINTAINING THE TEMPERATURE OF SEALED CABINETS

RO 400: reference 80705-40
RO 600: reference 80705-60

PLEASE READ CAREFULLY AND FULLY THIS MANUAL BEFORE INSTALLING THE UNIT THIS MANUAL IS AN INTEGRAL PART OF THE PRODUCT AND SHOULD ACCOMPANY IT UNTIL ITS POSSIBLE DISASSEMBLY.

GB

CONTENTS

Chapter **Section** **Page**

1. APPLICATION:....3
2. TECHNICAL CHARACTERISTICS....3
3. PRECAUTIONS ON USE....3
4. ASSEMBLY AND ELECTRICAL CONNECTION....4
4 - 1 - ASSEMBLY....5
4 - 2 - HYDRAULIC CONNECTION:....6
4 - 3 - ELECTRICAL CONNECTION:....7
5. COMMISSIONING PROCEDURE....8
5 - 1 - USE OF REGULATOR:....9
5 - 2 - ADJUSTMENT OF REGULATION PARAMETERS:....10
5 - 3 - OPERATION TEST DIODES:....11
5 - 4 - ALARM MESSAGES....11
6. FAULT DIAGNOSIS....12
7. MAINTENANCE....12
8. LIST OF RECOMMENDED SPARE PARTS....13
9. WARRANTY....13

CONGRATULATIONS! By opting for a VULCANIC air/water exchanger, you have chosen equipment in which we have invested a great deal of care both during manufacturing in our works at Neuilly sur Marne, near Paris, and during the individual test procedures; all these operations were carried out under ISO 9001 certification.

Your exchanger incorporates improvements that will render its setting up and maintenance easy. However, you must read carefully the various chapters that follow, if only to make the most of the many possibilities this product offers.

1. APPLICATION

Maintaining sealed cabinets at a given temperature by air recycling with electronic regulation.

These air/water exchangers are a good alternative to ambient air recirculation devices (fans) whenever a tightness factor of more than IP55 is necessary in the cabinet, and when there is cold water available.

Whenever a refrigerating air conditioner is not used with an air condenser.

2. TECHNICAL CHARACTERISTICS

Model	RO 400	RO 600
Cooling fluid	Water	
Electric power supply	400 V single-phase – 50 / 60 Hz	
Internal protection fuses	0.5A aM / 1A gl / 0.25A	
Nominal refrigerating power According to DIN 3168 (L35/W10)	3900 W	6875 W
Nominal flow rate (l/h)	430	690
Load losses at nominal flow rate (bar)	0,5	0,5
Installed electric power (W)	200	350
Tightness	IP 54	
Weight (kg)	20	30

- Vertical and outside facade mounting or on cabinet door by 4 Ø M6 studs (supplied).
- Equipment delivered with 2 seals (air inlet and outlet), and with a set of jets to optimize water consumption.
- Electrical connection by 10-pin connector (female extension connector included, with spring-loaded terminals).
- Hydraulic connection to cold water network by 1/2" cylindrical gas threaded couplings.
- Maximum noise level 60 dBA (RO 400) or 64 dBA (RO 600).

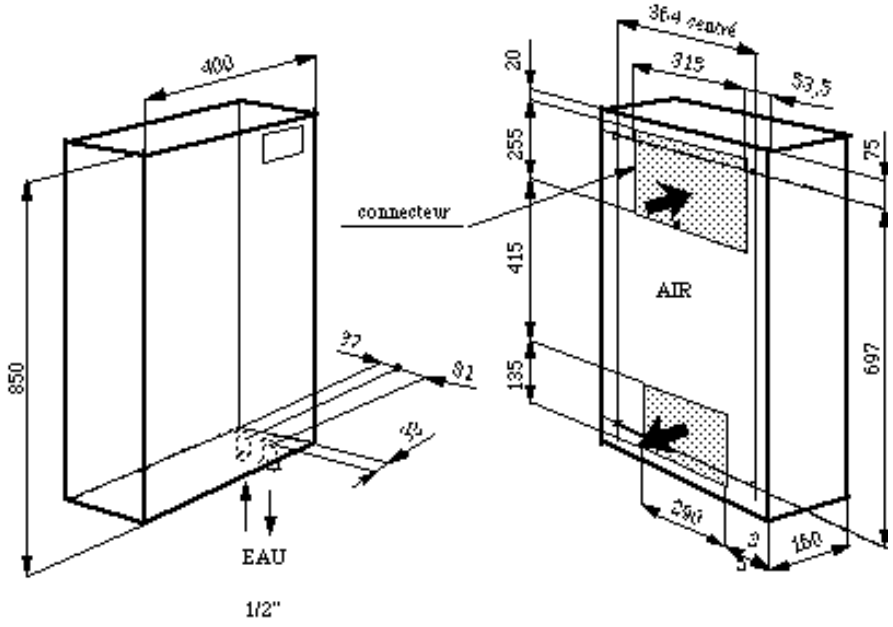
3. PRECAUTIONS ON USE

The installation and commissioning of the exchangers must be carried out by qualified personnel in conformity with the state of the art rules.

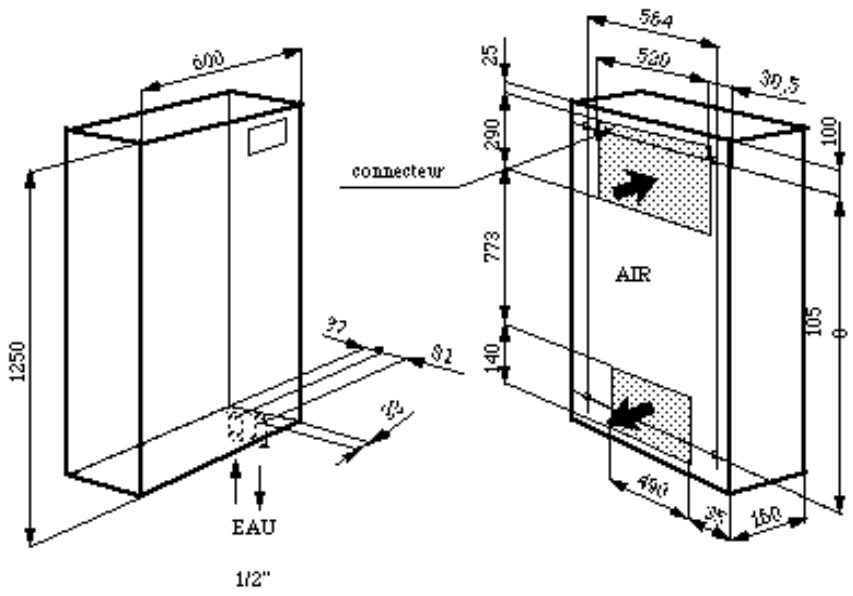
Check that:

- The power supply voltage and frequency are as mentioned on the nameplate, There is no obstacle likely to obstruct, even partially, the circulation of air: A space of at least 100 mm is required between the air inlet and outlet louvers and the components of the cabinet.
- The seals (supplied separately) are in place before the RO exchanger is secured.
- The cold water pressure is at between 0.5 and 10 bar; the temperature corresponds to the value for which the RO exchanger was selected and is included between 10°C and 25°C,
- The flow source is sufficient to ensure the minimum contractual flow rate: 430 l/h for the RO 400 exchanger and 690 l/h for the RO 600 exchanger,
- The continuity of the installation ground circuit is correct,
- The electrical power supply is properly cut off before any action is taken on the RO exchanger.
- The cover of the device is properly closed before it is turned on.
- The doors of the air conditioner cabinet are properly closed when the RO exchanger is operating.

4. ASSEMBLY AND ELECTRICAL CONNECTION



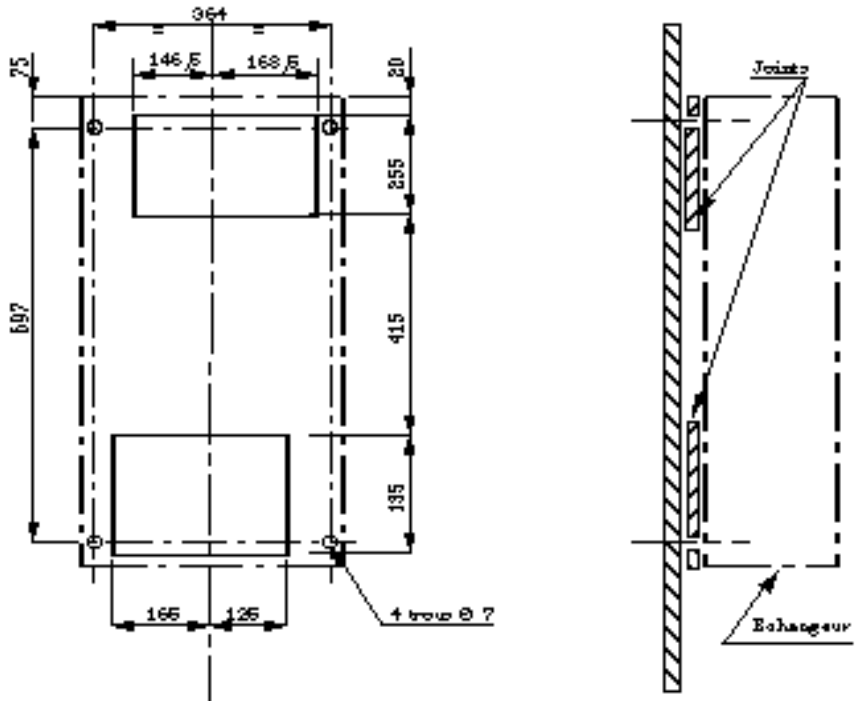
OVERALL DIMENSIONS OF RO 400 ref: 80705.40



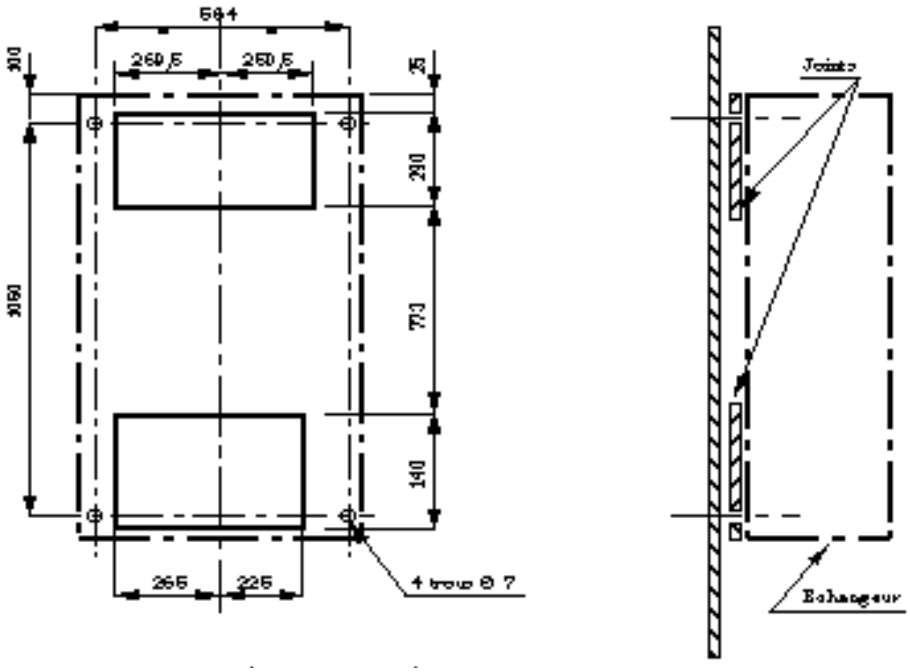
OVERALL DIMENSIONS OF RO 600 ECHANGER ref: 80705.60

4 - 1 - ASSEMBLY

- On the vertical outer face of the cabinet or on the door mark the 4 x Ø 7 mm attaching holes and the 2 openings to allow the in and out flow of air as per the diagram corresponding to the installed system:



DRILLING AND CUTTING FOR 400 EXCHANGER ref.: 80705.40

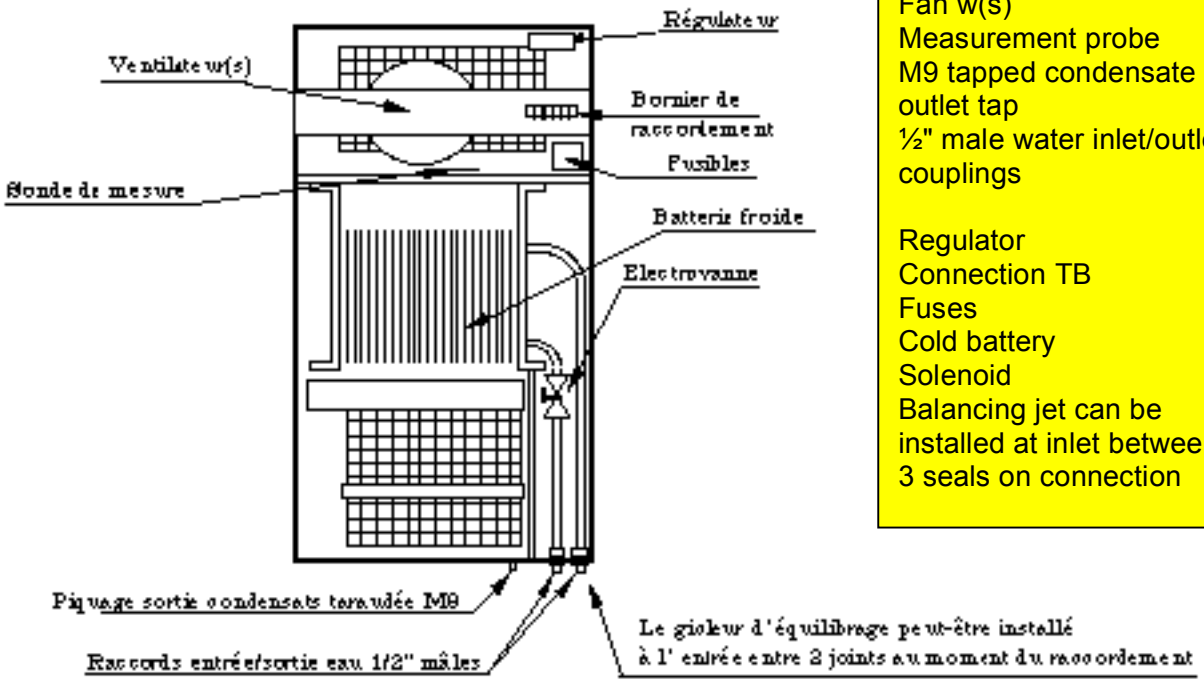


DRILLING AND CUTTING FOR 600 EXCHANGER ref.: 80705.60

- Drill and cut out according to the markings made.
- Bond the two seals (supplied separately) to the front of the RO exchanger.
- Position the RO exchanger and attach it using the 4 x Ø M6 studs and the nuts from the inside of the cabinet to be air-conditioned.

4 - 2 - HYDRAULIC CONNECTION:

For hydraulic connection to the cold water network, use piping that will tolerate at least 10 bar.
It is advisable to provide for an isolating valve on the water circuit.



Fan w(s)
Measurement probe
M9 tapped condensate outlet tap
½" male water inlet/outlet couplings

Regulator
Connection TB
Fuses
Cold battery
Solenoid
Balancing jet can be installed at inlet between 3 seals on connection

If several hydraulic exchangers are mounted in parallel, it may be necessary to provide for a balancing device on the cold water inlet pipe of each device in order to ensure compliance with the individual flow rates.

Hydraulic system balancing
To evacuate the nominal calorific power, the exchangers must be supplied with a minimum water flow rate as indicated in § 3, requiring a pressure deviation of at least 0.5 bar between the inlet and return pipes. When this pressure difference increases in the water supply circuit, the flow through the exchanger also increases.

If the exchanger is used on its own, this flow increase will tend to improve the refrigerating performance but will cause pointless extra consumption of water. Installing a correctly calibrated jet (depending on the temperature deviation) on the water inlet is a way of controlling the water consumption.

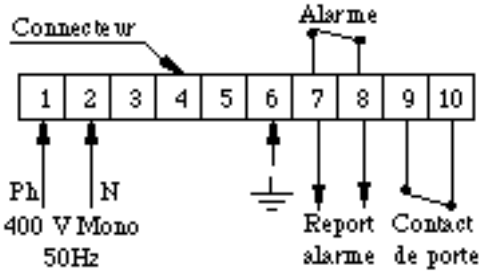
If the piping of the exchanger runs in parallel through an installation having other devices to be maintained at a temperature (electric spindles, linear motors, coils, etc.) the flow rates can also be balanced by installing one of the jets supplied as accessories and as indicated in the following table:

Supply pressure	RO 400 Jet to be installed	RO 600 Jet to be installed
$\Delta p < 1$ bar	None	None
1 bar < Δp < 2.5 bar	No. 1 Ø 5	No. 4 Ø 6.1
2.5 bar < Δp < 4 bar	No. 2 Ø 3.5	No. 5 Ø 4
$\Delta p > 4$ bar	No. 3 Ø 3	No. 6 Ø 3.3

∗ If the installation is fed from a VULCAFROID chiller, the pressure deviation may also be read on the pressure gauge installed on the front panel, as long as the return piping is not undersized and therefore having a load loss near zero.

4 - 3 - ELECTRICAL CONNECTION:

Connect the RO exchanger to the pug-in connector as per the following diagram:



Connector
Alarm
Mono = Single-ph
Alarm transfer
Door switch

- Single phase 400V electric network between terminals 1 (phase), 2 (neutral) and 6 (ground) on the connector.

- Door contact on terminals 9 and 10.
  This totally potential-free contact must conduct current when the door is closed.
  It will cause the circulation of water to stop when the cabinet door is open in order to limit the water consumption.
  If the cabinet has to be left open for a long time in a polluted environment, it is essential to turn off the main supply of the RO exchanger to prevent it from fouling.
  If this option is not taken, shunt the 2 terminals.

- General alarm transfer onto terminals 7 and 8.

This is a totally potential-free contact (breaking capacity 2 A under 250 VAC):

It trips in the following circumstances:

- the cabinet temperature is too high: 41°C (factory adjusted),
- probe or regulator fault,
- lack of power supply voltage

NOTES:

It is essential that the user operates the alarm transfer in order to act in the event of a fault but must never cut off the electric power supply of the RO exchanger.
Avoid running the power supply cables alongside the door contact connection cables and the general alarm transfer, through the same ducting. Use shielded cable for the remote controls.

An exchanger is designed to ensure the reliability of the components in a cabinet and its electric power supply must not be interrupted except in case of *force majeure*.

5. COMMISSIONING PROCEDURE

As soon as the RO exchanger is energized the fan is powered up electrically and therefore operates constantly.

The regulator controls the opening of the solenoid valve when the temperature of the cabinet exceeds 35°C (setpoint adjusted by default in the works), and its closing when the cabinet temperature drops below 31°C (regulator differential = 4°C).

The temperature inside the cabinet is thus maintained at between 31 and 35°C.

CAUTION:

Unlike what is usually believed, the reducing of the setpoint brings down the refrigerating power of the RO exchanger and does not generate the least reduction in terms of decreasing the temperature descent time. If the power of the RO exchanger is insufficient to achieve a given setpoint it is pointless modifying this setpoint and moving it lower.

Never change the setpoint without first consulting VULCANIC.

NOTES:

The solenoid closes if there is no electric power supply. To extend its life duration an anti-short-cycle device prevents it from opening for a period of less than 6 minutes.

Check that any isolating valves are open and that water circulates when the RO exchanger calls for cooling.

When the RO exchanger is switched on, a selftest lasting 5 seconds is run by the regulator program during which the display indicates "**- - -**". Once the selftest is complete, it displays the cabinet internal temperature value.

NOTES:

If the temperature inside the cabinet is higher than 41°C during energizing, the regulator high temperature alarm is activated (code HA flashes), and closes the potential-free contact of the alarm until this temperature drops back to 40°C.

5 - 1 - USE OF REGULATOR:

The regulator has 3 programming keys to the right of the display:

- Incrementation: ▲ (at the top left).
- Decrementation: ▼ (at the top right).
- Adjustment: **SET** (at the bottom right or left).

... as well as 4 test LEDs:

- Solenoid valve activated by the regulator, symbolized by the pictogram ❄ at the top right of the display (this LED flashes during the anti short-cycle delay or on a change of setpoints).
- Forced operation of the solenoid valve symbolized by the ☝ pictogram at the top left of the display.
- Activated evaporation fan, symbolized by the ✣ pictogram of the LED described above. (not used by this application).
- Alarm, symbolized by the pictogram at the bottom left pf the display.

The display normally indicates the temperature measurement in °C.
To **display the temperature setpoint** press fleetingly on the **SET** button**.** The setpoint value appears after 5 seconds.

To **display the maximum temperature** reached by the measurement press briefly on ▲.
The message **"Hi"** is displayed, followed immediately by the maximum recorded temperature which appears for 5 seconds. When this maximum temperature is re-updated, its value is replaced by the message **"rSt"** which flashes approximately 5 times.

To **display the minimum temperature** reached by the measurement press briefly on ▼.
The message **"Lo"** is displayed, followed immediately by the minimum recorded temperature which appears for 5 seconds. When this minimum temperature has just been re-updated, its value is replaced by the message **"rSt"** which flashes approximately 5 times.

To **reinitialize the maximum or minimum temperatures**, display the desired temperature using the above method then press immediately on **SET** until the message **"rSt"** appears and flashes.

To **change the temperature setpoint**, press **SET** for 3 seconds while the measurement is displayed. The setpoint value is then displayed and the ❄ LED flashes.
Increment or decrements the setpoint using ▲ and ▼ within the 10 seconds that follow: the new setpoint is recorded and there is no need to validate it. To return to the measurement display press **SET** again or wait 10 seconds.

NOTE:

If the keypad is locked, the message **"PoF"** will appear and flash and it will be impossible to change the setpoint.

See below:
To **unlock the keyboard**, press simultaneously on ▲ and ▼ for 3 seconds.
The message **"Pon"** flashes approximately 3 times.

To **lock the keyboard**, press simultaneously on ▲ and ▼ for 3 seconds.
The message **"PoF"** flashes approximately 3 times.

To actuate the **forced operation of the solenoid** press on * for 3 seconds while the measurement is displayed. The solenoid will start on completion of the 6 minute anti-short-cycle time-out if there is one.

To stop the solenoid and the condensation fan in the forced operation mode press once again the ▲ button for 3 seconds.

5 - 2 - ADJUSTMENT OF REGULATION PARAMETERS:

The display normally indicates the temperature measurement in °C.

To **enter the adjustment menu** press simultaneously on **SET** then ▲ for 3 seconds while the measurement is displayed.
The display indicates the first **"Con"** parameter of the setting menu while the ✣ and ❄ LEDs flash.

NOTE:

If the keypad is locked, the message **"PoF"** will appear and flash and it will be impossible to get into the adjustment menu.
Then unlock the keyboard using the above mentioned procedure.

Scroll through the parameters of the adjustment menu using ▲ or ▼.
Display the value of each parameter by pressing briefly on **SET**.

If necessary modify the value of each parameter with ▲ or ▼.
Validate the new value by briefly pressing **SET**; the display flashes three or so times to acknowledge reception of the modification.

In this menu, the only parameters that appear are the ones allowing constant default refrigerating power to be programmed, in the event of a discrepancy concerning the regulation probe:

Name of parameter	*Default value*
- **Con** = Duration of solenoid valve operating periods in minutes, when the RO exchanger is operating by constant power wave trains because of a probe fault.	
Con = 0 means that the solenoid valve has stopped.	0

- **Cof** = Duration of solenoid valve operating periods in minutes, when the RO exchanger is operating by constant power wave trains because of a probe fault. 4

- **Pr2** = change to configuration menu reserved for VULCANIC and protected by a confidential access code.

NOTE:

The CoF is adjusted by default to a value of 4 minutes. To simulate power of 33% the installed refrigerating power, configure Con = 2. To simulate power of 50% the installed refrigerating power, configure Con = 4. To simulate power of 66% the installed refrigerating power, configure Con = 8. To simulate power of 100% the installed refrigerating power, configure Con > 0 and CoF = 0.

To return to the operator menu (measurement display), press simultaneously **SET** then ▲, or wait for 15 seconds.

5 - 3 - OPERATION TEST DIODES:

The ❄ LED lights up when the solenoid valve and the condensation fan are operating. It flashes during the configuration of a parameter (including in the case of a setpoit temperature), and during the anti-short-cycle time-delay phases (6 minutes between last opening and closing of solenoid valve).

The LED lights up when the solenoid valve is operating in the forced mode or pending operation under the effect of the anti-short-cycle time delay (6 minutes between the last stoppage and the restarting of the compressor).

The ✣ LED lights up when the evaporator fan is operating (not used for this application). It flashes during the configuration of the "Con and "Cof" parameters in the adjuster menu.

The LED lights up in the event of a fault (indicated by one of the following messages).

5 - 4 - ALARM MESSAGES

The “**P1**” message flashes in case of a measurement probe fault. The alarm transfer contact opens and the solenoid valve works by wave streams to medium power depending on the adjustment of the "Con" and Cof" parameters. Regulation remains totally off if "Con" = 0 (default factory adjustment).

The “**HA**” message is displayed (alternating with the measured temperature) when the high temperature alarm threshold is reached (works adjustment to 41°C) following any possible time delays. The alarm transfer contact opens but the operation of the RO exchanger is not interrupted. The fault disappears as soon as the measurement drops 1°C below the high alrarm threshold (that is 40°C).
The HA temperature alarm is inhibited for 10 minutes when the exchanger is energized and after a door is closed.

The “**LA**” message is displayed (alternating with the measured temperature) when the low temperature alarm threshold is reached (works adjustment to 15°C) following any possible time delays. The alarm transfer contact opens but the operation of the exchanger is not interrupted. The fault disappears as soon as the measurement drops 1°C below the high alarm threshold (that is 16°C).

The LA temperature alarm is inhibited for 10 minutes when the exchanger is energized and after a door is closed.

The RO exchanger stops (solenoid valve) when the door opens. The message "**dA**" is displayed (alternating with the measured temperature) and the alarm contact opens after a time out lasting 10 minutes. The fault disappears as soon as the door closes again.

CAUTION:

Although the rear connector has a preferential ground pin, it is prohibited to disconnect it when live. Use the isolating switch or the dedicated fuse holder located in an air conditioned electrical cabinet.
The message "**EE**" is displayed when a software problem occurs.
Then press any key. If the display indicates "**rSt**" for 3 seconds, the RO exchanger becomes operational again immediately. Otherwise, return the regulator to VULCANIC for repair.

6. FAULT DIAGNOSIS

FAULTS	CAUSES	REMEDIES
The cabinet temperature is too high:	The fan is not running	Repair the electrical installation if necessary. Check the electrical connection of the fan. Check the condition of the fuses. Replace if necessary. Check the starting condenser, Replace if necessary. Check the condition of the fan. Replace if necessary.
	The cooling battery is fouled.	Clean it. See § 7
	The ambient temperature is too high.	Refer to the technical documentation or your VULCANIC contact.
	The flow rate or pressure are too low.	Check the water supply ciricuit (see § 2)
	The inlet temperature is too high.	Check the water supply ciricuit (see § 2)
	The solenoid valve is defective.	Check the state of the coil. Replace if necessary.
	The regulation is defective.	Replace the regulator.
	The equipment choice is unsuitable.	Refer to the technical documentation or your VULCANIC contact.
The cabinet temperature is too low:	The solenoid valve is defective.	Check the cleanliness of the internal valve. Replace if necessary.
	The regulation is defective.	Replace the regulator.

7. MAINTENANCE

Under normal operating conditions, the RO exchangers do not require any maintenance.

In the very particular case of an exchanger operating in a polluted atmosphere (cabin doors open when the door contact is not being used), it may happen that the cooling battery becomes fouled. Clean the fins by appropriate resources (low pressure lower, suction), taking care not to damage them.

Clean starting from the top. A fouled cold battery is detrimental to the performance of the RO exchanger.

Condensate recovery: When the cooling water temperature is low and the ambient air is damp, it is possible that the water flows out on starting, through the condensate drain tube at the bottom of the RO exchanger. A flexible hose with a trap (i.e. fitted with a "flushing" loop) can then be connected to this drain. During the condensation phase, the refrigerating power of the RO exchanger will decrease slightly, but the phenomenon will disappear once the dew point inside the cabinet has dropped below the temperature of the cooling water.

Obviously, the phenomenon reoccurs whenever the door has been opened, but disappears quickly again, unless the tightness of the cabinet is defective.

8. LIST OF RECOMMENDED SPARE PARTS

	REFERENCE RO 400	REFERENCE RO 600
Fan	3213928.01	3213928.01
Fan starting condenser	2007421.00	2007421.00
Solenoid valve	3207467.00	794985.00
24 V solenoid valve coil	2015481.00	2015481.00
Fuse holder 10 x 38	793109.00	793109.00
Fuse cartridge 10 x 38 0,5 A aM 500 V	793961.00	793961.00
Fuse cartridge 10 x 38 1 A gl 500 V	73116.00	73116.00
Fuse holder 5 x 20	790843.00	790843.00
Fuse cartridge 5 x 20 0,25 A 400V	753507.00	753507.00
Transformer 400V/ 24V 20VA	83497.00	83497.00
Regulator: Adjustment range 26° to 40°C	2006149.01	2006149.01
NTCO probe 15 HP00	3214543.00	3214543.00
Connector, 10 pin male base	2016637.00	2016637.00
Connector, 10 pim female base	2016451.00	2016451.00
Set of nozzle jets	4500407.01 to 03	4500407.04 to 06

9. WARRANTY

Our warranty is compliant with the union agreements of the Electrical Construction industry and the general sales conditions.

Any damage resulting from:
- use at a voltage exceeding by 10% the nominal voltage provided for
- wear caused by a lack of servicing, impact, clumsy or inexperienced users,
- failure to comply with this manual, the state-of-the-art rules and the legislation,
- corrosion or fouling phenomena that are not binding on our responsibility.