OPERATION MANUAL

Air cooled inverter water chillers

D-EOMAC00909-14EN

EWAD TZ-SS - Screw - R134a - 170÷710 kW - SILVER
EWAD TZ-SR - Screw - R134a - 170÷710 kW - SILVER
EWAD TZ-XS - Screw - R134a - 180÷682 kW - GOLD
EWAD TZ-XR - Screw - R134a - 180÷682 kW - GOLD
EWAD TZ-PS - Screw - R134a - 185÷639 kW - PLATINUM
EWAD TZ-PR - Screw - R134a - 185÷639 kW - PLATINUM

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1 SAFETY CONSIDERATIONS

1.1 General

Installation, start-up and servicing of equipment can be hazardous if certain factors particular to the installation are not considered: operating pressures, presence of electrical components and voltages and the installation site (elevated plinths and built-up up structures). Only properly qualified installation engineers and highly qualified installers and technicians, fully trained for the product, are authorised to install and start-up the equipment safely.

During all servicing operations, all instructions and recommendations, which appear in the installation and service instructions for the product, as well as on tags and labels fixed to the equipment and components and accompanying parts supplied separately, must be read, understood and followed.

Apply all standard safety codes and practices.

Wear safety glasses and gloves.

Use the proper tools to move heavy objects. Move units carefully and set them down gently.

1.2 Avoid electrocution

Only personnel qualified in accordance with IEC (International Electrotechnical Commission) recommendations may be permitted access to electrical components. It is particularly recommended that all sources of electricity to the unit be shut off before any work is begun. Shut off main power supply at the main circuit breaker or isolator.

IMPORTANT: This equipment uses and emits electromagnetic signals. Tests have shown that the equipment conforms to all applicable codes with respect to electromagnetic compatibility.

RISK OF ELECTROCUTION: Even when the main circuit breaker or isolator is switched off, certain circuits may still be energised, since they may be connected to a separate power source.

RISK OF BURNS: Electrical currents cause components to get hot either temporarily or permanently. Handle power cable, electrical cables and conduits, terminal box covers and motor frames with great care.

ATTENTION: In accordance with the operating conditions the fans can be cleaned periodically. A fan can start at any time, even if the unit has been shut down.

1.3 Safety Devices

Each unit is equipped with safety devices of three different kinds:

1.3.1 General safety devices

Safeties of this level of severity will shut down all the circuits and stop the entire unit. When a general safety device will occur a manual intervention on the unit will be required in order to re-establish the normal operability of the machine. There are exceptions to this general rule in case of alarms linked to temporary abnormal conditions.

- Emergency Stop

A push button is placed on a door of the unit electrical panel. The button is highlighted by a red color in yellow background. A manual pressure of the emergency stop button stops all loads from rotating, thus preventing any accident which may occur. An alarm is also generated by the Unit Controller. Releasing the emergency stop button enables the unit, which may be restarted only after the alarm has been cleared on the controller.

The emergency stop causes all motors to stop, but does not switch off power to the unit. Do not service or operate on the unit without having switched off the main switch.

1.3.2 Circuit safety devices

Safety of this level of severity will shut down the circuit they protect. The remaining circuits will keep running.

1.3.3 Component safety devices

Safety of this level of severity will shut down a component against abnormal running condition that could create permanent damages to it. An overview of the protecting devices is listed below:

- Overcurrent/Overload Protections

Overcurrent/overload devices protect electrical motors used on compressors, fans and pumps in case of overload or short circuit. In case of inverter-driven motors, overload and overcurrent protection is integrated in the electronic drives. A further protection from short circuit is accomplished by fuses or circuit breakers installed upstream each load or group of loads.

- Overtemperature Protections

Compressor and fan electrical motors are also protected from overheating by thermistors immersed into motor windings. Should the winding temperature exceed a fixed threshold, the thermistors will trip and cause the motor to stop. High Temperature Alarm is recorded in the Unit Controller only in case of compressors. Alarm must be reset from the controller.

Do not operate on a faulty fan before the main switch has been shut off. Overtemperature protection is auto-reset, therefore a fan may restart automatically if temperature conditions allow it.

- Phase reversal, under/over voltage, ground fault protections

When one of those alarms occurs the unit is immediately stopped or even inhibited to start. The alarms clear automatically once the problem is fixed. This auto clear logic allows the unit to automatically recover in case of temporary conditions where the supply voltage reaches the upper or lower limit set on the protection device. In the other two cases a manual intervention

on the unit will be required in order to solve the problem. In case of a phase reversal alarm two phases requires to be inverted.

In the event of a power supply outage, the unit will restart automatically without the need for an external command. However, any faults active when the supply is interrupted are saved and may in certain cases prevent a circuit or unit from restarting.

Direct intervention on the power supply can cause electrocution, burns or even death. This action must be performed only by trained persons.

- Flowswitch

The unit must be protected by a flowswitch. The flowswitch will stop the unit when the water flow becomes lower than the minimum allowed flow. When the water flow is restored the flow protection resets automatically. Exception is when the flowswitch opens with at least one compressor running, in this case the alarm shall be cleared manually.

- Freezing protection

Antifreeze protection prevents the water to freeze in the evaporator. It is automatically activated when the water temperature (entering or leaving) at the evaporator drops below the antifreeze limit. In freeze condition if the unit is in standby the evaporator pump will be activated to prevent freezing of the evaporator. If the freeze condition will activate when the unit is running all the unit will shut down in alarm while the pump will keep running. Alarm will automatically clear when the freeze condition will clear.

- Low pressure protection

If the circuit operates with a suction pressure lower than an adjustable limit for a certain time the circuit safety logic will shut down the circuit and generate an alarm. The alarm requires a manual action on the Unit Controller to be reset. Reset will take effect only if the suction pressure is no longer lower that the safety limit.

- High Pressure Protection

If the discharge pressure becomes too high and exceeds a limit which is linked with the operational envelop of the compressor the circuit safety logic will try to prevent the alarm or, if the corrective actions have no effect, it will shut down the circuit before the Mechanical High Pressure switch will open. This alarm required a manual action on the Unit Controller to be reset.

- Mechanical High Pressure Switch

Each circuit is equipped with at least one high pressure switch which tries to prevent the relief safety valve to open. When the discharge pressure becomes too high the Mechanical High Pressure switch will open and immediately stop the compressor cutting the power supply to the auxiliary relay. The alarm can be cleared as soon as the discharge pressure becomes normal again. The alarm must be reset on the switch itself and on the Unit Controller. The triggering pressure value cannot be changed.

- Relief Safety Valve

If the pressure becomes too high in the refrigerant circuit, the relief valve will open to limit the maximum pressure. If this happens switch off immediately the machine and contact your local service organization.

- Inverter fault

Each compressor can be equipped with its own inverter (integrated or external). The inverter can automatically monitor its status and inform the Unit Controller in case of faults or pre-alarm conditions. If this happen the Unit Controller will limit the compressor operation or eventually switch off the circuit in alarm. A manual action on the controller will be needed in order to clear the alarm.

1.4 Available sensors

1.4.1 Pressure transducers

Two types of electronic sensors are used to measure suction, discharge and oil pressure on each circuit. The range of each sensor is clearly indicated on the sensor casing. Discharge and oil pressures are monitored using a sensor of the same range.

1.4.2 Temperature sensors

The evaporator water sensors are installed in the entering and leaving side. An outdoor temperature sensor is mounted inside the chiller. Additionally each circuit installs a suction and discharge temperature sensors to monitor and control the superheated refrigerant temperatures.

On refrigerant-cooled inverters additional sensors immersed into the cooling plate measure the temperature of the drives.

1.4.3 Thermistors

Each compressor is equipped with PTC thermistors which are immersed into motor windings for motor protection. Thermistors trip to a high value in case the motor temperature reaches a hazardous temperature.

1.4.4 Leak detectors

As an option the unit can be equipped with leak detectors to sense the air in the compressor cabin and being able to identify a refrigerant leakage in that volume.

1.5 Available Controls

1.5.1 Evaporator pumps

The controller can regulate one or two evaporator pumps and takes care of automatic change-over between pumps. It's also possible to prioritize the pumps and temporarily disable one of the twos. The controller is also able to control the pump speeds if the pumps are equipped with inverters.

1.5.2 Compressors

The controller can regulate one or two compressors installed on one or two independent refrigerant circuit (one compressor per circuit). All the safeties of each compressor will be managed by the controller. Embedded inverter safeties are handled by the inverter onboard electronic and only notified to the UC.

1.5.3 Expansion Valve

The controller can regulate an electronic expansion valve per each refrigerant circuit. Microtech® III embedded logic will always guarantee the best operation for the refrigerant circuit.

1.6 Customer Terminal Block Connections

1.6.1 General description

The contacts below are available at the user's terminal block referred as MC24 or MC230 in the wiring diagram. The following table summarises the connections at the user's terminal block.

Description	Terminals	Notes
Flow Switch (mandatory)	708, 724	24 Vdc digital input
Double setpoint	703, 728	24 Vdc digital input
Current limit enable	884, 885	24 Vdc digital input
External Fault	881,884	24 Vdc digital input
Rapid Restart Enable (optional)	764, 765	24 Vdc digital input
Back-up chiller (optional)	764, 763	24 Vdc digital input
LOC/BMS selection (optional)	894, 895	24 Vdc digital input
On-Off Remote	540, 541	230 Vac digital input
General Alarm	525, 526	NO digital output (24…230 Vac ext supply)
Compressor #1 status	512, 513	NO digital output (24…230 Vac ext supply)
Compressor #2 status	514, 515	NO digital output (24…230 Vac ext supply)
Alarm Circuit #1 (optional)	560, 561	NO digital output (24…230 Vac ext supply)
Alarm Circuit #2 (optional)	560, 562	NO digital output (24…230 Vac ext supply)
Evaporator Pump #1 start	806, 805	NO digital output (24 Vdc internal supply)
Evaporator Pump #2 start	806, 807	NO digital output (24 Vdc internal supply)
Demand Limit	888, 889	4-20 mA analog input
Current Limit (optional)	886, 890	4-20 mA analog input
Setpoint Override	886, 887	4-20 mA analog input
Pump VFD Signal (optional)	882, 883	0-10 Vdc analog input

1.6.1.1 Flow Switch

Although the flow switch is offered as an optional, it is mandatory to install one and connect it to the digital input terminals in order to enable chiller operation only when a minimum flow is sensed.

Operating the unit by-passing the flow switch input or without an appropriate flow switch may damage the evaporator due to freezing. Operation of the flow switch must be checked prior to start up the unit.

1.6.1.2 Double setpoint

This contact can be used to switch between two different LWT setpoints and, depending on the application, between different modes of operation.

Ice operation must be selected in case of ice storage application. In this case the UC will run the chiller in on/off mode switching all the chiller off as soon as the setpoint is reached. In this case the unit will run to full capacity and then will switch off applying an ice delay different chiller starts.

1.6.1.3 Current limit (optional)

This optional feature enables a capacity control of the unit in order to limit the input current. The current limit feature is included in the Energy Meter option. The limiting signal will be compared

with a limiting value set on the HMI. By default the current limit setpoint is selected through the HMI; an external 4-20 mA signal can be enabled to allow a remotely changeable setpoint.

1.6.1.4 External Fault

This contact is available to report to the UC a fault or a warning from an external device. It could be an alarm coming from an external pump to inform the UC of the fault. This input can be configured as a fault (unit stop) or a warning (displayed on the HMI without any action on the chiller).

1.6.1.5 Rapid Restart (optional)

Purpose of the rapid restart feature is to let the unit restart in the shortest possible time after a power failure, and then recover in the shortest possible time (maintaining the reliability level of the normal operations) the capacity it had before the power failure. The rapid restart is enabled by the enable switch.

1.6.1.6 Remote On-Off

This unit can be started through a remote enable contact. The Q0 switch must be selected to “Remote”.

1.6.1.7 General Alarm

In case of a unit alarm, this output is closed thus indicating a fault condition to an externally connected BMS.

1.6.1.8 Compressor Status

The digital output is closed when the related circuit is in run state.

1.6.1.9 Alarm Circuit (optional)

This option is included with the “Rapid Restart” option. The related digital contact is closed in case of alarm on a circuit.

1.6.1.10 Evaporator Pump Start

A 24 Vdc digital output (with internal supply) is enabled when a pump (#1 or #2) is required to start. The output can be used to start an external pump (either at fixed or variable speed). The output requires an external input or relay with less than 20 mA excitation current.

1.6.1.11 Demand limit

This optional function can be used to limit the unit capacity percentage to a changeable limit value. This limitation cannot be directly linked to a corresponding limitation of the unit current (50% demand limit can differ from 50% of the unit FLA).

The demand limit signal can be changed continuously between 4 and 20 mA. The Microtech III will convert this signal into a unit capacity limitation changing between minimum capacity and full capacity with a linear relationship. A signal between 0 and 4mA will correspond to a full unit capacity, in this way if nothing is connected to this input no limitation will be applied. The maximum limitation will never force a unit shutdown.

1.6.1.12 Setpoint override

This input allows to apply an offset on the Active Setpoint to adjust the operating point of the ELWT. This input can be used to maximize the comfort.

1.6.1.13 Pump VFD Signal (optional)

When the inverter kit option is required, by default the speed control is customer supplied. The “Pump VFD Signal” terminals allow the customer to connect an external speed reference wire to the inverter. These terminals are placed inside the main electrical panel.

2 GENERAL DESCRIPTION

2.1 General

Microtech® III is a system for controlling single or dual-circuit air-cooled liquid chillers. Microtech® III controls compressor start-up necessary to maintain the desired heat exchanger leaving water temperature. In cooling mode it controls the operation of the fans to maintain the correct condensing pressure in each circuit.

Safety devices are constantly monitored by Microtech® III to ensure their safe operation. Microtech® III also gives access to a Test routine covering all inputs and outputs. All Microtech® III controls can work in accordance with three independent modes:

- Local mode: the machine is controlled by commands from the user interface.
- Remote mode: the machine is controlled by remote contacts (volt-free contacts).

Network mode: the machine is controlled by commands from a BAS system. In this case, a data communication cable is used to connect the unit to the BAS.

When the Microtech® III system operates autonomously (Local or Remote mode) it retains all of its own control capabilities but does not offer any of the features of the Network mode.

2.2 Abbreviations used

In this manual, the refrigeration circuits are called circuit #1 and circuit #2. The compressor in circuit #1 is labelled Cmp1. The other in circuit #2 is labelled Cmp2.

The following abbreviations are used frequently:

UC	Unit controller (Microtech III)
HMI	Human Machine Interface
CP	Condensing Pressure
EP	Evaporating Pressure
CSRT	Condensing Saturated Refrigerant Temperature
ESRT	Evaporating Saturated Refrigerant Temperature
ST	Suction Temperature
DT	Discharge Temperature
SSH	Suction SuperHeat
DSH	Discharge Superheat
EXV	Electronic Expansion Valve
ELWT	Evaporator Leaving Water Temperature
EEWT	Evaporator Entering Water Temperature

2.3 Controller Operating Limits

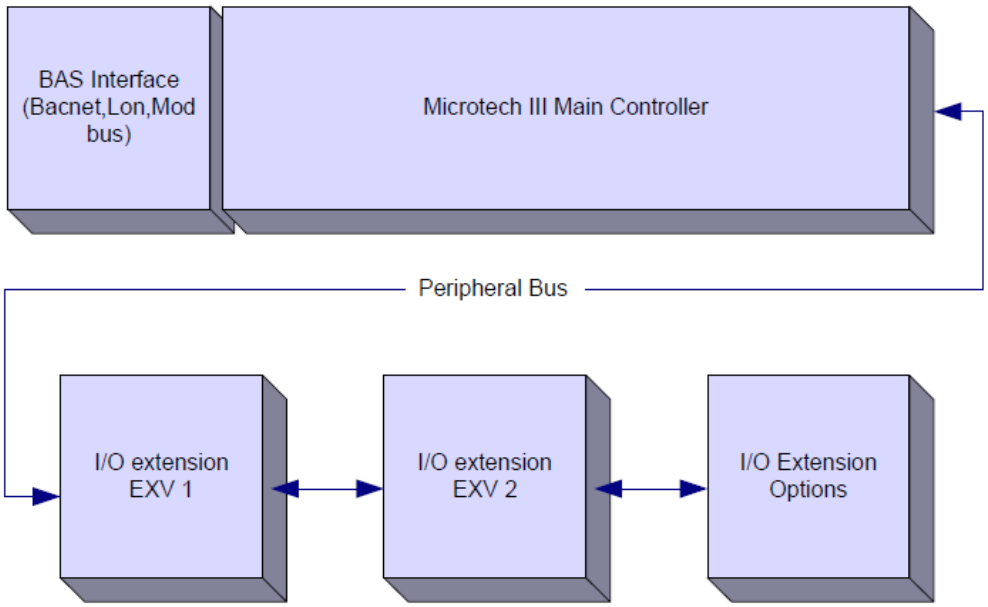
Operation (IEC 721-3-3):

- Temperature -40...+70 °C
- Restriction LCD -20… +60 °C
- Restriction Process-Bus -25….+70 °C
- Humidity < 90 % r.h (no condensation)
- Air pressure min. 700 hPa, corresponding to max. 3,000 m above sea level
- Transport(IEC 721-3-2):
- Temperature -40...+70 °C
- Humidity < 95 % r.h (no condensation)
- Air pressure min. 260 hPa, corresponding to max. 10,000 m above sea level.

2.4 Controller Architecture

The overall controller architecture is the following:

- One MicroTech III main controller
- I/O extensions as needed depending on the configuration of the unit
- Communications interface(s) as selected
- Peripheral Bus is used to connect I/O extensions to the main controller.



Controller/ Extension Module	Siemens Part Number	Address	Usage
Main Controller	POL687.70/MCQ	n/a	Used on all configurations
EEXV Module 1	POL94U.00/MCQ	3	Used on all configurations
EEXV Module 2	POL94U.00/MCQ	4	Used when configured for 2 circuits
Extension Module	POL965.00/MCQ	5	Used on all configurations
Rapid Restart Module	POL945.00/MCQ	22	Used with Rapid Restart option

All boards are supplied from a common 24 Vac source. Extension boards can be directly powered by the Unit Controller. All boards can be also supplied by a 24Vdc source.

CAUTION: Maintain the correct polarity when connecting the power supply to the boards, otherwise the peripheral bus communication will not operate and the boards may be damaged.

2.5 Communication Modules

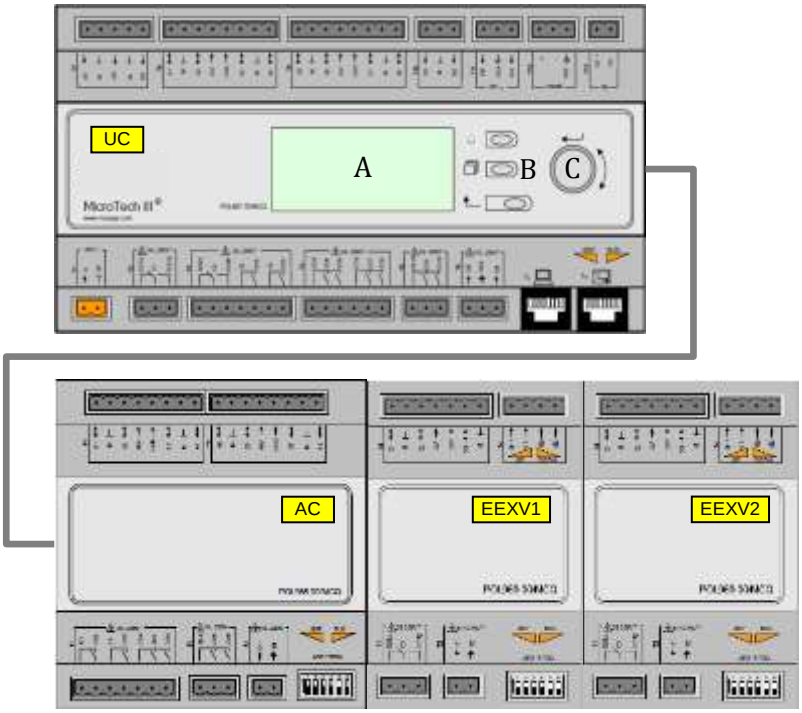
Any of the following modules can be connected directly to the left side of the main controller to allow a BAS or other remote interface to function. Up to three can be connected to the controller at a time. The controller should automatically detect and configure itself for new modules after booting up. Removing modules from the unit will require manually changing the cshouldonfiguration.

Module	Siemens Part Number	Usage
BacNet/IP	POL908.00/MCQ	Optional
Lon	POL906.00/MCQ	Optional
Modbus	POL902.00/MCQ	Optional
BACnet/MSTP	POL904.00/MCQ	Optional

3 Using the Controller

The control system consists of a unit controller (UC) equipped with a set of extension modules that implement additional features. All boards communicate via an internal peripheral bus with the UC. The Microtech III continuously manages the information received from the various pressure and temperature probes installed on the compressors and communicated to the unit . The UC incorporates a program that controls the unit.

The standard HMI consists of an inbuilt display (A) with 3 buttons (B) and a push'n'roll control (C).



The keypad/display (A) consists of a 5-line by 22 character display.

The function of the three buttons (B) is described below:

🔔	Alarm status (from any page it links with the page with alarm list, alarm log and alarm snapshot if available)
🗐	Back to Main Page
↰	Back to the previous level (it can be the Main Page)

The push'n'roll command (C) is used to scroll between the different menu pages, settings and data available on the HMI for the active password level. Rotating the wheel allows to navigate between lines on a screen (page) and to increase and decrease changeable values when editing. Pushing the wheel acts as an Enter Button and will jump from a link to the next set of parameters.

3.1 General Recommendation

Before switching on the unit read the following recommendations:

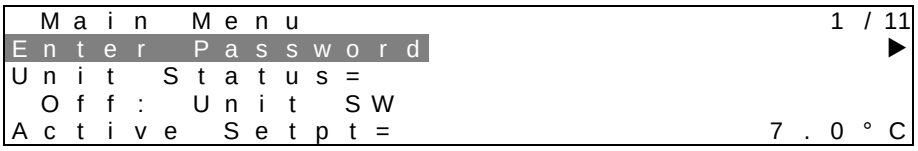
- When all the operations and all the settings have been carried out, close all the switchbox panels

- The switchbox panels can only be opened by trained personnel
- When the UC requires to be accessed frequently the installation of a remote interface is strongly recommended
- Evaporator, compressors and related inverters are protected from freezing by electrical heaters. These heaters are supplied through unit main supply and temperature controlled by thermostat or by the unit controller. Also the LCD display of the unit controller may be damaged by extremely low temperatures. For this reason, it is strongly recommended to never power off the unit during winter, especially in cold climates.

3.2 Navigating

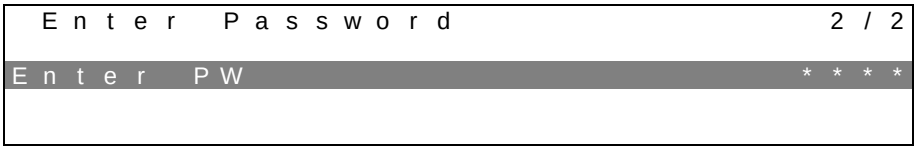
When power is applied to the control circuit, the controller screen will be active and display the Home screen, which can also be accessed by pressing the Menu Button The navigating wheel is the only navigating device necessary, although the MENU, ALARM, and BACK buttons can provide shortcuts as explained previously.

An example of the HMI screens is shown in the following picture.



A bell ringing in the top right corner will indicate an active alarm. If the bell doesn't move it means that the alarm has been acknowledged but not cleared because the alarm condition hasn't been removed.

The active item is highlighted in contrast, in this example the item highlighted in Main Menu is a link to another page. By pressing the push'n'roll, the HMI will jump to a different page. In this case the HMI will jump to the Enter Password page.



3.3 Passwords

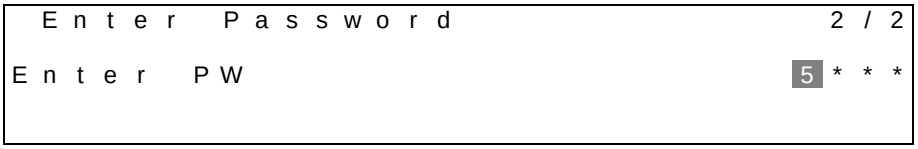
The HMI structure is based on access levels that means that each password will disclose all the settings and parameters allowed to that password level. Basic informations about the status including the active alarm list, active setpoint and controlled water temperature can be accessed without the need to enter the password.

The user UC handles two level of passwords:

USER	5321
MAINTENANCE	2526

The following information will cover all data and settings accessible with the maintenance password. User password will disclose a subset of the settings explained in chapter 4.

In the Enter Password screen, the line with the password field will be highlighted to indicate that the field on the right can be changed. This represents a setpoint for the controller. Pressing the push'n'roll the individual field will be highlighted to allow an easy introduction of the numeric password. By changing all fields, the 4 digits password will be entered and, if correct, the additional settings available with that password level will be disclosed.



The password will time out after 10 minutes and is cancelled if a new password is entered or the control powers down. Entering an invalid password has the same effect as continuing without a password.

Once a valid password has been entered, the controller allows further changes and access without requiring the user to enter a password until either the password timer expires or a different password is entered. The default value for this password timer is 10 minutes. It is changeable from 3 to 30 minutes via the Timer Settings menu in the Extended Menus.

3.4 Editing

The Editing Mode is entered by pressing the navigation wheel while the cursor is pointing to a line containing an editable field. Once in the edit mode pressing the wheel again causes the editable field to be highlighted. Turning the wheel clockwise while the editable field is highlighted causes the value to be increased. Turning the wheel counter-clockwise while the editable field is highlighted causes the value to be decreased. The faster the wheel is turned the faster the value is increased or decreased. Pressing the wheel again cause the new value to be saved and the keypad/display to leave the edit mode and return to the navigation mode.

A parameter with an "R" is read only; it is giving a value or description of a condition. An "R/W indicates a read and/or write opportunity; a value can be read or changed (providing the proper password has been entered).

Example 1: Check Status, for example -is the unit being controlled locally or by an external network? We are looking for the Unit Control Source Since this a unit status parameter, start at Main Menu and select View/Set Unit and press the wheel to jump to the next set of menus. There will be an arrow at the right side of the box, indicating that a jump to the next level is required. Press the wheel to execute the jump.

You will arrive at the Status/ Settings link. There is an arrow indicating that this line is a link to a further menu. Press the wheel again to jump to the next menu, Unit Status/Settings.

Rotate the wheel to scroll down to Control Source and read the result.

Example 2: Change a Set point, the chilled water set point for example. This parameter is designated as Cool LWT Set point 1 and is a unit set parameter. From the Main Menu select View/Set Unit. The arrow indicated that this is link to a further menu.

Press the wheel and jump to the next menu View/Set Unit and use the wheel to scroll down to Temperatures. This again has an arrow and is a link to a further menu. Press the wheel and jump to the Temperatures menu, which contains six lines of temperatures set points. Scroll down to Cool LWT 1 and press the wheel to jump to the item change page. Rotate the wheel to adjust the set point to the desired value. When this is done press the wheel again to confirm the new value. With the Back button it will be possible to jump back to the Temperatures menu where the new value will be displayed.

Example 3: Clear an Alarm,. The presence of a new alarm is indicated with a Bell ringing on the top right of the display. If the Bell is frozen one or more alarm had been acknowledged but are still active. To view the Alarm menu from the Main Menu scroll down to the Alarms line or simply press the Alarm button on the display. Note the arrow indicating this line is a link. Press the wheel to jump to the next menu Alarms There are two lines here; Alarm Active and Alarm Log. Alarms are cleared from the Active Alarm link. Press the wheel to jump to the next screen. When the Active Alarm list is entered scroll to the item AlmClr which is set to off by default. Change this value to on to acknowledge the alarms. If the alarms can be cleared then the alarm counter will display 0 otherwise it will display the number of alarm still active. When the alarms are acknowledged the Bell on the top right of the display will stop to ring if some of the alarms are still active or will disappear if all the alarms are cleared.

3.5 Basic Control System Diagnostic

MicroTech III controller, extension modules and communication modules are equipped with two status LED (BSP and BUS) to indicate the operational status of the devices. The BUS LED indicates the status of the communication with the controller. The meaning of the two status LED is indicated below.

UC BSP LED

BSP LED	Mode
Solid Green	Application running
Solid Yellow	Application loaded but not running (*) or BSP Upgrade mode active
Solid Red	Hardware Error (*)
Flashing Green	BSP startup phase. The controller needs time for starting.
Flashing Yellow	Application not loaded (*)
Flashing Yellow/Red	Fail safe mode (in case that the BSP upgrade was interrupted)
Flashing Red	BSP Error (software error*)
Flashing Red/Green	Application/BSP update or inizialization

(*) Contact Service.

Extension modules

BSP LED

BSP LED	Mode
Solid Green	BSP running
Solid Red	Hardware Error (*)
Flashing Red	BSP Error (*)
Flashing Red/Green	BSP upgrade mode

BUS LED

BUS LED	Mode
Solid Green	Communication running, I/O working
Solid Yellow	Communication running but parameter from the application wrong or missing, or uncorrect factory calibration
Solid Red	Communication down (*)

Communication modules

BSP LED (same for all modules)

BSP LED	Mode
Solid Green	BPS running, communication with controller
Solid Yellow	BSP running, no communication with controller (*)
Solid Red	Hardware Error (*)
Flashing Red	BSP Error (*)
Flashing Red/Green	Application/BSP update

(*) Contact Service.

LON module BUS LED

BUS LED	Mode
Solid Green	Ready for Communication. (All Parameter loaded, Neuron configured). Doesn't indicate a communication with other devices.
Solid Yellow	Startup
Solid Red	No Communication to Neuron (internal error, could be solved by downloading a new LON application)
Flashing Yellow	Communication not possible to the Neuron. The Neuron must be configured and set online over the LON Tool.

Bacnet MSTP BUS LED

BUS LED	Mode
Solid Green	Ready for Communication. The BACnet Server is started. It doesn't indicate a active communication
Solid Yellow	Startup
Solid Red	BACnet Server down. Automatically a restart after 3 seconds are initiated.

Bacnet IP BUS LED

BUS LED	Mode
Solid Green	Ready for Communication. The BACnet Server is started. It doesn't indicate a active communication
Solid Yellow	Startup. The LED stays yellow until the module receives a IP Address, therefore a link must be established.
Solid Red	BACnet Server down. Automatic restart after 3 seconds is initiated.

Modbus BUS LED

BUS LED	Mode
Solid Green	All Communication running
Solid Yellow	Startup, or one configured channel not communicating to the Master
Solid Red	All configured Communications down. Means no communication to the Master. The timeout can be configured. In case that the timeout is zero the timeout is disabled.

3.6 Controller maintenance

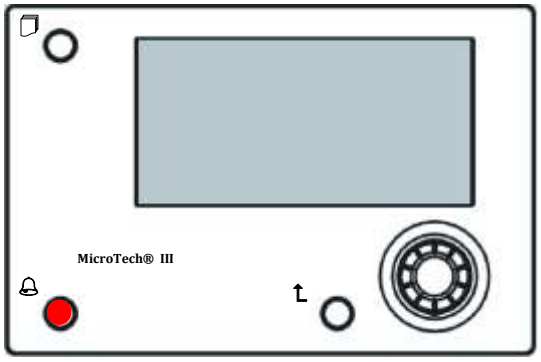
The controller requires to maintain the installed battery. Every two years it's required to replace the battery. Battery model is: BR2032 and it is produced by many different vendors.

To replace the battery remove the plastic cover of the controller display using a screw driver as shown in the following pictures:

Be careful to avoid damages to the plastic cover. The new battery shall be placed in the proper battery holder which is highlighted in the following picture, respecting the polarities indicated into the holder itself.

3.7 Optional Remote User Interface

As an option an external Remote HMI can be connected on the UC. The Remote HMI offers the same features as the inbuilt display plus the alarm indication done with a light emitting diode located below the bell button.

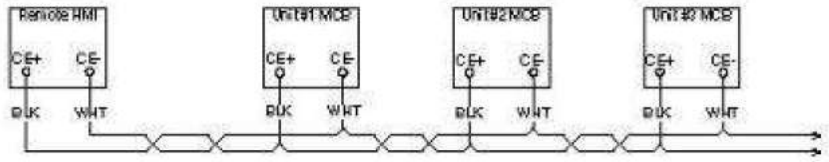


The Remote can be ordered with the unit and shipped loose as a field installed option. It can also be ordered anytime after chiller shipment and mounted and wired on the job as explained on the following page. The remote panel is powered from the unit and no additional power supply is required.

All viewing and setpoint adjustments available on the unit controller are available on the remote panel. Navigation is identical to the unit controller as described in this manual.

The initial screen when the remote is turned on shows the units connected to it. Highlight the desired unit and press the wheel to access it. The remote will automatically show the units attached to it, no initial entry is required.

The Remote HMI can be extended up to 700m using the process bus connection available on the UC. With a daisy-chain connection as below, a single HMI can be connected to up to 8 units. Refer to the specific HMI manual for details.

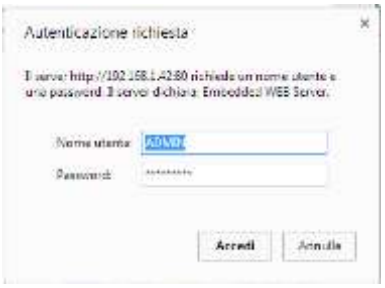


3.8 Embedded Web Interface

The MicroTech III controller has an embedded web interface that can be used to monitor the unit when connected to a local network. It is possible to configure the IP addressing of the MicroTech III as a fixed IP of DHCP depending on the network configuration.

With a common web browser a PC can connect with the unit controller entering the IP address of the controller or the host name, both visible in the “About Chiller” page accessible without entering a password.

When connected it will be required to enter a user name and a password as shown in the picture below:



Enter the following credential to get access to the web interface:

User Name: ADMIN
Password: SBTAdmin!

The following page will be displayed:

The page is a copy of the onboard HMI and follows the same rules in terms of access levels and structure.
In addition it allows to trend log a maximum of 5 different quantities. It's required to click on the value of the quantity to monitor and the following additional screen will become visible:

Depending on the web browser and its version the trend log feature may not be visible. It's required a web browser supporting HTML 5 like for example:

- Microsoft Internet Explorer v.11,
- Google Chrome v.37,
- Mozilla Firefox v.32.

These software are only an example of the browser supported and the versions indicated have to be intended as minimum versions.

4 Menu Structure

All settings are divided in different menus. Each menu collects in a single page other sub-menus, settings or data related to a specific function (for example Power Conservation or Setup) or entity (for example Unit or Circuit). In any of the following pages a grey box will indicate changeable values and the defaults.

4.1 Main Menu

Setpoint/Sub-Menu	Default	Range	Description
Enter Password	▶	-	Submenu to activate access levels
Quick Menu	▶	-	Submenu to resume unit data
Quick Setup	▶	-	Quick unit setup submenu
View/Set Unit	▶	-	Submenu for unit data and settings
View/Set Circuit	▶	-	Submenu for circuit data and settings
Unit Status=	Off: Unit Sw	Auto Off: Ice Mode Tmr Off: OAT Lockout Off: All Cir Disabled Off: Unit Alarm Off: Keypad Disable Off: Remote Sw Off: BAS Disable Off: Unit Sw Off: Test Mode Auto: Noise Reduction Auto: Wait For Load Auto: Evap Recirc Auto: Wait For Flow Auto: Pumpdn Auto: Max Pulldn Auto: Unit Cap Limit Auto: Current Limit	Status of the Unit
Active Setpt=	7.0°C	-	Leaving Water Temperature active setpoint
Evap LWT=	-273.1°C	-	Controlled water temperature
Unit Capacity=	0.0%	-	Unit staging
Unit Mode=	Cool	-	See chapter 4.4.2
Time Until Restart	▶	-	Submenu for compressors safety timers
Alarms	▶	-	Submenu for alarms; same function as Bell Button
Scheduled Maintenance	▶	-	Submenu for next maintenance visit scheduled
Review Operation	▶	-	Submenu for overviewing current running conditions
Manual Control	▶	-	Submenu for manual management of actuators
About Chiller	▶	-	Application Info submenu

4.2 Quick Menu

Setpoint/Sub-Menu	Default	Range	Description
Unit Status=	Off: Unit Sw	-	Status of the Unit (see 4.1)
Active Setpt=	7.0°C	-	
Evap LWT=	-273.1°C	-	Controlled water temperature
Evap EWT=	-273.1°C	-	Return water temperature
Unit Capacity=	0.0%	-	
Unit Current=	0.0A	-	
Softload Limit=	100.0%	-	Softload capacity limitation
Network Limit=	100.0%	-	Capacity limitation from BMS
Demand Limit=	100.0%	-	Capacity limitation from external signal
Unit Mode=	Cool	-	See chapter 4.4.2
Control Source=	Local	Local, Network	
Current Lim Sp=	800A	0.0…2000.0A	Current Limit Setpoint

4.3 Quick Setup

Setpoint/Sub-Menu	Default	Range	Description
Language	English	-	See chapter 4.4.2
Control Source	Local	Local, Remote	See chapter 4.4.1
Available Modes=	Cool	Cool, Cool w/Glycol, Cool/Ice w/Glycol, Ice w/Glycol, Test	See chapter 4.4.2
Temperature Set	▶	-	Submenu for basic settings for temperature control
Alarm Set	▶	-	Submenu for basic alarm limits
Ev Pump Set	▶	-	Submenu for basic evaporator pump type and control mode selection
Power Conservation	▶	-	See chapter 4.4.6
Date/Time/Schedules	▶	-	See chapter 4.4.5

4.4 View/Set Unit

Setpoint/Sub-Menu	Default	Range	Description
Status/Settings	▶	-	Submenu status of the Unit
Set-Up	▶	-	Submenu Setting for the unit (thermostat control)
Temperatures	▶	-	Submenu Temperature data and setpoints
Vfd Settings	▶	-	Submenu Vfd installation settings
Date/Time/Schedules	▶	-	Submenu Date, Time and Quiet Night mode schedule
Power Conservation	▶	-	Submenu Unit Limiting functions
Configuration	▶	-	Submenu Unit configuration details
PumpVfd	▶	-	Submenu Configuration for optional Pump VFD
Modbus Setup	▶	-	Submenu Setup of Modbus communication
Bacnet IP Setup	▶	-	Submenu Setup of Bacnet IP communication
Bacnet MSTP Setup	▶	-	Submenu Setup of Bacnet MSTP communication
LON Setup	▶	-	Submenu Setup of LON communication
Ctrlr IP Setup	▶	-	Submenu IP settings for on-board web-server
Design Conditions	▶	-	Submenu Unit Design data
Alarm Limits	▶	-	Submenu Alarm settings
Calibrate Sensors	▶	-	Submenu Sensors calibration
Menu Password	▶	-	Submenu Disable Password for User level

4.4.1 Status/Settings

This page resumes all the information related to the unit status. In addition to this it is possible to clear circuit interstage timers to allow faster circuit starts.

Setpoint/Sub-Menu	Default	Range	Description
Unit Status=	Off: Unit Sw	-	Status of the Unit (see 4.1)
Chiller Enable=	Enable	Enable, Disable	Chiller operation enable
Control Source=	Local	Local, Network	Determines whether on/off, cooling/ice setpoint, operation mode, capacity limit, should be commanded by local (HMI) settings or from BMS
Next Crkt On=	0	-	Shows next circuit to be started up
Next Crkt Off=	0	-	Shows next circuit number to be stopped
Netwrk En SP=	Disable	Enable, Disable	
Netwrk Mode SP=	Cool	-	Cool, Ice, Heat (NA), Cool/Heat Recovery
Netwrk Cool SP=	6.7°C	-	Cooling setpoint from BMS
Netwrk Cap Lim=	100%	-	Capacity limitation from BMS
Stg Up Dly Rem=	0s	-	Remaining delay to next compressor start
Stg Dn Dly Rem=	0s	-	Remaining delay to next compressor stop
Clr Stg Delays=	Off	Off, On	Clear remaining delays to next compressor start/stop
Netwrk Ice SP=	-4.0°C	-	Ice setpoint from BMS
Ice Cycle Rem=	0min	-	Remaining Ice cycle delay
Clr Ice Dly	Off	Off, On	Clear remaining delay
Evp Pmp Ctrl=	#1 Only	#1 Only, #2 Only, Auto, #1 Primary, #2 Primary	Set number of pumps operational and which priority. Auto se
Evap Recirc Tm=	30s		Water recirculating timer
Evap Nom DT=	5.6°C		Nominal water delta T
Evap Pmp 1 Hrs=	0h		Running Hours Pump 1 (if present)
Evap Pmp 2 Hrs=	0h		Running Hours Pump 2 (if present)
Remote Srv En=	Disable		Disable, Enable

4.4.2 Set-Up

This page resumes all settings related to thermostat control.

Setpoint/Sub-Menu	Default	Range	Description
Available Modes=	Cool	Cool, Cool w/ Glycol, Cool/Ice w/ Glycol, Ice w/ Glycol, Test	Available operating modes
Start Up DT=	2.7°C	0.0…5.0°C	Offset to start thermostat control
Shut Dn DT=	1.0°C	0.0…1.7°C	Offset to standby
Stg Up DT=	0.5°C	0.0…1.7°C	Offset to allow compressor starts
Stg Dn DT=	1.0°C	0.0…1.7°C	Offset to force one compressor off
Max Pulldn=	1.7°C/min	0.3…2.7°C/min	Max rate of water temperature cooling
Stg Up Delay=	5 min	0…60 min	Compressor start interstage
Stg Dn Delay=	3 min	3…30 min	Compressor stop interstage
Strt Strt Dly=	20min	-	Compressor Start to Start delay
Stop Strt Dly=	5min	-	Compressor Stop to Start delay
Pumpdn Press=	100kPa	70…280kPa	Pumpdown pressure limit
Pumpdn Time=	120s	0…180s	Pumpdown timeout limit
Lt Ld Stg Dn %=	40%	20…50%	Circuit capacity threshold to stage down one compressor
Hi Ld Stg Up %=	80%	50…100%	Circuit capacity threshold to stage up one compressor
Liq Inject Act=	90°C	80…100°C	Discharge Temperature limit to enable the liquid injection SV
Var VR Act PR=	3.8	-	Pressure Ratio threshold to activate VR3 slide position
Econ Act PR=	3.3	-	Pressure Ratio threshold to activate Economizer
Max Ckts Run=	2	1…2	Limit to the number of circuit to be used
C1 Sequence #=	1	1…2	Manual sequence of circuit #1
C2 Sequence #=	1	1…2	Manual sequence of circuit #2
Unit En Init=	Enable	Enable, Disable	Unit enable
Ice Cycle Dly=	12h	1…23h	Ice cycle delay
Ext Fault Cfg=	Event	Event, Alarm	
Rapid Restore=	Disable	Enable, Disable	Feature enable if Rapid Restore is installed
Pwr Off Time=	60s	-	Maximum black out time to enable Rapid Restore
Display Units=	Metric	Metric, English	
Language	English	-	Check for availability of your own language

4.4.3 Temperatures

This page resumes all the relevant temperatures and the chilled water temperature setpoints (limits and active setpoint will depend on the operating mode selected).

Setpoint/Sub-Menu	Default	Range	Description
Evap LWT=	-273.1°C	-	Controlled water temperature
Evap EWT=	-273.1°C	-	Return water temperature
HR LWT=	-273.1°C		Heat Recovery Leaving Water Temperature (displayed only if Heat Recovery set on)
HR EWT=	-273.1°C		Heat Recovery Entering Water Temperature (displayed only if Heat Recovery set on)
Evap Delta T=	-273.1°C		Delta T across Evaporator
Active Setpt=	7.0°C		Active controlled setpoint
Pulldn Rate=	0.0°C/min		Rate of decrease of the controlled temperature
Outside Air=	-273.1°C		Outside air temperature
Cool LWT 1=	7.0°C	4.0…15.0°C (cool mode) -8.0…15.0°C (cool w/ glycol mode)	Primary cooling setpoint
Cool LWT 2=	7.0°C	4.0…15.0°C (cool mode) -8.0…15.0°C (cool w/ glycol mode)	Secondary cooling setpoint (see 3.6.3)
Ice LWT=	-4.0°C	-8.0…4.0°C	Ice setpoint (ice banking with on/off mode)
Max LWT=	15.0°C		High limit for Cool LWT1 and Cool LWT2
HR EWT Stp	40.0°C	30.0…50.0°C	Heat Recovery Entering Water Setpoint
HR EWT Dif	2.0°C	1.0…10.0°C	Heat Recovery Water Temperature differential

4.4.4 Vfd Settings

This page contains basics Vfd Settings. It will be possible to set the Modbus address of each inverter installed on compressors. This function is supposed to be activated in case of compressor replacement. The page will also contain the Modbus setup parameters like baud rate, parity etc.

Setpoint/Sub-Menu	Default	Range	Description
Baud Rate=	19200	-	Modbus communication speed
Parity=	None	-	Parity
Two Stop Bits=	No	-	Number of stop bits

4.4.5 Date/Time/Schedules

This page will allow to adjust the time and date in the UC. This time and date will be used in the alarm log and to enable and disable the Quiet Mode. Additionally it's also possible to set the starting and ending date for the DayLight Saving time (DLS) if used.

Quiet Mode is a feature that is used to reduce the chiller noise. This is done by applying the maximum setpoint reset to the cooling setpoint and increasing the condenser temperature target by an adjustable offset.

Setpoint/Sub-Menu	Default	Range	Description
Actual Time=	12:00:00		
Actual Date=	01/01/2014		
UTC Diff=	-60min		Difference with UTC
DLS Enable=	Yes		No, Yes
DLS Strt Month=	Mar		DayLight Saving time start month
DLS Strt Week=	2ndWeek		DayLight Saving time start week
DLS End Month=	Nov	NA, Jan…Dec	DayLight Saving time end month
DLS End Week=	1stWeek	1st…5th week	DayLight Saving time end week
Quiet Mode=	Disable	Disable, Enable	Activate Quiet Mode
QM Start Hr=	21h	18…23h	Quiet Mode start hour
QM Start Min=	0min	0…59min	Quiet Mode start minute
QM End Hr=	6h	5…9h	Quiet Mode end hour
QM End Min=	0min	0…59min	Quiet Mode end minute
QM Cond Offset=	5°C	0.0…14.0°C	Quiet Mode condenser target offset

- *On board real time clock settings are maintained thanks to a battery mounted on the controller. Make sure that the battery is replaced regularly each 2 years (see section 3.6).*

4.4.6 Power Conservation

This page resumes all the settings that allows chiller capacity limitations. Further explanations of the setpoint reset options can be found in the chapter 7.2.

Setpoint/Sub-Menu	Default	Range	Description
Unit Capacity=	100.0%		
Demand Lim En=	Disable	Disable, Enable	Demand Limit Enable
Demand Limit=	100.0%		Demand Limit Mode - Active demand limitation
Unit Current=	0.0A		Current Limit Mode (optional) - Unit current reading
Current Limit=	800A		Current Limit Mode (optional) - Active Current limit
Current Lim Sp=	800A	0…2000A	Current Limit Mode (optional) - Current limit setpoint
Setpoint Reset=	None	None, 4-20mA, Return, OAT	Setpoint Reset Type
Max Reset=	5.0°C	0.0…10.0°C	Setpoint Reset Mode - Max Reset of water temp. setpoint
Start Reset DT=	5.0°C	0.0…10.0°C	Setpoint Reset Mode - Evaporator DT at which no reset is applied
Max Reset OAT=	15.5°C	10.0…29.4°C	Setpoint Reset Mode - OAT at which the max reset is applied
Strt Reset OAT=	23.8°C	10.0…29.4°C	Setpoint Reset Mode - OAT at wich 0°C reset is applied
Softload En=	Disable	Disable, Enable	Soft Load Mode Enable
Softload Ramp=	20min	1…60min	Soft Load Mode - Duration of the Softload ramp
Starting Cap=	40.0%	20.0…100.0%	Soft Load Mode - Starting capacity limit for Softload

4.4.7 Configuration

This page resumes all the specific settings for this unit like number of circuits, compressors type, fan regulation strategy, etc. Part of these settings cannot be adjusted and are supposed to be set during the manufacturing or commissioning of this unit. See chapter “Commission Unit” for more details.

Setpoint/Sub-Menu	Default	Range	Description
Apply Changes=	No	No, Yes	Type yes after changes
Number Of Ckts=	2	1,2	
Comp Type=	None		Compressor and max frequency set
Fan Type=	AC700	AC900, AC700, EC900, EC700, EC700L	Fan type
Cond Cntrl=	Step	Step, Vfd, SpdTrl	Set condenser fan control
Pump Type=	On/Off	On/Off, FixdSpd, VarFlow	Set Pump Control
Energy Mtr=	None	None, Nemo	Set Energy Meter Type
Leak Detector=	None	None, Analog	
Comm Module 1=	None	Modbus, Bacnet IP, Bacnet MSTP, Lon, AWM	
Comm Module 2=	None	Modbus, Bacnet IP, Bacnet MSTP, Lon, AWM	
Comm Module 3=	None	Modbus, Bacnet IP, Bacnet MSTP, Lon, AWM	

Modification to any of these values will require to be acknowledged to the controller by setting “Apply Changes = Yes”. This will cause a controller reboot! This action can only be performed with the Q0 switch on the unit switchbox set to 0.

4.4.8 Pump VFD

This page refers to the settings necessary to operate inverter driven pumps when installed. The sub-menu shown depends from the selection of Pump Type done in the Commissioning menu.

Pump Type= Fixd Spd

The list of settings below is shown when Fixd Spd is selected as pump type. Two setpoints are displayed, the active one is selected through a customer supplied switch.

Setpoint/Sub-Menu	Default	Range	Description
Pump Fixd Spd 1=	0.0%	0.0…100.0%	Pump speed when pump speed selector is OFF
Pump Fixd Spd 2=	0.0%	0.0…100.0%	Pump speed when pump speed selector is ON

4.4.9 Setup for communication modules

In order to properly setup the communication modules (Modbus, Bacnet IP, Bacnet MSTP and LON), please refer to the related documentation available from the factory.

4.4.10 Electrical Data

This page resumes the electrical data taken from the energy meter if the option has been enabled and the energy meter is installed properly.

Setpoint/Sub-Menu	Default	Range	Description
Average Voltage			Average voltage on the three phases
Average Current			Average current on the three phases
Active Power			Instantaneous active power
Cosphi			Unit Power Factor
Average Power			Average power
Active Energy			Active Energy accumulated

4.4.11 Controller IP setup

The Microtech ® III controller has an embedded web server showing a replica of the onboard HMI screens. To access this additional web HMI can be required to adjust the IP settings to match the settings of the local network. This can be done in this page. Please contact your IT department for further information on how to set the following setpoints.

To activate the new settings a reboot of the controller is required, this can be done with the Apply Changes setpoint.

The controller also supports DHCP, in this case the name of the controller must be used.

Setpoint/Sub-Menu	Default	Range	Description
Apply Changes=	No		No, Yes
DHCP=	Off		Off, On
Act IP=			Active IP address
Act Msk=			Active Subnet mask
Act Gwy=			Active Gateway
Gvn IP=			Given IP address (it will become the active)
Gvn Msk=			Given Subnet mask
Gvn Gwy=			Given Gateway

Check with IT Department on how to set these properties in order to connect the Microtech III to the local network

4.4.12 Design Conditions

This page shows the design condition for this chiller.

Setpoint/Sub-Menu	Default	Range	Description
Evap Dsn EWT=	0.0°C		Design return water temperature
Evap Dsn LWT=	0.0°C		Design controlled water temperature

4.4.13 Alarm Limits

This page contains all alarm limits, including low pressure alarm prevention thresholds. In order to ensure proper operation they have to be set manually according to the specific application.

Setpoint/Sub-Menu	Default	Range	Description
Low Press Hold=	180.0kPa		Low pressure safety limit to stop capacity increase
Low Press Unld=	160.0kPa		Low pressure alarm prevention
Hi Oil Pr Dly=	30s		Delay for the High oil pressure difference alarm
Hi Oil Pr Diff=	250kPa		Pressure drop for a clogged filter
Hi Disch Temp=	110.0°C		Maximum discharge temperature limit
Hi Cond Pr Dly=	5s		Delay on the High pressure alarm from transducer
Lo Pr Ratio Dly=	90s		Delay on the low pressure ratio alarm
OAT Lockout=	4.0°C		Air temperature operational limit
Strt Time Lim=	60s		Time limit for the low ambient start
Evap Water Frz=	2.2°C		Freeze protection limit
Evap Flw Proof=	15s		Flow proof delay
Evp Rec Timeout=	3min		Recirculating timeout before the alarm is raised
Low DSH Limit=	12.0°C		Minimum acceptable discharge superheat
HP Sw Test C#1	Off		On, Off. Enables to check operation of the high pressure switch on #1.
HP Sw Test C#2	Off		On, Off. Enables to check operation of the high pressure switch on #2.

The HP Sw Test shuts off all fans while compressor is running in order to raise condenser pressure until tripping of the high pressure switches. Beware that in case of high pressure switch failure the safety valves will trip and hot refrigerant will be ejected at high pressure!

Once tripped, the software will get back to normal operation. However, the alarm will not be reset until the high pressure switches are manually reset through the button included in the switch.

4.4.14 Calibrate Sensors

This page allows a proper calibration of the unit sensors

Setpoint/Sub-Menu	Default	Range	Description
Evap LWT=	7.0°C		Evaporator LWT current reading (includes the offset)
Evp LWT Offset=	0.0°C		Evaporator LWT calibration
Evap EWT=	12.0°C		Evaporator EWT current reading (includes the offset)
Evp EWT Offset=	0.0°C		Evaporator EWT calibration
Outside Air=	35.0°C		Outside Air Temperature current reading (includes the offset)
OAT Offset=	0.0°C		Outside Air Temperature calibration

4.4.15 Menu Password

It is possible to keep the User level always active to avoid to enter the User password. To do this the Password Disable setpoint shall be set to On.

Pwd Disable=	Off	Off, On

4.5 View/Set Circuit

In this section it is possible to select between the available circuits and access data available for the circuit selected.

Setpoint/Sub-Menu	Default	Range	Description
Circuit #1	▶		Menu for Circuit #1
Circuit #2	▶		Menu for Circuit #2

The submenus accessed for each circuit are identical but the content of each of them reflects the status of the corresponding circuit. In the following the submenus will be explained only once. If only one circuit is available the item Circuit #2 in the above table will be hidden and not accessible.

Each of the above links will jump to the following submenu:

Setpoint/Sub-Menu	Default	Description
Data	▶	Thermodynamic data
Status/Settings	▶	Status and settings
Comp 1	▶	Status of the compressor and electrical data
Condenser	▶	Status of the condenser fan regulation
EXV	▶	Status of the expansion valve regulation
Configuration	▶	Circuit configuration
Calibrate Sensors	▶	Sensor calibration

In any of the above submenus each item shows a value and a link to another page. In that page the same data will be represented for both circuits as a reference as shown in the below example.

Setpoint/Sub-Menu	Default	Range	Description
Comp 1 Run Hours			Indication of the data represented
Circuit #1=	0h		Data related to Circuit #1
Circuit #2=	0h		Data related to Circuit #2

4.5.1 Data

In this page all relevant thermodynamic data are displayed.

Setpoint/Sub-Menu	Default	Range	Description
Capacity=	0.0%		Circuit capacity
Evap Pressure=	220.0kPa		Evaporating Pressure
Cond Pressure=	1000.0kPa		Condensing Pressure
Suction Temp=	5.0°c		Suction Temperature
Discharge Temp=	45.0°C		Discharge Temperature
Suction SH=	5.0°C		Suction Superheat
Discharge SH=	23.0°C		Discharge Superheat
Oil Pressure=	1000.0kPa		Oil Pressure
Oil Pr Diff=	0.0kPa		Oil Pressure differential
EXV Position=	50%		Expansion valve position
Econ Sv Output=	Off		Economizer status
Liq Inj=	Off		Liquid Injection status
Variable VR St=	Off(VR2)		VR2 or VR3 slide position status
Evap LWT=	7.0°C		Evaporator LWT
Evap EWT=	12.0°C		Evaporator EWT

4.5.2 Status/Settings

This page resumes the status of the circuit.

Setpoint/Sub-Menu	Default	Range	Description
Circuit Status=			Status of the circuit
Off: VFD Heating			Off: Ready Off: Stage Up Delay Off: Cycle Timer Off: BAS Disable Off: Keypad Disable Off: Circuit Switch Off: Oil Heating Off: Alarm Off: Test Mode EXV Preopen Run: Pumpdown Run: Normal Run: Disch SH Low Run: Evap Press Low Run: Cond Press High Run: High LWT Limit Run: High VFD Amps Run: High VFD Temp Off: Max Comp Starts Off: VFD Heating Off: Maintenance
Circuit Mode=	Enable		Disable, Enable, Test
Circuit Cap=	100%		
Service Pumpdn=	Off		Off, On
Economizer=	With		Without, With
Econ En Spd=	1200rpm		Compressor speed to enable Economizer
Start VFD Spd=	1800rpm		Compressor start speed
Max VFD Spd=	5400rpm		Compressor maximum speed

4.5.3 Comp1

This page resumes all the relevant information about compressor. In this page a manual adjustment of the compressor capacity will be possible.

Setpoint/Sub-Menu	Default	Range	Description
Start=			Date and time of the last start
Stop=			Date and time of the last stop
Run Hours=	0h		Running hours of compressor
No. Of Starts=	0		Number of compressor starts
Cycle Time Rem=	0s		Remaining cycle time left
Clear Cycle Time			Cycle time clear command
Capacity=	100%		Compressor capacity
Act Speed=	5400rmp		Compressor speed (depends on model)
Current=	200.0A		Inverter current
Percent RLA=	85%		Percentage over the Full Load current
Power Input=	0kW		
Cap Control=	Auto		Auto, Manual
Manual Cap=	0.0%		Manual capacity percentage
Vfd Valve Life=	100%		Inverter cooling SV remaining cycles
Vfd Capct Life=	100%		Inverter capacitors remaining life

4.5.4 Condenser

This page resumes all the relevant data and settings to adjust the condenser pressure control to fit the specific requirements for the operating conditions.

Setpoint/Sub-Menu	Default	Range	Description
# Fans Running=	0		Number of fans currently running
# Of Fans=	6		Total number of fans
Stg Up Error=	0		Error to stage up one fan
Stg Dn Error=	0		Error to stage down one fan
Cond Target=	30.0°C		Saturated condenser temperature target
VFD Target=	30.0°C		Target for the VFD (only for Vfd and Speedtroll)
VFD Speed=	0.0%		Current VFD Speed
Fan VFD Enable=	Enable		Fan speed regulation enabled
Stg On Db 0=	4.0°C		Dead band for fan stage up #1
Stg On Db 1=	5.0°C		Dead band for fan stage up #2
Stg On Db 2=	5.5°C		Dead band for fan stage up #3
Stg On Db 3=	6.0°C		Dead band for fan stage up #4
Stg On Db 4=	6.5°C		Dead band for fan stage up #5
Stg On Db 5=	6.5°C		Dead band for fan stage up #6
Stg Off Db 2=	10.0°C		Dead band for fan stage down #2*
Stg Off Db 3=	8.0°C		Dead band for fan stage down #3
Stg Off Db 4=	5.5°C		Dead band for fan stage down #4
Stg Off Db 5=	4.0°C		Dead band for fan stage down #5
Stg Off Db 6=	4.0°C		Dead band for fan stage down #6
VFD Max Speed=	700rpm		VFD maximum speed
VFD Min Speed=	175rpm		VFD minimum speed

* last fan running stage down uses a fixed limit not accessible from the HMI.

Fan settings are set to have a good and stable control of the condenser saturated temperature in almost all operating conditions.
Improper modification of the default settings could affect performances and generate circuit alarms. This action must be performed only by trained persons.

4.5.5 EXV

This page resumes all the relevant informations about the status of the EXV logic.

Setpoint/Sub-Menu	Default	Range	Description
EXV State=	Closed		Closed, Pressure, Superheat
Suction SH=	6.0°C		Suction Superheat
Superht Target=	6.0°C		Suction Superheat setpoint
Evap Pressure=	220kPa		Evaporating Pressure
EXV Position=	50.0%		Expansion valve opening

4.5.6 Configuration

This page allows to adjust the number of fans for each circuit.

Setpoint/Sub-Menu	Default	Range	Description
Apply Changes=	No		No, Yes
C1 # Of Fans=	6		Number of fans available.
Heat Recovery=	Disable		Disable, Enable

4.5.7 Calibrate Sensors

This page allows to adjust the sensors and transducers readings.

Setpoint/Sub-Menu	Default	Range	Description
Evap Pressure=			Evaporator Pressure current reading (includes the offset)
Evp Pr Offset=	0.0kPa		Evaporator Pressure offset
Cond Pressure=			Condenser Pressure current reading (includes the offset)
Cnd Pr Offset=	0.0kPa		Condenser Pressure offset
Oil Pressure=			Oil Pressure current reading (includes the offset)
Oil Pr Offset=	0.0kPa		Oil Pressure offset
Suction Temp=			Suction Temperature current reading (includes the offset)
Suction Offset=	0.0°C		Suction Temperature offset
Discharge Temp=			Discharge Temperature current reading (includes the offset)

Disch Offset=	0.0°C		Discharge Temperature offset

Calibrations of the Evaporator Pressure and Suction Temperature are mandatory for the applications with negative water temperature setpoints. These calibrations have to be performed with proper gauge and thermometer.
An improper calibration of the two instruments may generate limitation of the operations, alarms and even damages to components.

4.6 Time until restart

This page indicates the remaining cycle timers for each circuit. When the cycle timers are active any new start of a compressor is inhibited.

Setpoint/Sub-Menu	Default	Range	Description
C1 Cycle Tm Left=		0s	
C2 Cycle Tm Left=		0s	

4.7 Alarms

This link jumps to the same page accessible with the Bell button. Each of the items represents a link to a page with different information. The information shown depends on the abnormal operating condition that caused the activation of unit, circuit or compressor safeties. A detailed description of the alarms and how to handle will be discussed in the section Troubleshooting this chiller.

Setpoint/Sub-Menu	Default	Description
Alarm Active	▶	List of the active alarms
Alarm Log	▶	History of all the alarms and acknowledges
Event Log	▶	List of the events
Alarm Snapshot	▶	List of alarm snapshots with all the relevant data recorded at time the alarm occurred.

4.8 Scheduled Maintenance

This page may contains the contact number of the Service organization taking care of this unit and the next maintenance visit schedule.

Setpoint/Sub-Menu	Default	Range	Description
Next Maint=	Jan 2015		Schedule date for next maintenance
Support Reference=	999-999-999		Reference number or email of Service Org

4.9 Review Operation

This page contains links to other pages already explained, grouped together to simplify the access to operational data.

Setpoint/Sub-Menu	Default	Range	Description
Alarm Active	▶		See section 4.7
Alarm Log	▶		See section 4.7
Unit Status/Settings	▶		See section 4.4.1
C1 Status/Settings	▶		See section 4.5.2
C2 Status/Settings	▶		See section 4.5.2
Scheduled Maintenance	▶		See section 4.8

4.10 Manual Control

This page contains links to other sub-pages where all the actuators can be tested, the raw values of the readings of each sensor or transducer can be checked, the status of all the digital inputs verified and the status of all the digital output checked.

Setpoint/Sub-Menu	Default	Range	Description
Unit	▶		Acutators and sensors for the common parts (Unit)

Circuit #1	▶		Acutators and sensors for Circuit #1
Circuit #2	▶		Acutators and sensors for Circuit #2

4.10.1 Unit

This page contains all the test point, status of the digital inputs, status of the digital output and raw value of the analog inputs associated to the Unit. To activate the test point it's required to set the Available Modes to Test (see section 4.4.2) and this requires the Unit to be disabled.

Setpoint/Sub-Menu	Default	Range	Description
Unit Alarm Out=	Off	Off/On	Test of the General Alarm relay output
C1 Alarm Out=	Off	Off/On	Test of the Circuit #1 Alarm relay output
C2 Alarm Out=	Off	Off/On	Test of the Circuit #2 Alarm relay output
Evap Pump 1=	Off	Off/On	Test of the Evaporator Pump #1
Evap Pump 2=	Off	Off/On	Test of the Evaporator Pump #2
Input/Output Values		Off/On	
Unit Sw Inpt=	Off	Off/On	Status of the Unit Switch
Estop Inpt=	Off	Off/On	Status of the Emergency Stop button
PVM Inpt=	Off	Off/On	Status of Phase Voltage monitor, Under-Over voltage protection or Ground Fault protection (check option installed)
Evap Flow Inpt=	Off	Off/On	Status of the Evaporator Flow switch
Ext Alm Inpt=	Off	Off/On	Status of the External Alarm input
CurrLm En Inpt=	Off	Off/On	Status of the Current Limit enable switch (optional)
Dbl Sp Inpt=	Off	Off/On	Status of the Double Setpoint switch
RR Unlock Inpt=	Off	Off/On	Status of the Rapid Restart enable switch (optional)
BK Chiller Inpt=	Off	Off/On	Status of the Backup Chiller enable switch (optional)
Evp LWT Res=	0Ohm	340-300kOhm	Resistance of the Evap LWT sensor
Evp EWT Res=	0Ohm	340-300kOhm	Resistance of the Evap EWT sensor
OA Temp Res=	0Ohm	340-300kOhm	Resistance of the OAT sensor
LWT Reset Curr=	0mA	3-21mA	Current input for the Setpoint Reset
Dem Lim Curr=	0mA	3-21mA	Current input for the Demand Limit
Unit Sgnl Curr=	0mA	3-21mA	Current input for the Unit Current signal (optional)
Unit Alm Outpt=	Off	Off/On	Status of the General Alarm relay
C1 Alm Outpt=	Off	Off/On	Status of the Circuit #1 Alarm relay
C2 Alm Outpt=	Off	Off/On	Status of the Circuit #2 Alarm relay
Evp Pmp1 Outpt=	Off	Off/On	Status of the Evaporator Pump #1 relay
Evp Pmp2 Outpt=	Off	Off/On	Status of the Evaporator Pump #2 relay

4.10.2 Circuit #1 (Circuit #2 if present)

This page contains all the test point, status of the digital inputs, status of the digital output and raw value of the analog inputs associated to the Circuit #1 (or Circuit #2 if present and depending on the link followed). To activate the test point it's required to set the Available Modes to Test (see section 4.4.2) and this requires the Unit to be disabled.

Setpoint/Sub-Menu	Default	Range	Description
Test Liq Inj=	Off	Off/On	Test of the Liquid Injection SV
Test Economizr=	Off	Off/On	Test of the Economizer SV
Test EXV Pos=	0.0%	0-100%	Test of the Expansion Valve movements
Test Fan 1=	Off	Off/On	Test of the Fan Output #1
Test Fan 2=	Off	Off/On	Test of the Fan Output #2
Test Fan 3=	Off	Off/On	Test of the Fan Output #3
Test Fan 4=	Off	Off/On	Test of the Fan Output #4
Test VFD Speed=	0	0-100%	Test of the VFD for fans
Test Var VR	Off	Off/On	Test of VR3 slide position
Input/Output Values			
Cir Sw Inpt=	Off	Off/On	Status of the Circuit Enable switch
Mhp Sw Inpt=	Off	Off/On	Status of the Mechanical High Pressure switch
Strtr Flt Inpt=	Off	Off/On	Status of the Starter feedback
Evap Pr Inpt=	0.0V	0.4-4.6V	Input voltage for the Evap Pressure
Cond Pr Inpt=	0.0V	0.4-4.6V	Input voltage for the Cond Pressure
Oil Pr Inpt=	0.0V	0.4-4.6V	Input voltage for the Oil Pressure
Suct Temp Res=	0.0Ohm	340-300kOhm	Resistance of the Suction Temp sensor
Disc Temp Res=	0.0Ohm	340-300kOhm	Resistance of the Discharge Temp sensor
Strtr Outpt=	Off	Off/On	Status of the Inverter start command

Liq Inj Outpt=	Off	Off/On	Status of the Liquid Line SV relay
Econ Sv Outpt=	Off	Off/On	Status of the Economizer SV relay
Fan 1 Outpt=	Off	Off/On	Status of the Fan Output #1
Fan 2 Outpt=	Off	Off/On	Status of the Fan Output #2
Fan 3 Outpt=	Off	Off/On	Status of the Fan Output #3
Fan 4 Outpt=	Off	Off/On	Status of the Fan Output #4
Fan Vfd Outpt=	0.0V	0-10.0V	Output voltage to the fan VFD
Variable VR St	Off(VR2)	Off(VR2)/On(VR3)	Variable VR slide position (VR2, VR3)

4.11 Commission Unit

This page contains links to other pages already explained, grouped together to simplify the access to operational data.

Setpoint/Sub-Menu	Default	Range	Description
About Chiller	▶		See section 4.12
Set-Up	▶		See section 4.4.2
Date/Time/Schedules	▶		See section 4.4.5
Power Conservation	▶		See section 4.4.6
Alarm Limits	▶		See section 4.4.13
Calibrate Unit Sensors	▶		See section 4.4.14
Calibrate Circt Sensors	▶		See section 4.5.7
Ctrlr IP Setup	▶		See section 4.4.11
Alarm Active	▶		See section 4.7
Alarm Log	▶		See section 4.7
Scheduled Maintenance	▶		See section 4.8
Unit Manual Control	▶		See section 4.10.1
C1 Manual Control	▶		See section 4.10.2
C2 Manual Control	▶		See section 4.10.2

4.12 About this Chiller

This page resumes all the information needed to identify the unit and the current software version installed. These information may be required in case of alarms or unit failure

Setpoint/Sub-Menu	Default	Range	Description
Model			Unit model and code name
G.O.			
Unit S/N=			Unit serial number
OV14-00001			
BSP Ver=			Firmware version
App Ver=			Software version
HMI GUID=			Unique Identification of the HMI software
			HEX number for HMI GUID
OBH GUID=			Unique Identification of the OBH software
			HEX number for OBH GUID

5 Working with this unit

This section contains a guide on how to deal with the everyday usage of the unit. The next sections describe how to perform routine tasks on the unit, such as:

- Unit Setup
- Unit/Circuit start-up
- Alarm handling
- BMS Control
- Battery replacement

5.1 Unit Setup

Before starting up the unit, some basic settings need to be set by the customer according to the application. All main operational settings of the unit are accessible through at the “Quick Setup” menu.

Further setup settings can be found in the sub-menus described in the previous chapter.

Language	English	See chapter 4.4.2
Control Source	Local	See chapter 4.4.1
Available Modes=	Cool	See chapter 4.4.2
Temperature Settings	▶	See chapter 5.1.4
Alarm Settings	▶	See chapter 5.1.5
Evap Pump Settings	▶	See chapter 5.1.6
Power Conservation	▶	See chapter 4.4.6
Date/Time/Schedules	▶	See chapter 4.4.5

5.1.1 Language Setting

The language used on the HMI can be selected after the user password has been inserted. Please check with Sales about the availability of your local language.

5.1.2 Control Source

This function allows to select which source should be used for unit control. The following sources are available:

Local	Unit is enabled by local switches placed into the switchbox, chiller mode (cool, cool w/glycol, ice), LWT setpoint and capacity limit are determined by local settings in the HMI.
Network	Unit is enable by a remote switch, chiller mode, LWT setpoint and capacity limit are determined by an external BMS. This function requires: • Remote enable connection to a BMS (unit on/off switch must be in remote) • Communication module and its connection to a BMS.

More parameters about network control can be found in 4.4.1.

5.1.3 Available Mode Setting

The following operating modes can be selected through the Setup menu:

Cool	Set if chilled water temperature down to 4°C is required. No glycol is generally needed in the water circuit, unless ambient temperature may reach low values.
Cool w/Glycol	Set if chilled water temperature below 4°C is required. This operation requires proper glycol/water mixture in the evaporator water circuit.
Ice	Set if ice storage is required. The application requires the compressors to operate at full load until the ice bank is completed, and then to stop for at least 12 hours. In this mode the compressor(s) will not operate at part load, but will work only in on/off mode.
Cool/Ice w/Glycol	Set in case a dual cool/ice mode is required. This setting implies an operation with double setpoint which is activated through a customer supplied switch, according to the following logic: • Switch OFF: The chiller will work in cooling mode with the Cool LWT 1 being as the Active Setpoint. • Switch ON: The chiller will work in ice mode with the Ice LWT as the Active Setpoint.

Test	Enables the Manual Control of the unit. The manual test feature helps in debugging and checking the operational status of sensors and acutators. This feature is accessible only with the maintenance password in the main menu. To activate the test feature is required to disable the Unit from the Q0 switch and change the available mode to Test (see section 5.2.3.2).

5.1.4 Temperature Settings

Purpose of the unit is to keep the evaporator leaving water temperature as close as possible to a pre-set value, called Active Setpoint. The Active Setpoint is calculated by the unit controller based on the following parameters:

- Available Modes (Cool, Cool w/Glycol, Ice)
- Cool/Ice LWT Setpoint
- Setpoint Reset
- Quiet Mode

Operation mode and LWT setpoint can also be set via network if the appropriate control source has been selected. The following setpoints are available through this menu:

Cool LWT1	See 5.1.4.1
Cool LWT2	See 5.1.4.1
Ice LWT	See 5.1.4.1
Ice Cycle Dly	Time before next unit start is allowed in ice mode.
OAT Lockout	Temperature below which unit operation is inhibited. This value should be set according to the operational envelope of the unit and the condensation control installed (fan speed control, speedtrol, fan step control, etc).
Start Up DT	See 5.1.4.2
Shut Dn DT	See 5.1.4.2
Max Pulldn	Max rate (°C/min) of leaving water temperature change.

Modification to any of these value will require to be acknowledged to the controller by setting "Apply Changes = Yes". This will cause a controller reboot!

User Password is required to change the leaving water temperature setpoint.

5.1.4.1 LWT Setpoint Setting

Setpoint range is limited according to the selected operating mode. The controller includes two setpoint in cooling mode (either standard cool or cool w/glycol) and one setpoint in ice mode, which are activated according to Operating mode and Dual Setpoint selection.

The table below lists the LWT Setpoint being activated according to the operation mode and the double setpoint switch status. The table also reports the defaults and the range allowed for each setpoint.

Operating Mode	Double Setpoint Input	LWT Setpoint	Default	Range
Cool	OFF	Cool LWT 1	7.0°C	4.0°C ÷ 15.0°C
	ON	Cool LWT 2	7.0°C	4.0°C ÷ 15.0°C
Cool w/ Glycol	OFF	Cool LWT 1	7.0°C	-8.0°C ÷ 15.0°C
	ON	Cool LWT 2	7.0°C	-8.0°C ÷ 15.0°C
Cool/Ice w/ Glycol	OFF (cooling mode)	Cool LWT 1	-4.0°C	-8.0°C ÷ 4.0°C
	ON (ice mode)	Ice LWT	-4.0°C	-8.0°C ÷ 4.0°C
Ice w/ Glycol	N/A	Ice LWT	-4.0°C	-8.0°C ÷ 4.0°C

The LWT setpoint can be overridden in case the setpoint reset (for details see chapter 5.1.7.3) or the quiet mode are activated (see chapter 5.1.8.2).

Dual Setpoint, Setpoint Reset and Quiet Mode are not operational in Ice Mode.

5.1.4.2 Thermostat Control Settings

Thermostat control settings allow to set up the response to temperature variations and the precision of the thermostat control. Default settings are valid for most applications, however site specific conditions may require adjustments in order to have a smooth and precise temperature control or a quicker response of the unit.

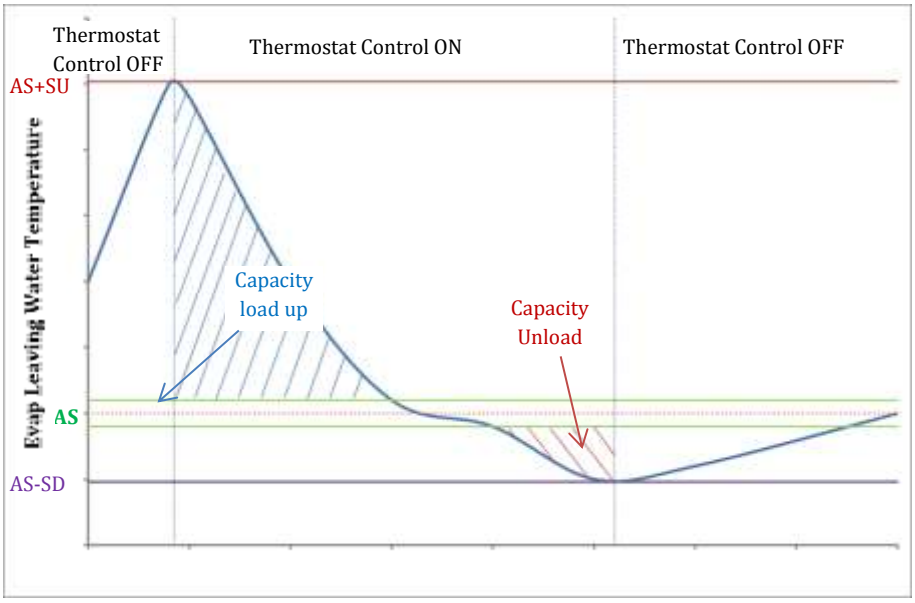
The control will start the first circuit if the controlled temperature is higher than the active setpoint (AS) of at least a Start Up DT (SU) value. Once circuit capacity exceeds the Hi Ld Stg Up % another circuit is switched on.

When leaving water temperature is within the deadband (DB) error from the active setpoint, unit capacity will not be changed.

If the leaving water temperature decreases below the setpoint, unit capacity is adjusted to keep it stable. Further decrease of the controlled temperature to a Shut Down DT offset (SD) can cause circuit shutdown and in the Shutdown area the whole unit is switched off. In particular, a compressor will be shut down if it is required to unload below the Lt Ld Stg Dn % capacity.

Loading and unloading speeds are calculated by a proprietary PID algorithm. However, maximum the rate of water temperature decrease can be limited through the parameter Max Pulldn.

Circuits are always started and stopped to guarantee the balancing of running hours and number or starts in multiple circuits units. This strategy optimizes the lifetime of compressors, inverters, capacitors and all the others circuit components.



5.1.5 Alarm Settings

Factory defaults are set for standard cooling mode, therefore they may not be properly tuned when working at different conditions. Depending on the application, the following alarm limits need to be adjusted:

- Low Press Hold
- Low Press Unload
- Evap Water Frz

Low Press Hold	Set the minimum refrigerant pressure of the unit. It is generally recommended to set to a value whose saturated temperature is 8 to 10°C below the minimum active setpoint. This will allow a safe operation and a proper control of compressor suction superheat.
Low Press Unload	Set lower than the hold threshold enough to allow a suction pressure recovery from fast transients without unloading the compressor. A 20 kPa differential is generally appropriate for most applications.
Evap Water Frz	Stops the unit in case the leaving temperature falls below a given threshold. To allow a safe operation of the chiller, this setting must be adequate to the minimum temperature allowed by the mixture water/glycol present in the evaporator water circuit.

5.1.6 Evap Pump Settings (optional)

This menu allows to set:

Pump Type	Set pump type between on/off, fixed speed and variable flow
Evap Pump Ctrl	Set number of active pumps and priority

5.1.6.1 Pump Type

These options are available:

On/Off	Set to this when pump operates with no inverter or with a customer supplied speed control signal. Controller output is only a start/stop command.
FixdSpd	Set to this when pump is with inverter but operates at a fixed speed. Controller output is a start/stop command and a locally set speed reference 0-10V signal. See also 7.5.1.
VarFlow	Set to this on inverter driven pumps where an automatic control of a variable primary flow is required. See also **Errore. L'origine riferimento non è stata trovata.**.

5.1.6.2 Evap Pump Ctrl

The following options are available to control the pump(s):

#1 Only	Set to this in case of single pump or twin pump with only #1 operational (f.e. in case of maintenance on #2)
#2 Only	Set to this in case of twin pump with only #2 operational (f.e. in case of maintenance on #1)
Auto	Set for automatic pump start management. At each chiller start, the pump with the least number of hours will be activated.
#1 Primary	Set to this in case of twin pump with #1 running and #2 as a backup
#2 Primary	Set to this in case of twin pump with #2 running and #1 as a backup

5.1.7 Power Conservation

5.1.7.1 Demand Limit

Demand limit function allows the unit to be limited to a specified maximum load. The capacity limit is given through an external 4-20 mA signal. Demand limit related setpoints available through this menu are:

Unit Capacity	Displays current unit capacity
Demand Limit En	Enables demand limit
Demand Limit	Displays active demand limit

5.1.7.2 Current Limit (Optional)

See 7.2 for more information.

5.1.7.3 Setpoint Reset

The setpoint reset function overrides the chilled water temperature selected through the interface, when certain circumstances occur. This feature helps in reducing energy consumption optimizing comfort as well. Three different control strategies can be selected:

- Setpoint Reset by Outside Air Temperature (OAT)
- Setpoint Reset by an external signal (4-20mA)
- Setpoint Reset by Evaporator ΔT (Return)

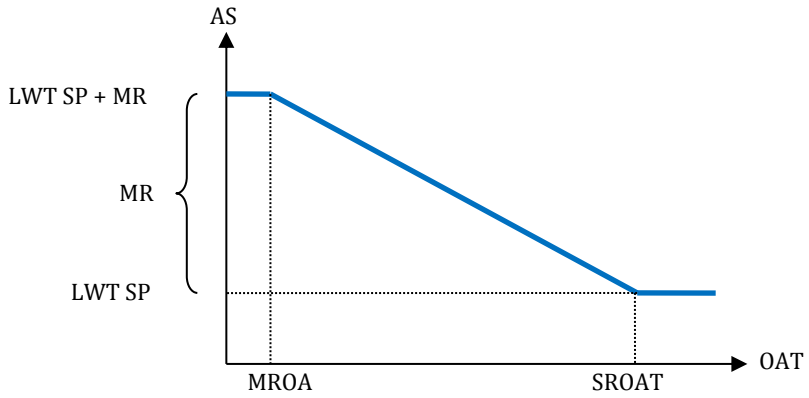
The following setpoints are available through this menu:

Setpoint Reset	Set the Setpoint Reset mode (None, 4-20 mA, Return, OAT)

Max Reset	Max Setpoint Reset (valid for all active modes)
Start Reset DT	Used on Setpoint Reset by Evaporator DT
Max Reset OAT	See Setpoint Reset by OAT Reset
Strt Reset OAT	See Setpoint Reset by OAT Reset

Setpoint Reset by OAT Reset

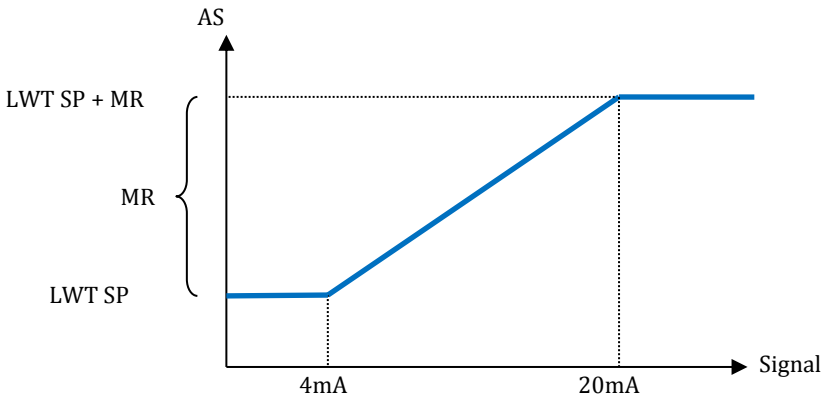
The active setpoint is calculated applying a correction which is a function of ambient temperature (OAT). As temperature drops below the Start Reset OAT (SROAT), LWT setpoint is gradually increased until OAT reaches the Max Reset OAT value (MROAT). Beyond this value, the LWT setpoint is increased by the Max Reset (MR) value.



Parameter	Default	Range
Max Reset (MR)	5.0°C	0.0°C ÷ 10.0°C
Max Reset OAT (MROAT)	15.5°C	10.0°C ÷29.4°C
Start Reset OAT(SROAT)	23.8°C	10.0°C ÷29.4°C
Active Setpoint (AS)		
LWT Setpoint (LWT SP)		Cool/Ice LWT

Setpoint Reset by External 4-20 mA Signal

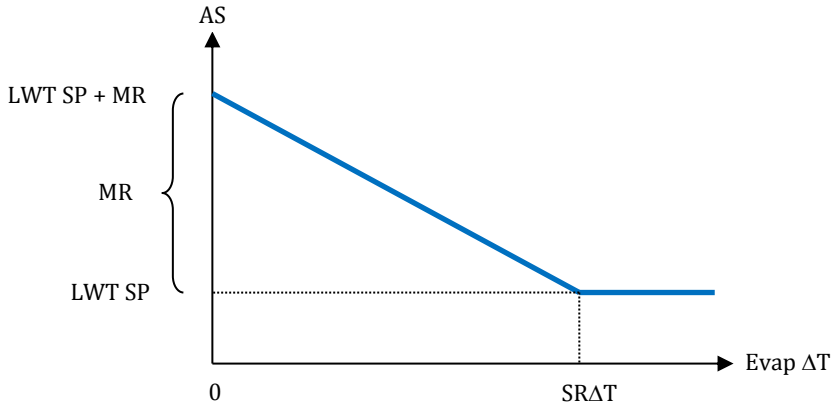
The active setpoint is calculated applying a correction based on an external 4-20mA signal. 4 mA corresponds to 0°C correction, while 20 mA corresponds to a correction of the active setpoint as set in Max Reset (MR).



Parameter	Default	Range
Max Reset (MR)	5.0°C	0.0°C ÷ 10.0°C
Active Setpoint (AS)		
LWT Setpoint (LWT SP)		Cool/Ice LWT
Signal		4-20mA External signal

Setpoint Reset by Evaporator Return Temperature

The active setpoint is calculated applying a correction that depends on the evaporator entering (return) water temperature. As evaporator ΔT becomes lower than the SRΔT value, an offset to the LWT setpoint is increasingly applied, up to the MR value when the return temperature reaches the chilled water temperature.



Parameter	Default	Range
Max Reset (MR)	5.0°C	0.0°C ÷ 10.0°C
Start Reset DT (SRΔT)	5.0°C	0.0°C ÷ 10.0°C
Active Setpoint (AS)		
LWT Target (LWT SP)		Cool/Ice LWT

The Return Reset may affect negatively the chiller operation when operated with variable flow. Avoid to use this strategy in case of inverter water flow control.

5.1.7.4 Soft Load

Soft Loading is a configurable function used to ramp up the unit capacity over a given time period, usually used to influence building electrical demand by gradually loading the unit. The setpoints that control this function are:

Softload En	Enables soft loading
Softload Ramp	Duration of the soft load ramp
Starting Cap	Begin capacity limit. Unit will increase capacity from this value to 100% over the time specified by the Softload Ramp setpoint.

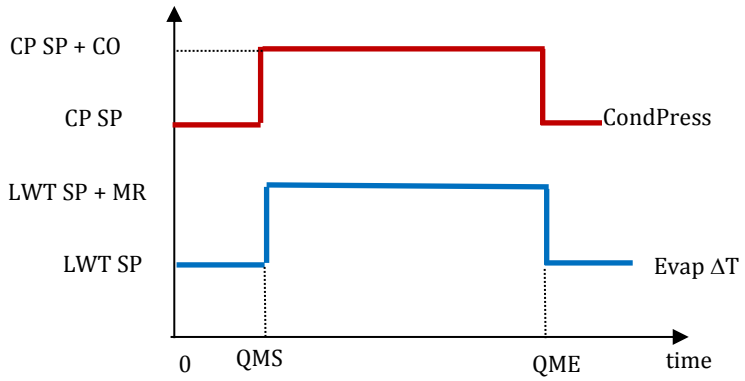
5.1.8 Date/Time Schedules

5.1.8.1 Date,Time and UTC Settings

See 4.4.5.

5.1.8.2 Quiet Mode Scheduling

The Quiet Mode can be used to reduce chiller noise in certain hours of the day when noise reduction is more important than cooling operation, like for example in night time. When Quiet Mode is activated, the LWT setpoint is increased by the maximum setpoint reset (MR) described in the chapter “Setpoint Reset”, thus forcing a capacity limitation to the unit without losing control on chilled water temperature. Also, condenser temperature target is increased by a value set in “QM Cond Offset”. In this way condenser fans are forced to reduce speed without losing control on condensation. Quiet mode is timer enabled.



Parameter	Default	Range
Quiet Mode	Disable	Disable, Enable
QM Start Hr (QMS)	21h	0…24h
QM Start Min	0min	0...60min
QM End Hr (QME)	6h	0…24h
QM End Min	0min	0…60min
QM Cond Offset (CO)	5°C	0…10°C

- *The Quiet Mode may affect negatively chiller efficiency due to the increased condenser setpoint.*

5.2 Unit/Circuit Start-up

In this section, starting and stopping sequence of the unit will be described. All HMI status will be briefly described to allow a better understanding of what is going on into the chiller control.

5.2.1 Prepare the unit to start

In order to let the unit start all the enable signals has to be changed to enable. The list of enabling signals are:

- Local/Remote Enable signals = Enable
- Keypad Chiller Enable = Enable
- BMS Chiller Enable Setpoint = Enable

These items will be now discussed. Each unit is equipped with a Local/Remote selector. It is installed on the unit switchbox and can be positioned on three different positions: Local, Disable, Remote as shown in the following picture:

With the Q0 switch in this position the unit is disabled. Pump will not start in normal operational condition. Compressor are kept disabled independently from the status of the individual enable switches.

With the Q0 switch in this position the unit is enabled. Pump will start if all other enable signals are set to enable and at least one compressor is available to run

With the Q0 switch in this position the unit can be enabled using the additional connections available on the connection terminals. A closed loop will identify an enable signal, this can come from a remote switch or a timer by example.

The Keypad enable signal cannot be modified with the user password level. If it is set to Disable contact your local maintenance to check if it can be changed to Enable.

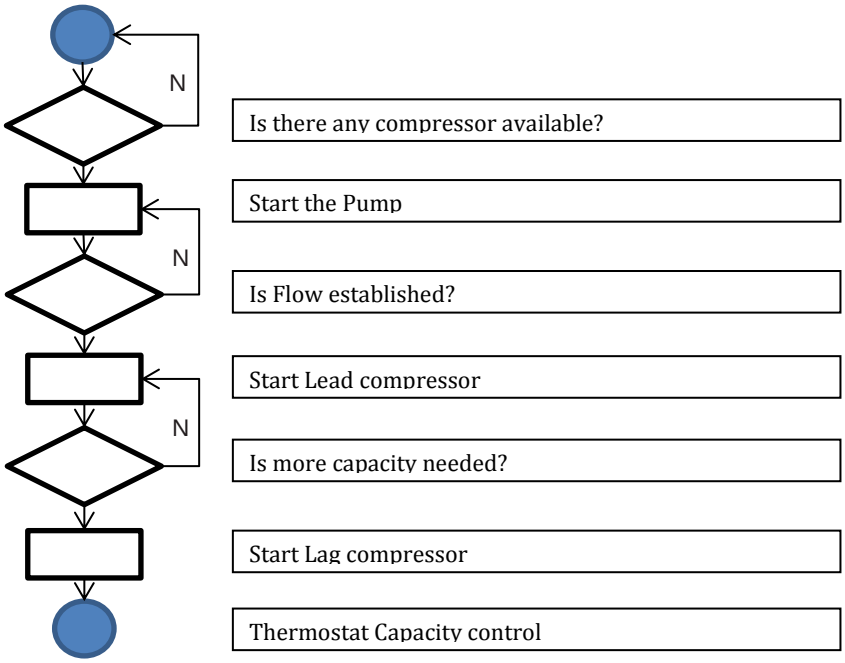
The last enable signal is coming through the high level interface, that mean from a Building Management System. From a BMS connected to the UC using a communication protocol the unit can be disabled. To see if the enable signal is coming from a BMS in the View/Set Unit and then Status/Settings check the Control Source, if it is set to Network than the Network En SP setpoint in the same page will reflect the actual signal coming from the BMS. If the value is set to Disable then the unit cannot start. In this case check with your BAS company how the chiller is operated.

The Unit Status will inform about the current unit status, possible status will be described in the following table:

Overall Status	Status	Description
Off:	Ice Mode Tmr	This status can be shown only if the unit can work in Ice Mode. The unit is off because the Ice setpoint has been satisfied. Unit will remain off until the Ice Timer has expired.
	OAT Lockout	The unit cannot run because the Oustide Air Temperature is below the limit foreseen for the condenser temperature control system installed in this Unit. If the Unit has to run anyway check with your local maintenance how to proceed.
	All Cir Disabled	No circuit is available to run. All circuits can be disabled by their individual enable switch or can be disabled by a component safety condition active or can be disabled by keypad or can be all in alarms. Check the individual circuit status for further details.
	Unit Alarm	A unit alarm is active. Check the alarm list to see what is the active alarm inhibiting the unit to start and check if the alarm can be cleared. Refer to the Troubleshooting section before proceeding.
	Keypad Disable	The Unit has been disabled by keypad. Check with your local maintenance if it can be enabled.
	Loc/Rem Switch	The Local/Remote enable switch is set to disable. Turn it to Local to enable the unit to start its starting sequence.
	BAS Disable	Unit is disabled by BAS/BMS system. Check with the BAS company how to start the unit.
	Test Mode	Unit mode set to Test. This mode is activated to check operability of onboard actuators and sensors. Check with the local maintenance if the Mode can be reverted to the one compatible with unit application (View/Set Unit – Set-Up – Available Modes).
Auto		Unit is in Auto control. The pump is running and at least one compressor is

		running.
Auto:	Noise Reduction	Unit is running with the Quiet Mode activated. Active setpoint may differ from what has been set as cooling setpoint.
	Wait For Load	Unit is in standby because the thermostat control satisfied the active setpoint.
	Evap Recirc	Unit is running the evaporator pump to equalize the water temperature in the evaporator.
	Wait For Flow	Unit pump is running but the flow signal still indicate a lack of flow through the evaporator.
	Pumpdn	Unit is shutting down.
	Max Pulldn	Unit thermostat control is limiting the unit capacity because the water temperature is dropping at a rate that could exceed the active setpoint.
	Unit Cap Limit	Demand limit has been hit. Unit capacity will not further increase.
	Current Limit	Maximum current has been hit. Unit capacity will not further increase.

As soon as the unit status turns to Auto, the start sequence is initiated. The start sequence follows the steps indicated in the simplified flowchart:



5.2.2 Preparing circuits to start

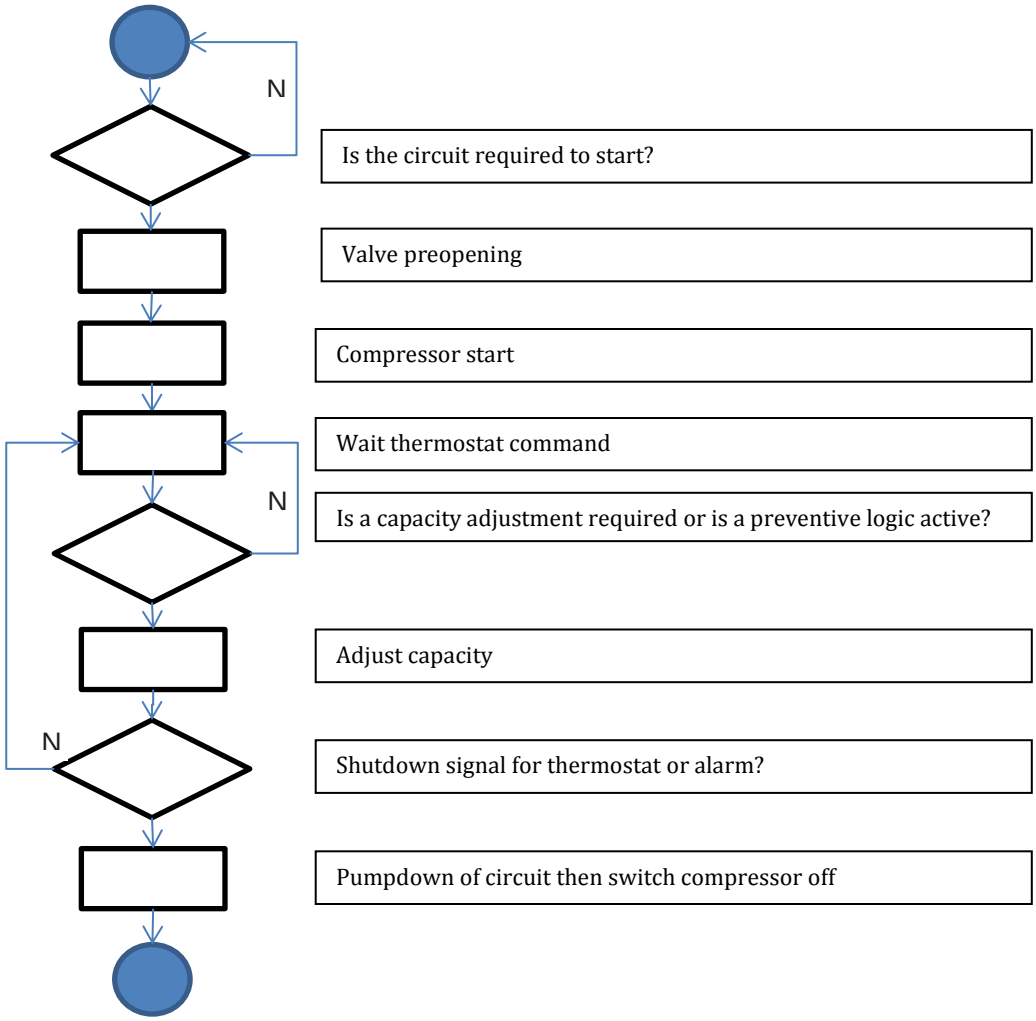
To allow a circuit start up is required to enable the circuit using the enable switch located on the unit switchbox. Each circuit is equipped with a dedicated switch identified with Q1, Q2 (if available) or Q3 (if available). The enable position is indicated with a 1 on the label whereas the 0 position corresponds to disable.

The status of the circuit is indicated in the View/Set Circuit – Circuit #x – Status/Settings. The possible status will be described in the following table.

Overall Status	Status	Description
Off:	Ready	Circuit is off waiting for a stage up signal from thermostat control
	Stage Up Delay	Circuit is off waiting for the stage up delay to expire.
	Cycle Timer	Circuit is off waiting for the compressor cycle timer to expire
	BAS Disable	Circuit is off by BAS signal. Check with the BAS company how to start the unit.
	Keypad Disable	Circuit is off by the local or remote HMI. Check with your local maintenance if it can be enabled.
	Circuit Switch	Circuit is off by Enable switch. Turn the Enable switch to 1 to allow the circuit start up procedure to start
	Oil Heating	Circuit is off because the oil temperature is too low to guarantee a proper lubrication of compressor. Heating resistor is activated to eliminate this temporary condition. It's suggested to power up the unit in advance to avoid this limiting condition.

	Alarm	A circuit alarm is active. Check the alarm list to see what is the active alarm inhibiting the circuit to start and check if the alarm can be cleared. Refer to the Troubleshooting section before proceeding.
	Test Mode	Circuit mode set to Test. This mode is activated to check operability of onboard circuit actuators and sensors. Check with the local maintenance if the Mode can be reverted to Enable.
	Max Comp Starts	Compressor starts exceed the maximum number of starts per hour.
	VFD Heating	Inverter on compressor cannot start because of low internal temperature. Heating resistor is activated to eliminate this temporary condition. It's suggested to power up the unit in advance to avoid this limiting condition.
	Maintenance	A component needs to be replaced or maintained. Refer to the Troubleshooting section before proceeding.
EXV	Preopen	EXV prepositioning before compressor starts.
Run:	Pumpdown	Circuit is shutting down because of thermostat control or pumpdown alarm or because the enable switch has been turned to off.
	Normal	Circuit is running within the expected operational conditions.
	Disch SH Low	Discharge superheat is below the acceptable value. This is a temporary condition that should disappear after few minutes of operation.
	Evap Press Low	Circuit is running with low evaporator pressure. This could be due to a transitory condition or a lack of refrigerant. Check with the local maintenance if corrective actions are required. Circuit is protected by preventive logic.
	Cond Press High	Circuit is running with high condenser pressure. This could be due to a transitory condition or high ambient temperature or problems with the condenser fans. Check with the local maintenance if corrective actions are required. Circuit will be protected by preventive logic.
	High LWT Limit	Circuit is running with a high water temperature. This is a temporary condition that will limit the maximum compressor capacity. Reduction of the water temperature will allow the compressor to reach the full capacity.
	High VFD Amps	Inverter current is higher than the maximum allowed current. Preventive logic will protect the inverter.

If the circuit is allowed to start, the starting sequence is initiated. Starting sequence is described in a simplified version with the following flowchart.



5.3 Compressor Capacity Control

Once a compressor is started, capacity will be modulated according to thermostat control requirements. However, there are some limitations which override the capacity control in order to prevent the chiller from abnormal running conditions. These preventions are summarized below:

- Minimum Capacity
- High Water Temperature
- Low Evaporating Pressure
- High Condensing Pressure
- High VFD Current
- High Discharge Temperature

5.3.1.1 High Water Temperature Limit

The only prevention that can activate at unit level will limit the maximum unit capacity to 80% when the leaving water temperature exceeds 25°C. This condition will be displayed at circuit level to indicate the capacity limitation.

Symptom	Cause	Solution
Unit maximum capacity equal to 80%	Leaving Evaporator water temperature higher than 25°C	Wait until the water temperature drops below 25°C

5.3.1.2 Low Evaporating Pressure

When the circuit is running and the evaporating pressure drops below the safety limits (see section 4.4.13) the circuit control logic reacts at two different levels in order to recover the normal running conditions.

If the evaporating pressure drops below the Low Pressure Hold limit, compressor is inhibited to increase its running capacity. This condition is indicated on the controller display in the circuit status as "Run: Evap Press Low". The status is automatically cleared when the evaporating pressure rise above the Low Pressure Hold limit by 14 kPa.

If the evaporating pressure drops below the Low Pressure Unld limit, compressor is unloaded in order to recover the normal operating conditions. This condition is indicated on the controller display in the circuit status as "Run: Evap Press Low". The status is automatically cleared when the evaporating pressure rise above the Low Pressure Hold limit by 14 kPa.

See section 6.1.8.1 to troubleshoot this problem.

5.3.1.3 High Condensing Pressure

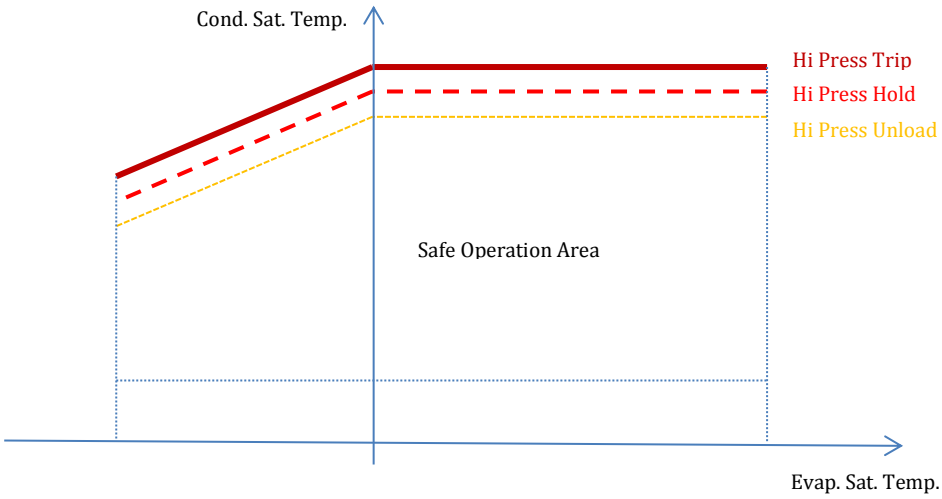
When the circuit is running and the condensing pressure rises above the safety limits the circuit control logic reacts at two different levels in order to recover the normal running conditions.

The two different levels, called High Pressure Hold and High Pressure Unload limits, are calculated by the controller from the maximum condenser pressure allowed by the compressor envelope. This value depends from evaporating pressure as reported in the figure below.

If the condensing pressure rises above the High Pressure Hold limit, compressor is inhibited to increase its running capacity. This condition is indicated on the controller display in the circuit status as "Run: Cond Press High". The limit is calculated in terms of saturated condensing temperature; the status is automatically cleared when the saturated condensing temperature rises above the High Pressure Hold limit by 5.6°C.

If the condensing pressure rises above the High Pressure Unload limit, compressor is unloaded in order to recover the normal operating conditions. This condition is indicated on the controller display in the circuit status as "Run: Cond Press High". The status is automatically cleared when the saturated condensing temperature rises above the High Pressure Hold limit by 5.6°C.

See section 6.1.8.2 to troubleshoot this problem.



5.3.1.4 High Vfd Current

When the compressor is running and its output current rises above the safety limits the circuit control logic reacts at two different levels in order to recover the normal running conditions. Safety limits are calculated by the controller based on the selected compressor type.

If the running current rises above the Running Current Hold limit (101% of RLA), compressor is inhibited to increase its running capacity. This condition is indicated on the controller display in the circuit status as "Run: High VFD Amps".

If the condensing pressure rises above the Running Current Unload limit (105% of RLA), compressor is unloaded in order to recover the normal operating conditions. This condition is indicated on the controller display in the circuit status as "Run: High VFD Amps". The status is automatically cleared when the running amps falls below the hold limit.

5.3.1.5 High Discharge Temperature

When the compressor is running and its discharge temperature rises above the safety limits the circuit control logic reacts at two different levels in order to recover the normal running conditions.

If the discharge temperature rises above the Discharge Temperature Hold limit (95°C), compressor is inhibited to increase its running capacity. This condition is indicated on the controller display in the circuit status as "Run: High Discharge Temp".

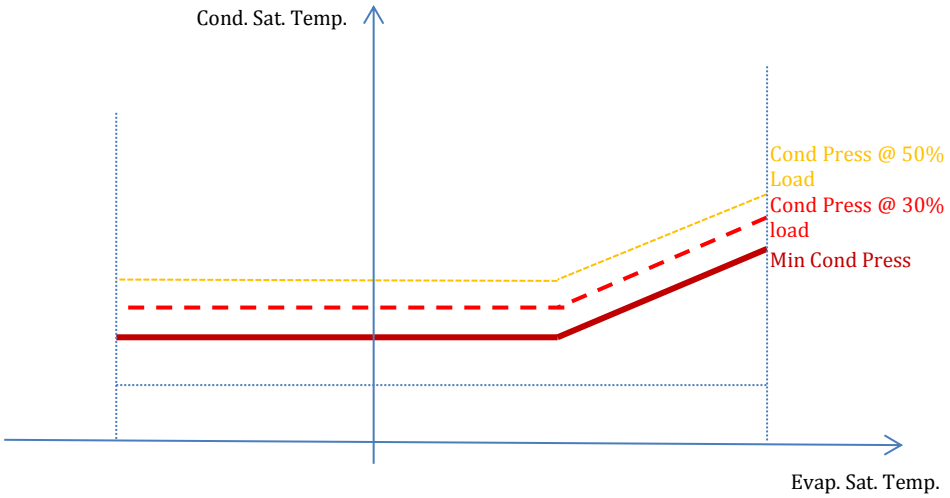
If the discharge temperature rises above the Discharge Temperature Unload limit (100°C), compressor is unloaded in order to recover the normal operating conditions. This condition is indicated on the controller display in the circuit status as "Run: High Discharge Temp". The status is automatically cleared when the discharge temperature falls below the hold limit.

5.4 Condensation Control

Condensing Pressure is controlled in order to achieve best chiller efficiency within compressor envelope limits. Condenser pressure control is achieved through fan staging and/or fan speed control, when the unit is equipped with fan speed regulation option. See chapter 0 for more details.

In particular, when the chiller operates at a low ambient temperature, a minimum condenser saturated temperature is imposed, based on saturated evaporating temperature. This allows the compressor to operate within its envelope. This setpoint is further increased (see figure below) by

a quantity which depends from outside ambient temperature and compressor load in achieve the best efficiency point, i.e. minimum energy consumption of compressor and fans.



5.4.1 Fan Settings

The unit may be equipped with on/off fans, inverter fans or brushless fans. Based on the fan type, different settings are required to the chiller controller and/or to the inverters.

5.4.1.1 Controller Settings

Controller settings for fans can be reviewed and changed in the menu "View/Set Unit" → "Configuration".

Fan Configuration	On/Off	Inverter	Brushless
Fan Type	AC700 (default, 700 rpm) AC900 (optional, 900 rpm)	AC700 (default, 700 rpm) AC900 (optional, 900 rpm)	EC700L (default, 600 rpm, up to 700 rpm) EC700 (optional, 700 rpm) EC800 (optional, 800 rpm) EC900 (optional, 900 rpm)
Cond Ctrl	On/Off	VFD	VFD

On/Off and brushless fans do not need any additional settings. Inverter fans need instead to be set up according to the list described in the following chapter.

The fan stage is adjusted in steps of 1 fan. Fan staging will accommodate anywhere from 5 to 12 fans per circuit according to the following table:

*	*	**	***

Fans are activated according to the difference between the saturated condenser temperature and the condensation target determined by the controller. If this difference exceeds the stage up or stage down settings, an error accumulation is calculated. Once the error accumulation exceeds a fixed threshold, a new step is activated or deactivated. If the saturated temperature returns to within the deadband area, the error accumulation is cleared.

5.4.2 Fan VFD Settings

Units may be equipped optionally or as a standard with fan VFD control. Each circuit is organized with two steps, arranged as per the following table. The two stages are activated according to the same logic as described in the previous chapter.

*	* * * * * * * *

Inverters used for fan control may be of two types, according to the number of fans which they control. Most parameters are valid for all, some other parameters (9900 series) are specific for the inverter and fan type used. For further details please refer to the instruction manual of the inverters included in the documentation of the unit.

Inverter parameter list – 1 fan control

Parameter	Description	Fan Type	
		AC900	AC700
1611	Param View	Long View	Long View
1002	Ext commands	NOT SEL	NOT SEL
1301	Min AI1	0%	0%
1601	Run Enable	DI1	DI1
1604	Fault Reset	DI1	DI1
2006	Undervoltage	Enable	Enable
2101	Start Function	AUTO	AUTO
2202	Acceleration Time	10 s	10 s
2203	Deceleration Time	10 s	10 s
2603	IR compensation Volt	10.5	10.5
2604	IR comp. frequency	50%	50%
2606	Switching Frequency	8kHz	8kHz
2609	Noise Smoothing	Enable	Enable
2618	FW voltage	400 V	400 V
3006	Motor Thermal Time Constant	350 s	350 s
3104	AR Overcurrent	Enable	Enable
3108	AR External Fault	Disable	Disable
9906	*Motor In*	*4.0 A*	*2.7 A*
9908	*Motor Speed*	*900 rpm*	*700 rpm*
9909	*Motor Power*	*1.2 kW*	*0.7 kW*

Inverter parameter list – 2 fan control

Parameter	Description	Fan Type	
		AC900	AC700
1611	Param View	Long View	Long View
1002	Ext commands	NOT SEL	NOT SEL
1301	Min AI1	0%	0%
1601	Run Enable	DI1	DI1
1604	Fault Reset	DI1	DI1
2006	Undervoltage	Enable	Enable
2101	Start Function	AUTO	AUTO
2202	Acceleration Time	10 s	10 s
2203	Deceleration Time	10 s	10 s
2603	IR compensation Volt	10.5	10.5
2604	IR comp. frequency	50%	50%
2606	Switching Frequency	8kHz	8kHz
2609	Noise Smoothing	Enable	Enable
2618	FW voltage	400 V	400 V
3006	Motor Thermal Time Constant	350 s	350 s
3104	AR Overcurrent	Enable	Enable
3108	AR External Fault	Disable	Disable
9906	*Motor In*	*8.0 A*	*5.4 A*
9908	*Motor Speed*	*900 rpm*	*700 rpm*
9909	*Motor Power*	*2.4 kW*	*1.4 kW*

5.5 EXV Control

As a standard, the unit is equipped with one electronic expansion valve (EXV) per circuit, moved by a stepper motor. The EXV controls the suction superheat in order to optimize evaporator efficiency and avoid at the same time suction of liquid to the compressor.

The controller integrates a PID algorithm which manages the dynamic response of the valve in order to keep a satisfactory quick and stable response to system parameter variations. PID parameters are embedded into the controller and cannot be changed. The EXV has the following operating modes:

- Pre-open
- Pressure
- Superheat

When the circuit is required to start, the EXV will go into the Pre-open. After that, the EXV can change to Pressure Control. The compressor will start synchronously with this transition.

In Pressure control, the EXV is positioned to control the evaporator pressure. The pressure target varies based on evaporator LWT and discharge superheat values.

When the EXV transitions to the Superheat control, the target is gradually changed until reaching the normal calculated target. The superheat target varies to avoid that liquid refrigerant droplets could reach the compressor. This target is constantly updated, and averaged over a 10 second period.

The transition from Pressure Control to Superheat Control requires all of the following:

- Evap LWT <= 15.5°C,
- Refrigerant circuit stabilized.

The transition from Superheat Control to Pressure Control may happen only if the water temperature increases again for any reason above the Maximum Operating Pressure (MOP) limit. This will occur if the following condition exists:

- Evap Press > 370kPa (MOP)

Whenever the circuit is running, the EXV position is limited between 5% or 100% position.

Any time the circuit is in the Off or starts the shutdown procedure, the EXV shall be in the closed position. In this case additional closing steps are commanded to guarantee a proper recovery of the zero position.

Expansion valve driver is equipped with UPS module to safely close the expansion valve in case of power failure.

5.6 Economizer Control

The circuit economizer will be activated if all the following conditions apply:

- Circuit in Run state
- Compressor speed > Econ En Spd
- Circuit Pressure Ratio > Econ Act PR
- Discharge Superheat > 22°C
- Percent RLA < 95%

The economizer will be deactivated if one of the following conditions apply:

- Circuit in Off state
- Circuit Pressure Ratio < Econ Act PR – 0.3
- Discharge Superheat < 17°C

5.7 Liquid Injection Control

Liquid injection will be activated when the discharge temperature rises above a safety limit temperature to avoid compressor components overheating.

Liquid injection will be turned off when the discharge temperature decreases below the activation setpoint by a differential of 5°C.

5.8 Variable Volume Ratio Control

Compressor Volume Ratio is controlled through VR slides in the compressor. These slides adapt discharge port geometry to achieve optimum compressor efficiency according to chiller operating conditions.

VR slides are moved between two positions, called VR2 (corresponding to a volume ratio 2.0) and VR3 (corresponding to a volume ratio 3). At compressor off, no slide valve is excited.

- At startup, slide is positioned to VR2.
- In running condition the selection between VR2 and VR3 will be done automatically to maximize compressor efficiency.

6 Alarms

The UC protects the unit and the components from operating in abnormal conditions. Protections can be divided in preventions and alarms. Alarms can then be divided in pump-down and rapid stop alarms. Pump-down alarms are activated when the system or sub-system can perform a normal shutdown in spite of the abnormal running conditions. Rapid stop alarms are activated when the abnormal running conditions require an immediate stop of the whole system or sub-system to prevent potential damages.

The UC displays the active alarms in a dedicated page and keep an history of the last 50 entries divided between alarms and acknowledges occurred. Time and date for each alarm event and of each alarm acknowledge are stored.

The UC also stores alarm snapshot of each alarm occurred. Each item contains a snapshot of the running conditions right before the alarm has occurred. Different sets of snapshots are programmed corresponding to unit alarms and circuit alarms holding different information to help the failure diagnosis.

6.1.1 Unit Events

6.1.1.1 Unit Power Restore (Rivedere)

This alarm only record a temporary power loss to the unit or to the controller.

Symptom	Cause	Solution
String in the alarm list: -- String in the alarm log: *±UnitPowerRestore*	Unit has lost power supply for a period of time.	Check reasons of losing external power supply and if it can be a potential problem for a correct chiller operation.
	Unit's controller has lost power supply because of a failure on 24V fuse.	Check 24V fuse.
	Unit's controller has lost power supply because of a trip of the circuit breaker M12	Check for a short circuit on the 230V

6.1.2 Unit Warning Alarms

6.1.2.1 External Event

This alarm indicate that a device, whose operation is linked with this machine, is reporting a problem.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. String in the alarm list: *UnitExternalEvent* String in the alarm log: *±UnitExternalEvent* String in the alarm snapshot *ExtEvent: InAlarm*	There is an external event that has caused the opening, for at least 5 seconds, of the digital input on the controller board.	Check for reasons of external event and if it can be a potential problem for a correct chiller operation.
NOTE: What above applies in case of USER configuration of the external fault digital input as Event (see section 4.4.2)		

6.1.2.2 Bad Demand Limit Input

This alarm is generated when the Demand Limit option has been enabled and the input to the controller is out of the admitted range.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. Demand Limit function cannot be used. String in the alarm list: *BadDemandLimitInput* String in the alarm log: *±BadDemandLimitInput* String in the alarm snapshot *BadDemandLmInpW: InAlarm*	Demand limit input out of range For this warning out of range is considered to be a signal less than 3mA or more than 21mA.	Check for values of input signal to the unit controller. It has to be in the allowed mA range; Check for electrical shielding of wirings. Check for right value of the unit's controller output in case input signal is into allowed range.

6.1.2.3 Bad Leaving Water Temperature Reset Input

This alarm is generated when the Setpoint Reset option has been enabled and the input to the controller is out of the admitted range.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. LWT Reset function cannot be used. String in the alarm list: *BadSetPtOverrideInput* String in the alarm log: *± BadSetPtOverrideInput* String in the alarm snapshot *BadSPtOvrdInpW: InAlarm*	LWT reset input signal is out of range. For this warning out of range is considered to be a signal less than 3mA or more than 21mA.	Check for values of input signal to the unit controller. It has to be in the allowed mA range. Check for electrical shielding of wirings. Check for right value of the unit's controller output in case input signal is into allowed range.

6.1.2.1 Bad Current Limit Input

This alarm is generated when the Flexible Current Limit option has been enabled and the input to the controller is out of the admitted range.

Symptom	Cause	Solution
Unit status is Run. Bell icon is moving on controller's display. Flexible Current Limit function cannot be used. String in the alarm list: *BadCurrentLimitInput* String in the alarm log: *± BadCurrentLimitInput* String in the alarm snapshot *BadCurrLmInpW: InAlarm*	Flexible current limit input out of range. For this warning out of range is considered to be a signal less than 3mA or more than 21mA.	Check for values of input signal to the unit controller. It has to be in the allowed mA range. Check for electrical shielding of wirings. Check for right value of the unit's controller output in case input signal is into allowed range.

6.1.3 Unit Problems

6.1.3.1 Outside Air Temperature (OAT) Lockout

Symptom	Cause	Solution
Unit Status is StartInhbtAmbTemp. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's	Outside ambient temperature is lower than value set into unit's controller.	Check the minimum outside ambient temperature value set into the unit's controller.

display. String in the alarm list: *BadCurrentLimitInput* String in the alarm log: *± BadCurrentLimitInput* String in the alarm snapshot *BadCurrLmInpW: InAlarm*		Check if this value is in accordance with chiller application, therefore check about the proper application and utilization of the chiller.
	Improper operation of Outside Ambient Temperature sensor.	Check for proper operation of OAT sensor according information about kOhm (kΩ) range related to temperature values.

6.1.3.2 Evaporator Pump #1 Failure

This alarm is generated if the pump is started but the flow switch is not able to close.

Symptom	Cause	Solution
Unit could be ON. Bell icon is moving on controller's display. Backup pump is used or stop of all circuits in case of pump #2 failure. String in the alarm list: *EvapPump1Fault* String in the alarm log: *± EvapPump1Fault* String in the alarm snapshot *EvPumpFlt1: InAlarm*	Pump nr.1 may not be oerating.	Check for problem in electrical wiring of the pump #1.
		Check that electrical breaker of pump #1 is tripped.
		Check for problem in wiring connection between pump starter and unit controller.
		Check the water pump filter and the water circuit for obstructions.
	Flow Switch doesn't operate properly	Check flow switch connection and calibration.

6.1.3.3 Evaporator Pump #2 Failure

Symptom	Cause	Solution
Unit could be ON. Bell icon is moving on controller's display. Backup pump is used or stop of all circuits in case of pump #1 failure. String in the alarm list: *EvapPump2Fault* String in the alarm log: *± EvapPump2Fault* String in the alarm snapshot *EvPumpFlt2: InAlarm*	Pump nr.2 does not work.	Check for problem in electrical wiring of the pump #1.
		Check that electrical breaker of pump #2 is tripped.
		Check for problem in wiring connection between pump starter and unit controller.
		Check the water pump filter and the water circuit for obstructions.
	Flow Switch doesn't operate properly	Check flow switch connection and calibration.

6.1.4 Unit Pumpdown Stop Alarms

6.1.4.1 Evaporator Entering Water Temperature (EWT) sensor fault

This alarm is generated any time the input resistance is out of an acceptable range.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *UnitOffEvpEntWTempSen* String in the alarm log: *± UnitOffEvpEntWTempSen* String in the alarm snapshot *EvapEntWTemp Fault: InAlarm*	Sensor is broken.	Check for sensor integrity. according table and allowed kOhm (kΩ) range.
		Check correct sensors operation
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.

6.1.4.2 Outdoor Ambient Temperature sensor fault alarm

This alarm is generated any time the input resistance is out of an acceptable range.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown precedure. Bell icon is moving on controller's display. String in the alarm list: *UnitOffAmbTempSen* String in the alarm log: *± UnitOffAmbTempSen* String in the alarm snapshot *OATemp: InAlarm*	Sensor is broken.	Check for sensor integrity.
		Check correct sensors operation according table and allowed kOhm (kΩ) range.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for absence of water or humidity on electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.

6.1.4.3 Evaporator Water Temperatures inverted

This alarm is generated any time the entering water temperature is lower than the leaving by 1°C and at least one compressor is running.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped with a normal shutdown precedure. Bell icon is moving on controller's display. String in the alarm list: *UnitOffEvpWTempInvrtd* String in the alarm log: *± UnitOffEvpWTempInvrtd* String in the alarm snapshot *EvapInvAl: InAlarm*	Entering and leaving water temperature sensors are inverted.	Check cabling of the sensors on the unit controller.
		Check offset of the two sensors with the water pump running
	Entering and leaving water pipes are reversed	Check if the water flows in counter flow respect to refrigerant.
	Water pump operate reverse.	Check if the water flows in counter flow respect to refrigerant.

6.1.5 Unit Rapid Stop Alarms

6.1.5.1 Emergency Stop

This alarm is generated any time the Emergency Stop button is activated.

Before resetting the Emergency Stop button please verify that the harmful condition has been removed.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *UnitOffEmergencyStop* String in the alarm log: *± UnitOffEmergencyStop* String in the alarm snapshot *OATemp: InAlarm*	Emergency stop button has been pushed.	Turning counterclockwise the emergency stop button, the alarm should be cleared.
	Emergency stop button is not pushed	Check electrical connection between the button and the controller.

6.1.5.2 OptionCtrlrCommFail

This alarm is generated in case of communication problems with the AC module.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *OptionCtrlrCommFail* String in the alarm log: *± OptionCtrlrCommFail* String in the alarm snapshot *OptionExtFlt: InAlarm*	Module has no power supply	Check the power supply from the connector on the side of the module.
		Check if LEDs are both green.
		Check if the connector on the side is tightly inserted in the module
	Module address is not properly set	Check if module's address is correct referring to the wiring diagram.
	Module is broken	Check if LED are on and both green. If BSP LED is solid red replace the module
		Check if power supply is ok but LEDs are both off. In this case replace the module

6.1.5.3 EXV Driver Error

This alarm is generated in case of communication problem with a exv driver module (EEXV1 or EEXV2).

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *Cx OffEXVCrtlrComFail* String in the alarm log: *± Cx OffEXVCrtlrComFail* String in the alarm snapshot *ExvExtFltx: InAlarm*	Module has no power supply	Check the power supply from the connector on the side of the module.
		Check if LEDs are both green.
		Check if the connector on the side is tightly inserted in the module
	Module address is not properly set	Check if module's address is correct referring to the wiring diagram.
	Module is broken	Check if LED are on and both green. If BSP LED is solid red replace the module
		Check if power supply is ok but LEDs are both off. In this case replace the module

6.1.5.4 PVM alarm

Resolution of this fault requires a direct intervention on the power supply of this unit.
Direct intervention on the power supply can cause electrocution, burns or even death. This action must be performed only by trained persons. In case of doubts contact your maintenance company.

This alarm is generated in case of problems with the power supply to the chiller.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *Cx OffEXVCrtlrComFail* String in the alarm log: *± Cx OffEXVCrtlrComFail* String in the alarm snapshot *ExvExtFltx: InAlarm*	Loss of one phase.	Check voltage level on each of the phases.
	Not correct sequence connection of L1,L2,L3.	Check sequence of L1, L2, L3 connections according indication on chiller's electrical scheme.
	Voltage level on the unit's panel is not in the allowed range (±10%).	Check that voltage level on each phases is into the allowed range that is indicated on the chiller label. Is important to check the voltage level on each phases not only with chiller not running, but mainly with chiller running from minimum capacity up to full load capacity. That's because voltage drop can occur from a certain

		unit cooling capacity level, or because of certain working condition (i.e. high values of OAT); In these cases the issue can be related with the sizing of power cables.
	There is a short-circuit on the unit.	Check for correct electrical isolation condition of each unit's circuit with a Megger tester.

6.1.5.5 Evaporator Flow Loss alarm

This alarm is generated in case of flow loss to the chiller to protect the machine against freezing.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *UnitOffEvapWaterFlow* String in the alarm log: *± UnitOffEvapWaterFlow* String in the alarm snapshot *EvapFlowLoss: InAlarm*	No water flow sensed for 30 seconds continuously or water flow too low.	Check the water pump filler and the water circuit for obstructions.
		Check the flow switch calibration and adapt to minimum water flow.
		Check if pump impeller can rotate freely and has no damages.
		Check pumps protection devices (circuit breakers, fuses, inverters, etc.)
		Check flow switch connections.

6.1.5.6 Evaporator Water Freeze Protect alarm

This alarm is generated to indicate that the water temperature (entering or leaving) has dropped below a safety limit. Control tries to protect the heat exchanger starting the pump and letting the water circulate.

Symptom	Cause	Solution
Unit status is Off. All circuits are stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *UnitOffEvapWaterTmpLo* String in the alarm log: *± UnitOffEvapWaterTmpLo* String in the alarm snapshot *EvFrz: InAlarm*	Water flow too low.	Increase the water flow.
	Inlet temperature to the evaporator is too low.	Increase the inlet water temperature.
	Flow switch is not working or no water flow.	Check the flow switch and the water pump.
	Refrigerant temperature become too low (< -0.6°C).	Check the water flow and filter. No good heat exchange condition into the evaporator.
	Sensors readings (entering or leaving) are not properly calibrated	Check the water temperatures with a proper instrument and adjust the offsets

6.1.5.7 External alarm

This alarm is generated to indicate that an external device whose operation is linked with this unit operation. This external device could be a pump or an inverter.

Symptom	Cause	Solution
Unit status is Off. All circuits are switched off with the normal shutdown procedure.	There is an external event that has caused the opening, for at least 5 seconds, of the port on the controller	Check causes of the external event or alarm.

Bell icon is moving on controller's display. String in the alarm list: *UnitOffExternalAlarm* String in the alarm log: *± UnitOffExternalAlarm* String in the alarm snapshot *ExtAlarm: InAlarm*	board.	Check electrical wiring from unit controller to the external equipment in case of any external events or alarms have been occurred.
NOTE: What above applies in case of USER configuration of the external fault digital input as Alarm (see section 4.4.2)		

6.1.6 Circuit Warning Alarms

6.1.6.1 Failed Pumpdown

This alarm is generated to indicate that the circuit hadn't been able to remove all the refrigerant from the evaporator.

Symptom	Cause	Solution
Circuit status is Off. No indications on the screen String in the alarm list: -- String in the alarm log: *± Cx Failed Pumpdown* String in the alarm snapshot *PdFail: InAlarm*	EEXV is not closing completely, therefore there's "short-circuit" between high pressure side with low pressure side of the circuit.	Check for proper operation and full closing position of EEXV. Sight glass should not show refrigerant flow after the valve is closed.
		Check LED on the top of the valve, C LED should be solid green. If both LED are blinking alternately the valve motor is not properly connected.
	Evaporating pressure sensor is not working properly.	Check for proper operation of evaporating pressure sensor.
	Compressor on circuit is internally damaged with a mechanical problems for example on internal check-valve, or on internal spirals or vanes.	Check compressors on circuits.

6.1.7 Circuit Pumpdown Stop Alarms

6.1.7.1 Suction Temperature Sensor fault

This alarm is generated to indicate that the sensor is not reading properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffSuctTempSen* String in the alarm log: *± CxCmp1 OffSuctTempSen* String in the alarm snapshot *Co1.SuctTemp: InAlarm*	Sensor is shorted.	Check for sensor integrity.
		Check correct sensors operation according information about kOhm (kΩ) range related to temperature values.
	Sensor is broken.	Check if sensor is shorted with a resistance measurement.
	Sensor is not good connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according with electrical scheme.

6.1.7.1 Discharge Temperature Sensor fault

This alarm is generated to indicate that the sensor is not reading properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffDischTmpSen* String in the alarm log: *± CxCmp1 OffDischTmpSen* String in the alarm snapshot *Co1.DischTemp: InAlarm*	Sensor is shorted.	Check for sensor integrity.
		Check correct sensors operation according information about kOhm (kΩ) range related to temperature values.
	Sensor is broken.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according with electrical scheme.

6.1.7.1 Oil Pressure Sensor fault

This alarm is generated to indicate that the sensor is not reading properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffOilFeedPSen* String in the alarm log: *± CxCmp1 OffOilFeedPSen* String in the alarm snapshot *Co1.OilFeedP: InAlarm*	Sensor is shorted.	Check for sensor integrity.
		Check correct sensors operation according information about kOhm (kΩ) range related to temperature values.
	Sensor is broken.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according with electrical scheme.
		Check the power supply to the sensor.

6.1.7.1 High Compressor Vfd Temperature fault

This alarm is generated to indicate that the Vfd temperature is too high to allow the compressor to run.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 VfdOverTemp* String in the alarm log: *± CxCmp1 VfdOverTemp* String in the alarm snapshot *VfdOverload: InAlarm*	Cooling solenoid valve is not operating properly.	Check electrical connection of the solenoid valve.
		Check refrigerant charge. Low refrigerant charge can cause overheating of the Vfd electronic.
		Check for obstructions in the pipe.
	Vfd Heater not properly connected.	Check if Vfd heater is switched off when the Vfd temperature increases.
		Check if the contactor that commands the Vfd heater can switch propertly.

6.1.7.1 Low Compressor Vfd Temperature fault

This alarm is generated to indicate that the Vfd temperature is too low to allow the compressor to run.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the normal shutdown procedure. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 VfdLowTemp* String in the alarm log: *± CxCmp1 VfdLowTemp* String in the alarm snapshot *LowVfdTemp: InAlarm*	Cooling solenoid valve is not operating properly. It's always open when compressor runs.	Check electrical connection of the solenoid valve.
		Check operation of the valve to see if it can close properly.
		Check operating cycles of the valve. It has a limited number of cycles.
	Vfd heater is not working.	Check if the Vfd heater is powered.
		Check if the Vfd heater is commanded on when Vfd temperature is low.

6.1.7.1 Gas Leakage fault

This alarm is generated to indicate that the Vfd temperature is too low to allow the compressor to run.

Symptom	Cause	Solution
Circuit status is Off. The circuit is switched off with the shutdown procedure performing a deep pumpdown of the circuit. Bell icon is moving on controller's display. String in the alarm list: *C1 OffGasLeakage* String in the alarm log: *± C1 OffGasLeakage* String in the alarm snapshot *GasLeakage: InAlarm*	Gas leakage in the compressors box.	Switch off the unit and perform a gas leakage test.
	Gas leakage sensor fault.	Put the sensor in open air and check that the alarm can be cleared. In case replace the sensor or disable the option before getting a new part.

6.1.8 Circuit Rapid Stop Alarms

6.1.8.1 Low Pressure alarm

This alarm is generated in case the evaporating pressure drops below the Low Pressure Unload and the control is not able to compensate to this condition.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped immediately. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffEvapPressLo* String in the alarm log: *± CxCmp1 OffEvapPressLo* String in the alarm snapshot *EvapRefPress: InAlarm*	Transitory condition like a fan staging.	Wait until the condition is recovered by EXV control
	Refrigerant charge is low.	Check sight glass on liquid line to see if there is flash gas.
		Measure sub-cooling to see if the charge is correct.
	Protection limit not set to fit customer application.	Check the evaporator approach and the corresponding water temperature to evaluate the low pressure hold limit.
	High Evaporator Approach.	Clean the evaporator
		Check the quality of the fluid that flows into heat exchanger.
		Check the glycol percentage and type (ethilenic or propilenic)
	Water flow into water heat exchanger is too low.	Increase the water flow.

	Evaporating pressure transducer is not working properly.	Check the sensor for proper operation and calibrate the readings with a gauge.
	EEXV is not working correctly. It's not opening enough or it's moving in the opposite direction.	Check if pump-down can be finished for pressure limit reached;
		Check valve movements.
		Check connection to the valve driver on the wiring diagram.
		Measure the resistance of each winding, it has to be different from 0 Ohm.
	Water temperature is low	Increase inlet water temperature. Check the low pressure safeties settings.

6.1.8.2 High Pressure alarm

This alarm is generated in case the Condenser saturated temperature rise above the Maximum condenser saturated temperature and the control is not able to compensate to this condition. The maximum condenser saturated temperature is 68.5°C but it can decrease when the evaporator saturated temperature become negative.

Symptom	**Cause**	**Solution**
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffCndPressHi* String in the alarm log: *±CxCmp1 OffCndPressHi* String in the alarm snapshot *CondRefPress: InAlarm*	One or more condenser fans do not operate properly.	Check if fans protections have been activated.
		Check that the fans can turn freely.
		Check that there is not any obstacle to the free ejection of the air blown.
	Dirty or partially blocked condenser coil.	Remove any obstacle; Clean the condenser coil using soft brush and blower.
	Inlet air temperature of the condenser is too high.	The air temperature measured at the inlet of the condenser may not exceed the limit indicated in the operational range (working envelope) of the chiller.
		Check the location where the unit is installed and check that there are no any short circuit of the hot-air blown from the fans of the same unit, or even from fans of next chillers (Check IOM for proper installation).
	One or more condenser fan turning in wrong direction.	Check for correct phases sequence (L1, L2, L3) in the electrical connection of the fans.
	Excessive charge of refrigerant into the unit.	Check liquid sub-cooling and suction super-heat to control indirectly the correct charge of refrigerant. If necessary recover all the refrigerant to weight the entire charge and to control if the value is in line with kg indication on unit label.
	Condensing pressure transducer could not operate properly.	Check for proper operation of the high pressure sensor.

6.1.8.3 Mechanical High Pressure Alarm

This alarm is generated when the condenser pressure rises above the mechanical high pressure limit causing this device to open the power supply to all the auxiliary relays. This causes an immediate shutdown of compressor and all the other actuators in this circuit.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMechPressHi* String in the alarm log: *± CxCmp1 OffMechPressHi* String in the alarm snapshot *Co1.MhpAI: InAlarm*	One or more condenser fans do not operate properly.	Check if fans protections have been activated.
		Check that the fans can turn freely.
		Check that there is not any obstacle to the free ejection of the air blown.
	Dirty or partially blocked condenser coil.	Remove any obstacle; Clean the condenser coil using soft brush and blower.
	Inlet air temperature of the condenser is too high.	The air temperature measured at the inlet of the condenser may not exceed the limit indicated in the operational range (working envelope) of the chiller.
		Check the location where the unit is installed and check that there are no any short circuit of the hot-air blown from the fans of the same unit, or even from fans of next chillers (Check IOM for proper installation).
	One or more condenser fan turning in wrong direction.	Check for correct phases sequence (L1, L2, L3) in the electrical connection of the fans.
	Excessive charge of refrigerant into the unit.	Check liquid sub-cooling and suction super-heat to control indirectly the correct charge of refrigerant. If necessary recover all the refrigerant to weight the entire charge and to control if the value is in line with kg indication on unit label.
	Mechanical high pressure switch is damaged or not calibrated.	Check for proper operation of the high pressure switch.

6.1.8.4 High Discharge Temperature Alarm

This alarm indicates that the temperature at the discharge port of the compressor exceeded a maximum limit which may cause damages to the mechanical parts of the compressor.

When this alarm occurs compressor's crankcase and discharge pipes may become very hot. Be careful when getting in contact with the compressor and discharge pipes in this condition.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffDischTmpHi* String in the alarm log: *± CxCmp1 OffDischTmpHi* String in the alarm snapshot *Co1.DischTemp: InAlarm*	Liquid Injection is not operating properly.	Check the electrical connection between the controller and the liquid injection solenoid valve.
		Check that the liquid injection line is not obstructed by observing the discharge temperature when it is activated.
	Liquid injection orifice is small.	Check if when the liquid injection solenoid is activated the temperature can be controlled between the limits.
	Discharge temperature sensor could not operate properly.	Check for proper operation of the discharge temperature

6.1.8.5 High Motor Temperature Alarm

This alarm indicates that the motor temperature has exceeded the maximum temperature limit for safe operations.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMotorTempHi* String in the alarm log: *± CxCmp1 OffMotorTempHi* String in the alarm snapshot *Co1.HighMotorTe: InAlarm*	Insufficient motor cooling	Check refrigerant charge.
		Check if operational envelope of the unit is respected.
	Motor temperature sensor could not operate properly.	Check the readings of the motor temperature sensor and check the Ohmic value. A correct reading should be around hundreds of Ohm at ambient temperature.
		Check the electrical connection of the sensor with the electronic board.

6.1.8.6 High Oil Pressure Differential Alarm

This alarm indicates that the oil filter is clogged and needs to be replaced.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffOilPrDiffHi* String in the alarm log: *± CxCmp1 OffOilPrDiffHi* String in the alarm snapshot *Co1.HighOilPd: InAlarm*	Oil filter is clogged	Replace oil filter.

6.1.8.7 No Pressure At Start alarm

This alarm avoids that a compressor could start with very low (< 35kPa) evaporating or condensing pressure on unit without the fan VFD.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *Cx OffNoPressAtStart* String in the alarm log: *± Cx OffNoPressAtStart* String in the alarm snapshot *NoPrAtStrt: InAlarm*	Ambient temperature is too low	Check the operating envelope for this machine.

6.1.8.8 No Pressure Change At Start alarm

This alarm indicates that the compressor is not able to start or to create a certain minimum variation of the evaporating or condensing pressures after start.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *Cx OffNoPressChgStart* String in the alarm log: *± Cx OffNoPressChgStart* String in the alarm snapshot *NoPrChgStrt: InAlarm*	Compressor cannot start	Check if the start signal is properly connected to the inverter.
	Compressor is turning in wrong direction.	Check correct phases sequence to the compressor (L1, L2, L3) according to the electrical scheme.
		Inverter is not properly programmed with the right direction of rotation
	Refrigerant circuit is empty of refrigerant.	Check circuit pressure and presence of refrigerant.

	Not proper operation of evaporating or condensing pressure transducers.	Check proper operation of evaporating or condensing pressure transducers.

6.1.8.9 Evaporating Pressure sensor fault

This alarm indicates that the evaporating pressure transducer is not operating properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 EvapPressSen* String in the alarm log: *± CxCmp1 EvapPressSen* String in the alarm snapshot *EvapRefPress Fault: Other*	Sensor is broken.	Check for sensor integrity. Check correct sensors operation according information about mVolt (mV) range related to pressure values in kPa.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe. The transducer must be able to sense the pressure through the valve's needle.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.

6.1.8.10 Condensing Pressure sensor fault

This alarm indicates that the condensing pressure transducer is not operating properly.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 CondPressSen* String in the alarm log: *± CxCmp1 CondPressSen* String in the alarm snapshot *CondRefPress Fault: Other*	Sensor is broken.	Check for sensor integrity. Check correct sensors operation according information about mVolt (mV) range related to pressure values in kPa.
	Sensor is shorted.	Check if sensor is shorted with a resistance measurement.
	Sensor is not properly connected (open).	Check for correct installation of the sensor on refrigerant circuit pipe. The transducer must be able to sense the pressure through the valve's needle.
		Check for absence of water or humidity on sensor electrical contacts.
		Check for correct plug-in of the electrical connectors.
		Check for correct sensors wiring also according electrical scheme.

6.1.8.11 High Motor Current Alarm

This alarm indicates that the compressor absorbed current is exceeding a predefined limit.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore or even unload, circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMtrAmpsHi*	The ambient temperature is too high.	Check the unit selection to see if the unit can operate at full load.
		Check if all fans are operating properly and are able to keep the condensing pressure at the proper level.
		Clean condenser coils to allow a lower condensing pressure.

String in the alarm log: *± CxCmp1 OffMtrAmpsHi* String in the alarm snapshot *Co1.Current Hi: xxx A*	The wrong compressor model has been selected.	Check the compressor model for this unit.

6.1.8.12 Low Pressure Ratio Alarm

This alarm indicates that the ratio between evaporating and condensing pressure is below a limit which depends on compressor speed and guarantees the proper lubrication to compressor.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffPrRatioLo* String in the alarm log: *± CxCmp1 OffPrRatioLo* String in the alarm snapshot *LowPrRatio: InAlarm*	Compressor is not able to develop the minimum compression.	Check fan setpoint and settings, it could be too low.
		Check compressor absorbed current and discharge superheat. Compressor can be damaged.
		Check the correct operation of suction / delivery pressure sensors.
		Check the internal relief valve didn't opened during previous operation (check the unit history). Note:- If the difference between delivery and suction pressure exceed 22bar, the internal relief valve open and need to be replaced.
		Inspect the gate rotors / screw rotor for possible damages.

6.1.8.13 Overvoltage Alarm

This alarm indicates that chiller supply voltage exceeded the maximum limit which allows proper operations of the components. This is estimated looking at the DC voltage on the inverter which depends of course from the main power.

Resolution of this fault requires a direct intervention on the power supply of this unit.
Direct intervention on the power supply can cause electrocution, burns or even death. This action must be performed only by trained persons. In case of doubts contact your maintenance company.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *Cx OffOverVoltage* String in the alarm log: *± Cx OffOverVoltage* String in the alarm snapshot *OverVoltage: InAlarm*	Chiller main power supply had an up peak which caused the trip.	Check if main power supply is within the acceptable tolerance for this chiller
	Main power supply setting on the Microtech III is not suitable with the power supply in use.	Measure the power supply to the chiller and select the proper value on the Microtech III HMI.

6.1.8.14 Undervoltage Alarm

This alarm indicates that chiller supply voltage exceeded the minimum limit which allows proper operations of the components.

Resolution of this fault requires a direct intervention on the power supply of this unit. Direct intervention on the power supply can cause electrocution, burns or even death. This action must be performed only by trained persons. In case of doubts contact your maintenance company.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *Cx OffUnderVoltage* String in the alarm log: *± Cx OffUnderVoltage* String in the alarm snapshot *UnderVoltage: InAlarm*	Chiller main power supply had a down peak which caused the trip.	Check if main power supply is within the acceptable tolerance for this chiller
	Main power supply setting on the Microtech III is not suitable with the power supply in use.	Measure the power supply to the chiller and select the proper value on the Microtech III HMI.

6.1.8.15 Compressor VFD OverTemp

This alarm indicates that the Inverter temperature has exceeded a safety limits and the inverter has to be stopped in order to avoid damages to components.

Symptom	Cause	Solution
Circuit status is Off. The circuit is stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffVfdOverTemp* String in the alarm log: *± CxCmp1 OffVfdOverTemp* String in the alarm snapshot *VfdOverTemp: InAlarm*	Insufficient motor cooling	Check refrigerant charge.
		Check if operational envelope of the unit is respected.
		Check operation of the cooling solenoid valve
	Motor temperature sensor could not operate properly.	Check the readings of the motor temperature sensor and check the Ohmic value. A correct reading should be around hundreds of Ohm at ambient temperature.
		Check the electrical connection of the sensor with the electronic board.

6.1.8.16 VFD Communication Failure

This alarm indicates a communication problem with the inverter.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore, circuit is immediately stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMechPressHi* String in the alarm log: *± CxCmp1 OffMechPressHi* String in the alarm snapshot *Co1.MhpAl: InAlarm*	RS485 network is not properly cabled.	Check the continuity of the RS485 network with the unit off. There should be continuity from the main controller to the last inverter as indicated on the wiring diagram.
	Modbus communication is not running properly.	Check inverter addresses and addresses of all the additional devices in the RS485 network (for example the energy meter). All the addresses must be different.
	Modbus interface card can be faulty	Check with your service organization to evaluate this possibility and eventually replace the board.

6.1.8.17 Compressor VFD Fault

This alarm indicates an abnormal condition that forced the inverter to stop.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not load anymore, circuit is immediately stopped. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffVfdFault* String in the alarm log: *± CxCmp1 OffVfdFault* String in the alarm snapshot *Co1.VfdFault: InAlarm*	Inverter is operating in an unsafe condition and for this reason the inverter must be stopped.	Check the alarm snapshot to identify the alarm code from the inverter. Contact your service organization to get the problem solved.

6.1.8.18 No Pressure At Start

This alarm is used to indicate a condition where the pressure at the evaporator or at the condenser is lower than 35kPa, so the circuit is potentially empty of refrigerant.

Symptom	Cause	Solution
Circuit status is Off. The compressor does not start Bell icon is moving on controller's display. String in the alarm list: *Cx OffNoPressAtStart* String in the alarm log: *± Cx OffNoPressAtStart* String in the alarm snapshot *NoPrAtStrt: InAlarm*	Evaporator or condenser pressure are below 35kPa	Check transducers calibration with an appropriate gauge. Check transducers cabling and readout. Check refrigerant charge and set it to the proper value.

6.1.8.19 CxCmp1 MaintCode01

This alarm indicates that a component in the inverter may require verification or even a replacement.

Symptom	Cause	Solution
Circuit status is On. The compressor keep operating as normal. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMechPressHi* String in the alarm log: *± CxCmp1 OffMechPressHi* String in the alarm snapshot *Co1.MhpAl: InAlarm*	The inverter cooling valve in the inverter, may require a verification or a replacement.	Contact your service organization to get the problem solved.

6.1.8.20 CxCmp1 MaintCode02

This alarm indicates that a component in the inverter may require verification or even a replacement.

Symptom	Cause	Solution
Circuit status is On. The compressor keep operating as normal. Bell icon is moving on controller's display. String in the alarm list: *CxCmp1 OffMechPressHi* String in the alarm log: *± CxCmp1 OffMechPressHi* String in the alarm snapshot *Co1.MhpAl: InAlarm*	The condenser in the inverter, may require a verification or a replacement.	Contact your service organization to get the problem solved.

7 Options

7.1 Total Heat Recovery (Optional)

This chiller can handle a total heat recovery option. This feature will require an additional module and sensors to read the entering and leaving heat recovery water temperatures, command a heat recovery water pump.

The heat recovery is enabled through the Q8 switch installed on the unit and requires to adjust settings on the unit controller in order to make it work as needed. First of all the function needs to be enabled on the main controller in order to display all the settings related to this function. With reference to section 4.5.6 the heat recovery enable setpoint has to be chanded to Enable.

Setpoint/Sub-Menu	Default	Range	Description
Apply Changes=	No		No, Yes
C1 # Of Fans=	6		Number of fans available.
Heat Recovery=	**Enable**		Disable, Enable

When this is done the controller will need to be reset by applying the changes.

After the reboot all the heat recovery data and settings will be displayed on the HMI. In the *View/Set Unit – Temperatures* the heat recovery entering and leaving water temperatures will be then visible.

HR LWT=	-273.1°C		Heat Recovery Leaving Water Temperature (displayed only if Heat Recovery set on)
HR EWT=	-273.1°C		Heat Recovery Entering Water Temperature (displayed only if Heat Recovery set on)

Additionally the Heat Recovery setpoint and differential will become visible and can be adjusted as needed:

Setpoint/Sub-Menu	Default	Range	Description
HR EWT Stp	40.0°C	30.0…50.0°C	Heat Recovery Entering Water Setpoint
HR EWT Dif	2.0°C	1.0…10.0°C	Heat Recovery Water Temperature differential

7.2 Energy Meter including Current Limit (Optional)

An energy meter can be optionally installed on the unit. The energy meter is connected through Modbus to the unit controller, which can display all relevant electrical data such as:

- Line to Line Voltage (per phase and average)
- Line Current (per phase and average)
- Active Power
- Cos Phi
- Active Energy

More details are described in chapter 4.4.10. All these data can be also accessed from a BMS by connecting it to a communication module. See the communication module manual for details on the device and parameter settings.

Both the energy meter device and the unit controller need to be properly set. The instructions below detail how to set the energy meter. Refer to the specific instructions of the energy meter for more detail on the operation of the device.

Energy Meter Settings

Password (Down+Enter)	1000	
Connection	3-2E	three phase Aron System
Address	020	
Baud	19.2	kbps
Par	None	parity bit
Time Out	3	sec

Password 2	2001	
CT ratio	see CT label	current transformer ratio (i.e if CT is 600:5, set to 120)
VT ratio	1	no voltage transformers (unless 690V chiller)

Once the energy meter has been configured, do the following steps in the unit controller:

- From Main Menu, go to *View/Set Unit → Configuration*
- Set ***Energy Mtr= Nemo***

The energy meter option integrates the current limit function, which allows the unit to limit its capacity in order not to exceed a pre-defined current setpoint. This setpoint can be set in the unit display or can be changed from an external 4-20 mA signal.

The current limit must be set according to the following instructions:

- From Main Menu, go to *View/Set Unit → Power Conservation*

The following settings related to current limit option are available into the menu:

Unit Current	Displays the unit current
Current Limit	Displays the active current limit (which can be given by an external signal if unit is in network mode)
Current Lim Sp	Set the current limit setpoint (if unit is in local mode)

7.3 Rapid Restart (Optional)

This chiller can activate a Rapid Restart (optional) sequence in reaction to a power failure. An additional module will include a contact to inform the controller that the feature is enabled. The feature will be configured in the factory.

Rapid restart is activated under the following conditions:

- The power failure exists for up to 180 seconds
- The unit and circuit switches are ON.
- No unit or circuit alarms exist.
- The unit has been running in the normal Run state (except backup unit).
- The BMS Circuit Mode setpoint is set to Auto when the control source is Remote

In installations with a primary/standby arrangement, if the primary unit has a safety shutdown, the standby unit (powered up, waiting for an enable command from the BAS) will start and may take a longer to reach full load on its first start than a unit that has already been running.

If the power failure is more than 180 seconds, the unit will start based on the setting of the Stop-to-Start cycle timer (minimum setting of 3 minutes) and load per standard unit without Rapid Restore.

When Rapid Restart is active, the unit will restart within 30 seconds of power restoration. The time to restore full load is less than 6 minutes.

Field supplied inputs to the units are required in the unusual case of a backup chiller being started after the power interruption rather than restarting the primary chiller. A field supplied control signal (normally a BMS) must turn off the Backup Chiller connection on the primary unit and turn on the Backup Chiller connection on the backup unit at the time of switching.

Rapid Restart must be enabled (set to Enable). To do this:

- From Main Menu, go to *View/Set Unit → Set-Up*
- Set ***Rapid Restart= Enable***

7.4 Inverter Pump Kit (Optional)

The inverter pump kit includes one or two centrifugal pumps, each one driven by an inverter. Pumps can be driven with a customer supplied or with a factory wired speed reference. In this latter case, a fixed flow control or a variable flow control can be set. In any case, the pump inverter needs to be loaded with the appropriate set of parameters (see table below). A detailed description of the operator panel and inverter parameters is given in the inverter instruction manual included in the documentation of the unit.

Start-up Wizard for Open Loop Applications				
Parameter	**Description**	**Settings**	**Default**	**NOTE**
0-03	Regional Settings	default	*[0] International*	
0-06	Grid Type	[12] 380-440V/50Hz	*[12] 380-440V/50Hz*	*Check nominal line supply*
1-10	Motor Construction	default	*[0] Asynchron*	
1-20	Motor Power	default	*Size related*	*See motor data label*
1-22	Motor Voltage	400 V	*Size related*	*See motor data label*
1-23	Motor Frequency	50 Hz	*Size related*	*See motor data label*
1-24	Motor Nominal Current	default	*Size related*	*See motor data label*
1-25	Motor Nominal Speed	See Pump Motor Label	*Size related*	*See motor data label*
1-73	Flying Start	[1] Enabled	*[0] Disabled*	
3-02	Minimum Reference	-	*0*	*Minimum speed corresponding to 0V signal.*
3-03	Maximum Reference	50	*50*	*Set same as 1-23 unless a lower speed is required.*
3-41	Ramp-Up Time	10 s	*Size related*	*Time to reach 1-23 frequency*
3-42	Ramp-Down Time	10 s	*Size related*	*Time to stop from 1-23 frequency*
4-12	Motor Speed Low Limit [Hz]	default	*0*	
4-14	Motor Speed High Limit [Hz]	default	*65*	
4-19	Max Output Frequency	default	*Size related*	
5-40	Function Relay [0]	default	*Alarm*	
5-40	Function Relay [1]	default	*Drive running*	
6-10	Terminal 53 Low Voltage	default	*0.07 V*	
6-11	Terminal 53 High Voltage	default	*10 V*	
6-12	Terminal 53 Low Current	default	*4 mA*	
6-13	Terminal 53 Low Voltage	default	*20 mA*	
6-14	Terminal 53 mode	default	*1*	*Voltage input - [0] switches to current input*

As a standard, this kit includes a wired start/stop signal from controller to inverter(s). No wire is factory connected from controller to inverter for speed reference signal. Terminals 53 and 55 are available in the inverter to accept either a 0-10V signal or a 4-20 mA signal. Reference signal type can be selected through parameter 6-14.

To set up the Inverter Pump Kit, follow the instructions below:

- From Main Menu, go to “View/Set Unit” → “Configuration”

- On the Configuration menu, set ***Pump Type= On/Off***

7.5 Pump Speed Control (Optional)

The kit includes factory-wired start/stop and speed reference signals from controller to inverter(s). Also, additional terminals are available for proper operating mode selection and/or external device control.

7.5.1 Dual Setpoint Fixed Pump Speed Control

The fixed pump speed control allows an inverter driven pump to operate at a fixed speed which can be set in the controller. To set up the Dual Setpoint Fixed Pump Speed Control, follow the instructions below:

- From Main Menu, go to “View/Set Unit” → “Configuration”
- On the Configuration menu, set ***Pump Type= FixdSpd***
- Go to “View/Set Unit” → “Pump VFD Settings”
- Set Pump Fixd Spd1 as the primary pump speed setpoint
- Set Pump Fixd Spd1 as a secondary pump speed setpoint (if required)

The primary or secondary setpoints are activated by a customer supplied dry-contact switch (referred to as “pump speed setpoint switch”) according to the following logic:

Pump Speed Setpoint Switch status	Active Pump Speed Setpoint
Open (default)	Pump Fixd Spd1
Closed	Pump Fixd Spd2

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