pCO^2 Controller
for chillers and heat pumps

Application FLBB0MP20A

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Configuration
and
use manual

USER version

BLUE BOX
condizionamento

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0. CONTENTS

1. GENERAL

1.1 Controller functions

The pCO^2 electronic microprocessor with FLBB0MP20A program is designed to control chiller units and heat pumps.
Correctly configured, the program can control water or air-cooled condensers fitted with shell and tube or plate-type exchangers.
Control of chiller units consists in the safe control of unit parts during all stages of operation.
The pCO^2 electronic microprocessor control family comprises boards of different sizes, each of which is selected according to the number of inputs and outputs required, thereby optimising operation.
In the event that a single board does not have a sufficient number of inputs and outputs, other boards may be interconnected to create a local pLAN network.
Connection for supervision or tele-maintenance is made by standard RS485 serial output on the boards.

2. User interface

The user interface is designed for installation as a panel; the back-lit LCD display comprises 4 lines and 20 columns.

Besides the liquid crystal display, the user interface features the following keys with relative functions:

“Menu key”: press in any display to return to the first menu page.

Maintenance key: press to access maintenance functions.

Print key: associated function currently unavailable.

“I/O” key: press to access pages displaying current status of digital inputs and outputs, values of analogue inputs and outputs.

“Clock” key: press to access clock functions.

“Set” key: press to access pages for modifying operating parameters.

“Prog” key: press to access service pages. Press at the same time as the "menu" key to access the manufacturer page.

"? info" key: press the key to access the pages to change the address of the unit connected to the terminal (when shared).


"Summer" and "Winter" keys: when the unit is set up for both chiller and heat pump operation, use these keys to switch between these modes.

"on/off" key: press this key to switch the unit from stand-by to on and vice-versa.

"Alarm" key: press to silence the alarm buzzer, to display (and cancel as necessary) the activated alarms.


Arrow keys: press to pass from one page to another or to change settings when in a modifiable field.

"Enter" key: press to access fields with modifiable parameters, then to confirm modifications.

Other functions accessible through the combined use of the above keys will be described in the sections relating to these functions.

3. PROGRAM OPERATION

3.1 General

The regulator is designed to maintain water temperature in the unit in which it is installed at the set value; this is mainly achieved through the control of the compressor operation.
To break down the cooling capacity, the controller has 2-step capacity control over each compressor (if compressors with step control are installed). The controller can control continuous step operation of compressors when the latter are fitted with charge and discharge valves on the step control cylinder.
Besides the compressors, the controller also actuates other components of the cooling system, such as pumps and fans, the operation of which is determined by time settings and alarms, as well as “accessory” functions, such as condensation and evaporation, free cooling, operation with continuous set point variation by external signal, etc.. These functions will be described in the sections below.
Note that even in the case of simple units, a local “pLAN” network must be constructed as described in previous sections of this manual.
The section dedicated to these pages also contains a description of all parameters and their use by the controller.

3.2 Main functions

The main functions include cooling unit operation regardless of outdoor conditions and other accessory functions.

3.2.1 Unit in stand-by mode

The unit is in stand-by mode when it is correctly powered but not enabled for operation.
In this condition, the controller will display the values detected by the analogue inputs as well as the status of digital inputs and outputs. In all cases, compressor outlets are not enabled. Other outlets can however be enabled as described below.
When in this condition, the unit may be put into service by pressing the “on-off” key, by means of a serial signal or the closing of the relative digital input.

3.2.2 Enabling the unit

The unit is considered enabled for operation when outputs can be automatically activated according to system requirements.
The unit interprets the system requirements by means of the water probe readout.
The controller outputs controlling the various sections of the chiller unit are activated in accordance with the operation time settings.

3.2.3 Pump control

The controller can control a system pump, which starts up automatically when the unit is turned on.
The controller can be configured to control two pumps, one acting as the back-up for the other. The outputs of the pumps are activated cyclically, at the pump rotation setting configured.
At the switchover from one pump to the other, both will operate for a few seconds to ensure the continuity of water flow throughout the system.
When the unit sets from operating status to stand-by by means of the opening of the digital input allocated to the external permissive, the controller allows the utilisation of accumulated heat.
When the digital input is opened, pump shutdown will be delayed for a certain time after the shutdown of the last compressor.

3.2.4 Compressor start-up

The controller automatically starts up the compressors when the unit is operating (if there are no active unit or compressor alarms).
The controller allows compressor start-up if the flowswitch input is closed by the time of start-up delay.
In the event that the flowswitch opens during unit operation, the unit will shut down (after a certain delay).
An alarm will be displayed in the event of unit shutdown due to the opening of the flowswitch input.
Compressor start-up, shutdown and step control will be carried out by the controller according to system requirements and selected operations.

3.2.5 Chiller operation

During chiller operation, the controller has the task of lowering water temperature and keeping it as close to the selected set point as possible.
The control of compressor outlets and relative step capacity will depend on unit configuration.
The controller enables the compressors after checking the difference between the input water temperature and the set point.
The reference water temperature is taken at the unit inlet and outlet.
The way the compressors are enabled will depend on where the reference temperature has been measured.
When the reading is taken at the unit inlet, the controller activates (or deactivates) the steps inside the differential, which is placed above the set point. When the reference water temperature is taken at the unit outlet, the controller activates (or deactivates) the power steps when the temperature is outside the dead band. The dead band is also above the set point.
The activation of power steps and unit step control are described in the section dedicated to auxiliary functions.

3.2.6 Heat pump operation

During heat pump operation, the controller has the task of raising water temperature and keeping it as close to the selected set point as possible.
The controller enables the compressors after checking the difference between the input water temperature and the set point.
The reference water temperature can only be measured at the unit inlet; in this way the controller activates and deactivates the power steps inside the differential.
Unlike in the case of chiller operation, the differential within which the power steps are positioned is below the set point.
As stated above, the power steps and unit step control are described in the section dedicated to auxiliary functions.

3.3 Auxiliary functions

The auxiliary functions include those that ensure the correct operation of the cooling system, while preventing malfunction and breakage in the event of critical operating conditions.

3.3.1 Evaporator antifrost

In the event that the output water temperature from a heat exchanger is lower than the antifrost limit value, the controller will cut in to shut down compressor operation in the chiller circuit and will give the antifrost alarm.
To cancel the antifrost alarms and restart the compressor/s, the water temperature at the heat exchanger outlet causing the alarm must be equal to or greater than the antifrost limit value, increased by the antifrost differential.
The antifrost alarm will automatically shut down the entire unit, and therefore all compressors in the chiller circuit, in cases in which there is a single exchanger in the hydraulic circuit.
The antifrost alarm will only appear when the unit is on (but not when in stand-by mode).

3.3.2 Antifrost heater

In the event of an antifrost alarm, the antifrost heater output is automatically enabled.
The heater is designed to maintain water temperature in the exchangers above the safety limit and prevent it from freezing.
The output remains enabled as long as the conditions causing the alarm persist.
While the alarm will only be given when the unit is switched on, the output of the antifrost heater will remain enabled even when the unit is in stand-by status.
In certain configurations there is no heater output; to identify the functions concerned, refer to the “List of inputs and outputs” in the section “I/O”.

3.3.3 Compressors

When the unit is operating correctly (without any general alarms as described above) and the water temperature requires, the microprocessor can activate the compressor outlets and step control.
Even when maximum power available is required, the controller will activate the compressors one at a time; compressors with step control will start up at maximum step power. These features allow the reduction of unit breakaway current.
In all cases, compressor activation is only permitted when suitable operating conditions apply, as determined by the status of compressor safety devices and relative operating times.
Before activating a compressor, the controller checks the status of its safety devices by means of the relative digital and analogue inputs.
The main safety devices act on high and low pressure, the pressure difference generated by the oil pump, compressor winding temperature control, absorbed current and gas delivery temperature.
Some of the safety devices are shared by all compressors, while others are only available on certain models. The section describing the safety devices includes the models on which they are featured.
Compressor operation depends not only on the status of safety devices, but also on the sequence of operating times.
When the unit is switched on, the first compressor is started up after a certain delay following pump start-up.
This delay is observed even when pump control is not envisaged.
In any case, each compressor will operate for a minimum time, even if the request for cooling water temperature has been satisfied.
Minimum operating time will only be disregarded in the event of serious alarm.
The alarms that can cause the compressor to shut down during the minimum operating time are the high pressure alarm and the compressor overload alarm. The oil pressure differential alarm can also stop the compressor, though given that the delay is normally longer than the minimum operating time of the compressor, this case is virtually impossible.
Once shut down, the compressors can only be restarted after the minimum shutdown time has elapsed, and in any case after the minimum interval between two consecutive compressor start-ups has elapsed.
The consecutive start-up of two compressors, or the start-up of a compressor followed by the relative step capacity operation, will take place with a minimum delay equal to the time of step start-up.

The consecutive shutdown of two compressors, or the consecutive deactivation of the step capacity operations and of the relative compressor, will be carried out with delays equal to the time for step deactivation.

3.3.4 High and low pressure and oil differential alarms

Delivery (high) pressure, suction (low) pressure and the difference in pressure between oil delivery and oil suction (oil differential) are checked by the controller by means of probes.
The high and low pressure alarms are a feature of all compressor types, while the oil pressure differential alarm is only present on semi-hermetic alternating compressors.
When the compressor is operating, the controller checks that:

- delivery pressure is always below the “hp1” value during cooling operations and “hp2” during heat pump operation. In the event that these values are exceeded, the controller immediately shuts down compressor operation and displays a high pressure alarm. This alarm can be removed manually on the controller only when the pressure rating read by the delivery pressure probe has dropped below the value that caused the shutdown, less the high pressure differential. The high pressure alarm “hp2” can be reset manually (like the “hp1” alarm), or automatically when the reset conditions have been reached. The operating limit “hp2” is used as a safety device in the case of recovery operation; reset is manual or automatic.
- The suction pressure is greater than the “lp1” value during cooling functions, or the “lp2” value during heat pump operation. In the event that the values read by the suction pressure probe are lower than “lp1” or “lp2” in the relative operating mode, the controller immediately shuts down the compressor operation and displays a low pressure alarm. This alarm is not instantaneous, and is disregarded with relative delays at unit start-up and during operation. The low pressure alarm can be cancelled either automatically or manually, depending on the prearranged operating mode. Low pressure alarms are managed by setting the number of alarms that can be automatically cancelled in a certain period of time. All low pressure alarms can be manually reset when the number of alarms that can be automatically reset is “zero”. To prevent inadvertent start-ups, do not set this time to “zero” in configurations with 3 or 4 compressors. It will be necessary to reset the compressor manually for restarting if the number of low pressure alarms inside the time interval set is greater than the maximum. If the low pressure alarms are tripped during normal unit operation (cooling or heat pump), the controller waits for the anti-recycle time conditions to be met before restarting the compressor. If an alarm is tripped during defrosting, the controller starts up the compressor without waiting for the anti-recycling time to elapse. Note that in any case low pressure alarms can be cancelled either automatically or manually by the controller only when the pressure reading made by the suction pressure probe is greater than the value that tripped the alarm, plus the reset differential.
- The controller shuts down the compressor and displays the oil pressure alarm if the difference between the oil and suction pressure is greater than the minimum differential value set. The oil pressure differential alarm is always delayed at compressor start-up; once the delay has elapsed, start-up is instantaneous.

3.3.5 Compressor and step capacity control

Compressor outputs are enabled by the controller in accordance to variations in reference water temperature in relation to the set point.
The reference water temperature is normally the one read at the inlet on the chiller unit. In the event that the reference temperature refers to the chiller outlet water, compressor and step capacity control is described as an accessory function in the section relating to operation with water outlet temperature.
All outputs on the compressors and step capacity controls are regulated by the controller as power steps.
If proportional operation only has been selected, the power steps are enabled proportionally inside the operating differential as the water temperature moves away from the set point value.
If P + I “proportional plus integration time” has been selected, the controller forces the activation of a further series of power steps, besides those requested in the case of proportional operation only.
These additional steps are activated when the time “I” set has been reached; the time is increased if the water temperature tends to increase, or decreased if the water temperature tends to drop.
In the case of “FPM” step control, all unit compressors are activated and step-controlled before the controller demands full load operation.
During “CPM” step control, the compressors are started up and reach full load operation one at a time as reference water temperature increases.
As the load request declines (as the reference water temperature drops), the number of power steps activated by the controller will be accordingly reduced.
The deactivation of power steps by the controller is carried out with the reverse procedure to that of activation; as the load decreases, the operation of all compressors is reduced by steps then shut down (“FPM” operation), or the operation of each compressor is progressively reduced by steps then shut down one at a time (“CPM”).
The even distribution of operating hours over all compressors in the unit is ensured by selecting rotation of operation requests.
When the operation rotation function is active, the first compressor to be activated is also the first to be shut down (the compressor that has not been activated for the longest time will in any case be activated).
The capacity control of compressors can be carried out either by steps or continuously.
During capacity step control, each solenoid valve represents a power step, which in turn is connected to a digital output on the controller.
Capacity step control is direct if, on activation of the output, there is a reduction in the power yield by the compressor (Copeland logic), or reverse if there is an increase in the power yield by the compressor (Feders logic).
In continuous capacity step control, compressor power is adjusted by the movement of the step control cylinder.
Cylinder movement is actuated by two solenoid valves: one to increase power yield, the other to reduce it.
The controller actuates continuous step capacity control according to the place where reference water temperature is measured.
For further information regarding the continuous step control function, refer to the section entitled "Continuous step control".
In all types of capacity step control, compressor shutdown and start-up are always carried out in steps.

3.3.6 Continuous step control

The continuous step control function is based on the ability of certain compressors to adjust cooling capacity seamlessly within a determined field.
Power is modulated by means of a cylinder actuated by two valves.
In simple terms, one valve increases compressor power, the other decreases it.
Cylinder position and the degree of step control is regulated by the controller, on the basis of the time necessary for entire cylinder stroke.
The controller divides the time for cylinder stroke on the differential percentage for step capacity control.

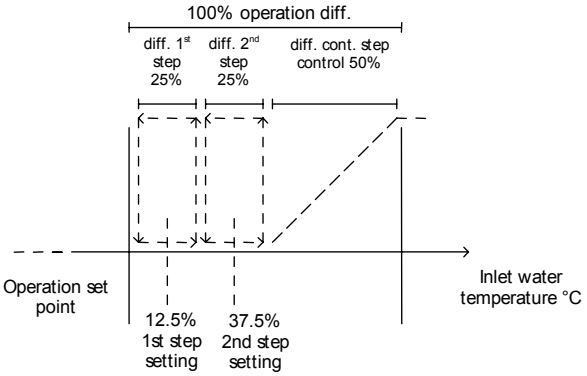
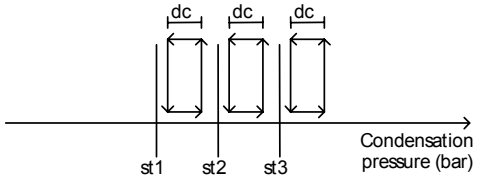


Illustration of the distribution of steps by two compressors operating in continuous step control

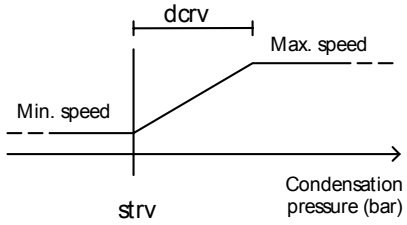
When the reference water temperature varies inside the step capacity differential, the controller energises the valves accordingly: the load valves if temperature increases, or the discharge valves if the temperature drops.
If the reference water temperature exceeds the operating set point plus the differential, the valve increasing compressor power remains energised.
In units with several compressors, cylinder movement (and therefore step capacity control) is simultaneous for all.

3.3.7 Condensation control

By means of the controller, condensation pressure can be maintained within a predefined operating range.
The condensation pressure can be kept inside this range either by the activation/deactivation of the fan digital outlets, or by means of a signal with a variable voltage of 0-10V sent to an outdoor controller.
Pressure control by means of digital outputs is defined “by steps”.
Pressure control by means of 0-10V signals to an outdoor regulator is defined “continuous”.
Condensation control by steps consists in the increase in the number of steps as condensation pressure rises.
In the controller, a condensation pressure value under which the step is deactivated is set for each step.
Each step is activated when the condensation pressure exceeds the sum of the deactivation value and the condensation control differential.
The deactivation value for capacity steps is defined “set point”.
The condensation control differential is the same for all condensation steps.
In the event that the control of a fourth group of fans is envisaged, their operation will coincide with that of the third group.
The figure represents condensation control by steps.



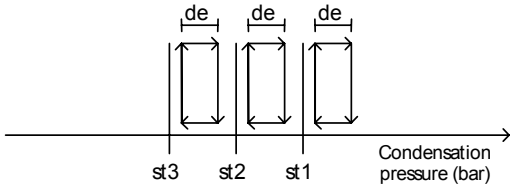
Continuous condensation control is carried out by a signal between 0 and 10V, that increases proportionally with the condensation pressure. The signal varies between the minimum pressure value set for deactivation of the first step by the controller, to a maximum of 10V when the pressure reaches the value obtained from the sum of the deactivation value and the condensation control differential.
If the controller regulates several compressors, the microprocessor will control the condensation pressure on the basis of the greater signal of those read.
The figure represents the operation of continuous condensation control.



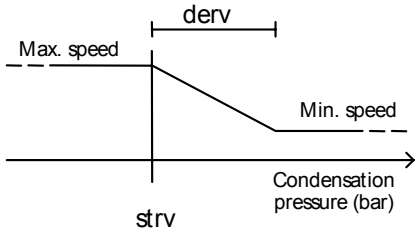
Condensation control can be activated in chiller only and heat pump units; this function remains active only during chiller mode operation.
In heat pump mode operation, condensation control is disregarded; fan operation is therefore forced to a maximum.
Fan outlet control during defrosting is described in the section concerning the defrosting function.
Condensation pressure control can be set in heat pump units, regardless of the presence of an evaporation control function.

3.3.8 Evaporation control

During heat pump operation in air condensing units with axial fans, evaporation pressure can be controlled and maintained within a predefined range.
The evaporation pressure can be kept inside this range either by the activation/deactivation of the fan digital outlets, or by means of a signal with a variable voltage of 0-10V sent to an outdoor controller.
Pressure control by means of digital outputs is defined “by steps”.
Pressure control by means of 0-10V signals to an outdoor regulator is defined “continuous”.
Evaporation control by steps consists in the reduction of the number of steps enabled as evaporation pressure increases.
In the controller, an evaporation pressure value under which the step is deactivated is set for each step.
Each step is deactivated when the evaporation pressure exceeds the sum of the activation value and the evaporation control differential.
The evaporation control differential is the same for all evaporation steps.
In the event that the control of a fourth group of fans is envisaged, their operation will coincide with that of the third group.
The figure represents evaporation control by steps.



Continuous evaporation control is carried out by a signal between 0 and 10V, that increases inversely to the reduction in evaporation pressure. The signal will be reduced from the 10V of the analogue output set point for the evaporation control, and will reach the minimum value set when the pressure reaches the value obtained from the sum of the set point and the relative differential.
If the controller regulates several compressors, the microprocessor will control the evaporation pressure on the basis of the lowest signal of those read.
The figure represents the operation of continuous evaporation control.



Evaporation control can be activated in units with heat pump operating mode; this function remains active only during heating mode operation.
Fan outlet control during defrosting is described in the section concerning the defrosting function.
Condensation pressure control can be set in heat pump units, regardless of the presence of an evaporation control function.

3.3.9 Defrosting

During heat pump operation of an air/water unit, this function prevents (or eliminates) the build-up of frost on the condensing/evaporating coil.
In units comprising several compressors, defrosting can be performed on the entire unit or on each separate compressor.
First defrosting on a chiller unit depends on a minimum operating time of the unit, in order to allow the accumulation of sufficient heat to ensure defrosting efficiency.
The request for the start-up of a defrosting cycle is given by the value of air suction pressure. For a defrosting cycle to begin, the air suction pressure of at least one compressor must remain within a time interval that is inferior to the pressure at the beginning of the cycle.
Defrosting takes place with the unit switchover from heat pump to chiller operation and the deactivation of fan outlets.
Before defrosting can commence - in the case of separate defrosting of cooling circuits - the capacity of the compressor must be forced to 100%; in the case of total defrosting of the entire unit, all compressors present (that are not excluded due to fault or by the operating cycle) will be forced to 100% capacity.
In the case of defrosting of separate cooling circuits, each one will take place with its own maximum time.
After reversing from heat pump operation to chiller (with unit fans stationary), condensation pressure will eventually reach a pressure value that gives the signal for the end of the defrosting cycle. If simultaneous defrosting is possible, the first circuit to reach this pressure value will give the signal for the end of the defrosting cycle for the whole unit.
The defrosting cycle has a minimum duration, during which time the end defrosting signal is disregarded.
Once the minimum defrosting time has elapsed and the controller has received the end defrosting signal, all fans will be forced to operate at maximum speed before the unit switches back from chiller to heat pump operation.
In the event that the condensation pressure does not reach the end defrosting value by a certain time, the cycle will end when the maximum defrosting time has elapsed, following the above procedure.
In this case, the event will be recorded in the alarms and displayed, though the controller will not intervene in any way.
The maximum time defrosting end alarm will automatically disappear from the active alarm display when a defrosting cycle has been completed normally (i.e. when the end-defrosting pressure has been reached).
In the case of defrosting of separate cooling circuits, each one will have its own maximum time end defrosting alarm, which will only be removed from the alarms list when a defrosting cycle has been correctly completed.
Two consecutive defrosting cycles of the unit, in the case of simultaneous defrosting, or of the same compressor, in the case of separate cycles, are separated by a minimum time of unit heating operation.
The service section includes a page from which a defrosting cycle can be forced manually.

3.4 Accessory functions

The accessory functions adapt the chiller unit to system requirements.

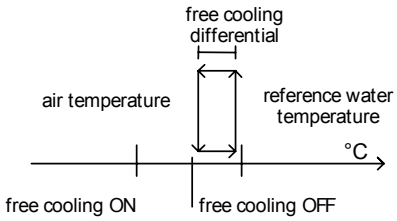
3.4.1 “No auxiliary voltage” digital input

This input can be used in the event of no power in a 230V auxiliary circuit, or to check the sequence of phases on the power line or the voltage level.
For correct unit start-up, the input must close when the controller is powered up, and must remain closed for a minimum time interval.
If the input does not remain closed for this time, the controller will inhibit activation of the outputs, and an auxiliary voltage alarm will be given. This alarm can be removed by closing the input manually (even if the input recloses).
Once the minimum time interval has elapsed, the input status will be interpreted by the controller according to the selected operation:

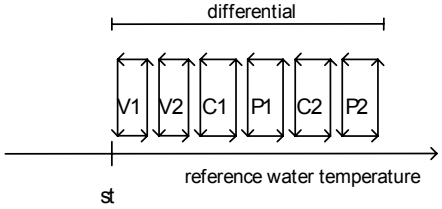
- in the case of phase sequence check only, the opening of the input will be disregarded;
- in the case of a check of auxiliary circuit power and voltage level, the opening of the input will cause the controller to give an alarm and to open all the outputs of utilities. In the event that the input recloses during an alarm phase, in which case the power voltage checked by special relays is found to be within the predetermined limits, the controller will remain in stand-by for a few minutes, then will reactivate the outputs (according to the load requirements) and automatically remove the auxiliary voltage alarm display from the active alarms list.

3.4.2 Free cooling

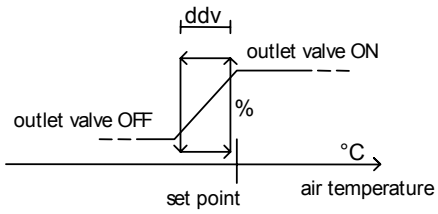
The free cooling function makes use of the air temperature to cool the utility water.
For the free cooling function to operate, the air temperature must be lower than the reference water temperature, less the free cooling differential.



When the free cooling function is enabled, the controller enables the digital or the analogue output to pilot the free cooling valve, and uses the fan outputs as power steps, before the compressor steps.
The figure below illustrates the operating steps with free cooling function enabled in a twin-compressor unit with capacity step control valve for compressor and two ventilation steps.



The free cooling valve, controlled by the digital or the analogue output, is disabled when the reference water temperature drops below the unit operation setting, less the valve disable differential.
If the valve is controlled by the analogue outlet, its opening inside the differential will range between 0 and 100%, between the disable temperature value and the unit operation setting.



With the inclusion of the fan steps inside the operating differential, the compressor steps will be limited to the second half of the differential.
The water coil for free cooling is either an integral component of the chiller unit, or separate with its own fans controlled by dedicated digital outlets.
In the event that the chiller unit fans are those of the free cooling coil, the outlets of the unit fans will be controlled as power steps. If the water coil is a separate component from the chiller, the coil fan outlets will have this function.

3.4.3 Heat recovery

This function recovers part or all of the energy on the condenser to be disposed of by means of a special heat exchanger.
The function is enabled when the relative digital input is closed.
Heat can only be recovered when the temperature of the water entering the exchanger is lower than the recovery set point; recovery will end when the temperature has increased by the recovery differential.
The set point limits for recovery are the same as those defined for heat pump operation.
Heat is recovered when the controller enables the relative digital outlet and disables the digital outlets of the unit fans.
If during heat recovery the condensation pressure of any one of the compressors exceeds the “hp2” pressure, recovery will be disabled and the controller will activate an alarm.
The end-recovery alarm triggered when the condensation pressure limit has been reached can be reset manually, but can only be cancelled when the condensation pressure drops below the cut-in value less the relative differential.

3.4.4 Continuous set point variation

The unit operating set point can be configured by keyboard or by means of an analogue input.
The use of an analogue input to configure the set point will automatically preclude the possibility of modifying it by the keyboard or by serial signal.
The power steps are activated inside the differential configured with reference to the setting read by the analogue input.
The set point can be modified within the upper and lower limits envisaged for set point configuration by keyboard.
During configuration in the manufacturer page, operation with variable set point will be enabled; on the service page the temperature limits between which the signal will vary and the signal to be sent can be configured.
This function is currently featured in units with single compressors in the controller board. To use the function on units with two, three or four compressors, connect another “Small” board with dedicated address “31” to the network.
The analogue signal must be sent to input “B1” with reference to relative “GND” terminal.
To ensure correct unit operation and continuous start-ups and shutdowns, the signal must be stable.

3.4.5 Dual set point

Operation with dual set point is only possible when the unit is operating in chiller mode.
In this case, the selection of the operating set point can be made either by keyboard or digital input; the two values must however be between the limits for summer set points.
The higher set point will always be active by default or when the digital input is open.
When the set point is configured by keyboard, the possibility of modifying the set point by digital input will be precluded, and vice-versa.
When the reference water temperature has reached the value configured for operation at low temperature, the controller enables the digital output for activation of the solenoid valves controlling the relative thermostatic valves.

3.4.6 Operation with outlet water temperature

For control of outlet water temperature, the reference probe must be installed at the exchanger outlet (of units with tube bundle exchangers) or, in the case of several exchangers, in the common water outlet manifold.
The activation of unit power steps does not depend on the operating differential, but on activation and deactivation delays in relation to a dead band.
When the reference water temperature exceeds the set point without leaving the dead band, no devices are enabled or disabled to lower the water temperature; when the reference water temperature exceeds the sum of the set point value and the dead band, a unit power step on a compressor or a step capacity will be activated (the power step could consist in the start-up of a step-controlled compressor or the increase of an operating compressor to full capacity operation).
If the temperature is not inside the dead band, another step will be activated after a delay, until the whole unit has been activated.
In the event that, following activation of one or more power steps or the reduction in load demand by the user, the reference water temperature value drops below the configured set point, the controller disables the power steps.
As in the case of activation, power steps will be deactivated following time delays.
In the event that, following deactivation of a power step, the reference water temperature value remains below the configured set point, the controller will continue to deactivate all compressors.
If the outlet water temperature of each circuit reaches the antifrost safety value configured, the relative compressor will be immediately shut down; if the reference temperature reaches the compressor shutdown limit, all compressors will be shut down immediately, without delay.

3.4.7 Forcing of capacity steps

The capacity step control of compressors is normally requested by the controller to ensure that the yield of the chiller is better able to respond to load variations, or on compressor start-up to reduce breakaway current, as well as unit shutdown, to allow compressors to start up at maximum capacity.
In certain conditions, capacity step control can also be requested to prevent the high pressure protection from cutting in, or to reduce electrical power absorption by the system.
Each single active compressor is automatically forced when the relative delivery pressure exceeds the capacity step forcing pressure; in this case, the compressor will operate normally when the condensation pressure drops below the forcing pressure of the relative differential.
All unit compressors are forced when the relative digital input is closed; normal operation will be reactivated when the input is reopened.
Given the exceptional nature of this function, forced capacity operation of compressors is limited to periods of time with intervals of full load operation.

3.4.8 Boss-runner operation

The boss-runner configuration allows the connection of up to eight units in a network.
The network is composed of a boss unit that controls operation of the runner units.
The boss-runner configuration equally distributes the total number of operating hours among all units, allowing the use of a number of units greater than actually required by the system; in this way, some units act as a back-up to those already operating.
During programming of the boss unit, the number of units making up the network and the quantity acting as back-up units must be specified.
A page in the boss I/O section displays the status of units present in the network.
In this page, the units are identified by the letter “U” (U1: U2: ...); another letter next to each unit will specify its status.
The letter “R” indicates that the unit is allocated to operation; the letter “S” identifies back-up units; the letter “O” specifies that the unit does not respond to the boss either because it is off or disconnected; the letter “F” indicates that the unit is in forced operation. The symbol “-“ indicates where no units are envisaged.
Units are activated in the same mode seen for outlet water control.
During the outlet water control function, the boss unit reads the reference temperature value; if the latter is higher that the zone value, the boss will request unit start-up.
The activation/deactivation of the boss chiller unit is the same as for the runner units.
The boss unit actuates a unit by enabling step control; the capacity steps are activated with the delay specified by the boss.
Once 100% power has been reached (i.e. all power steps have been activated), the boss unit will activate the other units if required by the heating load.
If the reference water temperature exceeds the “maximum temperature” for a time greater than the “load forced delay”, the boss unit will actuate a back-up unit to assist the units currently operating.
When the reference water temperature is inside the dead band, the boss unit will not activate or deactivate any power steps.
When the water reference temperature drops below the set value, the boss unit will request deactivation of the other units (commencing with the one that has been operating for the longest time).

3.4.9 Operation of digital inputs

For a compressor to operate, its relative digital input must be closed.
In all cases the controller controls the breakdown of the differential according to the number of compressors specified by configuration, regardless of the status of the digital inputs enabling the compressors.

3.5 Operating mode changeover

Operating mode changeover refers to the change from chiller to heat pump operating mode and vice-versa, excluding the changes for defrosting.

3.5.1 Changeover between chiller and heat pump modes

The changeover between chiller and heat pump operating modes is possible at all times, caused by an external signal with digital input, by keyboard or by serial signal.
Before starting up the unit in the selected mode, whatever the cause of the changeover, the controller disables the compressor outlets, and will wait for the minimum delay time configured in the service pages to elapse.
Once the time has elapsed, the unit will automatically start up and operate according to load demands.

4. I/O

4.1.1 General

As stated earlier, the software can control various combinations of hardware boards used on different types of chillers and operating modes.
The construction type, and therefore the type and number of boards that will be handled by the program, is automatically selected during configuration.
Depending on the board type, the functions performed by the digital and analogue inputs and outputs will vary; the section below will describe these functions according to the board used.
For the sake of clarity, the boards are identified by four different codes, according to the functions performed.

- 1: Medium board for control of a unit with a single compressor. In this I/O configuration, the Medium board can control units with a single compressor as well as various "common" functions of chiller units.
  Given that the unit has only one board, the latter will operate as Master.

- 2: Medium board for control of a compressor, without “common” functions; the board operates as Slave, and is installed for the control of a third compressor in units already fitted with a Large board with “code 3”.
  In the event that the Master board ceases operation, this board will be deactivated.

- 3: Large board for control of common functions of the chiller unit and two compressors; in this configuration, the board operates as Master in the control of units.
  In this I/O configuration, the board can be installed in units fitted with two compressors; besides the control of common functions, the board also controls the two compressors. The board can also be installed in units with three compressors; in this case, the board must be connected to the network with a Medium board acting as Slave (as in type 2 configuration). It can also be installed in units with four compressors, connected to the network with another Large board. In this case, the latter Large board will operate as Slave (as in configuration type 4).
  If the network connection is interrupted during operation with Slave type 2 or 4, the Large board acting as Master will continue to control the first two compressors while displaying a network communications fault alarm.

- 4: Large board for the control of groups of two compressors for connection in a network with board with “code 3” for control of units with 4 compressors. The board acts as Slave, and will remain deactivated if the Master is not activated.

Besides the above four configurations, another “Small” board can also be connected to the network with a code “3” board to enable the “variable set point by analogue input”. Address “31” is reserved for this board.

4.2 I/O list

Each identification code corresponds to a list of inputs and outputs, described with relative function.

4.2.1 Identification code “1”

Medium board for control of common functions and a compressor

Term.	Name	DESCRIPTION	Board	Function
J1-1	G	Power supply	Small	
J1-2	GO	Power supply ref.	Small	
J2-1	B1	Analogue univ. IN 1	Small	High pressure
J2-2	B 2	Analogue univ. IN 2	Small	Low pressure / Reference pressure
J2-3	B 3	Analogue univ. IN 3	Small	Oil
J2-4	GND	Analogue com. inputs	Small	
J2-5	+VDC	Power supply probes	Small	
J3-1	B4	Analogue passive IN 4	Small	Inlet water temperature “reference value”
J3-2	BC4	Common anal. input 4	Small	
J3-3	B5	Analogue passive IN 5	Small	Outlet water temperature “evaporator antifrost”
J3-4	BC5	Common anal. input 5	Small	
J4-1	VG	Aliment. OUT 24V	Small	
J4-2	VG0	Aliment. OUT 0V	Small	
J4-3	Y1	Anal. output 1	Small	Free cooling valve
J4-4	Y2	Anal. output 2	Small	Fan / shutter speed control
J4-5	Y3	Anal. output 3	Small	Recovery water valve control
J4-6	Y4	Anal. output 4	Small	
J5-1	ID1	Digital IN 1 24V	Small	Ext. interlock
J5-2	ID2	Digital IN 2 24V	Small	Water flow switch closed circuit
J5-3	ID3	Digital IN 3 24V	Small	Compressor permissive
J5-4	ID4	Digital IN 4 24V	Small	Forced capacity step control
J5-5	ID5	Digital IN 5 24V	Small	Source water circuit flow switch
J5-6	ID6	Digital IN 6 24V	Small	No power to auxiliaries
J5-7	ID7	Digital IN 7 24V	Small	Fan cut-out switch
J5-8	ID8	Digital IN 8 24V	Small	Summer/winter
J5-9	IDC1	Com. IN digit. 1 - 8	Small	
J6-1	B6	Analogue univ. IN 6	Medium	Ext. air temperature - cond. / evaporator output
J6-2	B7	Analogue univ. IN 7	Medium	Recovery water inlet temperature
J6-3	B8	Analogue univ. IN 8	Medium	Variable set point
J6-4	GND	Analogue com. inputs	Medium	
J7-1	ID9	Digital IN 9 24V	Medium	Change high - low temperature setting
J7-2	ID10	Digital IN 10 24V	Medium	Cut-out switch pump 1
J7-3	ID11	Digital IN 11 24V	Medium	Cut-out switch pump 2
J7-4	ID12	Digital IN 12 24V	Medium	Recovery permissive
J7-5	IDC9	Com. IN digit. 9 – 12	Medium	
J8-1	ID13H	Digital IN 13 230V	Medium	High pressure switch
J8-2	ID13	Digital IN 13 24V	Medium	
J8-3	IDC13	Com. digital IN 13 e 14	Medium	
J8-4	ID14	Digital IN 14 24V	Medium	
J8-5	ID14H	Digital IN 14 230V	Medium	Compressor cut-out switch
J9		Tel. connect. 8-way	Small	
J10		Tel. connect. 6-way	Small	
J11-1	TX-	Conn. RX-/TX-	Small	
J11-2	TX+	Conn. RX+/TX+	Small	
J11-3	GND	Conn. GND	Small	

J12-1	C1	Com. relay 1, 2, 3	Small	
J12-2	NO1	Contact relay 1	Small	Compressor 1st start-up PW
J12-3	NO2	Contact relay 2	Small	Compressor 2nd start-up PW
J12-4	NO3	Contact relay 3	Small	Compressor 1st step / valve increase power
J12-5	C1	Com. relay 1, 2, 3	Small	
J13-1	C4	Com. relay 4, 5, 6	Small	
J13-2	NO4	Contact relay 4	Small	Compressor 2nd step / valve reduce power
J13-3	NO5	Contact relay 5	Small	Fan 1 – Source water valve
J13-4	NO6	Contact relay 6	Small	Fan 2
J13-5	C4	Com. relay 4, 5, 6	Small	
J14-1	C7	Com. relay 7	Small	
J14-2	NO7	Contact relay 7	Small	Recovery enabled / Free cooling fan 2
J14-3	C7	Com. relay 7	Small	
J15-1	NO8	NO contact relay 8	Small	Alarm
J15-2	C8	Com. relay 8	Small	
J15-3	NC8	NC contact relay 8	Small	
J16-1	C9	Com. relay 9, 10, 11	Medium	
J16-2	NO9	Contact relay 9	Medium	Pump 1
J16-3	NO10	Contact relay 10	Medium	Pump 2
J16-4	NO11	Contact relay 11	Medium	Status summer/winter / Free cooling fan 1
J16-5	C9	Com. relay 9, 10, 11	Medium	
J17-1	NO12	NO contact relay 12	Medium	Evaporator antifrost heater – high/low setting
J17-2	C12	Com. relay 12	Medium	
J17-3	NC12	NC contact relay 12	Medium	
J18-1	NO13	NO contact relay 13	Medium	Summer/winter valve–Free cooling / Free cooling fa 2
J18-2	C13	Com. relay 13	Medium	
J18-3	NC13	NC contact relay 13	Medium	

4.2.2 Multiple-function inputs and outputs

Some inputs and outputs can be used for different functions, depending on the machine type configured and the functions enabled.

- B2: Normally used for low pressure control in units with temperature control; used also as reference value for units with pressure control.
- NO3: Contact used for first step of capacity control; also used to open step-control cylinder and increase the power yield of units with continuous step-control function.
- NO4: Contact used for second step of capacity control; also used to open step-control cylinder and decrease the power yield of units with continuous step-control function.
- NO5: Contact used for first fan in air/water units; also used to enable opening of source water solenoid valve in water/water units.
- NO7: Contact used to indicate recovery function active; also used to control second step of fans in units with free cooling function outside chiller.
- NO11: Contact used to indicate summer/winter operation status (summer - contact open, winter - contact closed) in units with heat pump function; also used to control first step of fans in units with free cooling function outside chiller.
- NO12: Contact used to control the antifrost heater; in the case of units with dual set point, the output is also used to activate solenoid valves of function at lower temperature.
- NO13: Contact used to control the reverse valve in heat pump units, for free cooling valve in free cooling units; in the case the unit is also enabled for recovery, the contact is also used to control the second step of fans of units with free cooling function outside the chiller.

The board cannot enable heat pump and free cooling functions at the same time.
In the event that the recovery and free cooling functions can be operated at the same time, the free cooling valve will be controlled by analogue output Y1.
Analogue output Y1 will control the free cooling valve even when the NO contact 13 is available.

4.2.3 Identification code “2”

Medium board for control of compressor functions

Term.	Name	DESCRIPTION	Board	Function
J1-1	G	Power supply	Small	
J1-2	GO	Power supply ref.	Small	
J2-1	B1	Analogue univ. IN 1	Small	High pressure compressor 3
J2-2	B 2	Analogue univ. IN 2	Small	Low pressure compressor 3
J2-3	B 3	Analogue univ. IN 3	Small	Oil compressor 3
J2-4	GND	Analogue com. inputs	Small	
J2-5	+VDC	Power supply probes	Small	
J3-1	B4	Analogue passive IN 4	Small	* Ext. air temperature
J3-2	BC4	Common anal. input 4	Small	
J3-3	B5	Analogue passive IN 5	Small	Outlet water temperature 3 “antifrost evaporator 3”
J3-4	BC5	Common anal. input 5	Small	
J4-1	VG	Aliment. OUT 24V	Small	
J4-2	VG0	Aliment. OUT 0V	Small	
J4-3	Y1	Anal. output 1	Small	
J4-4	Y2	Anal. output 2	Small	
J4-5	Y3	Anal. output 3	Small	
J4-6	Y4	Anal. output 4	Small	
J5-1	ID1	Digital IN 1 24V	Small	
J5-2	ID2	Digital IN 2 24V	Small	
J5-3	ID3	Digital IN 3 24V	Small	Compressor permissive 3
J5-4	ID4	Digital IN 4 24V	Small	
J5-5	ID5	Digital IN 5 24V	Small	
J5-6	ID6	Digital IN 6 24V	Small	
J5-7	ID7	Digital IN 7 24V	Small	
J5-8	ID8	Digital IN 8 24V	Small	
J5-9	IDC1	Com. IN digit. 1 - 8	Small	
J6-1	B6	Analogue univ. IN 6	Medium	Outlet water temperature cond. / evaporator 1
J6-2	B7	Analogue univ. IN 7	Medium	Outlet water temperature cond. / evaporator 2
J6-3	B8	Analogue univ. IN 8	Medium	Outlet water temperature cond. / evaporator 3
J6-4	GND	Analogue com. inputs	Medium	
J7-1	ID9	Digital IN 9 24V	Medium	
J7-2	ID10	Digital IN 10 24V	Medium	
J7-3	ID11	Digital IN 11 24V	Medium	
J7-4	ID12	Digital IN 12 24V	Medium	
J7-5	IDC9	Com. IN digit. 9 – 12	Medium	
J8-1	ID13H	Digital IN 13 230V	Medium	High pressure switch compressor 3
J8-2	ID13	Digital IN 13 24V	Medium	
J8-3	IDC13	Com. digital IN 13 e 14	Medium	
J8-4	ID14	Digital IN 14 24V	Medium	
J8-5	ID14H	Digital IN 14 230V	Medium	Compressor cut-out switch 3
J9		Tel. connect. 8-way	Small	
J10		Tel. connect. 6-way	Small	
J11-1	TX-	Conn. RX-/TX-	Small	
J11-2	TX+	Conn. RX+/TX+	Small	
J11-3	GND	Conn. GND	Small	

J12-1	C1	Com. relay 1, 2, 3	Small	
J12-2	NO1	Contact relay 1	Small	Compressor 3 “1st start-up PW”
J12-3	NO2	Contact relay 2	Small	Compressor 3 “2nd start-up PW”
J12-4	NO3	Contact relay 3	Small	Compressor 3 “1st step / valve increase power
J12-5	C1	Com. relay 1, 2, 3	Small	
J13-1	C4	Com. relay 4, 5, 6	Small	
J13-2	NO4	Contact relay 4	Small	Compressor 3 "2nd step / valve reduce power
J13-3	NO5	Contact relay 5	Small	Fan 3
J13-4	NO6	Contact relay 6	Small	
J13-5	C4	Com. relay 4, 5, 6	Small	
J14-1	C7	Com. relay 7	Small	
J14-2	NO7	Contact relay 7	Small	* Free cooling ON/OFF
J14-3	C7	Com. relay 7	Small	
J15-1	NO8	NO contact relay 8	Small	* Free cooling fan 1
J15-2	C8	Com. relay 8	Small	
J15-3	NC8	NC contact relay 8	Small	
J16-1	C9	Com. relay 9, 10, 11	Medium	
J16-2	NO9	Contact relay 9	Medium	* Free cooling fan 2
J16-3	NO10	Contact relay 10	Medium	* Free cooling fan 3
J16-4	NO11	Contact relay 11	Medium	
J16-5	C9	Com. relay 9, 10, 11	Medium	
J17-1	NO12	NO contact relay 12	Medium	Summer/winter valve 3
J17-2	C12	Com. relay 12	Medium	
J17-3	NC12	NC contact relay 12	Medium	
J18-1	NO13	NO contact relay 13	Medium	
J18-2	C13	Com. relay 13	Medium	
J18-3	NC13	NC contact relay 13	Medium	

Inlets and outlets marked by the symbol “*” substitute the same functions in the board with “code 3”.

4.2.4 Multiple-function inputs and outputs

Some inputs and outputs can be used for different functions, depending on the machine type configured and the functions enabled.

- NO3: Contact used for first step of capacity control; also used to open step-control cylinder and increase the power yield of units with continuous step-control function.
- NO4: Contact used for second step of capacity control; also used to open step-control cylinder and decrease the power yield of units with continuous step-control function.

4.2.5 Identification code “3”

Large board for control of two compressors and common functions

Term.	Name	DESCRIPTION	Board	Function
J1-1	G	Power supply	Small	
J1-2	GO	Power supply ref.	Small	
J2-1	B1	Analogue univ. IN 1	Small	High pressure compressor 1
J2-2	B 2	Analogue univ. IN 2	Small	Low pressure compressor 1/ Reference pressure
J2-3	B 3	Analogue univ. IN 3	Small	Oil compressor 1
J2-4	GND	Analogue com. inputs	Small	
J2-5	+VDC	Power supply probes	Small	
J3-1	B4	Analogue passive IN 4	Small	Inlet water temperature “reference value”
J3-2	BC4	Common anal. input 4	Small	
J3-3	B5	Analogue passive IN 5	Small	Outlet water temperature 1 “antifrost evaporator 1”
J3-4	BC5	Common anal. input 5	Small	
J4-1	VG	Aliment. OUT 24V	Small	
J4-2	VG0	Aliment. OUT 0V	Small	
J4-3	Y1	Anal. output 1	Small	Free cooling valve
J4-4	Y2	Anal. output 2	Small	Fan / shutter speed control
J4-5	Y3	Anal. output 3	Small	Recovery water valve control
J4-6	Y4	Anal. output 4	Small	
J5-1	ID1	Digital IN 1 24V	Small	Ext. interlock
J5-2	ID2	Digital IN 2 24V	Small	Water flow switch closed circuit
J5-3	ID3	Digital IN 3 24V	Small	Compressor permissive 1
J5-4	ID4	Digital IN 4 24V	Small	Compressor permissive 2
J5-5	ID5	Digital IN 5 24V	Small	Source water circuit flow switch
J5-6	ID6	Digital IN 6 24V	Small	No power to auxiliaries
J5-7	ID7	Digital IN 7 24V	Small	Fan cut-out switch
J5-8	ID8	Digital IN 8 24V	Small	Summer/winter
J5-9	IDC1	Com. IN digit. 1 - 8	Small	
J6-1	B6	Analogue univ. IN 6	Medium	High pressure compressor 2
J6-2	B7	Analogue univ. IN 7	Medium	Low pressure compressor 2
J6-3	B8	Analogue univ. IN 8	Medium	Oil compressor 2
J6-4	GND	Analogue com. inputs	Medium	
J7-1	ID9	Digital IN 9 24V	Medium	Change high - low temperature setting
J7-2	ID10	Digital IN 10 24V	Medium	Pump 1
J7-3	ID11	Digital IN 11 24V	Medium	Pump 2
J7-4	ID12	Digital IN 12 24V	Medium	Recovery permissive
J7-5	IDC9	Com. IN digit. 9 – 12	Medium	
J8-1	ID13H	Digital IN 13 230V	Medium	High pressure switch compressor 1
J8-2	ID13	Digital IN 13 24V	Medium	
J8-3	IDC13	Com. digital IN 13 e 14	Medium	
J8-4	ID14	Digital IN 14 24V	Medium	
J8-5	ID14H	Digital IN 14 230V	Medium	Compressor cut-out switch 1
J9		Tel. connect. 8-way	Small	
J10		Tel. connect. 6-way	Small	
J11-1	TX-	Conn. RX-/TX-	Small	
J11-2	TX+	Conn. RX+/TX+	Small	
J11-3	GND	Conn. GND	Small	
J12-1	C1	Com. relay 1, 2, 3	Small	
J12-2	NO1	Contact relay 1	Small	Compressor 1 “1st start-up PW”
J12-3	NO2	Contact relay 2	Small	Compressor 1 “2nd start-up PW”
J12-4	NO3	Contact relay 3	Small	Compressor 1 "1st step / valve increase power
J12-5	C1	Com. relay 1, 2, 3	Small	

J13-1	C4	Com. relay 4, 5, 6	Small	
J13-2	NO4	Contact relay 4	Small	Compressor 1 "2nd step / valve reduce power
J13-3	NO5	Contact relay 5	Small	Fan 1 – Source water valve
J13-4	NO6	Contact relay 6	Small	Fan 2
J13-5	C4	Com. relay 4, 5, 6	Small	
J14-1	C7	Com. relay 7	Small	
J14-2	NO7	Contact relay 7	Small	Recovery enabled – Free cooling fan 3
J14-3	C7	Com. relay 7	Small	
J15-1	NO8	NO contact relay 8	Small	Alarm
J15-2	C8	Com. relay 8	Small	
J15-3	NC8	NC contact relay 8	Small	
J16-1	C9	Com. relay 9, 10, 11	Medium	
J16-2	NO9	Contact relay 9	Medium	Pump 1
J16-3	NO10	Contact relay 10	Medium	Pump 2
J16-4	NO11	Contact relay 11	Medium	Summer/winter status – Free cooling fan 2
J16-5	C9	Com. relay 9, 10, 11	Medium	
J17-1	NO12	NO contact relay 12	Medium	Evaporator antifrost heater – high/low setting
J17-2	C12	Com. relay 12	Medium	
J17-3	NC12	NC contact relay 12	Medium	
J18-1	NO13	NO contact relay 13	Medium	Summer / winter valve 1 – Free cooling ON/OFF
J18-2	C13	Com. relay 13	Medium	
J18-3	NC13	NC contact relay 13	Medium	
J19-1	ID15H	Digital IN 15 230V	Large	High pressure switch compressor 2
J19-2	ID15	Digital IN 15 24V	Large	
J19-3	ID15C	Com. digital IN 13 e 14	Large	
J19-4	ID16	Digital IN 16 24V	Large	
J19-5	ID16H	Digital IN 16 230V	Large	Compressor cut-out switch 2
J20-1	Y5	Anal. output 5	Large	
J20-2	Y6	Anal. output 6	Large	
J20-3	B9	Analogue passive IN 9	Large	Outlet water temperature 2 “antifrost evaporator 2”
J20-4	BC9	Common anal. input 9	Large	
J20-5	B10	Analogue passive IN 10	Large	Recovery water temp. – External air temp.
J20-6	BC10	Common anal. input 10	Large	
J20-7	ID17	Digital IN 17 24V	Large	Force capacity step control
J20-8	ID18	Digital IN 18 24V	Large	
J20-9	IDC17	Com. digital IN 13 e 14	Large	
J21-1	NO14	NO contact relay 14	Large	Valv. Summer / winter 2 – Free cooling fan 1
J21-2	C14	Com. relay 14	Large	
J21-3	NC14	NC contact relay 14	Large	
J21-4	NO15	NO contact relay 15	Large	Compressor 2 “1st start-up PW”
J21-5	C15	Com. relay 15	Large	
J21-6	NC15	NC contact relay 15	Large	
J22-1	C16	Com. relay 16, 17 + 18	Large	
J22-2	NO16	NO contact relay 16	Large	Compressor 2 “2nd start-up PW”
J22-3	NO17	NO contact relay 17	Large	Compressor 2 "1st step / valve increase power
J22-4	NO18	NO contact relay 18	Large	Compressor 2 "2nd step / valve reduce power
J22-5	C16	Com. relay 16,17 + 18	Large	
J23-1	E-	Conn. RS485	Large	
J23-2	E+	Conn. RS485	Large	
J23-3	GND	Conn. RS485	Large	

The input for the variable set point is controlled by a “Small” board connected to the network with address “31”.

4.2.6 Multiple-function inputs and outputs

Some inputs and outputs can be used for different functions, depending on the machine type configured and the functions enabled.

- B2: Normally used for low pressure control in units with temperature control; used also as reference value for units with pressure control.
- NO3: Contact used for first step of capacity control; also used to open step-control cylinder and increase the power yield of units with continuous step-control function.
- NO4: Contact used for second step of capacity control; also used to open step-control cylinder and decrease the power yield of units with continuous step-control function.
- NO5: Contact used for first fan in air/water units; also used to enable opening of source water solenoid valve in water/water units.
- NO7: Contact used to indicate recovery function active; also used to control second step of fans in units with free cooling function in outside chiller.
- NO11: Contact used to indicate summer/winter operation status (summer - contact open, winter - contact closed) in units with heat pump function; also used to control second step of fans in units with free cooling function in outside chiller.
- NO12: Contact used to control the antifrost heater; in the case of units with dual set point, the output is also used to activate solenoid valves of function at lower temperature.
- NO13: Contact used to control the reverse valve of first of all cooling circuits in heat pump units, for free cooling valve in free cooling units.
- B10: Used to read the recovery water temperature; also used to read the temperature of external air in units with free cooling function. If both recovery and free cooling functions are envisaged, the input is used to read the air temperature for free cooling.
- NO17: Contact used for first step of capacity control; also used to actuate the step-control cylinder and increase the power yield of units with continuous step-control function.
- NO18: Contact used for second step of capacity control; also used to actuate the step-control cylinder and decrease the power yield of units with continuous step-control function.

The board cannot enable heat pump and free cooling functions at the same time.
In the event that the recovery and free cooling functions can be operated at the same time, recovery is enabled by a separate thermostat connected to the digital input for recovery enabling.
The analogue output Y1 controls the free cooling valve.
In the case that the recovery function is also envisaged with free cooling, the number of external fan steps drops from three to two.
In the event that the board is fitted on a unit with three or four compressors, the external free cooling fans, the free cooling on/off valve and the external air temperature readings are controlled by the medium board (unit with three compressors) or by the large board (units with four compressors).

4.2.7 Identification code “4”

Large board for control of two compressors to form units with four compressors in a network, with Large board “code 3”

Term.	Name	DESCRIPTION	Board	Function
J1-1	G	Power supply	Small	
J1-2	GO	Power supply ref.	Small	
J2-1	B1	Analogue univ. IN 1	Small	High pressure compressor 3
J2-2	B 2	Analogue univ. IN 2	Small	Low pressure compressor 3
J2-3	B 3	Analogue univ. IN 3	Small	Oil compressor 3
J2-4	GND	Analogue com. inputs	Small	
J2-5	+VDC	Power supply probes	Small	
J3-1	B4	Analogue passive IN 4	Small	* Ext. air temperature
J3-2	BC4	Common anal. input 4	Small	
J3-3	B5	Analogue passive IN 5	Small	Outlet water temperature 3 “antifrost evaporator 3”
J3-4	BC5	Common anal. input 5	Small	
J4-1	VG	Aliment. OUT 24V	Small	
J4-2	VG0	Aliment. OUT 0V	Small	
J4-3	Y1	Anal. output 1	Small	
J4-4	Y2	Anal. output 2	Small	Fan / shutter speed control
J4-5	Y3	Anal. output 3	Small	
J4-6	Y4	Anal. output 4	Small	
J5-1	ID1	Digital IN 1 24V	Small	
J5-2	ID2	Digital IN 2 24V	Small	
J5-3	ID3	Digital IN 3 24V	Small	Compressor permissive 3
J5-4	ID4	Digital IN 4 24V	Small	Compressor permissive 4
J5-5	ID5	Digital IN 5 24V	Small	
J5-6	ID6	Digital IN 6 24V	Small	
J5-7	ID7	Digital IN 7 24V	Small	Cut-out switch fans 3-4
J5-8	ID8	Digital IN 8 24V	Small	
J5-9	IDC1	Com. IN digit. 1 - 8	Small	
J6-1	B6	Analogue univ. IN 6	Medium	High pressure compressor 4
J6-2	B7	Analogue univ. IN 7	Medium	Low pressure compressor 4
J6-3	B8	Analogue univ. IN 8	Medium	Oil compressor 4
J6-4	GND	Analogue com. inputs	Medium	
J7-1	ID9	Digital IN 9 24V	Medium	
J7-2	ID10	Digital IN 10 24V	Medium	
J7-3	ID11	Digital IN 11 24V	Medium	
J7-4	ID12	Digital IN 12 24V	Medium	
J7-5	IDC9	Com. IN digit. 9 – 12	Medium	
J8-1	ID13H	Digital IN 13 230V	Medium	High pressure switch compressor 3
J8-2	ID13	Digital IN 13 24V	Medium	
J8-3	IDC13	Com. digital IN 13 e 14	Medium	
J8-4	ID14	Digital IN 14 24V	Medium	
J8-5	ID14H	Digital IN 14 230V	Medium	Compressor cut-out switch 3
J9		Tel. connect. 8-way	Small	
J10		Tel. connect. 6-way	Small	
J11-1	TX-	Conn. RX-/TX-	Small	
J11-2	TX+	Conn. RX+/TX+	Small	
J11-3	GND	Conn. GND	Small	
J12-1	C1	Com. relay 1, 2, 3	Small	
J12-2	NO1	Contact relay 1	Small	Compressor 3 “1st start-up PW”
J12-3	NO2	Contact relay 2	Small	Compressor 3 “2nd start-up PW”
J12-4	NO3	Contact relay 3	Small	Compressor 3 “1st step / valve increase power
J12-5	C1	Com. relay 1, 2, 3	Small	

J13-1	C4	Com. relay 4, 5, 6	Small	
J13-2	NO4	Contact relay 4	Small	Compressor 3 "2nd step / valve reduce power
J13-3	NO5	Contact relay 5	Small	Fan 3
J13-4	NO6	Contact relay 6	Small	Fan 4
J13-5	C4	Com. relay 4, 5, 6	Small	
J14-1	C7	Com. relay 7	Small	
J14-2	NO7	Contact relay 7	Small	* Free cooling ON/OFF
J14-3	C7	Com. relay 7	Small	
J15-1	NO8	NO contact relay 8	Small	* Free cooling fan 1
J15-2	C8	Com. relay 8	Small	
J15-3	NC8	NC contact relay 8	Small	
J16-1	C9	Com. relay 9, 10, 11	Medium	
J16-2	NO9	Contact relay 9	Medium	* Free cooling fan 2
J16-3	NO10	Contact relay 10	Medium	* Free cooling fan 3
J16-4	NO11	Contact relay 11	Medium	* Free cooling fan 4
J16-5	C9	Com. relay 9, 10, 11	Medium	
J17-1	NO12	NO contact relay 12	Medium	Summer / winter valve 3
J17-2	C12	Com. relay 12	Medium	
J17-3	NC12	NC contact relay 12	Medium	
J18-1	NO13	NO contact relay 13	Medium	Summer / winter valve 4
J18-2	C13	Com. relay 13	Medium	
J18-3	NC13	NC contact relay 13	Medium	
J19-1	ID15H	Digital IN 15 230V	Large	High pressure switch compressor 4
J19-2	ID15	Digital IN 15 24V	Large	
J19-3	ID15C	Com. digital IN 13 e 14	Large	
J19-4	ID16	Digital IN 16 24V	Large	
J19-5	ID16H	Digital IN 16 230V	Large	Compressor cut-out switch 4
J20-1	Y5	Anal. output 5	Large	
J20-2	Y6	Anal. output 6	Large	
J20-3	B9	Analogue passive IN 9	Large	Outlet water temperature 4 “antifrost evaporator 4”
J20-4	BC9	Common anal. input 9	Large	
J20-5	B10	Analogue passive IN 10	Large	
J20-6	BC10	Common anal. input 10	Large	
J20-7	ID17	Digital IN 17 24V	Large	
J20-8	ID18	Digital IN 18 24V	Large	
J20-9	IDC17	Com. digital IN 13 e 14	Large	
J21-1	NO14	NO contact relay 14	Large	
J21-2	C14	Com. relay 14	Large	
J21-3	NC14	NC contact relay 14	Large	
J21-4	NO15	NO contact relay 15	Large	Compressor 4 ”1st start-up PW”
J21-5	C15	Com. relay 15	Large	
J21-6	NC15	NC contact relay 15	Large	
J22-1	C16	Com. relay 16, 17 + 18	Large	
J22-2	NO16	NO contact relay 16	Large	Compressor 4 “2nd start-up PW”
J22-3	NO17	NO contact relay 17	Large	Compressor 4 "1st step / valve increase power
J22-4	NO18	NO contact relay 18	Large	Compressor 4 "2nd step / valve reduce power
J22-5	C16	Com. relay 16,17 + 18	Large	
J23-1	E-	Conn. RS485	Large	
J23-2	E+	Conn. RS485	Large	
J23-3	GND	Conn. RS485	Large	

The water temperature from the condenser/evaporator outlet for the antifrost function during heat pump operation will be controlled by the additional board.
Inlets and outlets marked by the symbol “*” substitute the same functions in the board with “code 3”.

4.2.8 Multiple-function inputs and outputs

Some inputs and outputs can be used for different functions, depending on the machine type configured and the functions enabled.

- NO3: Contact used for first step of capacity control; also used to open step-control cylinder and increase the power yield of units with continuous step-control function.
- NO4: Contact used for second step of capacity control; also used to open step-control cylinder and decrease the power yield of units with continuous step-control function.
- NO17: Contact used for first step of capacity control; also used to actuate the step-control cylinder and increase the power yield of units with continuous step-control function.
- NO18: Contact used for second step of capacity control; also used to actuate the step-control cylinder and decrease the power yield of units with continuous step-control function.

The board cannot enable heat pump and free cooling functions at the same time.

5. MESSAGES

5.1 Message pages

The pages from each section can be accessed by pressing one or a combination of keys, as indicated in the order given below.
The messages are ordered into the following sections: menu, set, maintenance, I/O, info.
Make use of the arrow keys to move from one page to another.
The cursor is always positioned in the field at the top left of each page displayed.
Press the “enter” key to move inside the pages between fields containing values to be configured. Press the “enter” key to confirm settings made.
Move the cursor inside the page to the value to be modified, then use the arrow keys to set the required value; press the key with the arrow pointing upwards to increase the value, the key with the arrow pointing downwards to decrease it.

5.1.1 Menu pages

The menu section features all the parameters concerning unit operation.
To access the service section, press the “menu” key.
Once the section has been accessed, scroll the pages by means of the “up” and “down” arrow keys

MENU_1

Inlet Water 00.0°C
Set +00.0°C
System: OFF
Chiller Operation supervisor.

This page features the inlet water temperature of the chiller, the set point and the current operating status.
Also indicates whether the unit has been shut down by digital input or supervisor. Operation type is also displayed.

MENU_2

Unload
Compressors
Step control

This page is displayed when compressors are operating in step control
caused by digital input or reaching of step control forcing pressure.

MENU_3

Free Cooling
not Operating
Recovery
not Operating

Only accessible when the free cooling and heat recovery functions have
been selected.

MENU_4

Dual Set Point
Dual set point
High Set
Operating 00.0°C

Only displayed when operation with dual set point has been enabled.
The page displays the active setting and value.

MENU_5

Decreasing time 00030
This Increasing time 00120
! !Dead Band!

Only displayed when the outlet temperature control is enabled.
This page displays decreasing or increasing power delays for the controller when reference water temperature is outside the dead band.
When the temperature is outside the dead band, an asterisk is displayed
on the last line.

5.1.2 Settings pages

The settings section is used to make the settings for operation or for parameters specifying special functions.
To access this section, press the “set” key.
Once the section has been accessed, the pages can be scrolled by means of the “up” and “down” arrow keys.
If no key is pressed for five minutes, the display will automatically return to the first page of the menu section.

SET_1

Set Point. Summer 00.0°C Winter 00.0°C

Use this page to define the summer operation set point; if heat pump mode is enabled, use it to define the winter operation set point as well.

SET_2

Dual Set Point Sel. HIGH

This page will only be displayed if operation with dual set point has been enabled and set point modification by keyboard is possible. Use the page to modify the operation set point from HIGH to LOW and
vice-versa.

SET_3

Set Point HIGH 00.0C° LOW 00.0°C

This page will only be displayed if operation with dual set point has been enabled. Use the page to modify set points.

SET_4

Set Point Recovery 00.0°C

This page will only be displayed if the heat recovery function has been
enabled.
Use the page to define the recovery set point.

SET_5

Set Point Pressure Operation 00.0 Bar

This page will only be displayed if the heat recovery function has been
enabled. Use the page to define the operating set point.

SET_6

Operation NO-LAN Set point 00.0°C Antifrost 00.0°C Max. Temp. 00.0°C

This page will only be displayed if outlet water temperature control has
been enabled. The page specifies when the unit is operating outside the
network (NO-LAN), is a BOSS or a RUNNER unit. It also displays the set,
the antifrost alarm and the maximum delivery temperature.

5.1.3 Maintenance pages

This section is consulted to set and display all parameters relating to maintenance of unit compressors and pumps.
To access the maintenance section, press the key featuring the key symbol.
The pages displaying the number of operating hours of compressors, unit and of pumps, as well as the number of start-ups, can be accessed without a password.
If no key is pressed for five minutes, the display will automatically return to the first page of the menu section.
Access to pages protected by password is reserved for assistance centre personnel.

MANU_1

Operation Hours Unit 00000 Compressor 1 00000 Compressor 2 00000

Features the number of operation hours of the unit and of single compressors.
Compressor 2 will only be displayed if enabled.

MANU_1_1

Operation Hours Compressor 3 00000 Compressor 4 00000

Features the number of operation hours of the unit and of single
The page is only displayed if compressor 3 is enabled (and the line relating to compressor 4 only if it has been enabled).

MANU_2

Starting Unit 00000 Compressor 1 00000 Compressor 2 00000

Shows the number of start-ups of the unit and of single compressors.

Compressor 2 will only be displayed if enabled.

MANU_2_1

Starting Compressor 3 00000 Compressor 4 00000

Displays the number of start-ups by compressors 3 and 4.
The page is only displayed if compressor 3 is enabled (and the line relating to compressor 4 only if it has been enabled).

MANU_3

Operation Hours Pump 1 00000 Pump 2 00000

Shows the number of operation hours of each pump.
The page and line relating to pump 2 will only be displayed if it is enabled.

MANU_4

Starting Pump 1 00000 Pump 2 00000

Displays the number of start-ups of each pump.

The page and line relating to pump 2 will only be displayed if it is enabled.

MANU_4_1

Rotation counter Unit 1 000000h Unit 2 000000h Unit 3 000000h

This page and the next two concern the controller boss function.
The number of pages displayed in the section depends on the number
of units in the network.
The pages display the operating time of the relative unit.

MANU_4_2

Rotation counter Unit 4 000000h Unit 5 000000h Unit 6 000000h

MANU_4_3

Rotation counter Unit 7 000000h Unit 8 000000h

MANU_5

Maintenance Password 00000 00000

Access to pages protected by a password is reserved for assistance centre personnel.

5.1.4 I/O pages

The I/O section displays the status of digital and analogue inputs and outputs.
To access the I/O section, press the “I/O” key.
Once the section has been accessed, scroll the pages by means of the “up” and “down” arrow keys
If no key is pressed for five minutes, the display will automatically return to the first page of the menu section.

I_0_100

Unit status U1:- U2:- U3:- U4:- U5:- U6:- U7:- U8:-

This page will only be displayed on a boss unit.
It displays the status of other units in the network.
R = Operating unit; S = Back-up unit; O = Unit off;
F = Forced unit; - = Unit not envisaged.

I_0_1

Reference Water Temperature +00.0°C Outlet 1 +00.0°C Outlet 2 +00.0°C

Displays the reference and outlet water temperature of chiller unit.
Outlet temperature of two circuits (if applicable) is also displayed.

I_0_2

Water Temperature Outlet 3 +00.0°C Outlet 4 +00.0°C

Displays the temperature of outlet water from circuits 3 and 4.

I_0_13

Pressure Suction 00.0bar

Displays the reference pressure of unit operation.

I_0_12

Water Temperature Well 1 00.0°C Well 2 00.0°C Well 3 00.0°C

Displays the temperature of well water at the outlet of condenser/evaporator exchangers in heat pump units.

I_0_11

External Temperature 00.0°C Recovery Temperature 00.0°C

Displays the reading by external air and recovery probes.
This page is only displayed if the functions are controlled by the controller.

I_0_3

Circuit 1 H 00.0 L 00.0 O 00.0 B 00.0 B 00.0 D 00.0 D 00.0

These pages (the number of which depends on the number of compressors) display the pressure readings of high, low and oil sensors.
As regards low and high pressure, the relative gas temperature is shown.
For mixed gases,the page shows the temperature of liquid B and steam D.

I_0_4

Circuit 2 H 00.0 L 00.0 O 00.0 B 00.0 B 00.0 D 00.0 D 00.0

I_0_5

Circuit 3 H 00.0 L 00.0 O 00.0 B 00.0 B 00.0 D 00.0 D 00.0

I_0_6

Circuit 4 H 00.0 L 00.0 O 00.0 B 00.0 B 00.0 D 00.0 D 00.0

I_0_7

Digital Input Status 1 - 25 CCCCC CCCCC CCCCC CCCCC CCCCC

Digital input status:
C = closed; A = open

I_0_8

Digital Output Status 1 – 18 AAAAA AAAAA AAAAA AAA

Digital output status:
C = closed; A = open

I_0_9

Digital Output Status 19 – 36 AAAAA AAAAA AAAAA AA

Digital output status of second unit board (if installed):
C = closed; A = open

I_0_10

Fan Speed 000% | Free Cooling 000% |

Percentage of signal sent to the speed regulator.
This page also shows whether the free cooling function has been configured for the relative valve.

I_0_14

Recovery valve 000% |

Displays the percentage of the signal sent to recovery valve (if function
has been enabled).

INFO_1

CHILLER/HP	Add. 00
BLUE BOX	
Cod. FLBBOMP20A	
Ver. 1.*** dd/mm/yyyy	

Code, version and date of issue of program, and address in the pLAN of current board.

INFO_2

Testing Date dd/mm/yyyy Inspector Code 00000

Date of testing and inspector code.

5.1.5 Info “?” pages

The Info “?” section does not feature any active pages.

5.1.6 Clock pages

The clock section displays the current date and time; these data can be modified after a password has been entered.
To access this section, press the “clock” key.
Once the section has been accessed, scroll to the page requiring the password by means of the “up” and “down” arrow keys.
The password has been set by default to 00001.
Once the correct password has been entered and confirmed, use the arrow keys to move to the page displaying time and date.
If no key is pressed for five minutes, the display will automatically return to the first page of the menu section.

OROL_1

Date 00/00/00 dd/mm/yy Hour 00 : 00 hh : mm

Current date and time.

OROL_2

Clock Password 00000

Password to be entered for access to page for correction of time and date displayed by the controller.

OROL_3

Date 00/00/00 dd/mm/yy Hour 00 : 00 hh : mm

Set current date and time in this page.

5.2 Alarm pages

Every alarm or detection of malfunction will cause an alarm page to be displayed.
Use the “alarm” key to display the alarm pages.
Press the “alarm” key once to silence the alarm siren (if applicable), twice to display the active alarm page (or the relative page if no alarm has been set off), three times to cancel all alarms.
Use the arrow keys to scroll the active alarm pages.
If no key is pressed for thirty minutes, the display will automatically return to the first page of the menu section.

5.2.1 Alarms list

ALL_1

No Alarm Active

This page is displayed when the “alarm” key is pressed twice and no alarm is active.

ALL_2

Flow Switch Alarm

Alarm displayed when the digital input of the water flow switch is open.
This alarm inhibits start-up of compressor while the relative pump is active.
The alarm can be cancelled manually only.

ALL_3

Pump 1 Overload

Alarm immediately displayed when the cut-out switch on pump 1 is open and pump operation has been requested.
The alarm shuts down the pump and enables a back-up (if fitted), otherwise unit operation is inhibited. Can only be cancelled manually by
keyboard.

ALL_4

Pump 2 Overload

Alarm immediately displayed when the cut-out switch on pump 2 is open and pump operation has been requested.
The alarm shuts down the pump and enables a back-up (if fitted), otherwise.
unit operation is inhibited. Can only be cancelled manually by keyboard.

ALL_5

Compressor 1 High Pressure

Alarm displayed when the digital input of the high pressure switch on circuit 1 is open, or when the pressure detected by the high pressure transducer on circuit 1 exceeds the value of the active alarm. This alarm
will immediately shut down compressor 1. Can only be cancelled manually by keyboard.

ALL_6

Compressor 2 High Pressure

Alarm displayed when the digital input of the high pressure switch on circuit 2 is open, or when the pressure detected by the high pressure transducer on circuit 2 exceeds the value of the active alarm. This alarm
will immediately shut down compressor 2. Can only be cancelled manually by keyboard.

ALL_7

Compressor 3 High Pressure

Alarm displayed when the digital input of the high pressure switch on circuit 3 is open, or when the pressure detected by the high pressure transducer on circuit 3 exceeds the value of the active alarm. This

	alarm will immediately shut down compressor 3. Can only be cancelled manually by keyboard.

ALL_8

Compressor 4 High Pressure

Alarm displayed when the digital input of the high pressure switch on circuit 4 is open, or when the pressure detected by the high pressure transducer on circuit 4 exceeds the value of the active alarm. This alarm
will immediately shut down compressor 4. Can only be cancelled manually by keyboard.

ALL_11

Compressor 1 Low Pressure

Alarm displayed when the pressure detected by the low pressure transducer on circuit 1 is lower than value lp1 or lp2.
This delayed alarm will cause compressor 1 to shut down. This alarm can be reset manually or automatically, depending on the configuration.

ALL_12

Compressor 2 Low Pressure

Alarm displayed when the pressure detected by the low pressure transducer on circuit 2 is lower than value lp1 or lp2.
This delayed alarm will cause compressor 2 to shut down. This alarm can be reset manually or automatically, depending on the configuration.

ALL_13

Compressor 3 Low Pressure

Alarm displayed when the pressure detected by the low pressure transducer on circuit 3 is lower than value lp1 or lp2.
This delayed alarm will cause compressor 3 to shut down. This alarm can be reset manually or automatically, depending on the configuration.

ALL_14

Compressor 4 Low Pressure

Alarm displayed when the pressure detected by the low pressure transducer on circuit 4 is lower than value lp1 or lp2.
This delayed alarm will cause compressor 4 to shut down. This alarm can be reset manually or automatically, depending on the configuration.

ALL_17

Compressor 1 Oil Differential

Alarm displayed when the pressure difference between the oil and suction is lower than the reference differential set.
This delayed alarm will immediately cause compressor 1 to shut down.
Manual reset.

ALL_18

Compressor 2 Oil Differential

Alarm displayed when the pressure difference between the oil and suction is lower than the reference differential set.
This delayed alarm will immediately cause compressor 2 to shut down.
Manual reset.

ALL_19

Compressor 3 Oil Differential

Alarm displayed when the pressure difference between the oil and suction is lower than the reference differential set.
This delayed alarm will immediately cause compressor 3 to shut down.
Manual reset.

ALL_20

Compressor 4 Oil Differential Pressure Switch

Alarm displayed when the pressure difference between the oil and suction is lower than the reference differential set.
This delayed alarm will immediately cause compressor 4 to shut down.
Manual reset.

ALL_23

Compressor 1 Thermal Overload Protection

The opening of the digital input of the thermal cut-out switch will cause
compressor 1 to shut down immediately and this page to be displayed.
Manual reset.

ALL_24

Compressor 2 Thermal Overload Protection

The opening of the digital input of the thermal cut-out switch will cause
compressor 2 to shut down immediately and this page to be displayed.
Manual reset.

ALL_25

Compressor 3 Thermal Overload Protection

The opening of the digital input of the thermal cut-out switch will cause
compressor 3 to shut down immediately and this page to be displayed.
Manual reset.

ALL_26

Compressor 4 Thermal Overload Protection

The opening of the digital input of the thermal cut-out switch will cause
compressor 4 to shut down immediately and this page to be displayed.
Manual reset.

ALL_27

Unit Needs Maintenance

Alarm displayed when the unit operation hours have exceeded the limit
configured for Maintenance.
This alarm is displayed only, and does not cause the unit to shut down.
The alarm can only be reset from the Maintenance section.

ALL_28

Compressor 1 Needs Maintenance

Alarm displayed when the compressor 1 operation hours have exceeded
the limit configured for Maintenance.
This alarm is displayed only, and does not cause the compressor to shut
down. The alarm can only be reset from the Maintenance section.

ALL_29

Compressor 2 Needs Maintenance

Alarm displayed when the compressor 2 operation hours have exceeded
the limit configured for Maintenance.
This alarm is displayed only, and does not cause the compressor to shut
down. The alarm can only be reset from the Maintenance section.

ALL_30

Compressor 3 Needs Maintenance

Alarm displayed when the compressor 3 operation hours have exceeded the limit configured for Maintenance.
This alarm is displayed only, and does not cause the compressor to shut
down. The alarm can only be reset from the Maintenance section.

ALL_31

Compressor 4 Needs Maintenance

Alarm displayed when the compressor 4 operation hours have exceeded the limit configured for Maintenance.
This alarm is displayed only, and does not cause the compressor to shut
down. The alarm can only be reset from the Maintenance section.

ALL_34

Pump 1 Needs Maintenance

Alarm displayed when the pump 1 operation hours have exceeded the
limit configured for Maintenance.
This alarm is displayed only, and does not cause the pump to shut down.
The alarm can only be reset from the Maintenance section.

ALL_35

Pump 2 Needs Maintenance

Alarm displayed when the pump 2 operation hours have exceeded the
limit configured for Maintenance.
This alarm is displayed only, and does not cause the pump to shut down.
The alarm can only be reset from the Maintenance section.

ALL_36

Defrost End Maximum Time Exceeded

Alarm displayed when defrosting has ended due to maximum time expiry.
This alarm does not depend on alarm digital output, and can be cancelled manually, or automatically after defrosting cycle is completed
normally.

ALL_36_1

Defrost End Maximum Time Exceeded Circuit 1

Alarm displayed when defrosting in circuit 1 has ended due to maximum time expiry.
This alarm does not depend on alarm digital output, and can be cancelled manually, or automatically after defrosting cycle is completed
normally.

ALL_36_2

Defrost End Maximum Time Exceeded Circuit 2

Alarm displayed when defrosting in circuit 2 has ended due to maximum time expiry.
This alarm does not depend on alarm digital output, and can be cancelled manually, or automatically after defrosting cycle is completed
normally.

ALL_36_3

Defrost End Maximum Time Exceeded Circuit 3

Alarm displayed when defrosting in circuit 3 has ended due to maximum time expiry.
This alarm does not depend on alarm digital output, and can be cancelled manually, or automatically after defrosting cycle is completed
normally.

ALL_36_4

Defrost End Maximum Time Exceeded Circuit 4

Alarm displayed when defrosting in circuit 4 has ended due to maximum time expiry.
This alarm does not depend on alarm digital output, and can be cancelled manually, or automatically after defrosting cycle is completed
normally.

ALL_37

Well Water Flow Switch

Alarm displayed when relative digital input is opened with unit in operation. After a delay, this alarm shuts down unit compressors.
Manual reset.

ALL_38

Fan Protections

Alarm displayed when fan cut-out switch is opened with unit in operation.
This alarm immediately shuts down unit compressors, and is reset manually when input of the fan cut-out switch is closed when unit is in operation.

ALL_39

User Water Inlet

Alarm displayed when inlet water temperature remains higher than

High Temperature Threshold Exceeded

the
maximum limit set for summer operation longer than the “threshold delay”.
The alarm shuts down compressor operation, though pump will continue.
Can be reset manually at any time, compressors will restart and delay reset.

ALL_40

User Water Inlet Low Temperature Threshold Exceeded

Alarm displayed when inlet water temperature remains lower than the minimum limit set for winter operation longer than the “threshold delay”.
The alarm shuts down compressor operation, though pump will continue.
Can be reset manually at any time, compressors will restart and delay reset.

ALL_41

User Water Outlet Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when user circuit outlet water temperature drops below antifrost limit during cooling mode operation. This alarm shuts down unit compressors, while pumps continue. Can be reset manually
when outlet water temperature rises above alarm cut-in limit plus relative differential.

ALL_42

Well Water Outlet Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when source water outlet temperature drops below antifrost limit during heating operating mode. This alarm shuts down unit compressors. Can be reset manually when outlet water temperature rises above alarm cut-in limit plus relative differential.

ALL_43

User Water Outlet High Temperature Threshold Exceeded

Alarm displayed when user circuit outlet water temperature exceeds maximum operating limit. This alarm shuts down unit compressors, while pumps continue. Can be reset manually when outlet water temperature drops below alarm cut-in limit less relative differential.

ALL_44

Well Water Outlet High Temperature Threshold Exceeded

Alarm displayed when circuit outlet source water temperature in water/water unit exceeds maximum limit in summer operating mode. This alarm shuts down unit operation. Can be reset manually when outlet water temperature drops below alarm cut-in limit less relative differential.

ALL_45

User Water Outlet 1 Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when water outlet temperature of circuit 1 drops below
antifrost value specified by service section. This alarm shuts down compressor 1. Can be reset manually when water temperature rises above threshold plus relative differential.

ALL_46

User Water Outlet 2 Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when water outlet temperature of circuit 2 drops below
antifrost value specified by service section. This alarm shuts down compressor 2. Can be reset manually when water temperature rises above threshold plus relative differential.

ALL_47

User Water Outlet 3

Alarm displayed when water outlet temperature of circuit 3 drops below

Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C	antifrost value specified by service section. This alarm shuts down compressor 3. Can be reset manually when water temperature rises above threshold plus relative differential.

ALL_48

User Water Outlet 4 Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when water outlet temperature of circuit 4 drops below
antifrost value specified by service section. This alarm shuts down compressor 4. Can be reset manually when water temperature rises above threshold plus relative differential.

ALL_51

Well Water Outlet 1 Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when source water temperature at exchanger outlet on
circuit 1 drops below the antifrost threshold specified by service section.
This alarm shuts down compressor 1. Can be reset manually when water
temperature rises above cut-in threshold plus relative differential.

ALL_52

Well Water Outlet 2 Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when source water temperature at exchanger outlet on
circuit 2 drops below antifrost threshold specified by service section.
This alarm shuts down compressor 2. Can be reset manually when water
temperature rises above cut-in threshold plus relative differential.

ALL_53

Well Water Outlet 3 Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when source water temperature at exchanger outlet on
circuit 3 drops below antifrost threshold specified by service section.
This alarm shuts down compressor 3. Can be reset manually when water
temperature rises above cut-in threshold plus relative differential.

ALL_54

Well Water Outlet 4 Low Temp. Threshold Exceeded: Manual Reset at Min. 00.0°C

Alarm displayed when source water temperature at exchanger outlet on
circuit 4 drops below antifrost threshold specified by service section.
This alarm shuts down compressor 4. Can be reset manually when water
temperature rises above cut-in threshold plus relative differential.

ALL_57

User Water Outlet 1 High Temperature Threshold Exceeded

Alarm displayed when water temperature at user circuit 1 outlet exceeds maximum operating limit during heating mode. This alarm shuts down compressor 1 while pumps continue. Can be reset manually
when outlet temperature drops below cut-in threshold less relative differential.

ALL_58

User Water Outlet 2 High Temperature Threshold Exceeded

Alarm displayed when water temperature at user circuit 2 outlet exceeds maximum operating limit during heating mode. This alarm shuts down compressor 2 while pumps continue. Can be reset manually
when outlet temperature drops below cut-in threshold less relative differential.

ALL_59

User Water Outlet 3 High Temperature Threshold Exceeded

Alarm displayed when water temperature at user circuit 3 outlet exceeds maximum operating limit during heating mode. This alarm shuts down compressor 3 while pumps continue. Can be reset manually
when outlet temperature drops below cut-in threshold less relative differential.

ALL_60

User Water Outlet 4 High Temperature Threshold Exceeded

Alarm displayed when water temperature at user circuit 4 outlet exceeds maximum operating limit during heating mode. This alarm shuts down compressor 4 while pumps continue. Can be reset manually
when outlet temperature drops below cut-in threshold less relative differential.

ALL_63

Well Water Outlet 1 High Temperature Threshold Exceeded

Alarm displayed when well water temperature on circuit 1 exceeds maximum operating limit during heating mode. This alarm shuts down
compressor 1 while pumps continue. Can be reset manually when outlet
temperature drops below cut-in threshold less relative differential.

ALL_64

Well Water Outlet 2 High Temperature Threshold Exceeded

Alarm displayed when well water temperature on circuit 2 exceeds maximum operating limit during heating mode. This alarm shuts down
compressor 2 while pumps continue. Can be reset manually when outlet
temperature drops below cut-in threshold less relative differential.

ALL_65

Well Water Outlet 3 High Temperature Threshold Exceeded

Alarm displayed when well water temperature on circuit 3 exceeds maximum operating limit during heating mode. This alarm shuts down
compressor 3 while pumps continue. Can be reset manually when outlet
temperature drops below cut-in threshold less relative differential.

ALL_66

Well Water Outlet 4 High Temperature Threshold Exceeded

Alarm displayed when well water temperature on circuit 4 exceeds maximum operating limit during heating mode. This alarm shuts down
compressor 4 while pumps continue. Can be reset manually when outlet
temperature drops below cut-in threshold less relative differential.

ALL_69

High Suction Pressure Threshold Exceeded

Alarm displayed when suction pressure exceeds maximum inlet value.
Delay is same as for temperature threshold alarm.

ALL_70

Phase Sequence Failure

Alarm displayed when input enabled for phase sequence control has remained open for more than 60 seconds after powering by controller.
This alarm inhibits unit start-up, and is cancelled manually.

ALL_71

Lacking Aux. Supply

Alarm displayed when input enabled to check for voltage is open.
This alarm shuts down unit operation. After a delay, the unit will restart
automatically when the input is closed.

ALL_72

Failed Connection Between pLAN Boards	Alarm displayed when Master detects incompatibility between controller software configuration and connection.

ALL_73

Clock Fault	Alarm displayed when controller detects clock fault.

ALL_74

Reference Temperature Alarm Connected Probe Faulty or not	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_75

Reference Pressure Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_76

High Pressure 1 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_77

Low Pressure 1 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_78

Oil Pressure 1 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_79

Antifrost 1 Temperature Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_80

High Pressure 2 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_81

Low Pressure 2 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_82

Oil Pressure 2 Alarm	Alarm displayed when values outside operating limits have been detected at relative input.

Probe Faulty or not Connected

ALL_83

Antifrost 2 Temperature Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_84

High Pressure 3 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_85

Low Pressure 3 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_86

Oil Pressure 3 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_87

Antifrost 3 Temperature Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_88

High Pressure 4 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_89

Low Pressure 4 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_90

Oil Pressure 4 Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_91

Antifrost 4 Temperature Alarm Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_92

Temp. Probe Alarm Ext. air Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_93

Recovery Water Alarm Temp. Probe Faulty or not Connected	Alarm displayed when values outside operating limits have been detected at relative input.

ALL_94

Recovery High pressure 1	Alarm displayed when recovery is stopped due to reaching of maximum permitted pressure (i.e. value set in HP2) in circuit 1.

ALL_95

Recovery High pressure 2	Alarm displayed when recovery is stopped due to reaching of maximum permitted pressure (i.e. value set in HP2) in circuit 2.

ALL_96

Recovery High pressure 3	Alarm displayed when recovery is stopped due to reaching of maximum permitted pressure (i.e. value set in HP2) in circuit 3.

ALL_97

Recovery High pressure 4	Alarm displayed when recovery is stopped due to reaching of maximum permitted pressure (i.e. value set in HP2) in circuit 4.

ALL_100

pLAN alarm Board 31 offline	Alarm displayed when, in unit configuration, following enabled functions, the presence of a Small board with address 31 is required.

ALL_110

>Caution< pLAN configuration error	Alarm displayed when number of units installed in boss/runner configuration does not correspond to specified number.

ALL_111

Unit 1 offline	Alarm displayed when unit 1 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

ALL_112

Unit 2 offline	Alarm displayed when unit 2 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

ALL_113

Unit 3 offline	Alarm displayed when unit 3 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

ALL_114

Unit 4 offline

Alarm displayed when unit 4 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

ALL_115

Unit 5 offline

Alarm displayed when unit 5 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

ALL_116

Unit 6 offline

Alarm displayed when unit 6 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

ALL_117

Unit 7 offline

Alarm displayed when unit 7 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

ALL_118

Unit 8 offline

Alarm displayed when unit 8 is offline in boss/runner configuration. This page is also displayed on other units connected to network.

Aderisce al Consorzio Piove Clima

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