EN *Service manual*

IT *Manuale assistenza*

ANTARES (ATT025-040)

DATE: **ISSUE:**

Index

Enclosures:

1 – Introduction

Compressed Air has become an indispensable source of energy in modern industrial processes.
All atmospheric air contains a certain quantity of water vapour which is mixed with other gases, such as nitrogen, oxygen and carbon monoxide. This water vapour is drawn into the air compressor with the incoming air during the compression cycle.
The water vapour becomes a major hazard in compressed air systems, given that it is distributed together with the compressed air itself. As the compressed air is cooled whilst passing through the plant's air piping, so this water vapour will condense.

How and why does this occur?
Compressed air, at normal ambient temperatures, cannot hold as much water vapour as air at atmospheric pressure. However, the heat generated during the compression cycle increases its ability to hold water vapour. When the compressed air is cooled between the compressor and the point of use, this water vapour will condense and become liquid water, depositing itself in the system piping, air receiver, tools, etc.
This condensed water will corrode system components resulting in increased maintenance costs and reduced system efficiency.

Compressed air drying

Almost every compressed air system uses an aftercooler (air-cooled or water-cooled) to cool compressed air as it exits the air compressor. The air exiting the compressor is typically at 100°C - 180°C, depending on the type of compressor.
The aftercooler will cool the air to approximately 10°C above the cooling medium (ambient air or cooling water). The liquid condensate which has formed due to this cooling process is removed from the compressed air.
In almost all cases, the air exiting the aftercooler is saturated, meaning it cannot hold any additional water vapor at its present temperature and pressure. Despite the fact that a large amount of liquid water has been removed, any additional decrease in compressed air temperature after the aftercooler will result in water vapor condensing in the piping.

Refrigeration dryers are generally installed downstream of the aftercooler, in order to further dry the compressed air. Refrigeration dryers use a refrigeration circuit to cool the refrigerant flowing inside it. This cold refrigerant comes into contact with the compressed air in an appropriately designed heat exchanger; consequently the compressed air is cooled down to the required temperature (the dew point). The liquid condensate which has formed due to this cooling process is removed from the compressed air. The air is re-heated before exiting the dryer, and as a consequence the outlet air is no longer saturated.

Adsorption dryers are used in those applications where very dry air is required; they are generally either installed downstream of the aftercooler or the refrigeration dryer.
Adsorption dryers feature a desiccant material contained within a vessel; the compressed air passes through the vessel and across the desiccant bed, and the water vapor is absorbed by the desiccant material. The air exits the adsorption dryer in a very dry state; the dew point achieved varies according to the specific application, but typically the level is -40°C.

The dew point

The pressure dew point is the temperature at which water vapor begins to condense at the pressure of the compressed air system. As long as the air's temperature remains above the dew point temperature no liquid water will form, but on dropping below the dew point the water vapor will transform into a liquid.
The dew point is usually indicted as a temperature, but it is important to underline that has no sense to talk about dew point if it is not specified the pressure at which the system is operating.

Assuming we have ambient air at the following conditions:
- pressure: 0barg (atmospheric pressure)
- temperature 25°C
- relative humidity: 60%

This air would contain 15,4 gr/m³ of water vapor.

When compressed to 7barg this air, at the compressor discharge (say 100°C) still contains the same 15,4 gr/m³ of water vapor.

The aftercooler reduces the air to 35°C.
The moisture content of the air is now 5,5 gr/m³, and as such the aftercooler has removed (15,4-5,5=) 7,9 gr/m³ of water.

The refrigeration dryer achieves a dew point of 4°C; the moisture content of the air is now 0,8 gr/m³, and as such the refrigeration dryer has removed (7,9 - 0,8 =) 7,1 gr/m³ of the water.

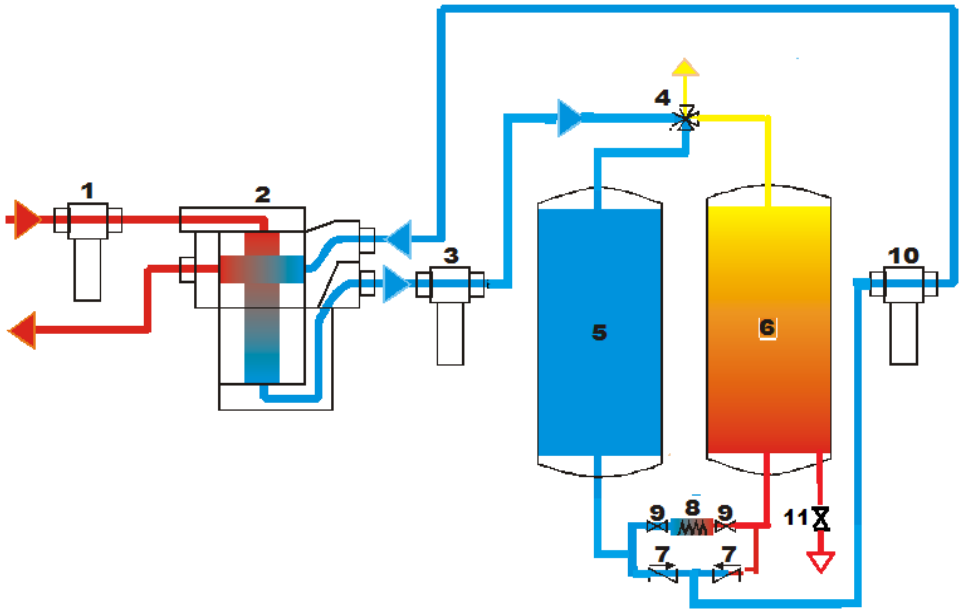
An adsorption dryer achieving a dew point of -40°C reduces the moisture content of the air to 0,01 gr/m³, and as such the adsorption dryer has removed (0,8 – 0,01 =) 0,79 gr/m³ of water.

2 – Functioning

2.1 – Basic principles

2.1.1 – Compressed air circuit

The hot and humid air, after passing through the pre-filter ① enters the fridge dryer ② and flows through the air-to-air, thus being pre-cooled by the outlet cold air.
The air then passes through the evaporator, where it is further cooled, by heat exchange with refrigerant evaporating at a temperature slightly above zero.
At evaporator outlet, the air (cooled down to its lowest point) flows through a condensate separator, where the condensate is separated from the air flow. The water produced and collected at the bottom of the separator is then eliminated by means of an automatic timed drain.
The cold air (saturated of moisture) flows through an oil filter ③ whose purpose is to retain traces of oil which could contaminate the desiccant material.
Compressed air then enters the adsorption dryer and flows through the desiccant material ⑤ inside the columns. The material retains particles of water vapor so reducing the moisture content of the air (and thus lowering the dewpoint temperature). At columns outlet the air flows through a particle filter ⑩ which retains any dust created inside the columns due to possible because "chalking" of desiccant material.
Cold air (but not anymore saturated) flows back into the air-to-air heat exchanger dryer ②, where it is post-heated by the hot air entering the dryer.
The temperature of compressed dry air at unit outlet will be about 5-10°C lower than the temperature of the compressed air inlet.

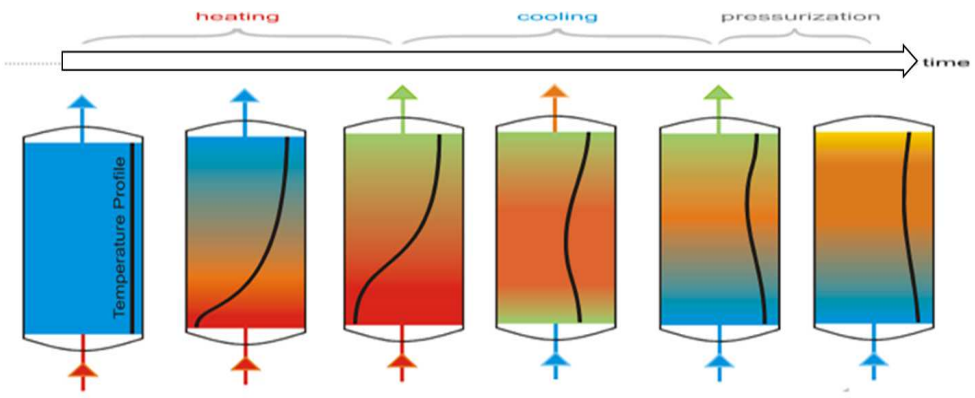


2.1.2 – Fridge circuit

It is a closed circuit containing refrigerant R134a.
The hot gas, pumped by the fridge compressor, enters the condenser where it is cooled and then condensed.
The liquid refrigerant flows through a filter drier to be then sent to the expansion device (expansion valve or capillary), where it is subject to an adiabatic expansion.
The refrigerant liquid at low pressure and low temperature feeds the evaporator, in which heat exchange takes place with the compressed air. Thanks to the heat supplied by the air, the refrigerant evaporates to be again sucked by the compressor.
In case of low thermal load the excess of cooling capacity is dissipated by injecting the hot gas from compressor discharge to the evaporator outlet (model ATT040).
The expansion valve (ATT025) and the hot gas by-pass valve (ATT040) must be properly calibrated so that, in the absence of air flow, the pressure in the evaporator (and corresponding temperature) is maintained constant at a safety value that does not allow the moisture to freeze.

2.1.3 – Desiccant circuit

It consists of two tanks (columns ⑤ and ⑥) filled with desiccant material which holds the air moisture as it flows inside the tanks.
The two columns alternating in the adsorption / regeneration cycle.
While a column ⑤ is flown by the main compressed air flow, the other ⑥ is regenerated (the previously absorbed moisture is removed from the material).
The regeneration phase is realized by means of a small quantity of dry air (purge) that is heated by an electrical resistance ⑧. The flow of hot and dry air cleans the adsorbent material to be then discharged into the environment. In a second step, the heater is turned off while the air purge continues the work of regeneration and at the same time cools the bed of adsorbent material.

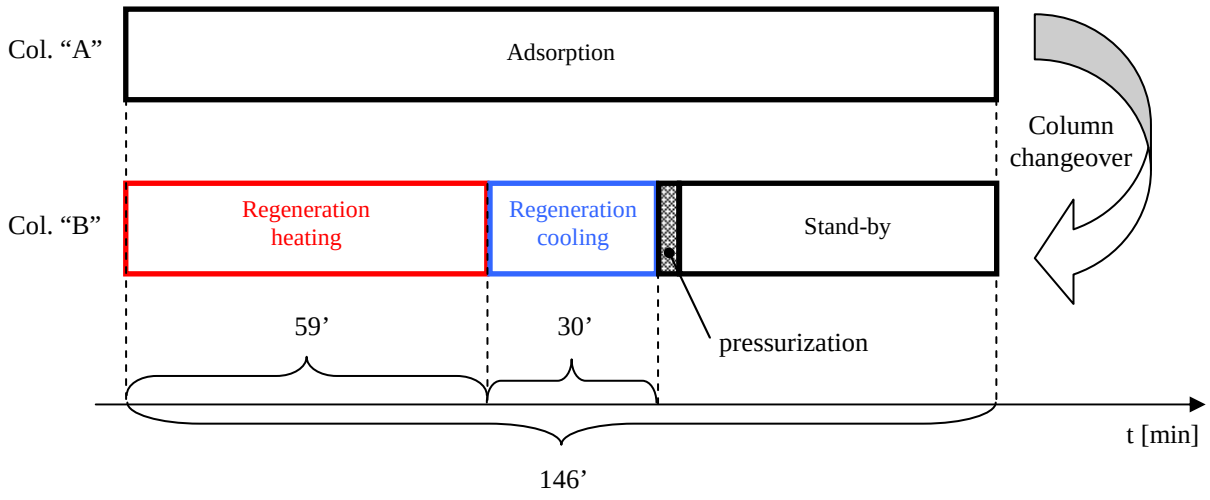


At the end of re generation time, the purge air is used to pressurize the column at the working pressure, the column is now ready for operation.
At the expiration of cycle time, the air flow between the two columns is swopped.
The columns swop can be delayed if at the end of the cycle time, the material of the first column is still able to ensure the dewpoint set (dewpoint operation mode).

2.2 – Example of standard working cycle

Working cycle with fixed time, setpoint ≥ -40°C and pressure = 7 bar

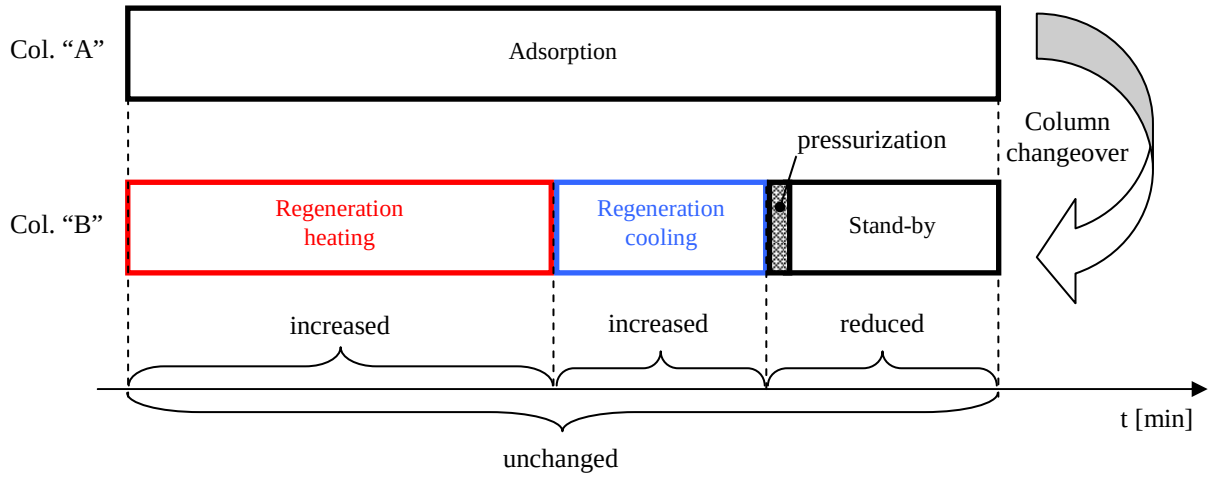
Total cycle time: 146'.
Maximum heating regenerating time (electrical heater ON): 59'.
Maximum cooling regenerating time (electrical heater OFF): 30'.
At the end of regeneration phase (heating + cooling) outlet purge air valves are closed, purge air is used to pressurized the column just regenerated.
When pressurization phase is completed (maximum 60 seconds) the column go in stand-by status.
At the end of total cycle time it happens the columns changeover.
Column "A" is de-pressurised and then regenerated, while column "B" starts the adsorption phase.



The electronic controller allows to set the dryer working pressure (parameter U2).
Working times are automatically recalculated accordingly with pressure setting.

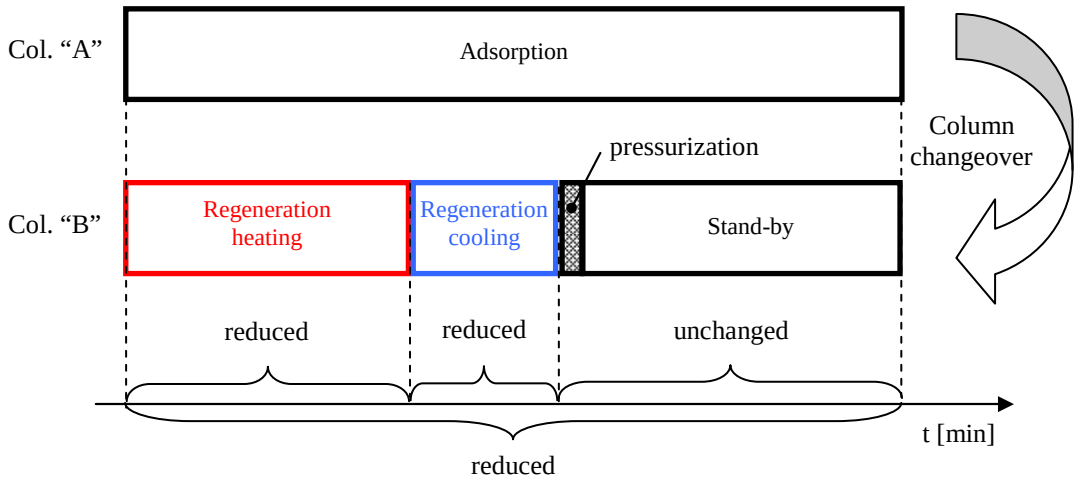
Working cycle with fixed time, setpoint ≥ -40°C and pressure < 7 bar

Effects on the working cycle are as follow:
- Total cycle time: unchanged
- Maximum heating regenerating time: increased
- Maximum cooling regenerating time: increased
- Stand-by time: reduced



Working cycle with fixed time, setpoint ≥ -40°C and pressure > 7 bar

Effects on the working cycle are as follow:
- Total cycle time: reduced
- Maximum heating regenerating time: reduced
- Maximum cooling regenerating time: reduced
- Stand-by time: unchanged

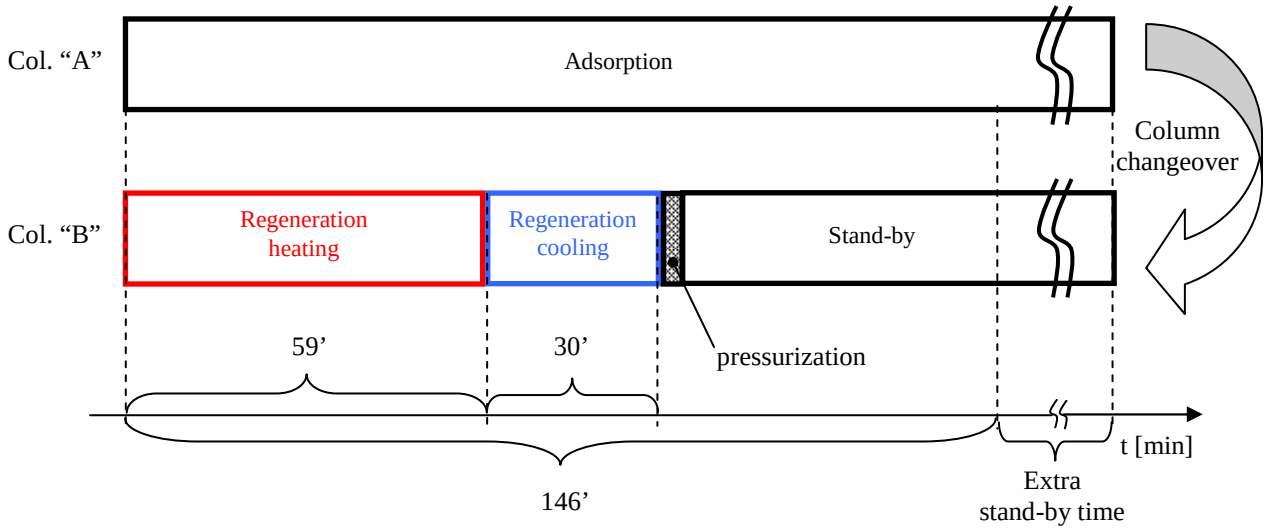


By setting parameter U6 = “fitted”, the dewpoint control function is activated.
Such function is available only if for dewpoint ≥ -40°C

Working cycle with dewpoint control, set dewpoint ≥ -40°C and pressure = 7 bar

Maximum heating regenerating time (electrical heater ON): 59’.
Maximum cooling regenerating time (electrical heater OFF): 30’.
At the end of regeneration phase (heating + cooling) outlet purge air valves are closed, purge air is used to pressurized the column just regenerated.
When pressurization phase is completed (maximum 60 seconds) the column go in stand-by status.
At the end of the cycle time, the electronic controller compares the value of the dewpoint read by the sensor with the set value.
As long as the sensor reading is lower than the set value, the column "B" is left in stand-by condition, while the column "A" continues the adsorption phase.

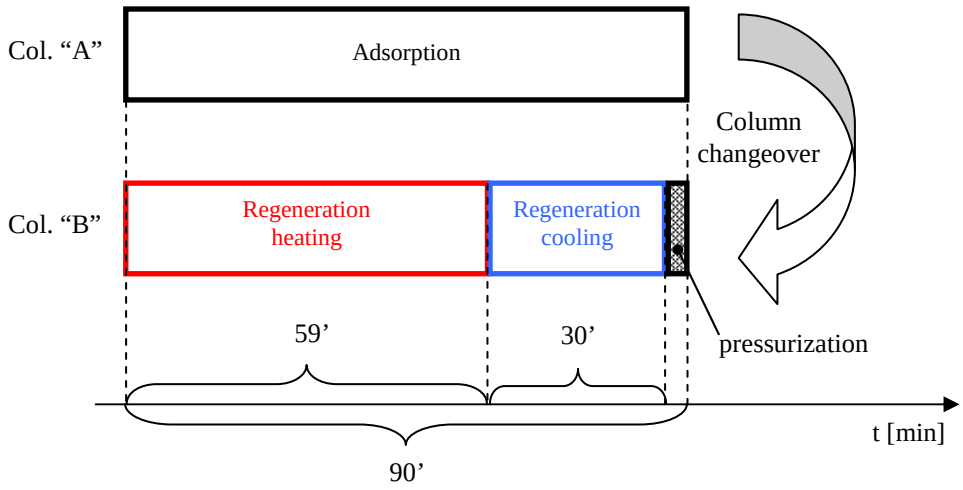
When the reading of the dewpoint sensor exceeds the set value, the columns changeover occurs.
Column “A” is de-pressurised and then regenerated, while column “B” starts the adsorption phase.
The total cycle time will therefore be higher compared to the 146’ of the cycle with fixed times.
The extra time of stand-by phase is the energy savings generated by the dewpoint control function.



If a particularly deep drying is required (dewpoint lower than -40°C), the desiccant material must be regenerated more frequently. The electronic controller modifies the working cycle eliminating the time of stand-by.
Times here below indicated don't depends on the working pressure set by parameter U2.

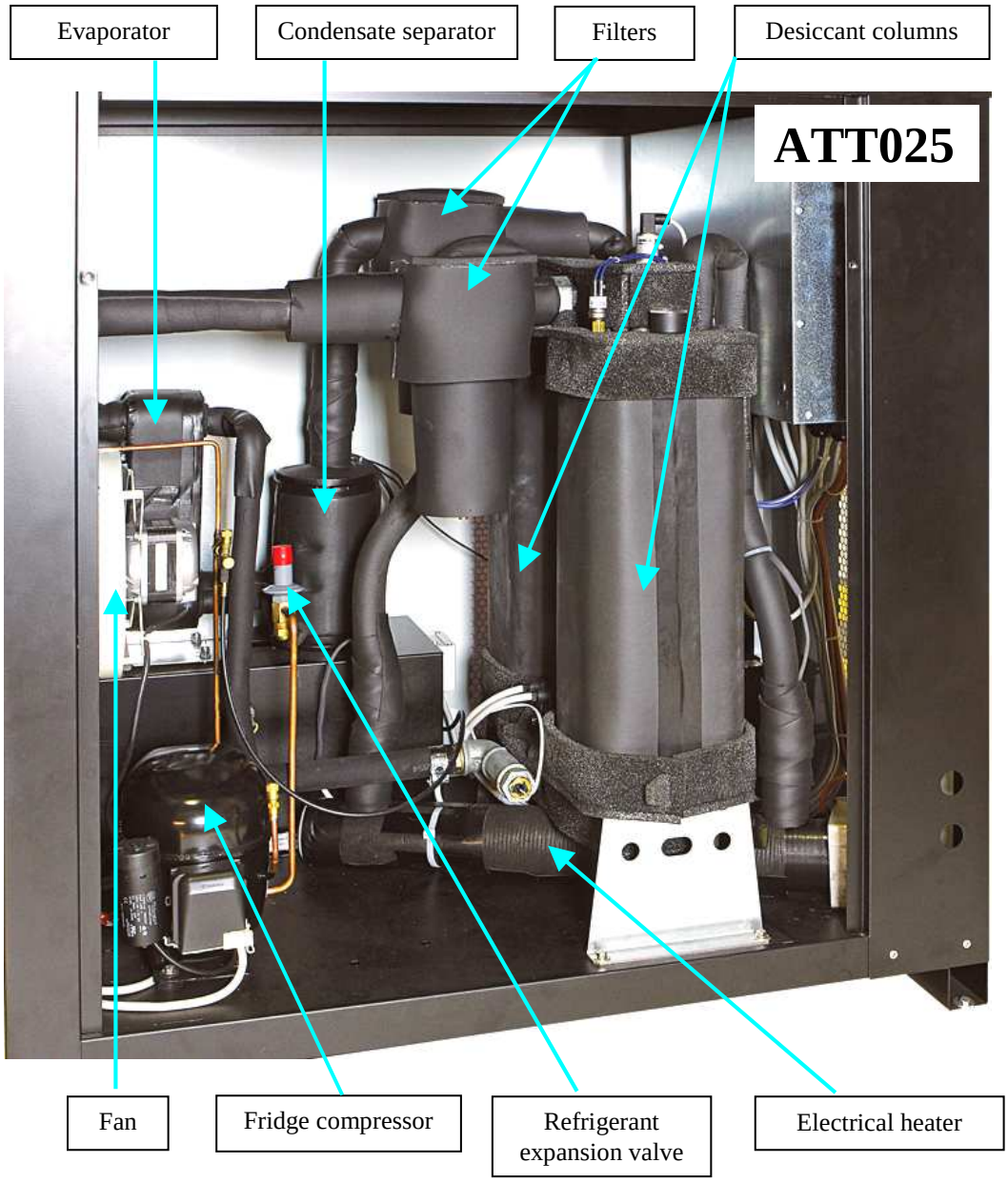
Working cycle with fixed time, setpoint < -40°C

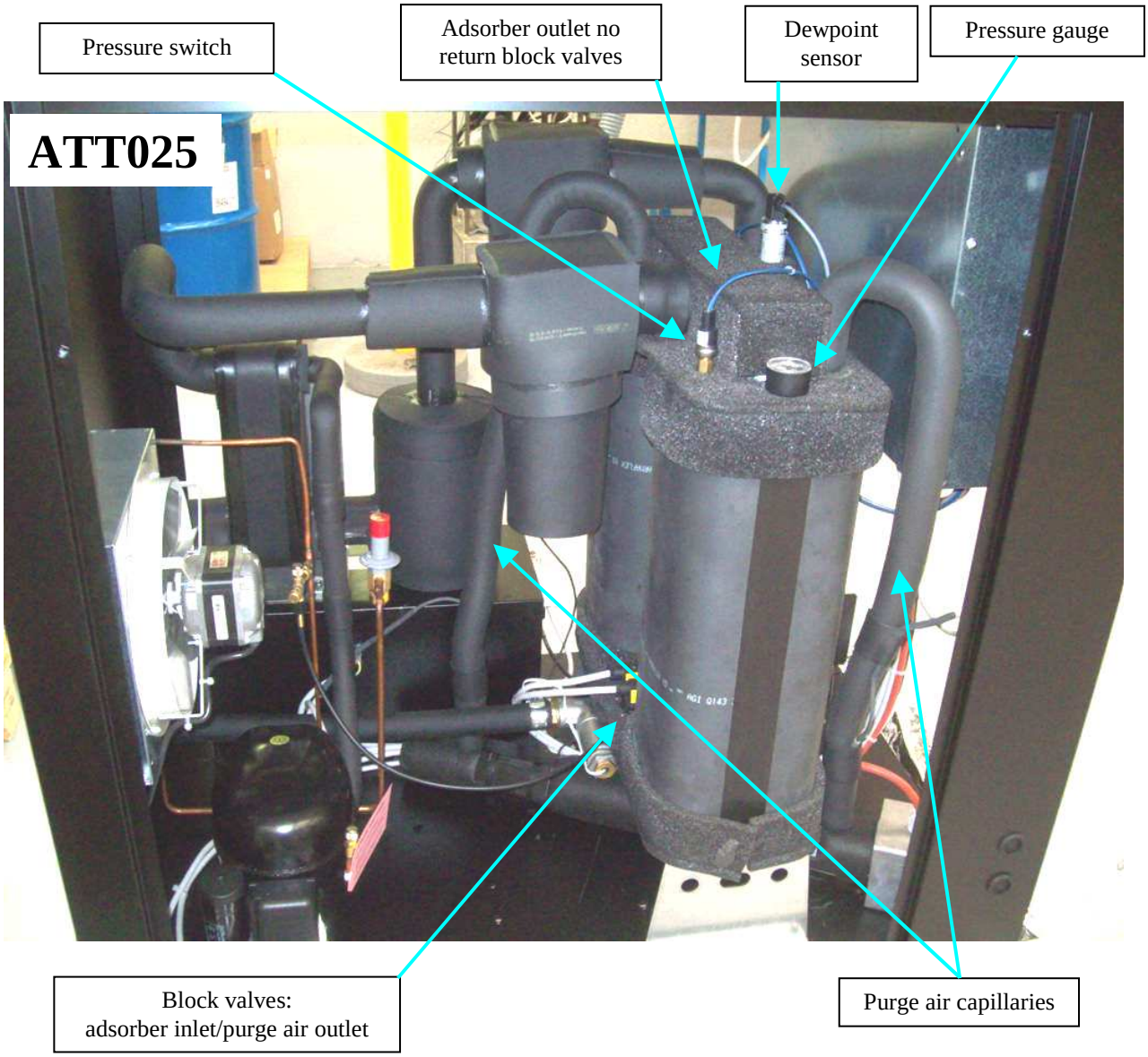
Total cycle time: 90'.
Maximum heating regenerating time (electrical heater ON): 59'.
Maximum cooling regenerating time (electrical heater OFF): 30'.
At the end of regeneration phase (heating + cooling) outlet purge air valves are closed, purge air is used to pressurized the column just regenerated.
When pressurization phase is completed the columns changeover happens immediately (there is no stand-by time for the column just regenerated).
Column "A" is de-pressurised and then regenerated, while column "B" starts the adsorption phase.



2.3 – Product details

The following section shows more in detail the components and operation of dryers ATT.




Pressure switch
Adsorber outlet no return block valves
Dewpoint sensor
Pressure gauge
ATT025
Block valves: adsorber inlet/purge air outlet
Purge air capillaries

2.3.1 – Fridge dryer

Pre-filter

The prefilter (standard on all ATT models) has the function of retaining any impurities that could clog the plate heat exchanger (air / air - evaporator), with a consequent increase of pressure drops.
It is not necessary to use filter with a particularly deep filtration grade. Filters used are Parker Zander GL with elements grade Z (1 micron).

Compressor

It's an hermetic piston compressor, with thermal overload protection and internal starter device.
The refrigerant (R134a), sucked from the evaporator in vapor phase, is compressed and sent to the condenser.

Condenser + fan

The condenser is an heat exchanger inside of which, by means of a forced cooling via one or more fans, the vapor refrigerant is condensate to liquid state.
The refrigerant rejects to the environment the heat previously absorbed during the evaporation phase (heat removed from the compressed air flow).

Expansion + cooling capacity control

The expansion device (automatic valve on ATT025; capillary on ATT040) guarantee the correct pressure reduction of the liquid refrigerant liquid.
At the outlet of the expansion device the liquid refrigerant is ready to be injected into the evaporator.

ATT025: the expansion valve performs the refrigerant flow modulation in order to guarantee the correct cooling capacity depending on the thermal load.
ATT040: the cooling capacity regulation is made by means of the valve by-pass hot gas: such valve by-passes part of the hot vapor refrigerant coming from the compressor, injecting it into the suction piping (evaporator outlet); thereby reducing the cooling capacity of the dryer if this exceeds the actual thermal load.

Pressure switches

The refrigerant circuit is provided with two pressure switches.

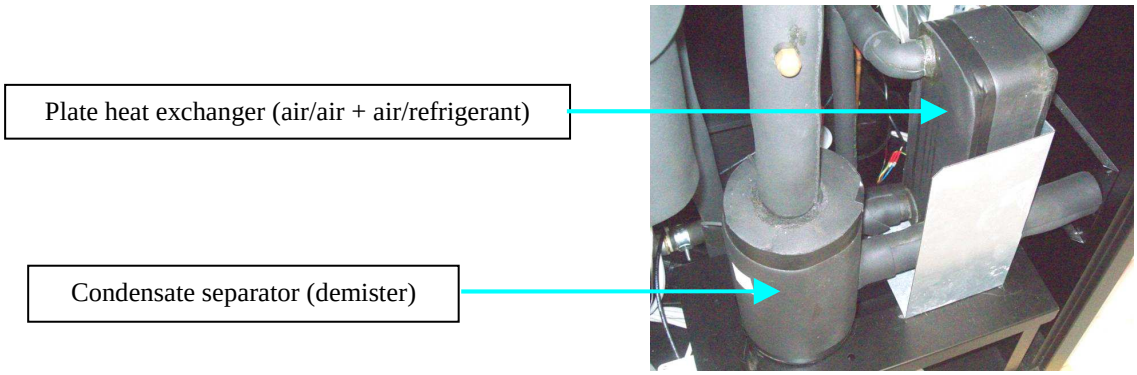
Fan pressure (PV): operates the fan when the condensing pressure exceeds 11 bar and turns it off when the pressure drops below 8 bar.

High pressure switch (HP), only on ATT040: it stops the fridge circuit when the condensing pressure exceeds 28 bar, the pressure switch has manual reset.

On ATT025 model the function of the high pressure switch is performed by a high temperature switch (HT), which is also a manual reset.

Heat exchanger

It's a stainless steel brazed plates heat exchanger.



It actually includes two heat exchangers:

- air/air heat exchanger, in which the humid inlet air is pre-cooled by the outlet dry and cold air
- air/refrigerant heat exchanger (evaporator), in which the liquid refrigerant, injected at low pressure and low temperature, absorbs heat from the compressed air flow (which is cooled to the required dewpoint). The heat exchanging allows the evaporation of the refrigerant which passes from liquid to vapor phase.

The water condensate produced inside the heat exchanger must be separated from the cold and dry air delivered to the desiccant columns.

A demister condensate separator is installed outside the heat exchanger.

Condensate drain

The condensate previously separated is discharged by means of a timed solenoid valve, managed by electronic control. The setting of opening/closing time can be done directly by the end user according to the site working conditions.

2.3.2 – Desiccant dryer

Filters

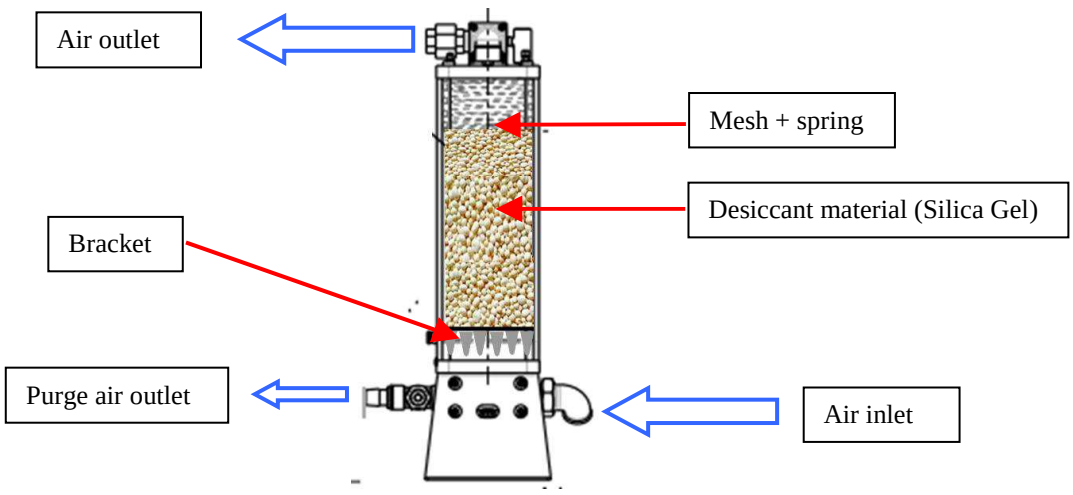
First internal filter (coalescence type, Parker Zander GL grade X), is located in the air circuit between the evaporator outlet and the inlet of the adsorption stage.
It's a filter for oil/water aerosol; its purpose is to protect the adsorbent material inside the columns from any residual traces of oil in the compressed air.

A second dust filter (Parker Zander GL, grade Z) is installed at the outlet of the adsorbing section, before the inlet of air/air heat exchanger. It has the purpose of protecting the heat exchanger and the compressed air line from any particles of material adsorbent could come from the column.

Desiccant columns

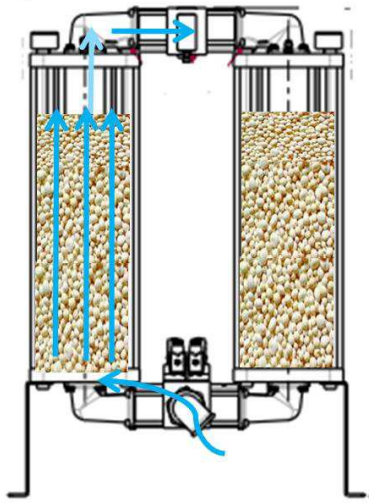
The adsorption stage is made by two aluminum columns filled with desiccant material (Silica Gel). The two columns work alternately. While one is flown by the compressed air to be dried, the other is in the regeneration phase.

It has to be underlined that the compressed air enters the desiccant columns at low temperature. In fact, after the passage through the evaporator, the air does not flow back immediately into the air/air heat exchanger, but it flows directly into the desiccant columns. The second passage through the air/air heat exchanger takes place downstream of the adsorption phase.
The compressed air low temperature allows a better efficiency of the desiccant material, with consequent reduction in the amount of material used.



- Adsorbing phase

During the adsorption phase the compressed air flows from below upwards. The lower support (in addition to supporting the material) allows a uniform distribution of air flow through the column section, so as to have a uniform utilization of the desiccant bed.

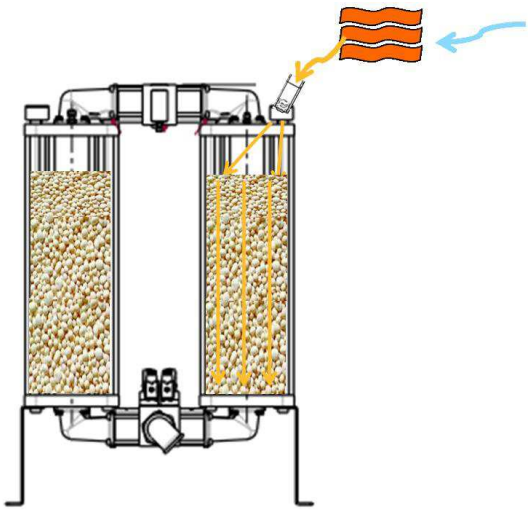


On the top of the column a mesh + spring keep the bed compact, preventing movement of the desiccant material and the creation of dust.

The desiccant material regeneration consists of a particular combination of the two traditional regeneration techniques used in the classical adsorption dryers:
- cold regeneration cold (PSA - pressure swing adsorption)
- hot regeneration (TSA - temperature swing adsorption).

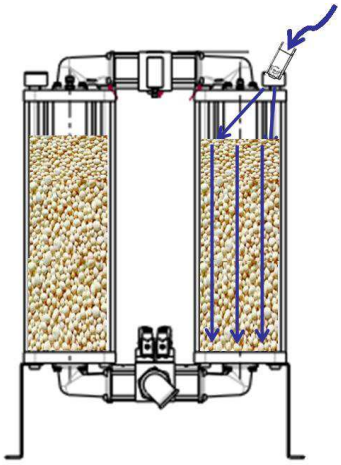
- Regeneration phase - heating

During the regeneration phase, purge air flows from top to bottom.
Purge air (about 5% of the dryer nominal airflow) is heated by an electrical resistance up to a temperature of about 150 ° C. Heated purge air enters the column, in order to regenerate the desiccant material.
Purge air is then exhausted into the ambient.



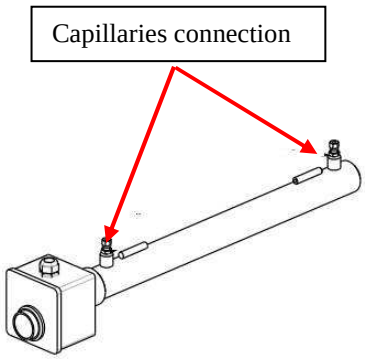
- Regeneration phase - cooling

At the end of heating regeneration phase, the electrical resistance is switched off, while the purge air continues to flow through the column.
The cold purge air has both the purposes to complete the cleaning of the adsorbent bed and to reduce its temperature.
At the end of cooling regeneration phase, the discharge valve is closed and the purge air pressurize the column. Once reached the working pressure, the column remains in stand-by mode until the next switch, when the regenerated column will start the adsorption function.



Electrical heater

The purge air is heated by an electrical resistance. The resistance is housed in a steel tube externally insulated.
The amount of purge air that passes through the resistance is defined by the size of two copper capillary tubes.
Two temperature sensors allow the controller to modulate the power of the heater in order to maintain almost constant the temperature of the purge air at the inlet of desiccant columns.
Additional temperature sensors protect the heater from overheating.

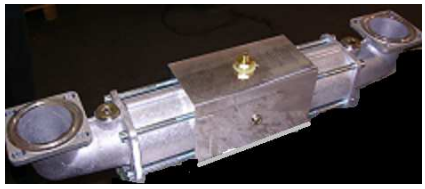


Valve block air inlet/purge outlet

The solenoid valves are housed inside an aluminium block.
Inlet valves: direct the compressed air from the fridge dryer to the column in the adsorption phase.
Purge outlet valve: exhaust to the ambient the purge air from the column in regeneration phase.

No return valves

No return valves are assembled into an aluminium block.
To avoid that outgoing air from the column in adsorption phase could flow back through the column in regeneration phase.



Pressure switches

Provide to the controller the signal of presence or absence of pressure inside the columns; this in order to manage the adsorption/regeneration phases and if necessary to activate alarms.

Flowmeter

The flow meter, connected to the dewpoint sensor, ensures the correct air flow (3÷5 liters/minute) to the sensor for optimum measurement.
To be checked and calibrated periodically.

3 – Installation/Start-up

Install the dryer inside, in a clean area protected from direct atmospheric agents (including sunlight).
Install the unit with an orientation which makes easy the access to the control panel and to the drain niche.
Verify that a minimum clearance of 1.5m is left around the machine for maintenance access and for correct ventilation to the unit.
The min/max ambient temperature should be within the limits 5÷50°C

Verify that the power supply to the dryer is up to what indicated in name plate of the unit.
Connect the electrical saupply to the main switch, and the earth to the yellow/green terminal on the main switch side.
Install on the main line upstream the dryer an overcurrent and earth leakage circuit breaker ($I\Delta n$ = 0.3A.
Overcurrent circuit breaker must have $In \geq FLA$ and intervention curve type D.

Correctly connect the dryer to the air inlet and outlet connections labeled on the unit.
Install a bypass line and shut off valves on the compressed air line, so that maintenance or calibration operations can be carried out without interrupting the compressed air supply to the points of use. The by pass line should be open when the dryer is in off and the plant requires compressed air flow.
Filter elements must be replaced at least once per year, accordingly with the periodical maintenance schedule.

If the compressed air circuit is subject to vibration, use hoses to connect the dryer. If the circuit is subject to pulsations, eliminate them by connecting the dryer to an air chamber to equalize the pressure.
Verify that the dryer pneumatic circuit is protected by one or more safety valves to prevent the design pressure (16 barg) from being exceeded at all times.

The ambient air around the dryer and compressor must not contain solid or gaseous contaminants. All compressed and condensed gases can generate acids or chemical products which may be aggressive against the aluminum cooler or the other components inside the dryer.
Take particular care with sulphur, ammonia, chlorine and installations in marine environments.

If the system is prone to instantaneous heavy withdrawals of compressed air which exceed the dryer rated capacity, install a correctly sized receiver just upstream the requiring point.

The dryer is equipped with a timed drain.
Do not connect the drain valve in a close loop already pressurized by other drain lines .
Check for proper drainage of condensate drain. Dispose the condensate in accordance with local environmental regulations.

The dryer is equipped with an outlet port for the discharge of depressurization/purge air. A silencer has to be connected to the outlet port.
The silencer can be connected directly to the unit or in case of need it can be installed remotely; in that case the connection can be done with a rubber hose with a maximum length of 10m (synthetic rubber with internal steel spiral, resistant to temperature 80° C and pressure 10 barg).

Start-up

Before starting the dryer verify that the shut-off valve upstream the dryer is open and that there is no flow of air through the dryer (shut-off valve downstream dryer closed).

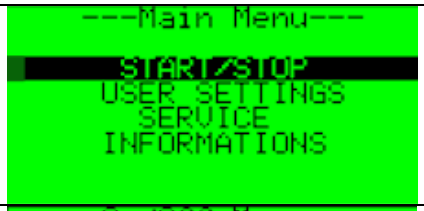
Caution: Make sure that at dryer start the air compressor is running (dryer supplied with compressed air). Otherwise you risk serious damage to the electrical heater.

Start the dryer giving power by turning the main switch to “ON”; display will show the Main Mask (par. 4.2.1).

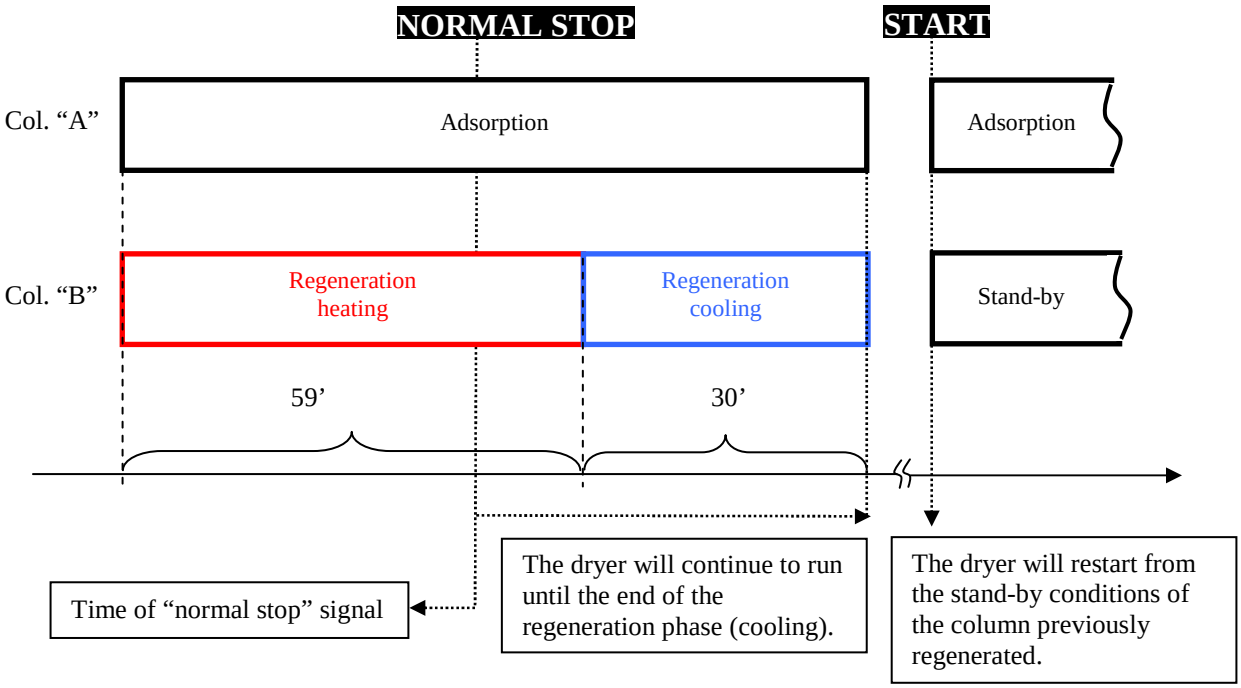
First dryer start-up is made, by default, in “Forced Regeneration” mode; the regeneration time (both heating and cooling) is properly increased in order to ensure the maximum efficiency of the desiccant material.
The unit will work in forced regeneration mode for a complete cycle (both columns), then it automatically switches to normal working mode.
It is recommended to keep the outlet air valve closed during the whole start-up procedure, in order to preserve the proper functioning of the desiccant bed.
Once the start-up procedure is completed, open the outlet valve.

Run the dryer while the air compressor is running.
The dryer works automatically, calibrations are not required on the field.
If there are excessive and unexpected airflows, by-pass to avoid overloading the dryer.

Dryer Start/Stop

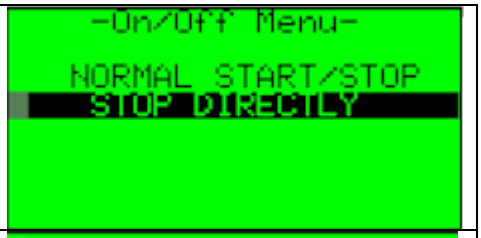
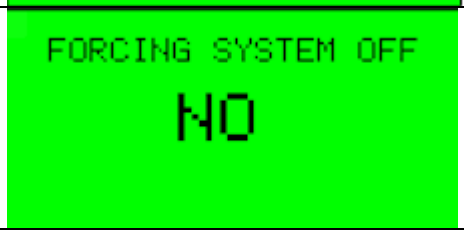
Press button ***Prg***  , to access the Main Menu	
Select **START/STOP** Confirm with button ***Enter*** 	
Select **NORMAL START/STOP** confirm with button ***Enter*** 	
Select **START**, to start the dryer. Select **STOP**, to stop the dryer.	

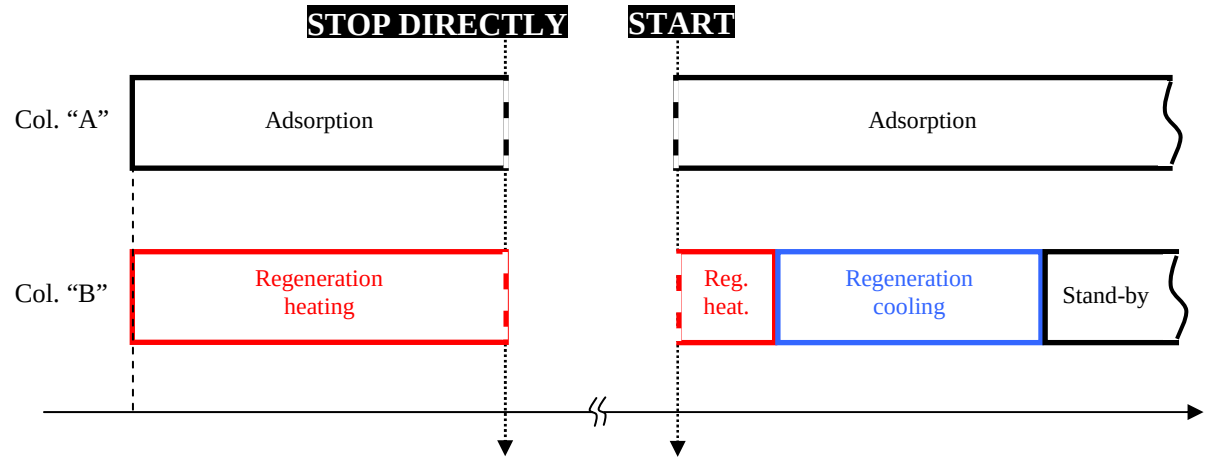
From the moment you select STOP in the controller, normally it passes quite a long time before the dryer really stops. In fact the dryer stops only when the regeneration cycle is completed.
This to ensure a proper functioning of the system at the next restart.
During the switching-off delay, make sure there is compressed airflow through the dryer.
If the STOP command is given during the stand-by mode (regeneration phase already completed), the dryer will stop immediately.



Immediate shutdown of the dryer

When you do not want to wait until the end of the regeneration cycle, it is possible to force the immediate stop of the dryer.
When re-started, the dryer will start from the state it was at the time of shutdown.
It is recommended to always use the Normal stop.
Use the "Stop directly" procedure only if necessary.

Press ***Prg*** to access the Main Menu and select **START/STOP**, then select **STOP DIRECTLY**	
Select **YES** and confirm. After a few seconds the value automatically reset to **NO**.	



Time of "Stop directly" signal.
The dryer stops immediately; the controller stores the operating condition at the time of shutdown.

The dryer will restart from the conditions existing at the time of shutdown and will complete the regeneration cycle previously interrupted.

Unit behavior in case of power failure.

Unit status at the time of power failure.	Unit status on return of power	Notes
On	On	The dryer will restart from the point at which the power failure occurred, completing the cycle previously interrupted.
Off	Off	
Normal stop (shutdown in progress)	Off	When you restart the dryer, it will start with column 1 in adsorption phase and column 2 in regeneration phase, whatever the state of the cycle at the time of blackout. In other words the dryer re-starts like the first start-up.
Stop directly	Off	When you restart the dryer, it will start with column 1 in adsorption phase and column 2 in regeneration phase, whatever the state of the cycle at the time of blackout. In other words the dryer re-starts like the first start-up.

In case it should be necessary to proceed with a maintenance intervention that requires the opening of the front panel (and therefore the opening of the main switch) for just a short period of time (for example to replace a relay or a contactor), it is recommended to shutdown and restart the unit simply opening and closing the main switch.
It is not necessary to switch off the dryer with the commands “Normal Stop” or “Stop Directly”, because the dryer would start with the first column in adsorption phase even if it had not been previously regenerated.

In case the maintenance intervention should require a longer time (e.g. replacement of desiccant material) it is possible to switch off the dryer by commands “Normal Stop” or “Stop Directly” (accordingly with needs) before removing the power supply.
Once power is restored and unit restarted by command “Start”, working cycle will start with column1 in adsorption phase. It is also recommended to start the dryer by setting a forced regeneration cycle (parameter U3 = "2").

4 – Electronic controller

4.1 – Hardware description

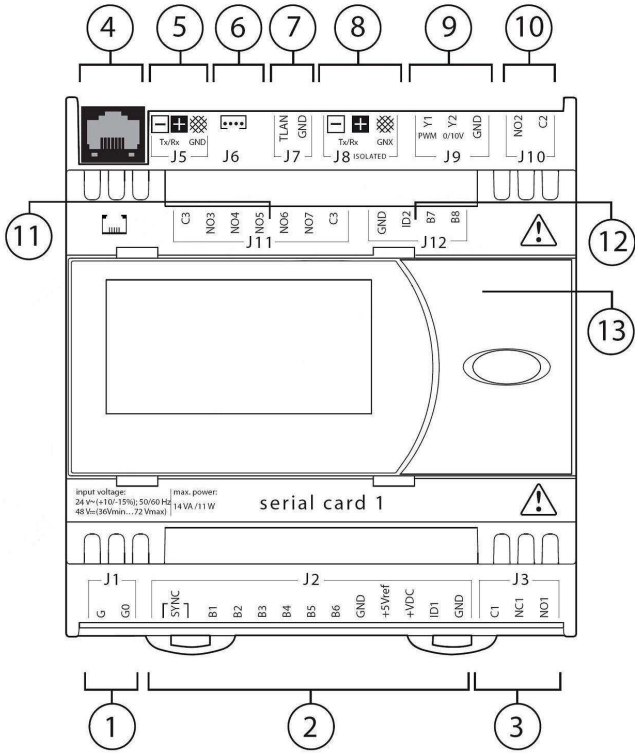
The electronic controller allows to manage all the start-up, running and shut-down operations.
In addition it carries out a continuous monitoring of operating parameters by reporting any anomaly through display and lights.

The board also allows:

- record of the last 16 events occurred
- counting of dryer running hours
- setting of last maintenance date

It is possible to connect the controller to a supervision network by using an optional serial card and the standard Modbus RTU protocol.

Controller: PCOCOMPACT



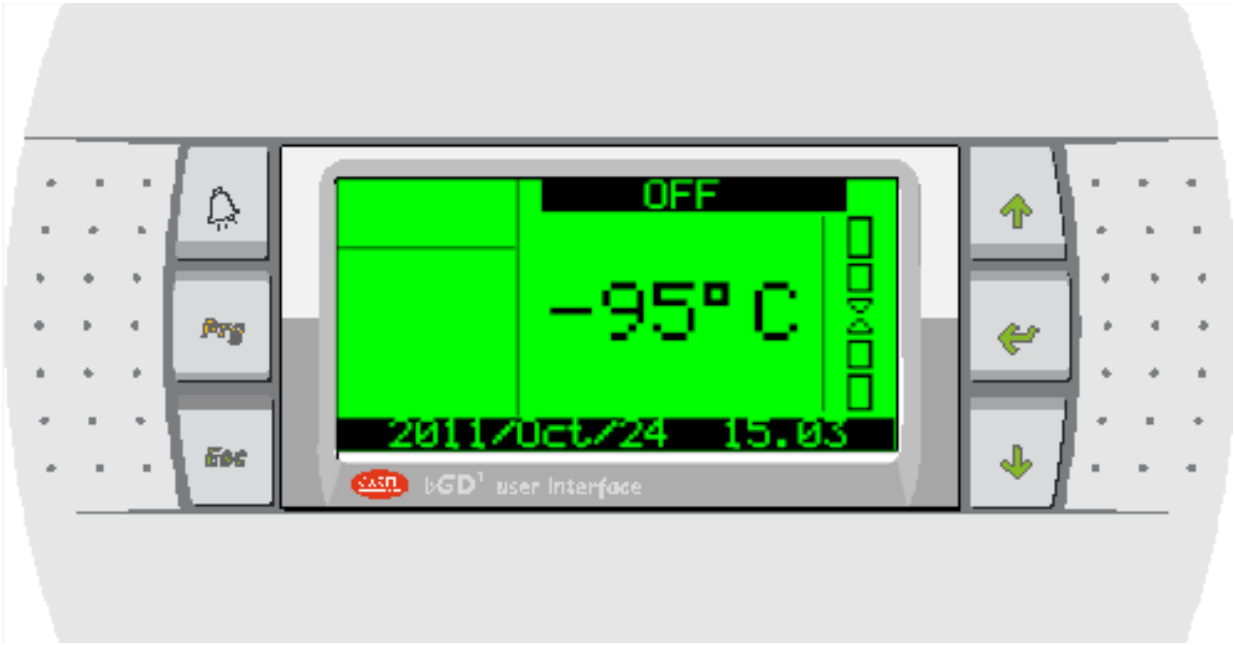
Specifications

Electrical supply	24Va.c., +10/-15%, 50/60Hz
Maximum current absorption	14VA, 11W
Operating range PT1000 sensor	-50÷350 °C
Operating range NTC sensor	-50÷90 °C
Operating range NTC HT sensor	0÷150 °C
Operating range pressure transducer	0÷30 bar

	Terminal	Group	Description	Type
Analogical Input	B1	J2	Pressure Dewpont transducer	4/20mA
	B2		Purge air temperature sensor	NTC HT
	B3		Electrical heater air outlet temp. sensor 2	PT1000
	B4		Electrical heater air outlet temp. sensor 1	PT1000
	B7	J12	Adsorber inlet temperature sensor	NTC
Digital Input	ID1	J2	Electrical heater temperature switch	Volt-free contact
	B5		Pressure switch column 1	Volt-free contact
	B6		Pressure switch column 2	Volt-free contact
	ID2	J12	Remote ON/OFF	Volt-free contact
	B8		Fridge circuit alarm (HT or HP)	Volt-free contact
Digital Output	NO1	J3	Alarm relay	Volt-free changeover contacts
	NC1			
	NO2	J10	Condensate drain valve	230Vac
	NO3	J11	Electrical heater contactor	230Vac
	NO4		Purge air solenoid valve column 1	230Vac
	NO5		Purge air solenoid valve column 2	230Vac
	NO6		Inlet air solenoid valve column 1	230Vac
	NO7		Inlet air solenoid valve column 2	230Vac
Analogical Output	Y2	J9	Electrical heater power modulation	0-10Vdc

4.2 – Control panel

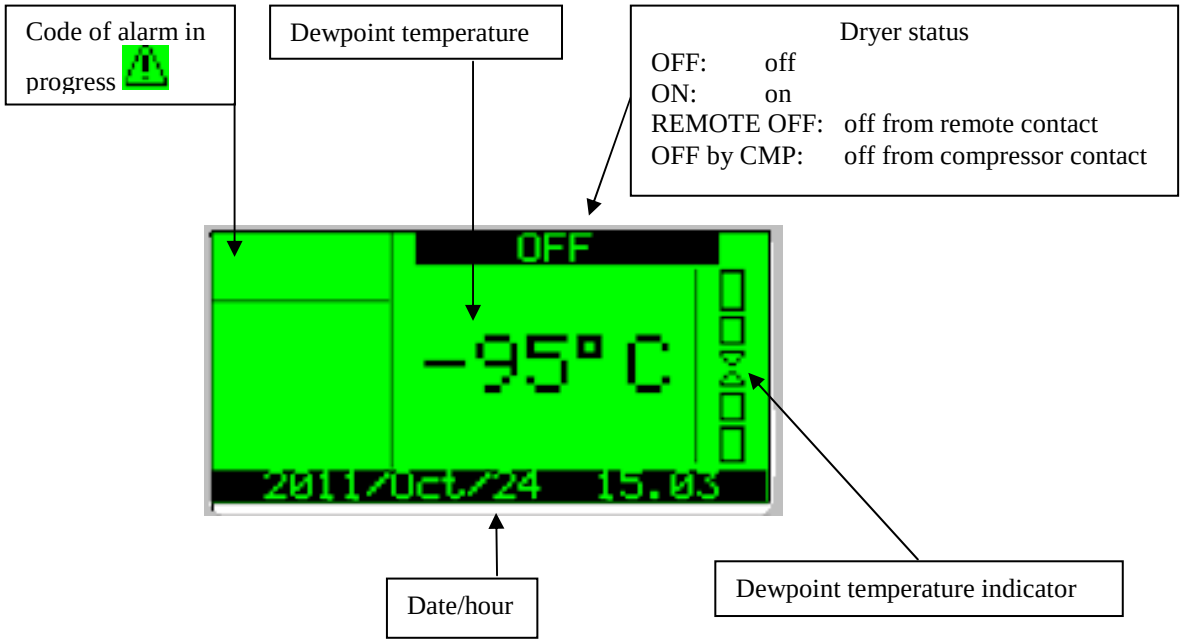
Control panel of ATT dryers consists of
- FSTN graphic display, backlit, 132x64 pixel resolution
- n° 6 backlit keys
- buzzer alarm



Key	*Function*
Up 	Scroll display masks (when the cursor is positioned at the top left) and parameter modification
Down 	Scroll display masks (when the cursor is positioned at the top left) and parameter modification
Enter 	Enter menu/parameter, confirm data modification
Prg 	Access to main Menu
Esc 	Return to the previous screen
Alarm 	Display alarm occurring - Reset Alarms

4.2.1 – Main screen

The main screen provides information about unit status.



4.2.2 - Dewpoint temperature indicator

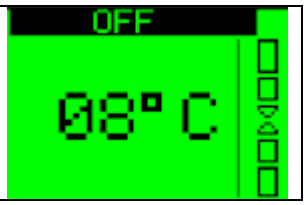
The main screen, in addition to the value of the dewpoint, also includes vertical indicator that shows the quality of the compressed air dewpoint compared to the setpoint (parameter U1).

The indicator is divided into 6 areas proportional to the setpoint value and to the minimum (-100°C) and maximum (+20°C) adjustable values of setpoint.
The cross in the middle of vertical bar represents the setpoint.
A cursor provides an immediate reading of the dewpoint quality:
- cursor over the intersection ⇨ dewpoint higher (worse) than the setpoint
- cursor under the intersection ⇨ dewpoint lower (better) than the setpoint

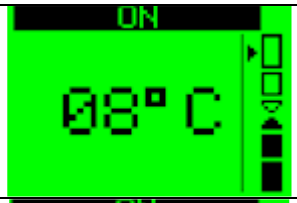
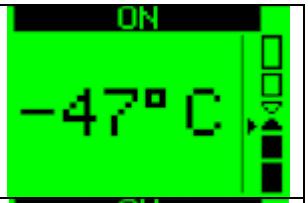
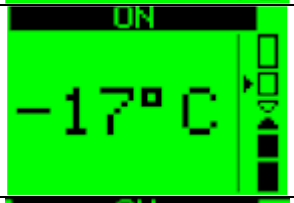
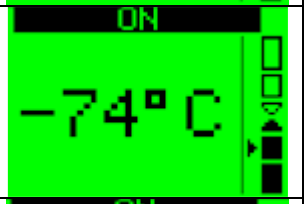
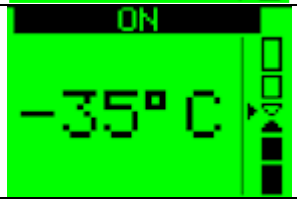
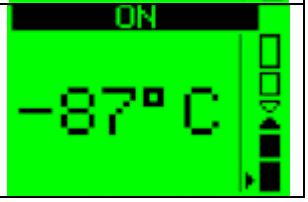
The dewpoint shown on display will flash if the dewpoint is higher than: setpoint + differential (differential is adjustable by parameter P37; default value 10°C).

Example

Assuming setpoint -40°C, and being the dewpoint limit values -100°C and +20°C, six different areas can be identified.
The cursor will move on the vertical bar accordingly with actual dewpoint value.

Unit in OFF	

Unit in ON

dp ≥ 0°C		-60 ≤ dp < -40	
-20 ≤ dp < 0		-80 ≤ dp < -60	
-40 ≤ dp < -20		dp < -80	

4.2.3 - Visualization of energy saving

It’s is possible to show on the screen how much Energy (in terms of kWh) the unit is saving, compared to a similar dryer of your choice:

- Heatless
- Heat Regenerated
- Blower

To access the visualization, press button DOWN  (from main screen).
Following mask appears:

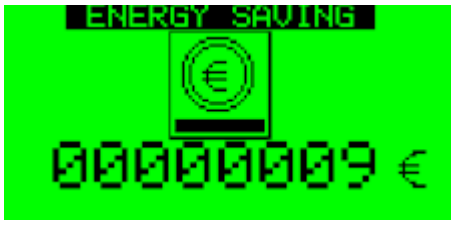
Note: the energy saving calculation is made accordingly with the compressor hours of operation and it is based on theoretical calculations which take into account also of:

- unit in Winter o Summer running mode
- electrical heater setpoint temperature

Visualization of energy saving in monetary terms

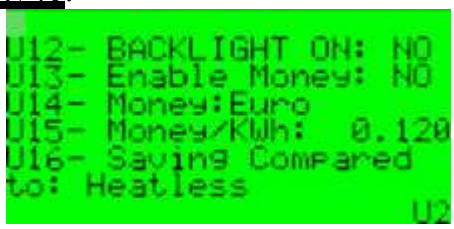
End user has the option to enable the display of a monetary value resulting from the conversion of kWh saved.

This value is indicated in the mask:



Mask is accessible from the main screen by pressing twice the button DOWN  , if the function was previously enabled.

To enable function, press key PRG from main screen to access main menu, then select menu **USER SETTINGS**, then submenu **OTHER**:



Parameter **U13- Enable Money**: set YES to enable the display of energy saving in monetary terms

Parameter **U14- Money**: visualization of currency symbol, choice between:

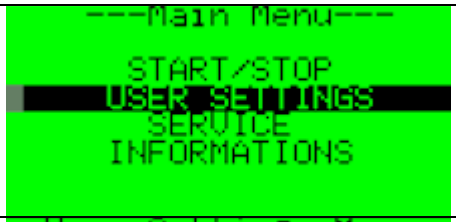
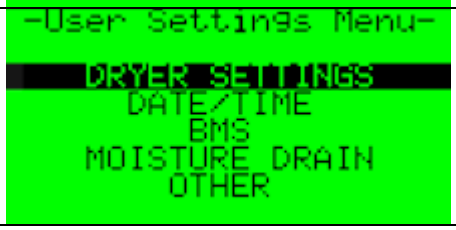
Parameter	Description	Symbol
Euro	Euro	€
USA Dollar	American Dollar	$
ENG Pound	English Pound	£
JAP Yen	Japanese Yen	¥
SCAN Krone	Scandinavian Krone	Kr
RUS Rublo	Russian Rublo	руб

Parameter **U15- Money/KWh**: conversion factor for the calculation in currency terms. Default setting is 0,12 which is conversion factor between Euro and kWh

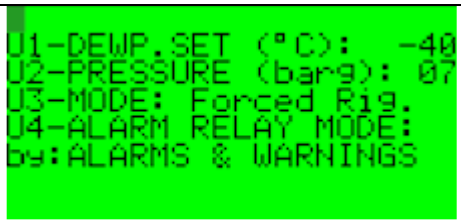
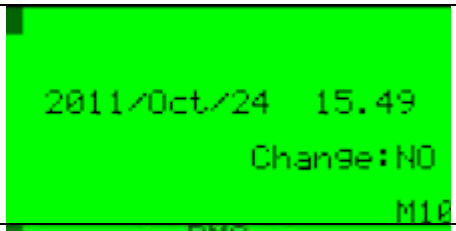
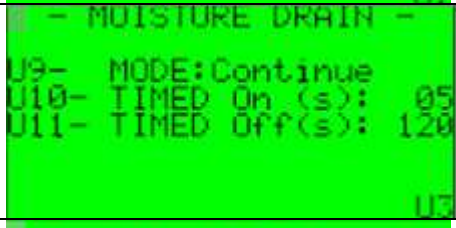
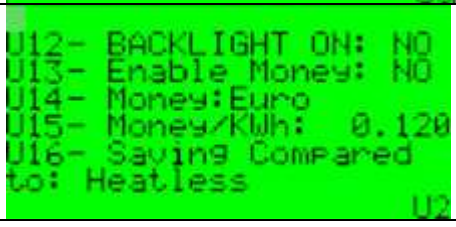
Parameter **U16- Saving Compared to**: to select the type of dryer form Energy saving comparison: Heatless, Heat Regenerated, Blower.

NOTE: The symbol  is shown only if the unit is in status ON.

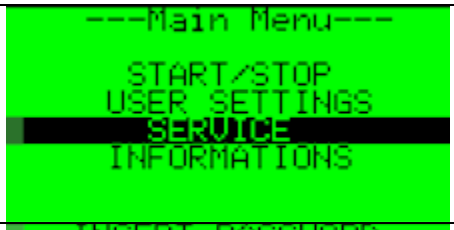
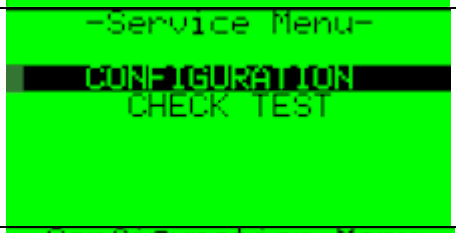
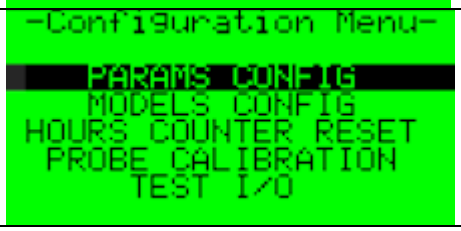
4.2.4 - Access to user parameters

Access to main menu with key ***Prg***; select **USER SETTINGS** with keys ***Up*** and ***Down***; press key ***Enter*** to access the user menu	
Display shows user submenus. Press ***Up*** e ***Down*** to select the required submenu and press ***Enter*** to confirm.	

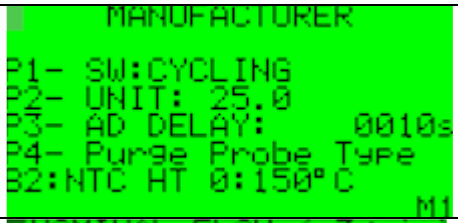
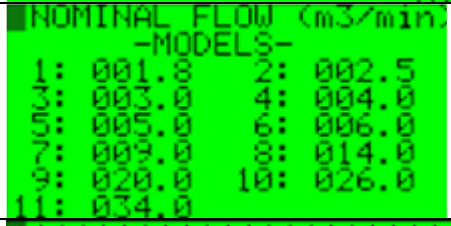
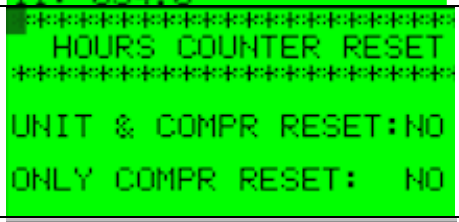
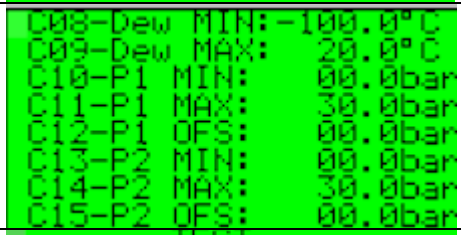
Available submenus

Submenu **DRYER SETTINGS** Press ***Enter*** to scroll parameters, press ***Up*** e ***Down*** to modify parameter value and press ***Enter*** to confirm and save modification. In the last screen (press ***Down*** to access) it is possible to update the last maintenance date.	
Submenu **DATE/TIME**	
Submenu **BMS** Press ***Enter*** to scroll parameters, press ***Up*** e ***Down*** to modify parameter value and press ***Enter*** to confirm and save modification.	
Submenu **MOISTURE DRAIN** Press ***Enter*** to scroll parameters, press ***Up*** e ***Down*** to modify parameter value and press ***Enter*** to confirm and save modification.	
Submenu **OTHER** Press ***Enter*** to scroll parameters, press ***Up*** e ***Down*** to modify parameter value and press ***Enter*** to confirm and save modification.	

4.2.5 - Access to dryer configuration

Access to main menu with key ***Prg***; select **SERVICE** with keys ***Up*** and ***Down***; press key ***Enter*** to access the service menu.	
Service password is required.	
Press ***Enter*** to move cursor on the figure **000**, use ***Up*** e ***Down*** to select **002**, press ***Enter***	
Display shows service submenus. Press ***Up*** e ***Down*** to select **CONFIGURATION** menu, press ***Enter*** to confirm.	
Display shows available submenus. Press ***Up*** e ***Down*** to select the required submenu and press ***Enter*** to confirm.	

Available submenus

Submenu **PARAMS CONFIG** Press ***Enter*** to scroll parameters, press ***Up*** e ***Down*** to modify parameter value and press ***Enter*** to confirm and save modification.	
Submenu **MODELS CONFIG** Nominal air flow of different ATT dryers are shown.	
Submenu **HOURS COUNTER RESET** To reset the dryer and fridge compressor hour counter. Press ***Enter*** to select which hour counter you want to reset. Press ***Up/Down*** to change value to Yes	
Submenu **PROBE CALIBRATION** To adjust the offset for analogue readings. <u>Att: to be used with caution and only by trained people</u> Press ***Enter*** to scroll parameters, press ***Up*** e ***Down*** to modify parameter value and press ***Enter*** to confirm and save modification.	
Submenu **TEST I/O** To show the reading of analogue inputs and the status of digital inputs	

Parameter list

Parameter type: M = machine, A = adsorber, F = fridge
Display code: U = user, P = factory
Data type: B = Boolean, I = integer, A = analogical

Parameter Type	Display Code	Mask pGD1	Variable	Description	Unit of measure	Min	Max	Def	Data type
A	U1		Dewpoint SET	Setpoint dewpoint user	°C	-100	20	-40	I
M	U2		Pressure	Working pressure	barg	1	16	7	I
A	U3		MODE	Adsorbing mode 1=Normal; 2=Forced regeneration	---	1	2	2	I
M	U4		Alarm Relay Mode	Alarm relay mode 0=Alarms+warnings 1=only alarms	--	0	1	0	B
M	U6		Dew Point Meter	Dewpoint control mode: No Fitted - Fitted	---	No Fitted	Fitted	No Fitted	B
M	U7		BMS_ADDRESS	BMS unit address	---	0	207	1	I
M	U8		BMS_BaudRate	Baudrate BMS (bit/sec): 1200, 2400, 4800, 9600, 19200	---	1200	19200	9600	I
M	U9		Moisture Drain Mode	Condensate drain mode (0=continue; 1=timed; 2=capacitive)	---	0	2	0	I
M	U10		Moisture Drain Time ON	Drain ON time (in timed mode)	s	1	60	5	I
M	U11		Moisture Drain Time OFF	Drain OFF time (in timed mode)	s	1	900	120	I
M	U12		BackLight_ON	Display backlighting: yes= always ON; No= automatic switching OFF after 30”.	---	Yes	No	No	B
M	U13		Enable Money	Enable energy saving mask (in currency)	---	Yes	No	No	B
M	U14		Money	Currency symbol displayed: Euro; Dollar; Pound; Yen; Krone; Rublo	---	-	-	Euro	I
M	U15		Money/kWh	Conversion factor currency/kwh	--	0	0.999	0.120	I
M	U16		Saving compared to	Technology for energy saving comparison: heatless; heat regenerated; blower	--	-	-	Heatless	I
M	U17		Mode	Working pressure setting mode: 0=manual; 1=automatic	--	0	1	0	I
M	U18		Pressure reading	Working pressure reading	bar	-	-	-	I
M	P1	M1	Software	Sofware installed	---	-	-	NOCYC1	I
M	P2	M1	Unit Model	Model selection: factory set	---	1,8	55	-	I
M	P3	M1	Adsorber Delay	Adsorber starting delay (after fridge start)	s	0	3600	0	I
M	P4	M1	Purge Probe Type	Purge air sensor type: 0=NTC HT 0÷150°C; 1= NTC -50÷90°C	---	0	1	0	B
A	P5	M2	SetT purge H	Purge air temperature setpoint (heating)	°C	0	200	38	I
A	P6	M2	SetT purge C	Purge air temperature setpoint (cooling)	°C	0	200	15	I
A	P7	M2	Diff PDP	Factory set	°C	0	50	5	I
A	P8	M2	Div PDP	Factory set	°C	1	10	2	I
A	P9	M3	Set Dt	Time of discharge phase	s	0	20000	30	I
A	P10	M3	Set Ht40	Time of heating phase (7barg & -40°C)	min	0	530	59	I
A	P11	M3	Rit Tc	Minimum time of heating phase	min	0	530	10	I
A	P12	M3	Set Ct40	Time of cooling phase (7barg & -40°C)	min	0	530	30	I
A	P13	M3	Set Ptmin	Minimum time of stand-by phase	s	0	20000	60	I

A	P14	M3	Pt STD	Stand-by phase standard time (P>7bar)	min	0	530	56	I
A	P15	M3	Set At	Total adsorption time (at 7barg and 100% air flow)	min	0	530	146	I
A	P16	M3	Set At70	Total adsorption time (at 7barg and 100% air flow) for dewpoint -70°C	min	0	530	90	I
A	P17	M4	Set Incrt1	Factory set	s	0	32767	0	I
A	P18	M4	Set Incrt2	Factory set	s	0	32767	0	I
A	P19	M4	SetI	N° cycles before forced regeneration	---	0	999	5	I
A	P20	M4	Lim Ht	Max heating time in forced regeneration mode	min	0	530	180	I
A	P21	M4	Lim Ct	Max cooling time in forced regeneration mode	min	0	530	90	I
M	P22	M5	Heat Power	Electrical heater max heating capacity.	%	0	100	100	I
A	P23	M5	Set THeat	Electrical heater setpoint during heating.	°C	-99	999	150	I
A	P24	M5	Set TBand	Factory set	°C	0,1	99,9	1,0	A
M	P25	M5	PWM Period	Factory set	s	0	1000	20	I
M	P26	M5	Heater Probe Delay	Faulty sensor alarm delay (for electrical heater temperature sensors)	s	0	999	0	I
A	P27	M6	High AD Inlet Temp	Adsorber high inlet temperature alarm	°C	0	70	15	I
A	P28	M6	High AD Inlet Delay	Adsorber high inlet temp. alarm delay	s	60	3600	900	I
A	P29	M6	Low AD Inlet Temp	Adsorber low inlet temperature alarm	°C	-9,9	9,9	-2,0	A
A	P30	M6	Low AD Inlet Delay	Adsorber low inlet temp. alarm delay	s	1	600	180	I
A	P31	M7	High Heater Temp	Heater high temperature alarm	°C	150	250	220	I
A	P32	M7	Low Heater Temp Diff	Differential for electrical heater low temperature alarm	°C	0	100	30	I
A	P33	M7	Low Heater Temp Delay	Heater low temperature alarm delay	s	0	1800	600	I
A	P34	M8	High Purge Air Temp	Purge air high temperature alarm	°C	0	200	100	I
A	P35	M8	High Purge Air Delay	Purge air high temperature alarm delay	s	0	1800	900	I
A	P36	M8	High DewP Diff.	Differential for high dewpoint alarm	°C	1	50	10	I
A	P37	M8	High DewP Delay Startup	High dewpoint alarm delay (at start-up)	h	0	100	24	I
A	P38	M8	High DewP Delay Running	High dewpoint alarm delay (in running)	s	0	6000	600	I
A	P40	M9	Low Press Column Delay	Column low pressure alarm delay	s	0	3600	120	I
A	P41	M9	High Press Column Delay	Column high pressure alarm delay	s	0	3600	120	I
M	P48	M17	AD_EV_Inlet logic	Factory set	--	NO	NC	NO	B
M	P49	M17	Enable Summer Mode	Enable SUMMER mode	--	NO	Yes	No	B
M	P50	M17	Alarm Delay Bypass	By-pass activation alarm delay	m	0	60	2	I
M	P51	M17	Remote OFF Mode	Dryer stop mode by remote contact: Normal stop - Stop directly		Normal	Directly	Normal	B
M		M18	DeltaT	Energy savings - ΔT for competitors energy consumption calculation	°C	0	999	120	I
M		M18	PST Performance	Energy savings, PST efficiency	kW/ m^3/h	0.001	0.009	0.002	I
M		M18	Compressor Performance	Energy savings, air compressor efficiency	kW/ m^3/h	0.1	9.9	5.5	A
M	C01		AD INLET	offset sensor	°C	-10	10	0	A
M	C02		PURGE	offset sensor	°C	-10	10	0	A
M	C03		Dewpoint	offset sensor	°C	-30	30	0	A
M	C04		HEAT1	offset sensor	°C	-10	10	0	A
M	C05		HEAT2	offset sensor	°C	-10	10	0	A
M	C06		DISCHARGE	offset sensor	°C	-10	10	0	A
M	C07		EVAP	offset sensor	°C	-10	10	0	A
M	C08		Dewpoint Min	Minimum value dewpoint sensor	°C	-200	0	-100	A
M	C09		Dewpoint Max	Maximum value dewpoint sensor	°C	0	80	20	A
	C10		P1 Min	Min. value pressure transducer 1		0	30.0	0	A
	C11		P1 Max	Max. value pressure transducer 1		0	30.0	30.0	A
	C12		P1 OFS	Offset pressure transducer 1		-30.0	30.0	0.0	A

	C13		P2 Min	Min. value pressure transducer 2		0	30.0	0	A
	C14		P2 Max	Max. value pressure transducer 2		0	30.0	30.0	A
	C15		P2 OFS	Offset pressure transducer 2		-30.0	30.0	0.0	A
M		F1	Nominal Flow Mod1	Nominal air flow dryer model 1	m^3/min	0	99,9	1,8	A
M		F1	Nominal Flow Mod2	Nominal air flow dryer model 2	m^3/min	0	99,9	2,5	A
M		F1	Nominal Flow Mod3	Nominal air flow dryer model 3	m^3/min	0	99,9	3,0	A
M		F1	Nominal Flow Mod4	Nominal air flow dryer model 4	m^3/min	0	99,9	4,0	A
M		F1	Nominal Flow Mod5	Nominal air flow dryer model 5	m^3/min	0	99,9	5,0	A
M		F1	Nominal Flow Mod6	Nominal air flow dryer model 6	m^3/min	0	99,9	6,0	A
M		F1	Nominal Flow Mod7	Nominal air flow dryer model 7	m^3/min	0	99,9	9,0	A
M		F1	Nominal Flow Mod8	Nominal air flow dryer model 8	m^3/min	0	99,9	14	A
M		F1	Nominal Flow Mod9	Nominal air flow dryer model 9	m^3/min	0	99,9	20	A
M		F1	Nominal Flow Mod10	Nominal air flow dryer model 10	m^3/min	0	99,9	26	A
M		F1	Nominal Flow Mod11	Nominal air flow dryer model 11	m^3/min	0	99,9	34	A
M		F1	Nominal Flow Mod12	Nominal air flow dryer model 12	m3/min	0	99,9	55	A

4.3 – Alarm menu

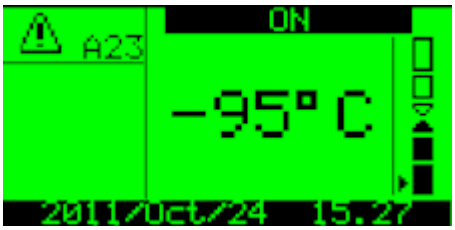
4.3.1 - Alarm occur

In case of alarm the key ***Alarm*** is backlit in red ().

To visualize the code of alarm in progress, press ***Alarm.***
If there are multiple alarms in progress, scroll through the alarms with keys ***Up*** e ***Down***.

To reset the alarm, press again ***Alarm***. If the alarm condition is solved, the alarm is actually reset.

Moreover, the presence of alarm is shown on the display by the appearance of the icon followed by the alarm code in progress.



Management of alarm relay:
The alarm relay function can be adjusted by user parameter U4.
This parameter allows to choose whether to activate the relay in case of an alarm or warning (default setting), or just in case of an alarm which stops the unit.

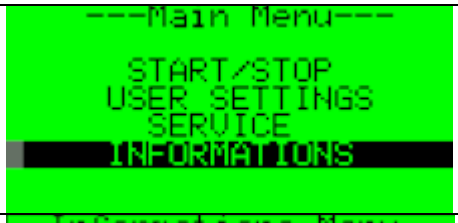
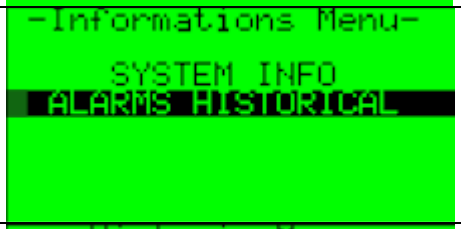
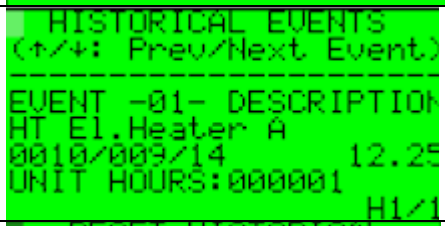
4.3.2 - Alarm list

Code	Display PGD1	Reset	Delay	Conditions for alarm activation	Note
A01	WARNING PROBE Adsorber inlet *Temperature*	Automatic	3 s	Sensor defective or disconnected	It stops the fridge compressor. Compressor restart after reset on display
A02	WARNING PROBE *Purge Air Temperature*	Automatic	3 s	Sensor defective or disconnected	
A03	WARNING PROBE *Dewpoint Meter*	Automatic	3 s	Sensor defective or disconnected	
A04	WARNING PROBE *Heater Outlet Temperature 1*	Automatic	3 s	Sensor defective or disconnected	It switches off the electrical heater
A05	WARNING PROBE *Heater Outlet Temperature 2*	Automatic	3 s	Sensor defective or disconnected	It switches off the electrical heater
A13	WARNING ADSORBER High Electrical Heater Temperature Column 1	Automatic, T< P23 (**)	5s	T > P31 (*)	It switches off the electrical heater. Alarm disabled if sensor is disconnected. (*) P31: default 220°C (**) P23: default 150°C
A14	WARNING ADSORBER High Electrical Heater Temperature Column 2	Automatic, T< P23 (**)	5s	T > P31 (*)	It switches off the electrical heater. Alarm disabled if sensor is disconnected. (*) P31: default 220°C (**) P23: default 150°C
A15	WARNING ADSORBER Low Electrical Heater Temperature Column 1	Automatic, T>P23-P32+20°C	600s	T < P23-P32 (*)	Alarm disabled if sensor is disconnected. (*) P23: default 150°C, P32: default 30°C
A16	WARNING ADSORBER Low Electrical Heater Temperature Column 2	Automatic, T>P23-P32+20°C	600s	T < P23-P32 (*)	Alarm disabled if sensor is disconnected (*) P23: default 150°C, P32: default 30°C
A17	WARNING ADSORBER High Purge Air Temperature	Automatic, T<P34-2°C	900s	T > P34 (*)	Alarm disabled if sensor is disconnected (*) P34: default 100°C°
A18	WARNING ADSORBER High Dewpoint Temperature	Automatic, T<U1+P36-2°C	600s (**)	T > U1 + P36 (*)	Alarm disabled if sensor is disconnected (*) U1: set dewpoint, P36: default 10°C (**) minimum 24h from start-up
A20	WARNING ADSORBER Low Pressure Column 1	Automatic	120s	Pressure switch “A” didn’t switch after column pressurization.	It switches off the electrical heater
A21	WARNING ADSORBER High Pressure Column 1	Automatic	120s	Pressure switch “A” didn’t switch after column de-pressurization.	It switches off the electrical heater
A22	WARNING ADSORBER Low Pressure Column 2	Automatic	120s	Pressure switch “B” didn’t switch after column pressurization.	It switches off the electrical heater
A23	WARNING ADSORBER High Pressure Column 2	Automatic	120s	Pressure switch “B” didn’t switch after column de-pressurization.	It switches off the electrical heater
A29	ALARM ADSORBER Heater Manual reset Safety Thermostat	Switch off control board		Safety thermostat intervention	It switches off the electrical heater
A30	WARNING ADSORBER Check filters	Reset last maintenace date		Time based warning	Check or replace filter elements
A31	CLOCK ALARM	Switch off control board			Check or replace the clock card.
A33	FRIDGE SWITCH ALARM	Automatic		Fridge circuit alarm	It stops the fridge circuit

4.3.3 - Alarm history

The controller stores the last 16 events.
For each alarm, the following information are available
- alarm description
- date and hour of alarm
- working hours when alarm occurred

It is also possible to delete all alarms stored in controller memory.

Access to main menu with key ***Prg***; select **INFORMATION** with keys ***Up*** and ***Down***; press key ***Enter*** to access.	
Select submenu **ALARMS HISTORICAL** and confirm with ***Enter.***	
Select **EVENT LIST** and confirm with ***Enter.***	
Use keys ***Up*** e ***Down*** to scroll stored events.	
Alarm history reset Select **EVENT RESET** and confirm with ***Enter.*** Press ***Enter*** to move the cursor on RESET EVENTS row; select YES with ***Up*** or ***Down***.	

5 – Troubleshooting

A01 WARNING PROBE - Adsorber inlet temperature

Cause: fridge circuit outlet air temperature sensor (B7) disconnected or defective.
Remedy: check sensor wiring or replace it if necessary

A02 WARNING PROBE - Purge Air Temperature

Cause: Purge air temperature sensor (B2) disconnected or defective
Remedy: check sensor wiring or replace it if necessary

A03 WARNING PROBE - Dewpoint meter

Cause: Dewpoint temperature sensor (BT1-25) disconnected or defective
Remedy: check sensor wiring or replace it if necessary

A04 WARNING PROBE - Heater outlet temperature 1

Cause: Column1 heater outlet air temperature sensor (B4) disconnected or defective
Remedy: check sensor wiring or replace it if necessary

A05 WARNING PROBE - Heater outlet temperature 2

Cause: Column2 heater outlet air temperature sensor (B3) disconnected or defective
Remedy: check sensor wiring or replace it if necessary

A13 WARNING ADSORBER - High electrical heater temperature column 1

Cause: Temperature control function not working (if T_{B4}>150°C, heater must be switched off).
Remedy: Replace electronic controller

Cause: Heater power regulator VCR defective (heater always on).
Remedy: Replace power regulator

A14 WARNING ADSORBER - High electrical heater temperature column 2

Cause: Temperature control function not working (if T_{B3}>150°C, heater must be switched off).
Remedy: Replace electronic controller

Cause: Heater power regulator VCR defective (heater always on).
Remedy: Replace power regulator

A15 WARNING ADSORBER - Low electrical heater temperature column 1

Cause: Column1 heater outlet air temperature sensor (B4) non positioned correctly.
Remedy: Correctly install the sensor.

Cause: Heater defective.
Remedy: Check heater functioning, replace it if necessary.

Cause: Heater relay KA1 defective.
Remedy: Check relay functioning, replace it if necessary.

Cause: Heater power regulator VCR defective (heater always on).
Remedy: Replace power regulator

Cause: Temperature control function not working (if $T_{B4} < 150°C$, heater must be on).
Remedy: Replace electronic controller

A16 WARNING ADSORBER - Low electrical heater temperature column 2

Cause: Column2 heater outlet air temperature sensor (B3) non positioned correctly.
Remedy: Correctly install the sensor.

Cause: Heater defective.
Remedy: Check heater functioning, replace it if necessary.

Cause: Heater relay KA1 defective.
Remedy: Check relay functioning, replace it if necessary.

Cause: Heater power regulator VCR defective (heater always on).
Remedy: Replace power regulator

Cause: Temperature control function not working (if $T_{B3} < 150°C$, heater must be on).
Remedy: Replace electronic controller

A17 WARNING ADSORBER - High purge air temperature

Cause: Unit working with very low airflow (the desiccant bed has previously absorbed a low quantity of water; during the regeneration phase, the heat given by the electrical heater is only partially used to desorb the moisture; at the same time the heat can lead to an excessive increase in air temperature).
Remedy: Increase airflow.

Cause: Purge air temperature sensor (B2) non positioned correctly (it reads a temperature lower than real). The heater, which should be switched off when $T_{B2} > 38°C$, actually it is

deactivated at an higher temperature; due to thermal inertia, the air purge temperature can increase above the warning threshold.
Remedy: Correctly install the sensor.

A18 WARNING ADSORBER - High dewpoint temperature

Cause: Bad reading by dewpoint temperature sensor (BT1-25)
Remedy: Check on flow meter (33) if sample airflow through sensor is correct

Cause: Too high airflow.
Remedy: Reduce airflow (it is recommended to proceed with a forced regeneration cycle).

Cause: Desiccant material exhausted.
Remedy: Replace material.

Cause: Too much humidity at adsorber inlet (malfunction of the fridge dryer).
Remedy: Check the operation of the fridge dryer (it is recommended to proceed with a forced regeneration cycle)

Cause: Too much humidity at adsorber inlet (malfunction of the condensate drain on the fridge dryer).
Remedy: Check the operation of the condensate drain; in case increase the discharge time to allow the complete discharge of the condensate, (it is recommended to proceed with a forced regeneration cycle)

Cause: Silencer (19) clogged, purge air has pressure higher than atmospheric (consequently the regeneration efficiency is lower).
Remedy: Clean or replace silencer (it is recommended to proceed with a forced regeneration cycle).

Cause: Working pressure set on control board higher than real working pressure.
Remedy: Set on control board the right value of working pressure.

A20 WARNING ADSORBER - Low pressure column 1

Cause: Column 1 pressure switch (PS1) defective.
Remedy: Check the pressure in the column after the pressurization; if P>2,5 bar replace the pressure switch.

Cause: Column 1 purge air solenoid valve (YP1-16) defective, does not close correctly.
Remedy: Check coil wiring, replace coil and/or valve body if necessary.

A21 WARNING ADSORBER - High pressure column 1

Cause: Column 1 pressure switch (PS1) defective.
Remedy: Check the pressure in the column after the discharge phase; if P<1,5 bar replace the pressure switch.

Cause: Column 1 purge air solenoid valve (YP1-16) defective, does not open correctly.
Remedy: Check coil wiring, replace coil and/or valve body if necessary.

Cause: Silencer (19) clogged.
Remedy: Clean or replace silencer.

Cause: Column 1 inlet solenoid valve (YI1-15) defective, does not close correctly.
Remedy: Check coil wiring, replace coil and/or valve body if necessary.

Cause: Column 1 outlet no-return valve (26) bad sealing, does not close correctly.
Remedy: Clean/replace the valve.

A22 WARNING ADSORBER - Low pressure column 2

Cause: Column 2 pressure switch (PS2) defective.
Remedy: Check the pressure in the column after the pressurization; if P>2,5 bar replace the pressure switch.

Cause: Column 2 purge air solenoid valve (YP2-16) defective, does not close correctly.
Remedy: Check coil wiring, replace coil and/or valve body if necessary.

A23 WARNING ADSORBER - High pressure column 2

Cause: Column 2 pressure switch (PS2) defective.
Remedy: Check the pressure in the column after the discharge phase; if P<1,5 bar replace the pressure switch.

Cause: Column 2 purge air solenoid valve (YP2-16) defective, does not open correctly.
Remedy: Check coil wiring, replace coil and/or valve body if necessary.

Cause: Silencer (19) clogged.
Remedy: Clean or replace silencer.

Cause: Column 2 inlet solenoid valve (YI2-15) defective, does not close correctly.
Remedy: Check coil wiring, replace coil and/or valve body if necessary.

Cause: Column 2 outlet no-return valve (26) bad sealing, does not close correctly.
Remedy: Clean/replace the valve.

A29 ALARM ADSORBER - Heater manual reset safety thermostat

Cause: Column1/2 heater outlet air temperature sensor (B3/B4) non positioned correctly (sensor B3/B4 reads a lower temperature respect the real and never reach the reading of 150°C, so that the heater is never switched off and its temperature exceeds the alarm threshold).
Remedy: Correctly install the sensor.

Cause: Heater thermal protection (PI1) defective.

Remedy: Replace protection.

Cause: Dryer working without compressed air flow (sensors B3/B4 are not flown by the hot purge air and they don't reach the temperature of 150°C; so that the heater is never switched off and its temperature exceeds the alarm threshold).
Remedy: Always allow compressed air flow through the dryer when it is turned on.

Cause: Air pressure P< 2bar (regeneration air flow is very low; consequence is similar to the previous point described above).
Remedy: Guarantee minimum 2 bar compressed air pressure.

Cause: Alarm relay KA2 defective
Remedy: Check electrical wiring, in case replace relay.

Cause: Temperature control function not working (if $T_{B3/B4}$ > 150°C, heater must be off).
Remedy: Replace electronic controller.

Cause: Heater power regulator VCR defective (heater always on).
Remedy: Replace power regulator

A30 WARNING ADSORBER – Check filters

Cause: High pressure drop on dryer filters.
Rimedio: Replace filter elements and update last maintenace date to reset the warning (par. 4.2.4).

A31 CLOCK ALARM

Cause: Clock card damaged or flat buffer battery.
Remedy: Check clock card battery; replace battery or clock card.

A33 FRIDGE SWITCH ALARM

Cause: Condenser dirty or obstructed
Remedy: Clean condenser fins, don't obstruct condenser.

Cause: Condenser fan not rotating
Remedy: Check fan functioning, in case replace it.
Check fan pressure switch functioning (PV-12), in case replace it.

Cause: High ambient temperature
Remedy: Lower, if possible, the ambient temperature (ventilate the room)

Cause: Low refrigerant charge in the fridge circuit
Remedy: Locate the leak and fix it; charge the fridge circuit.

Cause: Fridge compressor alarm relay (KA3) defective.
Remedy: Check electrical wiring, in case replace relay.

6 – Maintenance

6.1 – Periodic checks

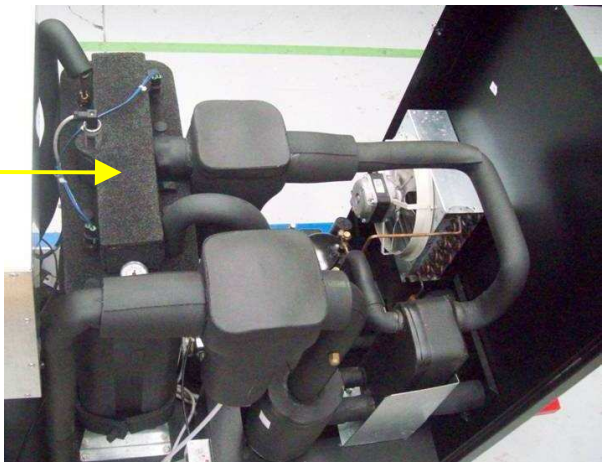
	daily	monthly	every 4 mts	every 12 mts	every 24 mts	every 48 mts
General						
Check alarm report on display.	●					
Check ambient temperature and room ventilation.		●				
Air circuit						
Check dewpoint indication on display.	●					
Replace filter elements (inlet filter, oil filter, dust filter).				●		
Verify air inlet temperature in within limits for which the dryer was selected (usually 30÷40°C).		●				
Check for possible air leaks from flanges, couplings, connections etc.				●		
Check and clearing of discharge silencer.				●		
Replace discharge silencer.						●
Replace dewpoint temperature sensor					●	
Replace inlet/purge solenoid valve body					●	
Replace inlet and outlet (no-return) valves					●	
Replace o-ring on inlet/outlet block valve					●	
Replace temperature sensors						●
Replace desiccant material						●
Replace solenoid valve coil (inlet, purge)						●
Fridge circuit						
Visual check of fridge piping status; check if there are oil stains indicating possible leaks.			●			
Leak detection on connections, joints, brazing.				●		
Check setting of expansion valve / hot gas by-pass valve.				●		
Cleaning of the condenser fins by blowing compressed air.			●			
Condensate drain						
Verify that drain valve works properly.	●					
If drain set in timed mode (parameter U9), verify if there is an excess of condensate production; in case increase the discharge time (parameter U10).		●				
Disassemble the drain and clean all components; replace the coil.				●		
Electrical circuit						
Check current absorption is within dryer limit.			●			
Check tightening of the cables, clean the moving contacts with compressed air in case of ambient particularly dusty.			●			

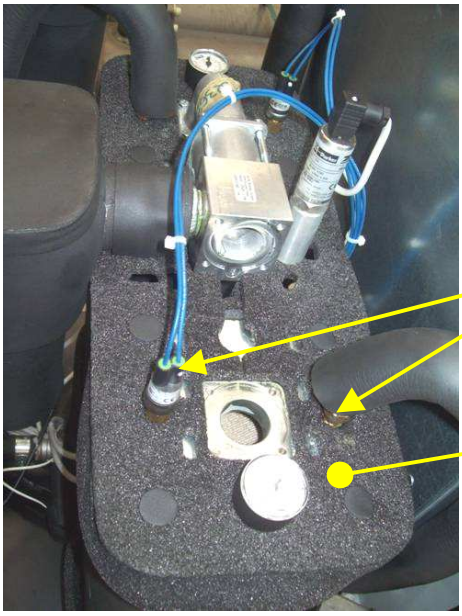
6.2 – Periodic maintenance procedures

6.2.1 - Desiccant material replacement

Remove the top cover in order to have better access to the parts to be replaced.

Remove the top thermal insulation.





Remove elbows of upper block valve.

Remove pressure switch and purge air capillary.

Remove the upper plate thermal insulation.

Unscrew the four fastening bolts and remove the top plate to have access to the material inside the column.

Remove the spring and the mesh (used to keep the material compact and to avoid turbulence during operation).

Remove desiccant material with a vacuum cleaner.
Charge the new desiccant material and close the column following the above steps in reverse order.

6.2.2 - Filter element replacement

Inlet filter

From the initial position (reference marks aligned), turn the filter body one full turn to re-align the ref. marks.

Slip filter body from the head, extract the filter element and replace it.
Re-assemble the filter body.

Inlet adsorber oil filter - Outlet adsorber dust filter

Open the thermal insulation at the filter head and remove the portion of the insulation relative to the filter body

Remove the filter body by rotating one full turn.

Extract the filter element and replace it.
Re-assemble the filter body.

Reapply the thermal insulation previously removed (paste it if necessary).

6.2.3 - Solenoid valve replacement

Inlet air / purge air

Remove the solenoid from the aluminum block valve by loosening the two fixing screws.
Replace the damaged item or the whole piece in accordance with the program of periodic maintenance.

6.2.4 - Valves / o-ring replacement

Top - outlet block valves

Remove the elbows of upper block valves as described in par. 6.2.1.

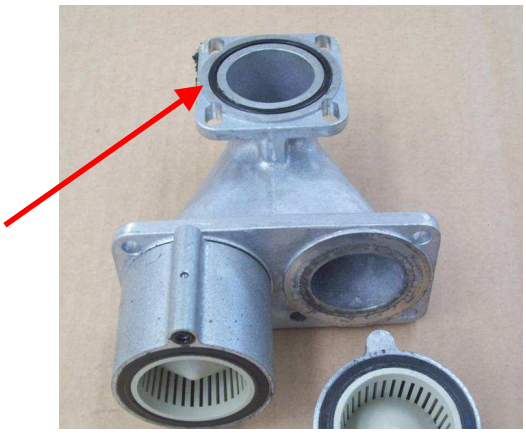
Replace the o-ring inserted between the flanges connecting tank with elbow.

Remove the no-return valve from the aluminum casing and replace it.
Pay attention to the direction of installation of the no-return valve; the rubber coated part must be positioned on the elbow side (see picture).

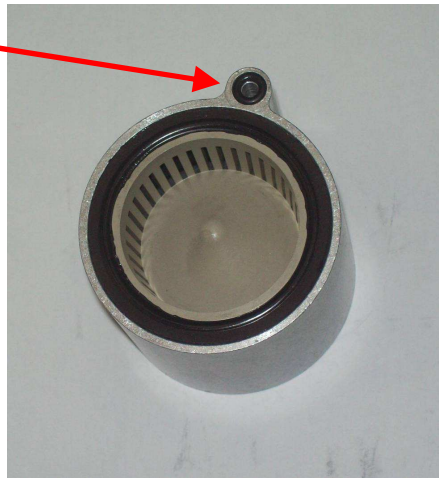
Bottom - inlet block valves

Remove the bottom inlet block valves thermal insulation. Disassemble the elbows.

Replace the o-ring inserted between the flanges connecting tank with elbow.



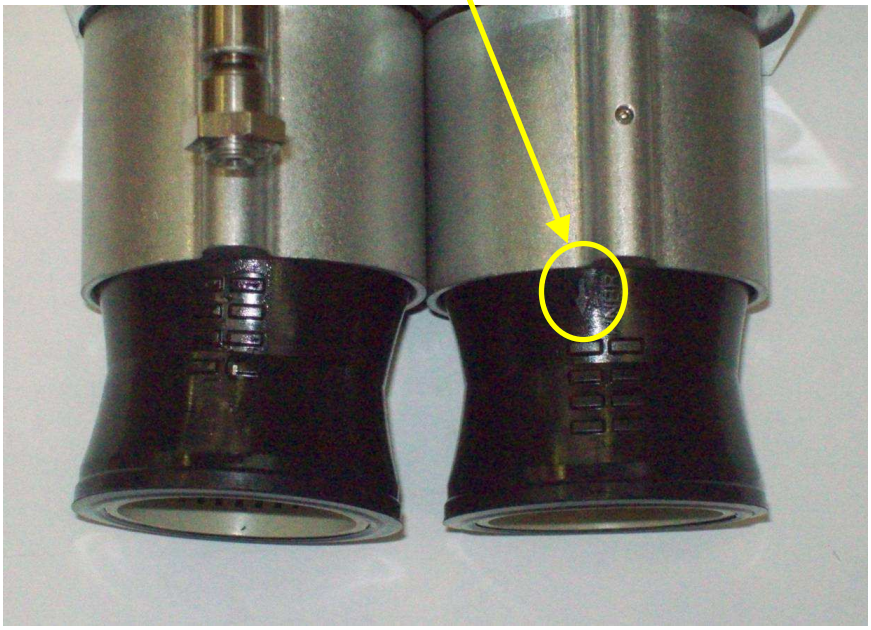
The side of aluminum casing equipped with o-ring must be positioned on the central part of the valve block.



Remove the valve from the aluminum casing and replace it.

Pay attention to the direction of installation of the valve inside the aluminium casing.

Arrows are marked on the valve rubber surface.



Arrow direction must be consistent with the direction of the air flowing through the valve.

- Inlet air valves: arrow direction from block valve center to elbow.
- Purge air valves: arrow direction from elbow to block valve center.

7 – Technical data

		ATT025	ATT040
General			
Working pressure	[bar]	2÷16	2÷16
Nominal inlet air flow	[m^3/h]	150	240
Purge air flow	[m^3/h]	7	12
Inlet temperature	[°C]	5÷65	5÷65
Ambient temperature	[°C]	5÷50	5÷50
Electrical supply		230/1/50	230/1/50
Air connections		1” BSP-T	1” BSP-T
Protection class		IP44	IP44
F.L.A.	[A]	11,5	13,3
L.R.A.	[A]	24,6	36,2
Refrigerant part			
Refrigerant charge (R134a)	[kg]	0,36	1,03
Compressor discharge temperature	[°C]	40÷70	45÷70
Compressor current absorption	[A]	3,7÷5,0	5,1÷6,1
Fan current absorption	[A]	0,6÷0,9	0,6÷0,9
Hot gas valve setting	[bar]	2,2÷2,4	2,2÷2,4
Fan pressure switch setting	[bar]	8÷11	8÷11
High pressure switch cut out	[bar]	----	28
High temperature switch cut out	[°C]	80	130
Desiccant part			
Desiccant charge	[kg]	8,6	8,6
Electrical heater max power	[W]	1500	1500
Pressure switch setting	[bar]	1,5/2,5	1,5/2,5