INSTALLATION, OPERATING AND MAINTENANCE

R410A

CEILING MOUNTED SPLIT UNIT

@DNOVA

THS

2,5 - 38 kW

ADNOVA-THS_R410A-
IOM-1304-E

www.lennoxemea.com

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1 General Description

THS "**Lennox Telecom Split**" units composed by an evaporating indoor unit **THSI** for ceiling or wall installation and a motor-condensing outdoor unit **THSC**, mainly for electronic equipped shelters, process centers, telecommunications sites from 4.5 to 38 kW of nominal cooling capacity.

The system provides air filtration, indoor ventilation, cooling, heating, free cooling with outdoor fresh air to assure the useful climate in the site.

1.1 Structure

All **THS** units have a galvanized sheet steel supporting base and enclosing panels are painted with epoxy polyester powder coating cured at 180°C, or, on request, painted galvanized sheet steel (RALxxxx).

1.2 Field of application

All **THS** units are to be used within the operating limits stated in this manual (see Tab. 1); failure to comply with said limits will invalidate the warranties provided in the contract of sale.

Tab. 1 Operating limits

Model: THS		**025**	**035**	**045**	**056**	**073**	**090**	**105**	**120**	**145**	**310**	**380**
Power supply		230Vac ±10% / 1Ph / 50Hz					400Vac ±10% / 3Ph+N+PE / 50Hz					
		24Vdc ±16% (Emergency cooling)										
		48Vdc ±16% (Emergency cooling)										
Outdoor temperature	Min.	-20 °C										
	Max.	-	-	48.0°C	46.5°C	45.0°C	47.0°C	45.0°C	44.0°C	-	45°C	47°C
Temp. / Humidity conditions	Min.	19 °C / 30% R.H.										
	Max.	35 °C / 50% R.H.										
Storage conditions	Min.	10 °C / 90% R.H.										
	Max.	55 °C / 90% R.H.										

1.3 Cooling circuit

The entire cooling circuit is built in the **Lennox factory** using only components of the finest quality brands and processes conforming to the specifications of "Directive 97/23" for brazing and testing.

Compressors

On THS units are installed only primary brand scroll compressors of leading international manufacturers.
Today scroll compressors represent the best solution in terms of reliability, efficiency and MTBF.

Cooling components

- Molecular mesh activated-alumina filter dryer.
- Flow indicator with humidity indicator (indications are provided directly on the sight glass).
- Thermostatic valve with external equalization and integrated MOP function.
- High and low pressure switches.
- Schrader valves for checks and/or maintenance.

Electric control board

The electric control board is constructed and wired in accordance with Directives 73/23/EEC and 89/336/EEC and related standards. All the remote controls use 24V signals powered by an insulating transformer.

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

Microprocessor control

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

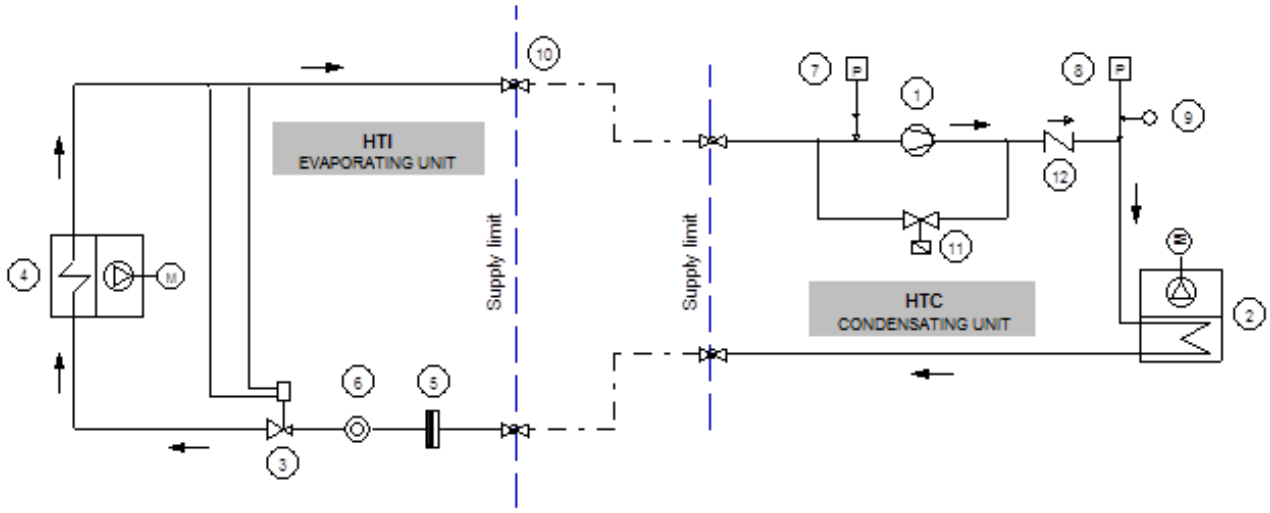
Switching ON/OFF of compressor to maintain the temperature set point “T” inside the shelter.

- Alarm management:
  - High / Low pressure;
  - Dirty filters alarm;
  - Air flow alarm.
- Alarm signalling.
- Display of operating parameters.
- RS232, RS485 serial output management (optional).
- Phase sequence error (Not displayed by the mP, but prevents the compressor from starting up).

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

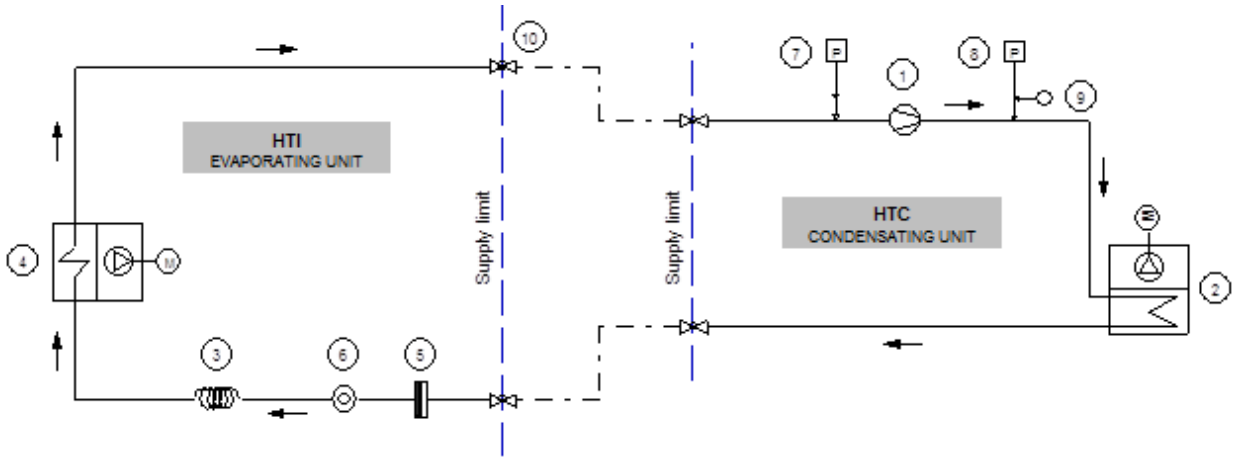
Fig. 1 Basic cooling circuits

THS025-035



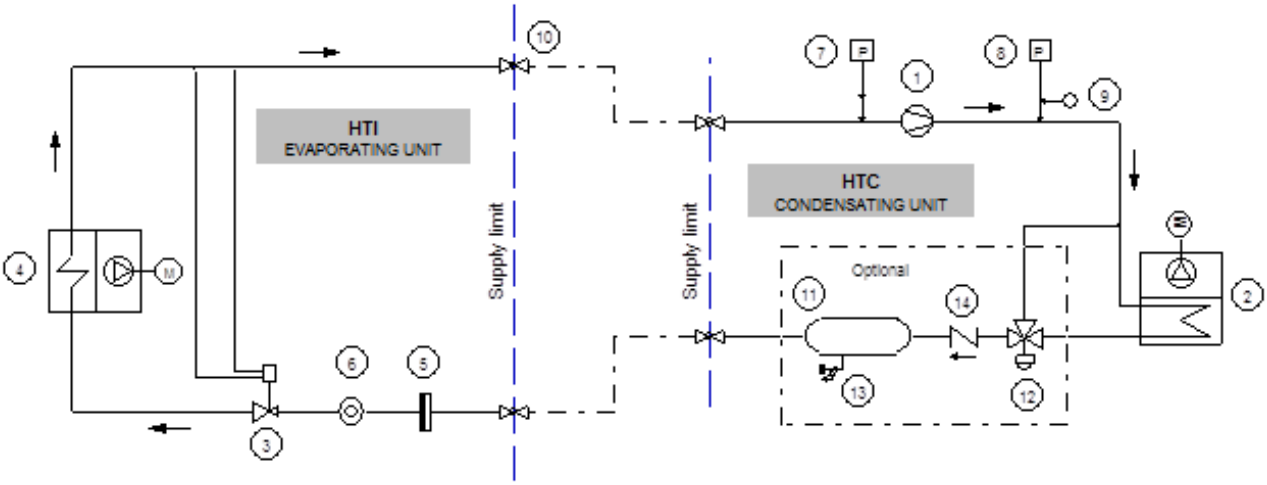
Pos.	Description	Pos.	Description
1	Compressor	**7**	Low pressure switch (LP)
2	Condenser	**8**	High pressure switch (HP)
3	Thermostatic valve	**9**	Condensing pressure probe
4	Evaporator	**10**	Tap
5	Filter dryer	**11**	Solenoid valve
6	Sight glass	**12**	Check valve

THS025-035



Pos.	Description	Pos.	Description
1	Compressor	**6**	Sight glass
2	Condenser	**7**	Low pressure switch (LP)
3	Capillary tupe	**8**	High pressure switch (HP)
4	Evaporator	**9**	Condensing pressure probe
5	Filter dryer	**10**	Tap

THS045-056-073-090-105-120-145-310-380



Pos.	Description	Pos.	Description
1	Compressor	**8**	High pressure switch (HP)
2	Condenser	**9**	Condensing pressure probe
3	Thermostatic valve	**10**	Tap
4	Evaporator	**11**	Liquid receiver
5	Filter dryer	**12**	Flodding valve
6	Sight glass	**13**	Safety valve
7	Low pressure switch (LP)	**14**	Check valve

1.4 Installation warnings

General rules

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

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

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

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

2 Inspection / Transport

2.1 Inspection on receipt

On receiving the unit, check that it is perfectly intact: the unit left the factory in perfect conditions; immediately report any signs of damage to the carrier and note them on the Delivery Slip before signing it. **Lennox** or its Agent must be promptly notified of the entity of the damage. The Customer must submit a written report describing every significant sign of damage.

2.2 Lifting and transport

While the unit is being unloaded and positioned, utmost care must be taken to avoid abrupt or violent maneuvers. The unit must be handled carefully and gently; avoid using machine components as anchorages or holds and always keep it in an upright position.
The unit should be lifted using the pallet it is packed on; a trans pallet or similar conveyance means should be used.

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

2.3 Unpacking

The packing must be carefully removed to avoid the risk of damaging the unit. Different packing materials are used: wood, cardboard, nylon etc.
It is recommended to keep them separately and deliver them to suitable waste disposal or recycling facilities in order to minimize their environmental impact.

3 Installation

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

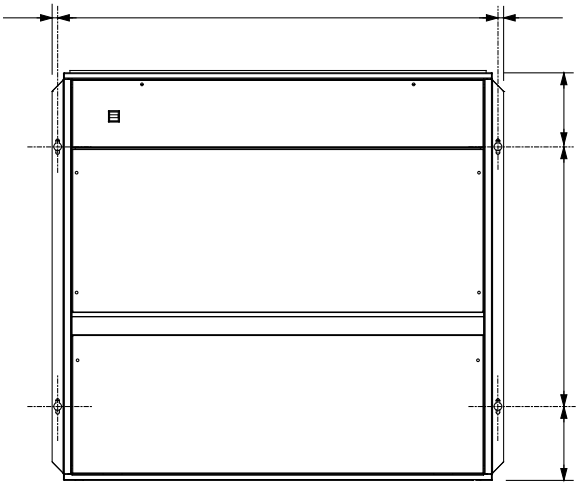
3.1 THSI - Indoor unit positioning

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

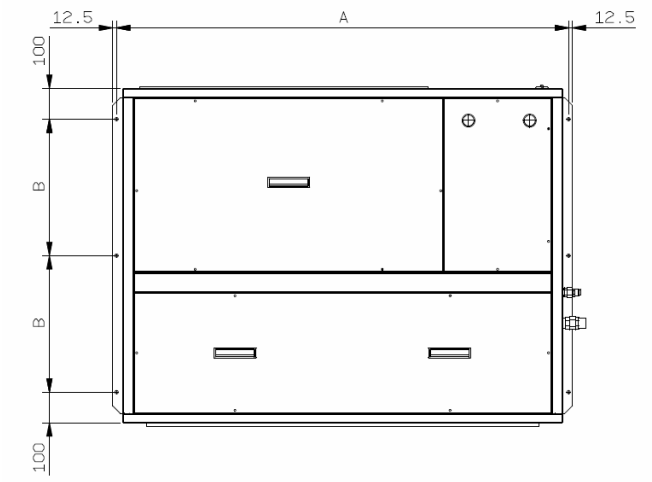
- position of the indoor unit next to the main heat source;
- location of power supply;
- solidity of the supporting ceiling / wall.

It is recommended to first prepare holes in the ceiling / wall for the screw anchors.

The dimensions and the positions of the holes for the screw anchors are shown below.

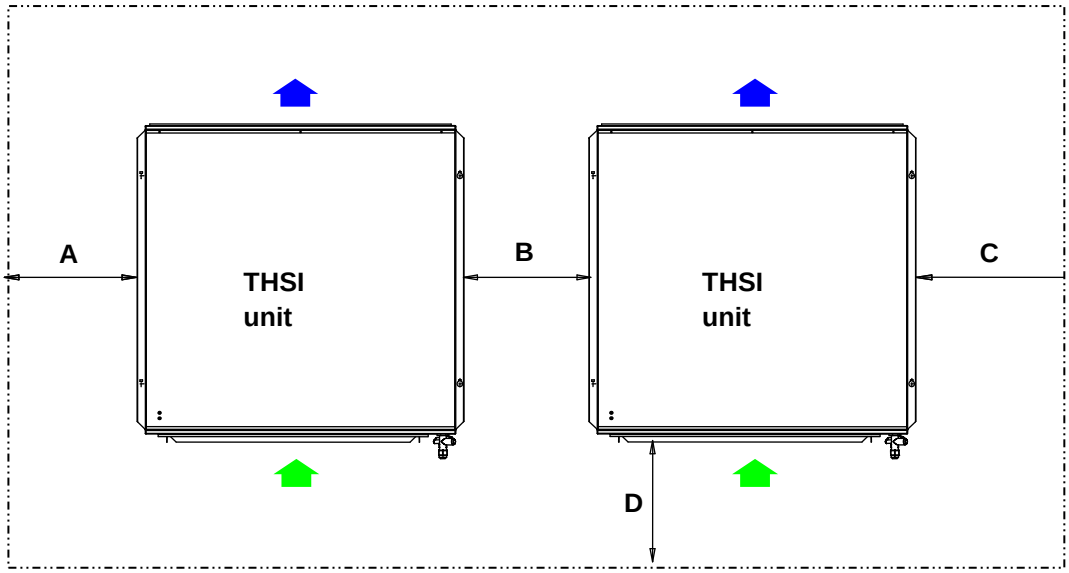


Model: THSI	A (mm)	B (mm)
025-035	621.6	560
045-056-073-090-105	1021.6	560
120-145	1121.6	650



Model: THSI	A (mm)	B (mm)
310 - 380	1475	445
ONLY FOR CEILING MOUNTING		

Fig. 2 Service area

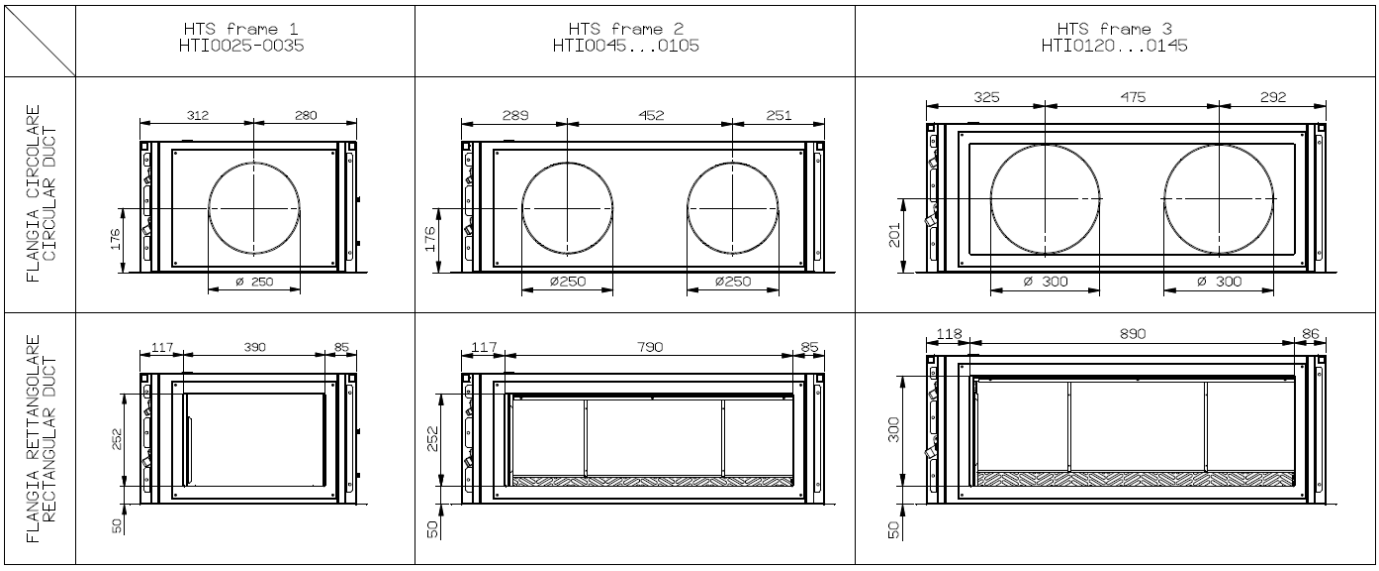


Model	A (mm)	B (mm)	C (mm)	D (mm)
THSI 025-035-045-056-073-090-105-120-145-310-380	0	200	200	200

3.2 Free-cooling duct connections (optional)

The air conditioner may be supplied with an integrated free-cooling device (optional), which uses fresh air from outside to cool the ambient without starting up the compressor.
The device supplies the correct cooling capacity required, through a modulating motor damper.

In this case, the back side of the unit is equipped with connections collect the outside air, as follows:



In both cases, the holes in the ceiling/wall have to be protected by rainproof grilles with pre-filter to avoid water or foreign bodies get in the conditioner.

Outside air, taken into the room by the fan, gets out through an overpressure damper, which is installed on the ceiling / wall of the room and is protected also by external rainproof grille.

3.3 THSC - Outdoor unit positioning

The condensing unit must be positioned outside to enable its cooling.

It is connected to the air conditioner through the refrigerant lines.

3.4 Refrigerant connections

THIS OPERATION MUST BE CARRIED OUT BY AN EXPERT TECHNICIAN.

Keep refrigerant lines as short as possible and use the suggested diameter and the indication of the “Piping Design Criteria” (attached to the unit documentation)

3.5 Lines positioning

Connect the air conditioner to the condensing unit by using refrigerant lines in hard or soft copper.

- Limit the number of pre shaped bends; if this is not possible, every bend must have a radius of at least 100mm.
- The gas line must be insulated.
- The liquid line must be kept far from heat sources; if this is not possible it has to be insulated.
- If the condensing unit is placed above the evaporating unit, the last segment of the intake tube (insulated tube) must lean towards the condensing unit.
- If, on the other hand, the condensing unit is placed under the conditioner it is advisable to create a trap on the intake tube.

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

4 THS - Evacuation and Charging Operations

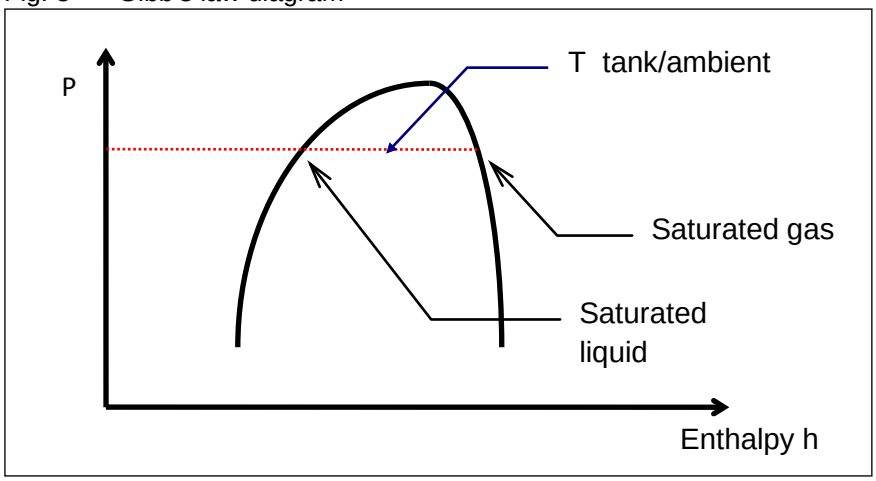
This type of work must be carried out by qualified personnel only trained to do their job in accordance with current laws and regulations.

4.1 Introductions

The simultaneous presence of liquid and vapour makes it necessary for both to be in a state of saturation (Gibbs law), as shown in Fig. 3). In conditions of thermal equilibrium, the pressure in the tank corresponds to the T of the surrounding environment; a withdrawal of refrigerant charge will cause pressure drops, which will be associated with:

- .. withdrawal of refrigerant charge: .... pressure drop inside the tank;
- .. pressure drop inside the tank: ..... T drop & change of status;
- .. T drop & change of status: .. .. evaporation of part of the liquid, causing a cooling down of the liquid;
- cooling of liquid: thermal exchange with ambient air, further evaporation of remaining liquid; the original pressure in the tank will be restored after a certain period of time.

Fig. 3 Gibb's law diagram

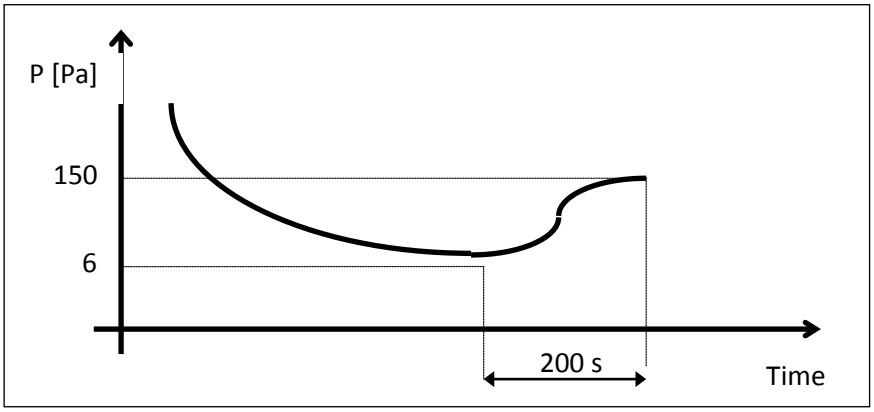


4.2 Full vacuum and charge of the unit

Vacuum cycle

In general it is better to apply a "long" rather than a "hard" vacuum: reaching a low pressure too abruptly may in fact cause that any remaining humidity evaporates instantaneously, thus freezing part of it.

Fig. 4 Vacuum cycle diagram

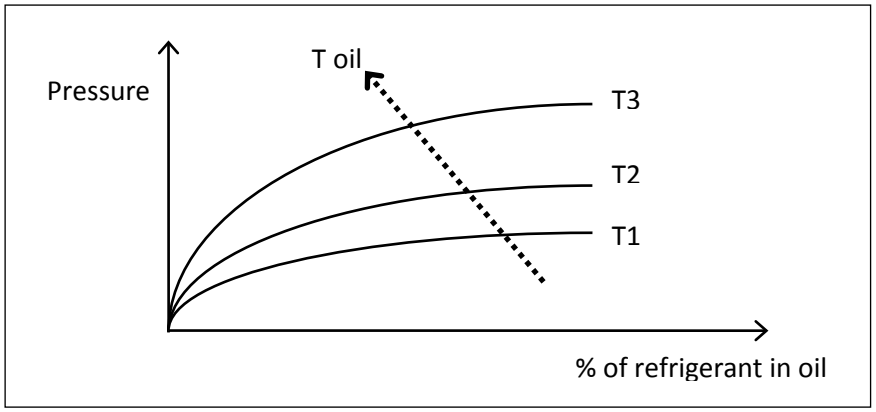


The Fig. 4 represents a vacuum cycle and an optimal subsequent pressure rise for the refrigeration devices we manufacture. Generally in bigger refrigeration systems or if there is a suspicion of an extensive quantity of humidity in the refrigeration circuit, the vacuum needs to be "broken" by using anhydrous nitrogen. Then the steps of evacuation need to be repeated as described before. This operation facilitates the removal of remaining and/or frozen humidity during the evacuation process.

4.3 Evacuating a circuit “contaminated” with refrigerant

The first step is to remove the refrigerant from the circuit. To do this a specific machine is necessary with a drying compressor in order to recover the refrigerant.
Refrigerants all tend to dissolve in oil (compressor sump). The Fig. 5 illustrates a specific property (Charles’ Law) of gases, which are more soluble in liquids as the pressure increases but less soluble as the temperature increases.

Fig. 5 Charles’ law diagram



1) The release of refrigerant from the cooling circuit tends to cool down the oil and thus actually creates the opposite effect by keeping more refrigerant dissolved in the oil: for this reason, it is advisable to switch on -if available- the crankcase heater during the evacuation process.

2) If a high % of refrigerant gets in contact with the Pirani gauge (vacuum sensor), it may “mislead” this sensitive sensor and misinterpret the value for a certain period of time. For this reason, if no machine for recovering refrigerant is available, it is nonetheless advisable to switch on the crankcase heater and to avoid full vacuum before the circuit has been adequately purged of refrigerant. The refrigerant may in fact dissolve in the oil of the vacuum pump, reducing its performance for a long time (hours).

4.4 Charging positions (single point)

The best position to charge the unit is the section between the thermostatic valve and the evaporator. Take care to avoid the fixing of the thermostat bulb until the operation is completed. It is important to ensure that the valve orifice remains open in order to allow the passage of refrigerant also towards the condenser / liquid receiver.
If possible, avoid the charge of refrigerant into the suction line of the compressor as this may cause excessive dilution of the lubricant. In any case verify first the necessary volume of the crankcase and compare it with the required charge volumes.

5 Electrical Connections

5.1 Generalities

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

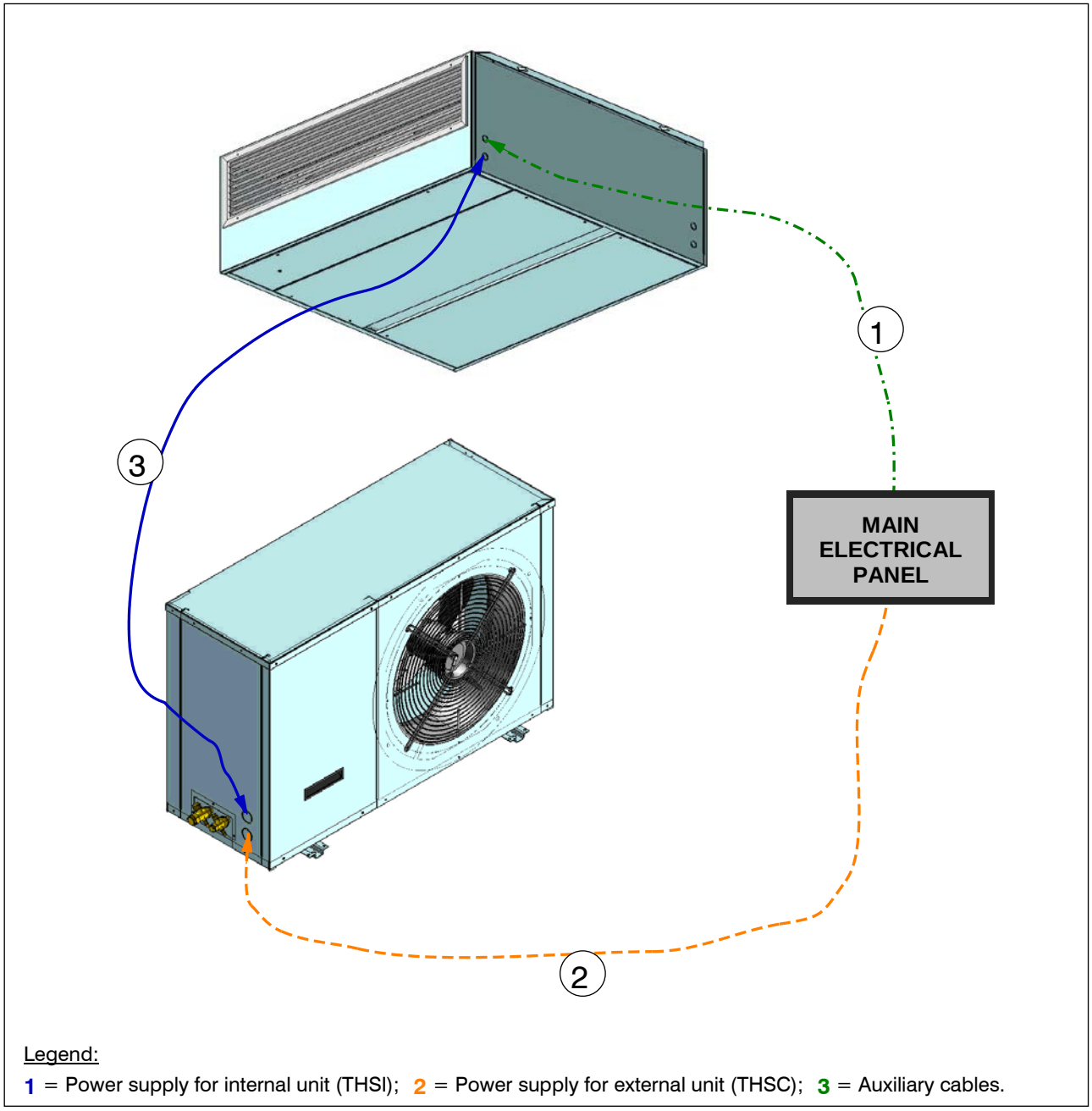
Check that the mains electricity supply is compatible with the specifications (voltage, number of phases, frequency) shown on the unit rating plate.
The power connection for single-phase loads is to be made with a three-pole cable and “N” wire at the centre of the star (optional: power supply w/o neutral).

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

The supply voltage may not undergo fluctuations exceeding ±5% and the unbalance between phases must always be below 2%.

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

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



Legend:

1 = Power supply for internal unit (THSI); **2** = Power supply for external unit (THSC); **3** = Auxiliary cables.

6 Starting Up

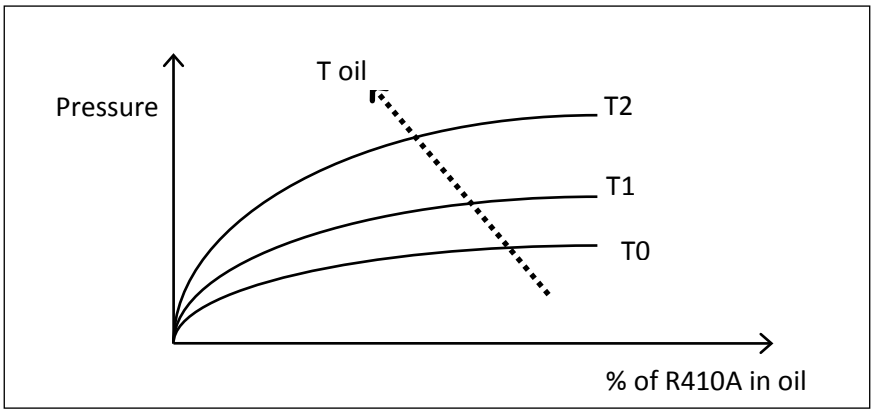
6.1 Preliminary checks

- Check that the electrical connections have been made properly and that all the terminals are **securely tightened**. This check should also be included in a periodic six-month inspection.
- Check that the voltage at the RST terminals is 230± 5% or 400 V ± 5% and make sure the yellow indicator light of the phase sequence relay is on. The phase sequence relay is positioned on the electric control board; if the sequence is not duly observed, it will not enable the machine to start.
- Make sure there are no refrigerant leaks that may have been caused by accidental impacts during transport and/or installation.
- Check the power supply to the crankcase heating elements (where present).

The heating elements must be turned on at least 12 hours before the unit is started.
They are automatically activated when the main switch is put on. Their function is to raise the T of the oil in the sump and limit the quantity of refrigerant dissolved in it.

To verify whether the heating elements are working properly, check the lower part of the compressors: it should be warm or in any case at a temperature 10 - 15 °C higher than the ambient temperature.

Fig. 6 Charles' law diagram



The diagram above illustrates a specific property of gases (Charles' Law), which are more soluble in liquids as the pressure increases but less soluble as the temperature increases: if the oil in the sump is held at a constant pressure, an increase in temperature will significantly reduce the amount of refrigerant dissolved in it, thus ensuring that the desired lubricating function is maintained.

6.2 Starting up for the first time

Instructions for THSI units and THSC units

Refrigerant connection between two units (THSI + THSC)

- THSI and THSC units are both pre-charged with nitrogen.
- Following here-attached refrigeration diagram instructions (pay attention in particular to IN/OUT) start refrigeration connections between THSI and THSC units.
- Make the vacuum in refrigerant line between in/out of the two units.

Electrical connection

- Open the frontal panel of the two units.
- Turn THSI unit QS main switch OFF.
- Switch OFF THSC unit Q01 automatic switch.
- Insert the power supply cable using one of the special holes you can find on THSI unit sides and connect it to QS main switch.
- Following wiring diagram instructions make electrical connections between THSI and THSC units power supply and power supply and auxiliary circuit cables.
- Connect user interface to microprocessor J10 connector (you can find it in THS wiring diagram) using a telephone cable.
- Turn THSI unit QS main switch ON.
- Turn THSC unit Q01 automatic switch ON.
- Charge the circuit with R410A refrigerant.
- Close the panels with the matching screws.

6.3 Start up

When you give power to microprocessor, you can see the first mask of main menu where you can see the following information:

- Indoor air temperature (**T_{int}**);
- Supply air temperature (**T_{sup}**);
- External air temperature (**T_{ext}**) (only Freecooling version);
- Compressors and fans state;
- Counter for evaporator fans and compressors.

In next mask (m_on_off), that you can see pushing **Down** , it is possibile to turn the unit **on** or **off** pushing **Enter** , **Down** and then again **Enter** . It is also shown if the unit is a master or a slave unit (this is a fundamental information for LAN operations) and configuration of local net address (Unit 1, Unit 2 or Stand Alone).

main		**m_on_off**
Comp OFF T_{int} 00.0 °C		UNIT ON:
Evap OFF T_{sup} 00.0 °C		No
Cond OFF T_{ext} 00.0 °C		Master
Ev 00000 Comp 00000 h		STAND ALONE UNIT

In THSI unit there is a RED coloured LED to show that alarm is present 

Usage

D Always consult the “USER MANUAL” and control system manual provided with the unit when undertaking maintenance and/or advanced set-ups.

D **N.B.:** In THSI unit there is not condensing pressure gouge so the value is not reliable.

6.4 Starting operation

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

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

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

6.5 Checks during operation

Check the phase sequence relay on the control board to verify whether the phases occur in the correct sequence: if they do not, disconnect the unit from power supply and invert two phases of the incoming three-pole cable.
Never attempt to modify internal electrical connections: any undue modifications will immediately invalidate the warranty.

6.6 Checking the refrigerant level

After a few hours of operation, check whether the liquid level indicator has a green ring: a yellow colour indicates the presence of humidity in the circuit. In such a case the circuit must be dehumidified by qualified personnel.
Large quantities of bubbles should not appear through the liquid level indicator. A constant passage of numerous bubbles may indicate that the refrigerant level is low and needs to be topped up.

Make sure the overheating of the cooling fluid is limited to between 5 and 8 °C: to this end:

1) read the temperature indicated by a contact thermometer placed on the compressor intake pipe;

2) read the temperature indicated on the scale of a pressure gauge likewise connected to the intake side; refer to the pressure gauge scale for the refrigerant R410A.
The degree of overheating is given by the difference between the temperatures thus determined.

Make sure that the Sub-cooling of the cooling fluid is limited to between 3 and 5°C, to this end:

1) read the temperature indicated by a contact thermometer placed on the condenser outlet pipe;

2) read the temperature indicated on the scale of a pressure gauge connected to the liquid inlet at the condenser outlet; refer to the pressure gauge scale for the refrigerant R410A.
The degree of Sub-cooling is given by the difference between the temperatures thus determined.

Warning: All THS units are pre-charged with nitrogen. Any top-ups must be made using the same type of refrigerant. This operation is to be considered extraordinary maintenance work and must be performed by qualified personnel only.

Warning: The refrigerant R410A requires "POE" polyolester oil of the type and viscosity indicated on the compressor rating plate.
For no reason should oil of a different type be introduced into the oil circuit.

7 Operating Parameters Setting

7.1 Generalities

All the control devices are set and tested in the factory before the unit is dispatched. However, after the unit has been in service for a reasonable period of time you can perform a check on the operating and safety devices.
The settings are shown in Tab. 4 and Tab. 5.

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

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

Tab. 4 Setting of control devices

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

Values to be calibrated depending on the application.

Tab. 5 Setting of safety-control devices

Control device		Activation	Differential	Resetting
Maximum pressure switch	Bar	42.0	4.0	Manual
Minimum pressure switch	Bar	2.0	1.5	Automatic
Modulating condensation control device	Bar	18.0	7.0	-
Time lapse between two compressor starts	s	480	-	-

7.2 Maximum pressure switch

The high pressure switch stops the compressor when the outlet pressure exceeds the set value.

Warning: Do not attempt to change the setting of the maximum pressure switch: Should the latter fail to trip in the event of a pressure increase, the pressure relief valve will open.

The high pressure switch must be **manually** reset; this is possible only when the pressure falls below the set differential (see Tab. 5).

7.3 Minimum pressure switch

The low pressure switch stops the compressor when the inlet pressure falls below the set value for more than 120 seconds. The switch is automatically reset when the pressure rises above the set differential (see Tab. 5).

8 Maintenance

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

8.1 Warnings

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

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

The upper part and the outlet pipe of the compressor reach high temperatures. Be especially careful when working in the surrounding area with the panels off.

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

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

8.2 Periodical checks

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

Tab. 6 Periodical checks

Operation	Frequency
Check the efficiency of all the control and safety devices.	Once a year
Check the terminals on the electric control board and compressor terminal boards to ensure that they are securely tightened. The movable and fixed contacts of the circuit breakers must be periodically cleaned and replaced whenever they show signs of deterioration.	Once a year
Check the refrigerant level by means of the liquid level indicator.	Every 6 mos.
Check the efficiency of the differential air pressure switch and dirty filter differential pressure switch.	Every 6 mos.
Check the condition of the air filter and replace it if necessary.	Every 6 mos.
Check the humidity indicator (**green** = dry, **yellow** = humid) on the liquid level indicator; if the indicator is not green as shown on the indicator sticker, replace the filter.	Every 6 mos.

Fig. 7 Inspecting the air filter

Remove the grilled panel to access the damper and air filter compartment.
Pull out the air filter.
Check the condition of the filter and replace it if necessary.

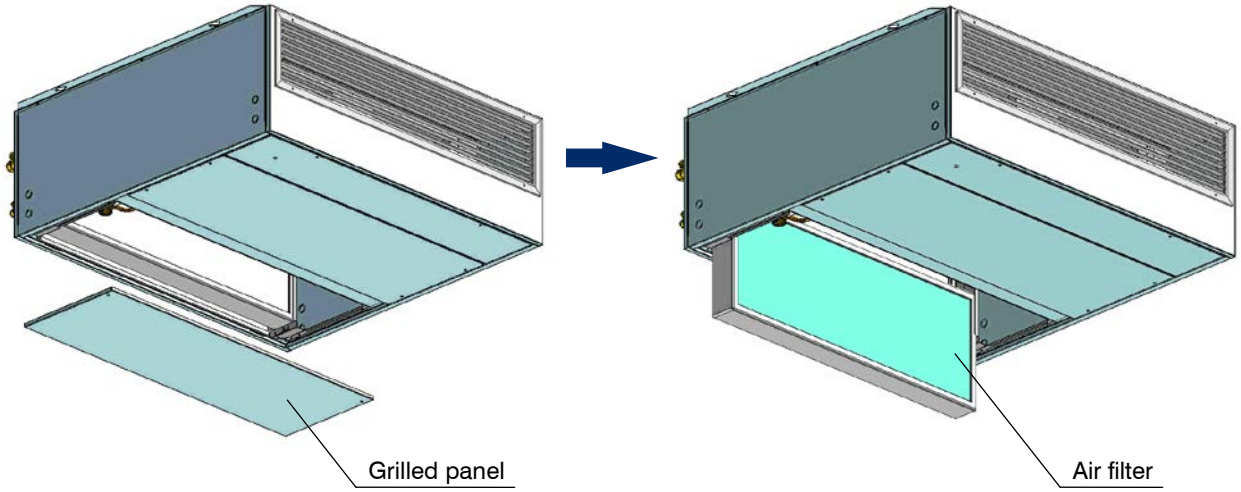
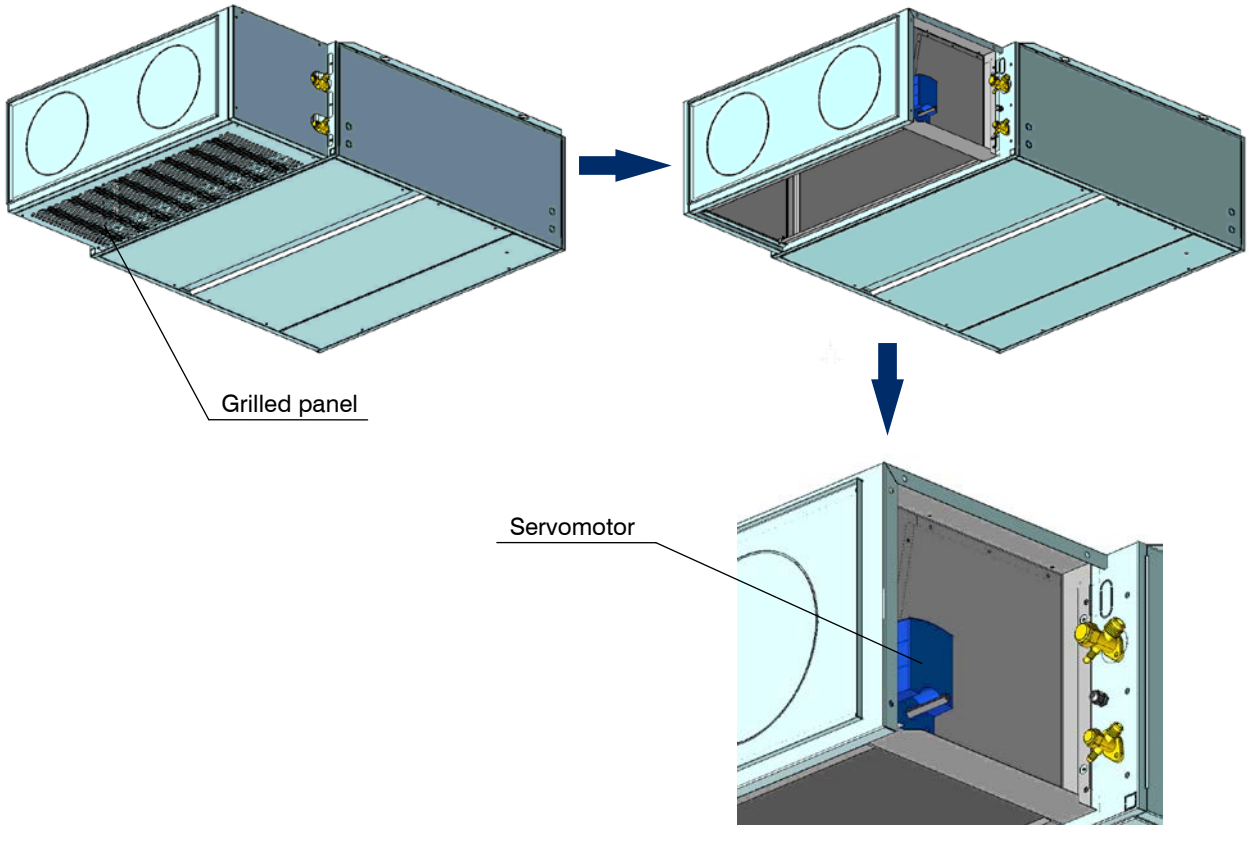


Fig. 8 Inspecting the damper servomotor

Remove the grilled panel to access the damper and air filter compartment.
Remove the damper fastening screws placed at the side.
Pull out the entire damper section to access the servomotor.



8.3 Repairing the cooling circuit

Warning: While performing repairs on the cooling circuit or maintenance work on the compressors, make sure the circuit is left open for as little time as possible. Even if briefly exposed to air, ester oils tend to absorb large amounts of humidity, which results in the formation of weak acids.

If the cooling circuit has undergone any repairs, the following operations must be carried out:

- tightness test;
- evacuation and drying of the cooling circuit;
- charging with refrigerant.

If the system has to be drained, always recover the refrigerant present in the circuit using suitable equipment; the refrigerant should be handled exclusively in the liquid phase.

8.4 Tightness test

Fill the circuit with anhydrous nitrogen supplied from a tank with a pressure-reducing valve until the pressure rises to 22 bar.

During the pressurization phase, do not exceed a pressure of 22 bars on the compressor low pressure side.

The presence of any leaks must be determined using special leak detectors. Should any leaks be detected during the test, empty out the circuit before repairing the leaks with suitable alloys.

Do not use oxygen in the place of nitrogen as a test agent, since this would cause a risk of explosion.

8.5 Hard vacuum and drying of cooling circuit

To achieve a hard vacuum in the cooling circuit it is necessary to use a pump capable of generating a high degree of vacuum, i.e. 150 Pa of absolute pressure with a capacity of approximately 10 m^3/h. If such a pump is available, one evacuation will normally suffice to achieve an absolute pressure of 150 Pa.
If there is no such vacuum pump available, or whenever the circuit has remained open for long periods of time, you are strongly recommended to adopt the triple evacuation method. This method is also recommended when there is a presence of humidity within the circuit. The vacuum pump should be connected to the inlets.

The procedure to be carried out is as follows:

- Evacuate the circuit until you reach an absolute pressure of at least 350 Pa: at this point inject nitrogen into the circuit until you reach a relative pressure of about 1 bar.
- Repeat the step described above.
- Carry out the step described above for the third time, but in this case attempting to reach the hardest vacuum possible.

Using this procedure you can easily remove up to 99% of pollutants.

8.6 Recharging with refrigerant R410A

- Connect the tank of refrigerant gas to the male 1/4 SAE inlet situated on the liquid line after discharging a little gas to eliminate air in the connection pipe.
- **Fill with refrigerant in liquid form** until you reach 75% of the total charge.
- Then connect to the inlet on the pipe between the thermostatic valve and evaporator and complete the charging process with the refrigerant in **liquid form** until no more bubbles can be seen on the liquid level indicator and the operating parameters specified in section 7 have been reached.

A unit that was originally charged with (nitrogen) in the factory must not be charged with R22 or other refrigerants without the written authorization Lennox

8.7 Environmental protection

The law implementing the regulations (reg. EEC 2037/00) which govern the use of ozone-depleting substances and greenhouse gases bans the dispersal of refrigerant gases in the environment and requires whoever is in their possession to recover them and, at the end of their useful life, either to return them to the dealer or take them to a suitable waste disposal facility. The refrigerant HFC R410A is not harmful to the ozone layer but is included among the substances responsible for the greenhouse effect and thus falls within the scope of the aforesaid regulations.

Therefore, special care should be taken when carrying out maintenance work to minimize refrigerant leaks.

9 Troubleshooting

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

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

Tab. 7 Fault-Causes-Corrections

FAULT	POSSIBLE CAUSES	CORRECTIVE ACTIONS
The unit does not start	No power supply.	Check if power is being supplied both to the primary and auxiliary circuits.
	The electronic card is cut off from the power supply.	Check the fuses.
	Alarms have been released.	Check whether any alarms are signalled on the microprocessor control panel, eliminate the causes and restart the unit.
	The phase sequence is wrong.	Invert two phases in the primary power line after disconnecting them upstream from the unit.
The compressor is noisy	The compressor is rotating in the wrong direction.	Check the phase sequence relay. Invert the phases on the terminal board after disconnecting the unit and contact the manufacturer.
Presence of abnormally high pressure	Insufficient airflow through the condenser.	Check for the presence of obstructions in the condenser section ventilation circuit.
		Check whether the condenser coil surface is obstructed.
		Check the condensation control device (optional).
	Presence of air in the refrigerant circuit, as revealed by the presence of bubbles in the flow indicator also with sub-cooling values exceeding 5 °C.	Drain and pressurise the circuit and check for leaks. Evacuate slowly (for more than 3 hours) until reaching a pressure of 0.1 Pa and then recharge in the liquid phase.
	Unit overcharged, as revealed by a Sub-cooling of more than 8 °C.	Drain the circuit.
	Thermostatic valve and/or filter obstructed. These symptoms may also occur in the presence of an abnormally low pressure.	Check the temperatures upstream and downstream from the valve and filter and replace them if necessary.
Low condensation pressure	Transducer fault.	Check the efficiency of the condensation control device (optional).
Low evaporation pressure	Malfunctioning of thermostatic valve.	Warming the bulb with your hand, check whether the valve opens and adjust it if necessary. If it does not respond, replace it.
	Filter dryer clogged.	Pressure drops upstream and downstream from the filter should not exceed 2°C. If they do, replace the filter.
	Low condensation temperature.	Check the efficiency of the condensation control device (where present).
	Low level of refrigerant.	Check the refrigerant level by measuring the degree of Sub-cooling; if it is below 2°C replenish the charge.
The compressor does not start	The circuit breakers or line fuses have been tripped by a short circuit.	Pinpoint the cause by measuring the resistance of the individual windings and the insulation from the casing before restoring power.
	One of the HP or LP pressure switches has tripped.	Check on the microprocessor, eliminate the causes.
	The phases have been inverted in the distribution compartment.	Check the phase sequence relay.
Water out from the unit	The drain pan hole is closed.	Open the front panels, remove the sheet metal just below the e-panel (down flow units) and clean it.
	The siphon is missing.	Check for the presence and provide for a new one.
	Unit is not perfectly level	Place correctly the unit.

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