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Artificial Intelligence

master plant SEQuencer

SEQUENCER
RC Ai Artificial Intelligence

master plant SEQuencer
Sequencer for liquid chillers,
heat pumps and multifunction units.

Catalogo Tecnico: T_SEQ_0914_GB

rcgroupairconditioning

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MASTER PLANT SEQUENCER

Master Plant SEQuencer is part of the RC Group Artificial Intelligence.
Master Plant SEQuencer offers some useful tools for the management of several units installed in parallel on a hydronic network: liquid chillers; heat pumps, multifunction units and dry coolers.

HIGHLIGHTS

The choice of RC Group reliable, made with hi-tech components, with extremely high energy efficiency units is only the first step.
Only with proper plant measurements, analysis and control instruments is possible to grant a long-lasting efficiency and quality.
The features of Master Plant SEQuencer add value to the installed units, to the plant and to the building.

ENERGY SAVINGS MAXIMIZATION
Master Plant SEQuencer maximizes energy savings by the activation of the RC Group units that offer the highest possible efficiency according to the required working conditions. Master Plant SEQuencer:

- Is directly connected with the RC Group units using MP COM microprocessor by a serial link;
- Automatically recognizes the type of RC Group chiller and acquires the key information by a "plug and play" logic (SEQuencer has in its memory the mapping of the RC Group chillers);
- Always activates the chiller offering the highest possible efficiency according to the required working conditions optimizing the plant's energy efficiency.
- Cuts energy bills significantly.

NOISE REDUCTION
Master Plant SEQuencer follows all the law requirements against noise, installation in the historic city centres and noise limitation during night hours. It is possible to program the limitation of the units' acoustic emission in time slots.

OPTUMUM EFFICIENCY OF THE UNITS
Master Plant SEQuencer collects all the plant information in a single supervision point, it allows real time plant control and analysis, granting greater efficiency and durability. Master Plant SEQuencer makes the plant last longer and grant its full efficiency also through the dedicated functions such as the installed units working hours equalization and programmed maintenance automatic requests sending.

PLANT MONITORING AND MANAGEMENT IN SINERGY WITH RILHEVA
RC Rilheva System is part of the RC Group Artificial Intelligence. It is the most advanced solution in unattended monitoring and remote management for an air conditioning plant.

The combination of the optional accessory RILHEVA with Master Plant SEQuencer allows:

- The entire plant or units real time unattended monitoring of the main physical data (pressure, levels, temperatures, failures, unit conditions,…) even in mobility, everywhere in the World, through an easy web access from PC's , tablets or smartphones;
- The system performance analysis over time, charts creation and export.
- Units remote control.

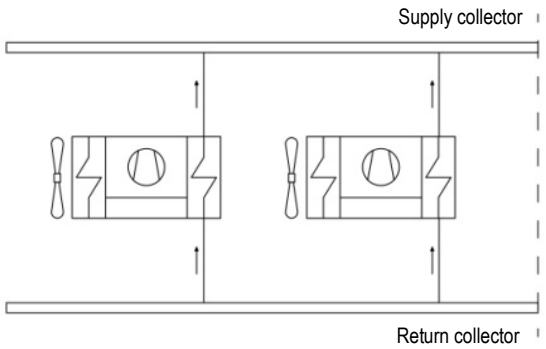
For further information please consult the chapter on RILHEVA in this catalogue.

Master Plan Sequencer
Installation in dedicated cabinet

APPLICATION FIELDS

The sequencer can be applied to:

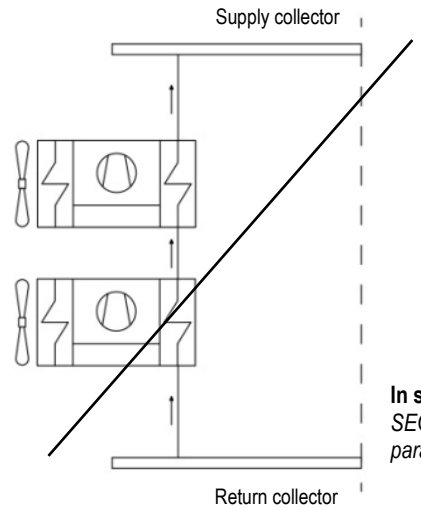
- 2-pipe and 4-pipe plants;
- In parallel installed units;
- Up to 5 liquid chillers, even different in type and size;
  - Liquid chillers;
  - Heat pumps and multifunction units;
- Chillers supplied by other manufacturers, different from RC Group;
- Fixed speed and variable flow pumps.
- Dry coolers.



In parallel installation
SEQuencer can be applied to in parallel installed units.

The sequencer **CANNOT** be applied to:

- In series installed units.
- Air conditioners;
- Rooftop units;
- Air handling units;



In series installation
SEQuencer CANNOT be applied to in parallel installed units.

The device is designed to work in standalone mode or in combination with a BMS supervisor:

- It can work in standalone mode with its own graphics interface and its own 7"graphic touch screen display.
- It can be linked to a supervision system using BACnet or ModBus protocols (serial port are supplied as options).

The software interface is available only in English language.

MAIN FEATURES

CONNECTION WITH RC GROUP UNITS
The SEQquencer and the units microprocessor control systems are connected to LAN using ModBus protocol. The ModBus serial board, supplied as an option, must be installed on each linked unit. The functions managed by SEQuencer are specified as follows:

- active control:
  - activation / deactivation of units depending on the criteria freely configurable by the user, as:
    - priority rules, easily customizable and totally flexible;
      - Units parallel insertion;
      - Units sequential insertion.
    - changeover for units working hours equalization, based on:
      - stand-by type (fixed, rotating, none);
      - insertion rule (on alarm, on temperature).
  - Temperature control:
    - Temperature precise control, thanks to the availability of all the capacity steps of the units;
    - automatic plant set-point compensation functions based on:
      - ambient temperature, measured with a dedicated sensor, supplied as a standard.
      - free-cooling availability, with the aim of maximizing the free-cooling working mode.
      - cooling/thermal load, when measured (requires dedicated instruments for the measurement).
    - Time scheduling, allows the hourly scheduling of several functions:
      - plant activation;
      - set-point modification;
      - set-point compensation rules modification;
      - acoustic emission limitation during night time made by fans speed limitation.
  - plant management, by:
    - liquid chillers electrical absorption limiting (electrical demand limit function) based on user-defined thresholds (the implementation of this function must be studied case by case in function to the features of the units installed in the plant):
    - pumps control of the hydronic circuit:
      - fixed speed pumps, with hourly changeover and on alarm management;
      - variable flow pumps, controlled by:
        - a pressure signal for VPF, variable primary flow plants
        - a differential temperature signal as indirect measurement of the water decoupling pipe flow between primary and secondary plant for mixed plant, with fixed flow to single units and variable flow to internal units.
    - special functions conceived to manage free cooling units, multifunction units and units equipped with recovery heat exchangers for energy savings optimization:
      - when the ambient temperature is favourable, the activation of free-cooling units has priority on the activation of traditional chillers;
      - when the plant needs it, the contemporary production of cold and hot water automatically has priority.
    - energy performances control, for real time visualization of the plant and/or single unit EER/COP (requires dedicated instruments for flow measurement and electrical absorption);
    - anti-freeze function integration, through the configuration of alarms based on fluid or ambient temperature, in case of free-cooling units.

- passive control
  - collection of all alarms signal coming from the units;
  - faults and events report;
  - automatic request of pre-programmed maintenance activities.

CONNECTION WITH UNITS OF DIFFERENT MANUFACTURERS, NOT RC GROUP.
The standard integration of these units is limited to the elaboration of physical I/O (clean contacts for unit start/stop, working mode, set-point modification, general alarm).
The serial mapping integration is available as an option. Please contact RC Group for further information.

IMPORTANT
Master Plant SEQuencer is pre-configured by RC Group and adapted to the specific plant in order to make the start-up easier. It is necessary to provide the following information to RC Group: plant scheme and functional description, BMS information and BMS communication protocol information.

MAIN COMPONENTS

- Dedicated cabinet:
  - Dimensions: BxHxP 405x500x200 mm;
  - Degree of protection: IP65.
- Local/remote selector with safety key;
- Safety magnetothermic switches;
- Transformer for auxiliary circuit and microprocessor supply.
- Microcontroller: CPU: 32 bit, 44 MHz
  - FLASH memory: 2+2 MB
  - RAM: 512 MB
  - Clock precision: 100 ppm
  - Battery: lithium CR2430 3Vdc
- Touch screen display: Resolution: 800x480, WVGA
  - Active display area: 7" diagonal
  - Colors: 64K
  - Backlight: LED
  - Front panel: 187x147 mm (7.36x5.79").
- Terminal for digital/analog input/output.
- Ambient temperature sensor.

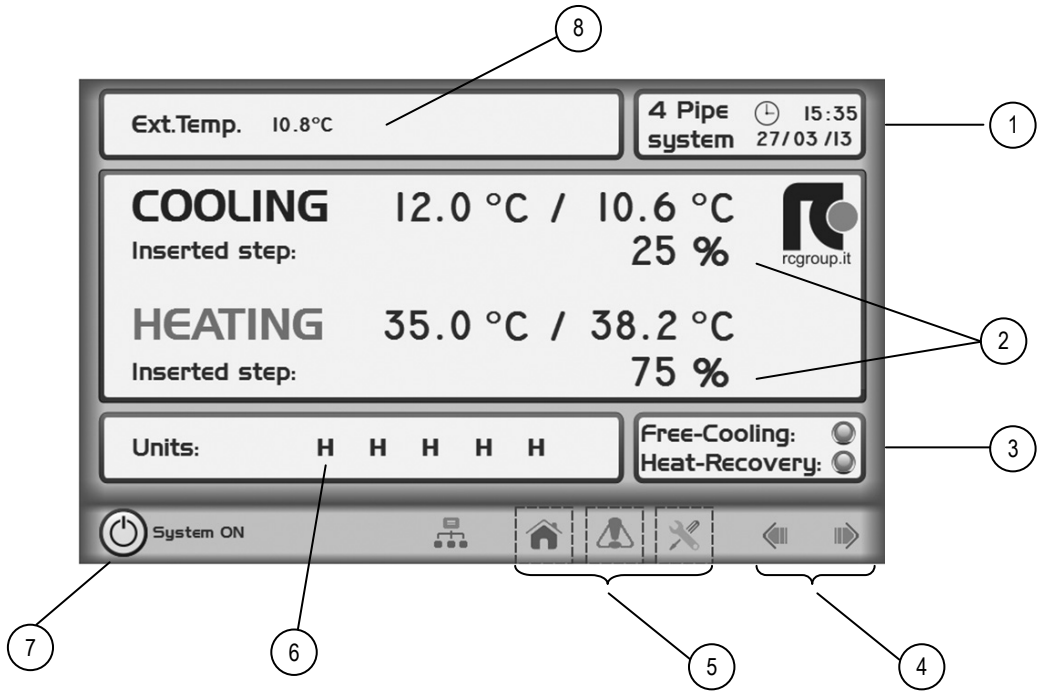
CHARACTERISTICS:

- Power supply: 100-240 Vac / 1 / 50-60 Hz
- Power consumption: max 100VA
- Operating temperature: -10/60°C

Master Plan SEQuencer
7" touch screen
Local/remote selector with safety key

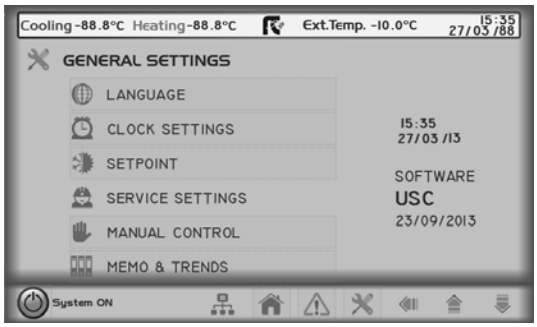
MICROCONTROLLER WITH 7" TOUCH SCREEN DISPLAY

Home mask

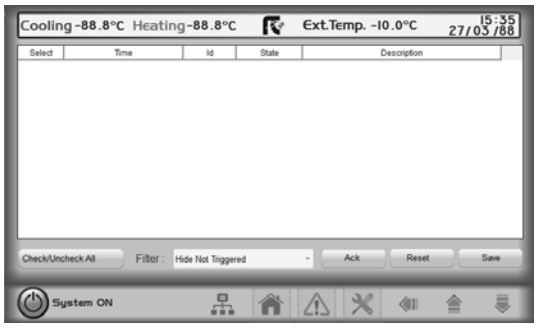


1 General information (date, time, plant type).
2 Delivery and return plant liquid temperatures, indication of inserted capacity steps (shown as percentage of the overall system capacity)
3 Special function activation (free-cooling, partial heat recovery).
4 Arrows, allow to move inside the menu.
5 Toolbar: allow the access to the "Menu", "Alarms", "Set point", "Set point compensation" masks.
6 Unit status: (-) available, not activated or in stand-by; (/) not available, in alarm; (S) activated, running machine; (D) in defrost; (X) offline (released); (O) manually OFF; (M) manually ON.
7 System status (to activate the system hand-held display is mandatory as shown in the following page)

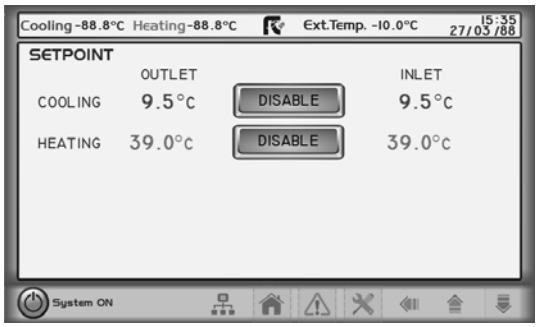
(4) Toolbar, allow the access to the following masks



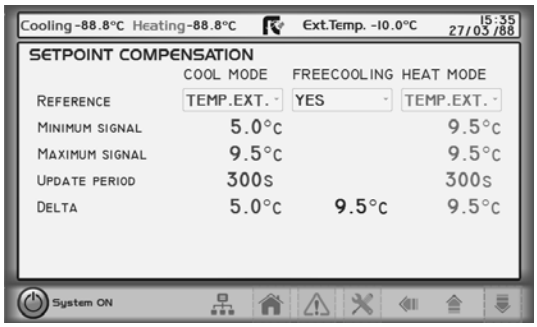
"Menu" mask



"Alarms" mask



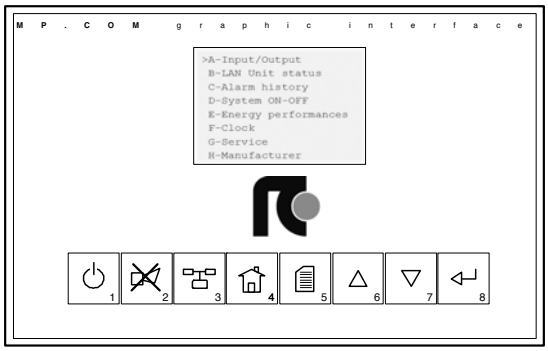
"Set point" mask



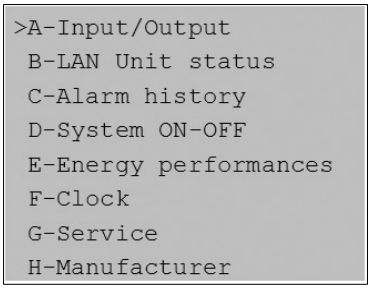
"Set point compensation" mask

PORTABLE TERMINAL - HAND HELD DISPLAY

Portable terminal with 8 keys with backlighted graphic display for the system advanced configuration and for the visualization of general settings (PLC settings). The information are displayed as text or easily identifiable by symbols.



Hand held display



Main menu

KEYBOARD FUNCTIONS

KEY 1	not used
KEY 2	active alarm(s) visualization
KEY 3	not used
KEY 4	Home key – displays the main screen. One step back in menu activation.
KEY 5	Enters to control and visualization menus as: • Input - Output • LAN unit status • Intervened alarms history • System ON-OFF • Energy performance • Date and time setting • Service menu (password protected) • Menu manufacturer (password protected)
KEY 6	Scroll the pages inside each menu and increased the displayed value
KEY 7	Scroll the pages inside each menu and decreased the displayed value
KEY 8	Confirm a parameter insertion

WARNING

The hand held display must be used for the commissioning and for settings of the system exclusively by qualified personnel.

OPTIONAL ACCESSORIES

SEQUENCER ACCESSORIES

- Serial port for the connection to an external supervisor BMS (it's possible to install only one of the following serial ports:
  - Serial port RCcom, MBUS/JBUS.
  - Serial port BACnet for Ethernet – SNMP – TCP/IP.
  - Serial port BACnet for MS/TP.
- Installation in cabinet suited for outdoor installation (IP65): BxHxP 405x650x200 mm;
- Installation within the electrical panel of one of the linked units. This solution must be evaluated case by case by RC Group.
- RILHEVA. Plant monitoring and management GPRS solution.

Master Plant SEQuencer can acquire and operate on the most significant plant operative parameters, in real time, through: Modbus communication protocol, analog signal 0-10V or 4-20mA, digital signal (clean contacts).
When properly equipped, Master Plant SEQuencer can acquire unit or plant:

- energy consumption;
- differential pressure and temperature;
- cooling/thermal capacity erogated by water flow measurement;
- energy performance evaluation (EER/COP).

The list that follows is an example of the most common optional installable accessories on single units and on the plant.

SEQUENCER OPTIONAL ACCESSORIES – FOR EACH LINKED UNIT
Installation of the optional accessories on each unit connected with the Master Plant Sequencer.

- MP.COM microprocessor control accessories:
  - Serial port RCcom, MBUS/JBUS to link the sequencer to each unit
- Demand limit. The optional accessory limits the electrical absorption of the unit according to a set point value with a reduction of the machine engaged load.
- Analog flowmeter (0÷1V / 4-20mA) for evaporator's water flow measurement and display. The optional accessory stop the machine in case of water flow anomalies.
- Electrical network analyzer: measurement and display of the machine electrical engaged power (kW).

SEQUENCER OPTIONAL ACCESSORIES – FOR THE PLANT

- Analog flowmeter (0÷1V / 4-20mA) for water flow measurement and display;
- Temperature sensors on water inlet and outlet.

WARNING
For the introduction of several specific function of Master Plant SEQuencer, the units must be completed with proper optional accessories. Please refer to the Master Plant SEQuencer documentation of the specific plant. For further information about optional accessory matching please consult the chapter on OPTIONAL ACCESSORIES on the technical catalogues of the RC GROUP units to be linked to the Sequencer.

OPTIONAL ACCESSORIES – RILHEVA - PLANT MONITORING AND MANAGEMENT GPRS SOLUTION.

Rilheva is a part of the RC Group Artificial Intelligence. Is the most advanced solution in unattended monitoring and remote management for an air conditioning plant. Rilheva can be used everywhere in the World, through an easy web access from mobile devices such as PC's, tablets or smartphones.

The solution is available for PC, tablet and smartphone:

- Thanks to an easy access to rcgroup.rilheva.it website the user is provided with an interface that allows him to operate directly on the field.
- Dedicated apps for Android and iOS operative systems are available for the mobile network access.

Each device can manage up to 400 Modbus registers and up to 31 (linked in serial) RC Group units:

- Air conditioners;
- Liquid chillers;
- Heat pumps and multifunction units.

MAIN FEATURES:

- Real time plant's check;
- Units remote control (start/stop, set point modification, alarms reset);
- Customizable visualization and analysis (historical) of each unit data;
- Charts creation and export;
- Data monitoring on maps;
- SMS, Mail, Speech Synthesis, FAX and APP (iOS e Android) notifications;
- Integration of different devices in the system (pumps, cameras, etc.) through RS485 communication ports on ModBus RTU communication protocol.

MAIN COMPONENTS:
The system is factory assembled and it includes:

- RILHEVA electronic card that measures physical data (pressure, levels, temperatures, failures, unit conditions,…) through RS485 communication ports on ModBus RTU communication protocol and transmits them with a GPRS modem to a central server where they are stored, elaborated and made available to enabled users through the use of a common internet browser.
- Omni-directional dual band (900 and 1800MHz) antenna with magnetic base for data transmissions and receptions.
- Modular transformer TMC 15/12 230V / 4-8-12 V AC 15 VA for the power supply.

IMPORTANT
The optional accessory requires the installation of the serial port RCcom MBUS/JBUS on each unit to control (optional accessory, not included).
The optional accessory requires also the installation of a SIM card with an internet data subscription with a mobile phone provider (not included) and an annual subscription to RC GROUP service.

ADDITIONAL MODULE FOR pLAN CONNECTION
When the RS 485 serial connection is not available in the units to control is possible to connect Rilheva to a pLAN network. This option requires an additional module installation. The additional module is electrically supplied by the same modular transformer used for RILHEVA. The additional module is linked to RILHEVA by the RS232 communication port.

RC GROUP SERVICE SUBSCRIPTION
Several annual subscription forms are available.
Please contact RC Group for further information.

RILHEVA ELECTRONIC CARD

WARNING
For further information please consult the Rilheva TECHNICAL CATALOGUE.

APPLICATION EXAMPLES – MASTER PLANT SEQUENCER

1 – 4 PIPE PLANT WITH MULTIFUNCTION UNITS.
Multifunction units are connected to 4-pipe plants for simultaneous and non-simultaneous production of chilled/heated water. Master plant SEQuencer manages these units the goal of improving the overall efficiency of the system, following these simple assumptions:

- these units offer their best energy performance when used in simultaneous production of heating and cooling;
- when used in the same plant with chillers or heat pumps (e.g. units with high efficiency as designed for a specific function), they are generally less efficient than these last ones when exploited in a single side (cooling or heating).

These assumptions are converted into an automatic correction of priority sequence as follows:

- for simultaneous production of heated and chilled water, multifunctional units assume higher priority;
- when only one of the two requests is satisfied, specialized units (chillers in front of an overcoming request of cooling and heat pumps for heating) are in priority to available multifunctional units.

EXAMPLE: INSTALLATION WITH ONE LIQUID CHILLER, THREE MULTIFUNCTION UNITS AND ONE HEAT PUMP

Case 1: System activation with cooling request only. Chiller is activated first. In accordance to the load multifunctional units are started in sequence, in simple cooling mode.

Case 2: System activation with heating request only. Heat pump is activated first. In accordance to the load, multifunctional units are started in sequence, in simple heating mode.

Case 3: system activation in front of simultaneous request of heating and cooling. One multifunctional unit is activated first.
If the temperatures of both circuits (chilled water and heated water) are not satisfied, another multifunctional unit is released. If the temperature of one of the two circuits, heated or chilled, is satisfied, either the liquid chiller or the heat pump obtains the priority

Units deactivation follows the inverted logic.

Multifunction units

MULTIPLO PF

REVERSO SCREW

TRILOGY

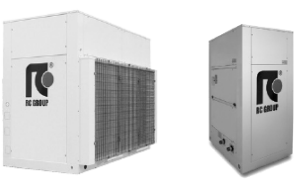
2 – PLANT WITH FREE-COOLING UNITS
Free-cooling units are connected to 2-pipe plants for chilled water production.
Master plant SEQuencer manages these units with the goal of improving the overall efficiency of the system, following these simple assumptions:

- The indirect free-cooling system consists in the complete cooling of the chilled water of the exhisting cooling system with the outside air;
- The energy savings will be higher the longer the outside temperature remains below the required temperature for cooling.

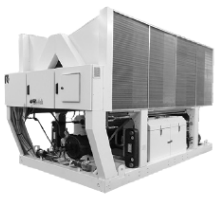
These assumptions are converted into an automatic correction of priority sequence as follows:

- When the ambient temperature is favorable the activation of the free-cooling units has priority on the activation of traditional chillers;

Free-cooling chillers



MAXIMO PF, MAXIMO



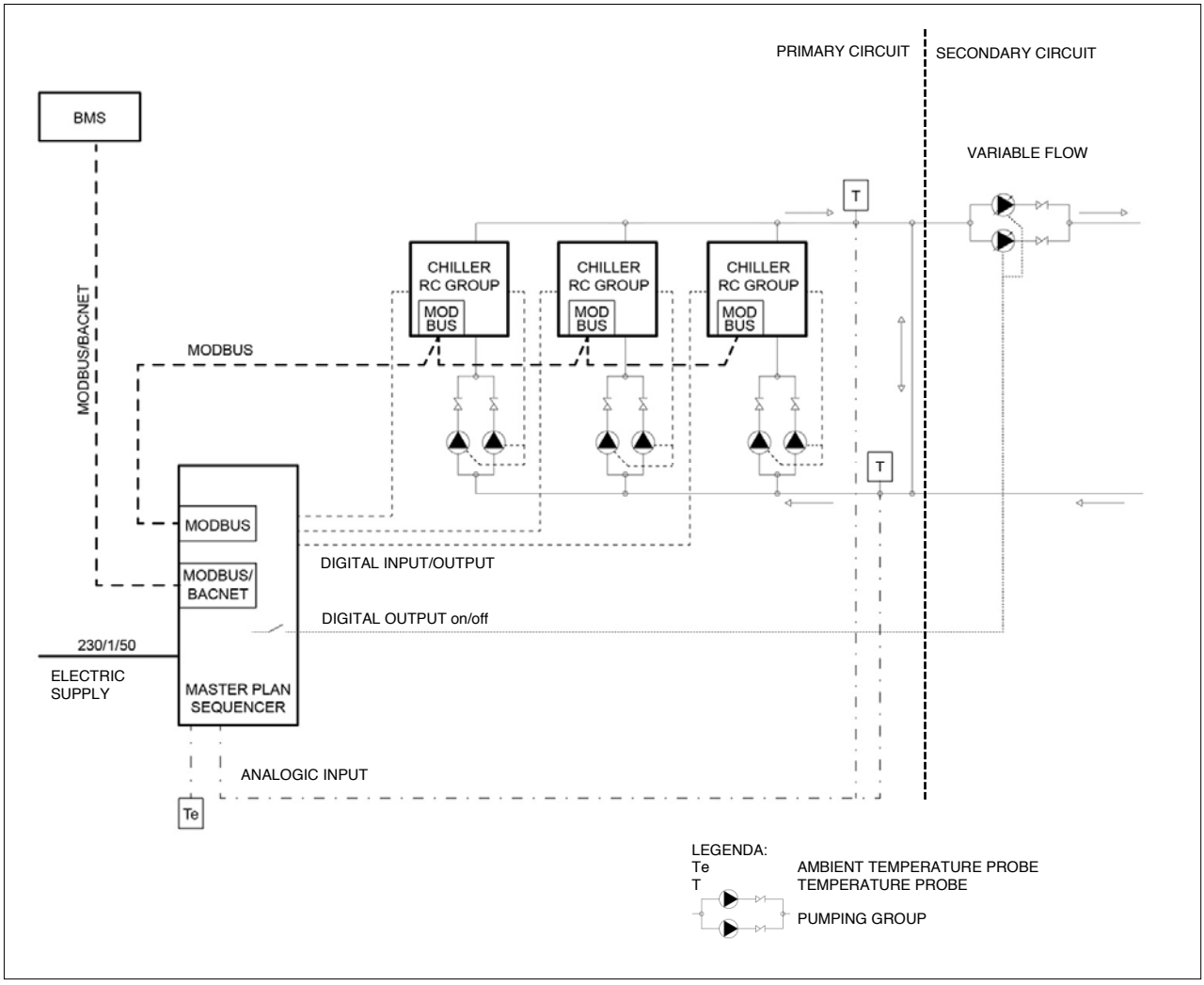
GLIDER EVO FREE

UNICO TURBO FL FREE

3 - EXAMPLE SCHEME – PLANT WITH 3 LIQUID CHILLERS.

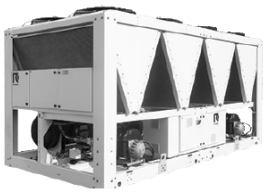
Example of a plant with fixed flow primary circuit and variable flow secondary circuit.

In this example the primary circuit pumps are managed by the units microprocessor control system, while the SEQuencer manages the secondary circuit pumps through a pressure signal.



Liquid chillers

PYXIS



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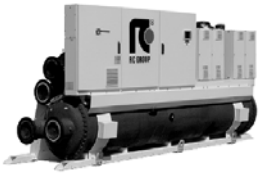

FRIGO TURBO FL

Il continuo miglioramento dei prodotti può comportare variazioni nei dati indicati nel presente catalogo.

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