

MITSUBISHI ELECTRIC HYDRONICS & IT COOLING SYSTEMS S.p.A.

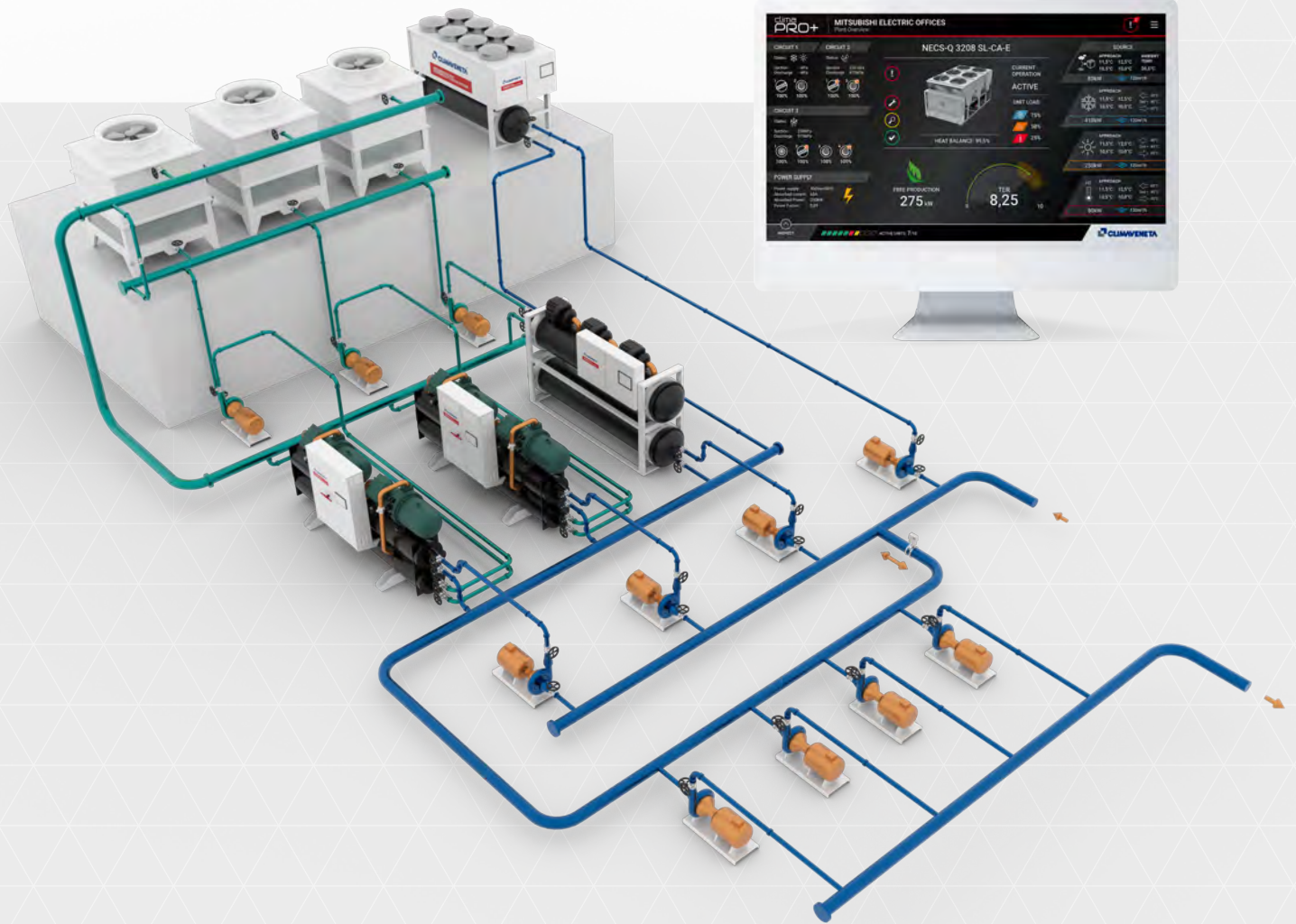
COMFORT

PROCESS

CONTROL, SUPERVISION AND OPTIMISATION SYSTEMS

CLIMAPRO+

THE PLANT ROOM
OPTIMIZATION SYSTEM

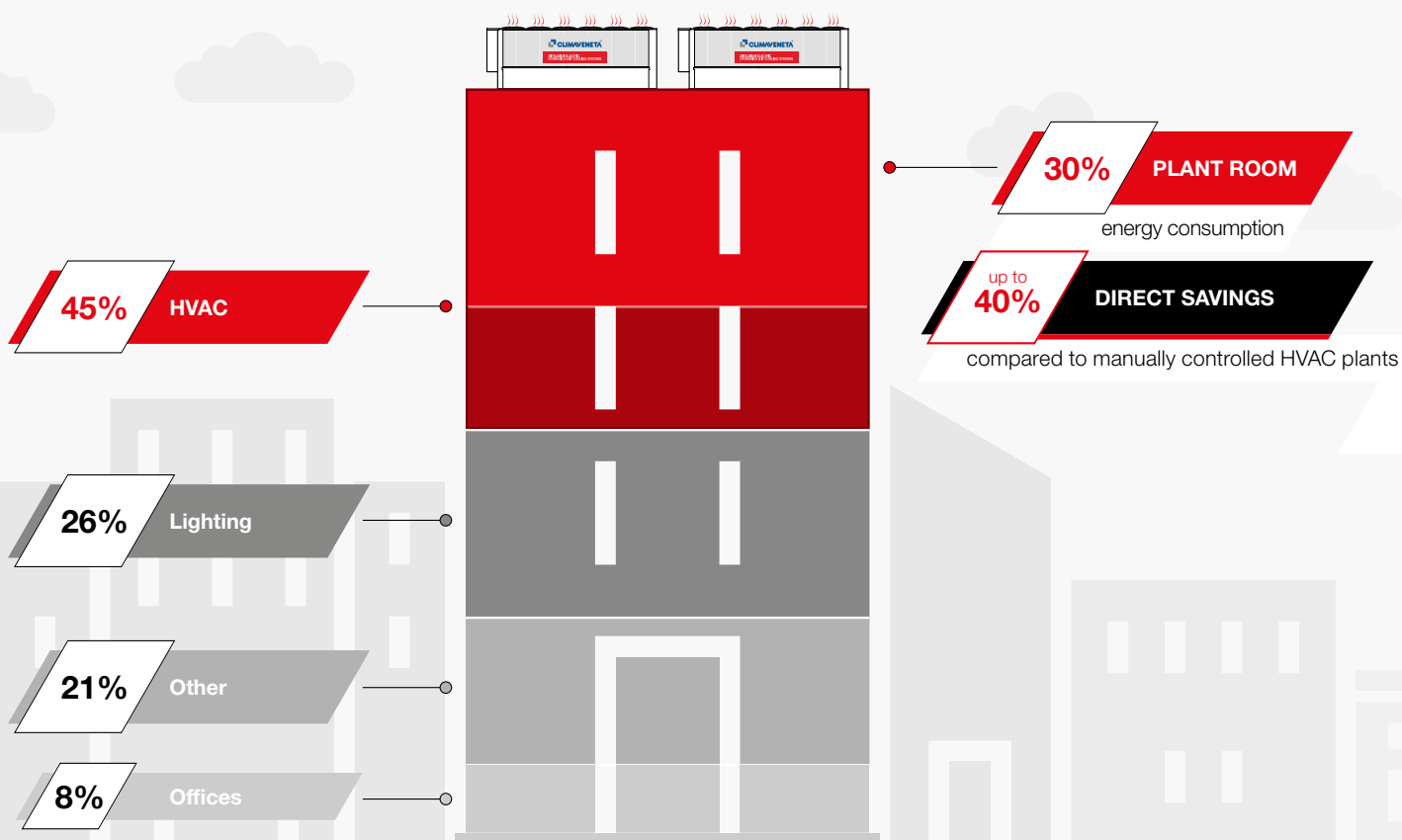


CLIMA PRO+

THE INNOVATIVE SPECIALIZED CONTROL AND OPTIMIZATION SOLUTION DEDICATED TO PLANT ROOMS

In commercial buildings,
HVAC systems make up more than half of the total energy consumption.

Over 30% of energy consumption comes from the plant room.



**OPTIMIZED CONTROL OF THE WHOLE
PLANT ROOM AND INDIVIDUAL UNITS**

DIRECT SAVINGS

- ▶ **Intelligent unit staging and sequencing** according to their performances.
- ▶ **Smart combination between homogenous and non-homogeneous technologies** (inverter and on-off compressors, free-cooling, heat recovery systems).
- ▶ **Chilled water and hot water flow optimization** on primary and secondary circuits.



**REDUCED
MAINTENANCE ACTIVITIES**

INDIRECT SAVINGS

- ▶ **Preventive diagnostic system** for predictive maintenance of your plant.
- ▶ **Condition based maintenance** with consequent reduction of operating costs
- ▶ **Early detection of system failures**

THE SMART MANAGEMENT OF YOUR PLANT

ClimaPRO+ changes the way you manage your HVAC plant and introduces a new approach: an advanced optimization system entirely geared towards maximum efficiency and value over time.



EFFECTIVE INTEGRATION AMONG DIFFERENT UNITS

ClimaPRO+ allows units featuring non-homogeneous technologies to synergistically work together.

Each unit technology is exploited at its peak performance, according to the actual plant demand.

ENHANCED PROPERTY VALUE

Stringent energy standards for modern buildings have increased the complexity of HVAC plant design.

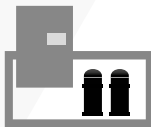
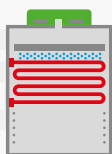
Thanks to an advanced control and management system that allows the units to always work at their best, **ClimaPRO+** increases the value of the property by improving the score obtained through the energy certifications.



INTELLIGENT STAGING AND SEQUENCING OF CHILLERS

Complex HVAC plants require dedicated control of each single unit.

With extreme precision, **ClimaPRO+** adjusts any type of source on both the primary and secondary circuits, thus ensuring energy savings up to 40% higher than those of manually controlled plants.



REDUCED OPERATING COSTS

ClimaPRO+ utilizes predictive maintenance algorithms and a smart diagnostic system.

Thanks to simplified accessibility to the plant metrics and operating parameters, **ClimaPRO+** monitors the current unit operation, in real time, translating the data into clear and easy-to-read reports, predicting operational problems which might occur in the plant room.



CLIMAPRO+

TURN YOUR PLANT ROOM INTO A VALUE GENERATING ASSET

The core of **ClimaPRO+** is a performance feedback loop; a continuous cycling control algorithm, which instantaneously detects any change to the plant, and rectifies its actions accordingly. The optimization strategy involves:

- ▶ Chillers and heat pumps
- ▶ Primary and secondary pumps
- ▶ Source devices
- ▶ The diagnostic engine that detects the unit's operating conditions

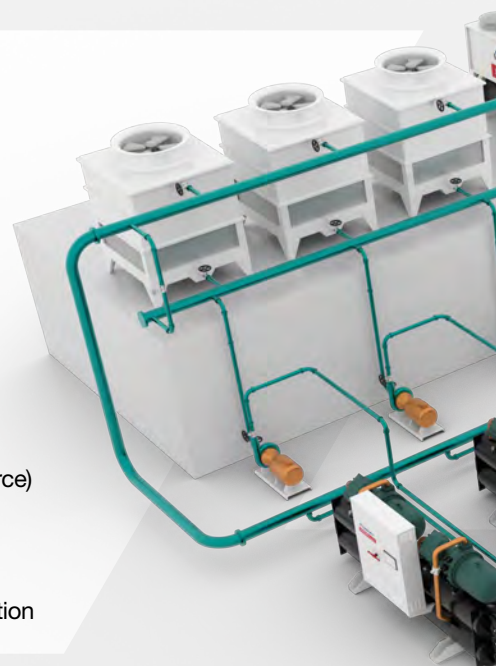
UNIT SEQUENCING

ClimaPRO+ determines the best unit sequence to be activated according to the performance profile. The algorithm detects the actual cooling and heating load required, establishes which units to activate and their load percentage as well as each individual component in the plant room.

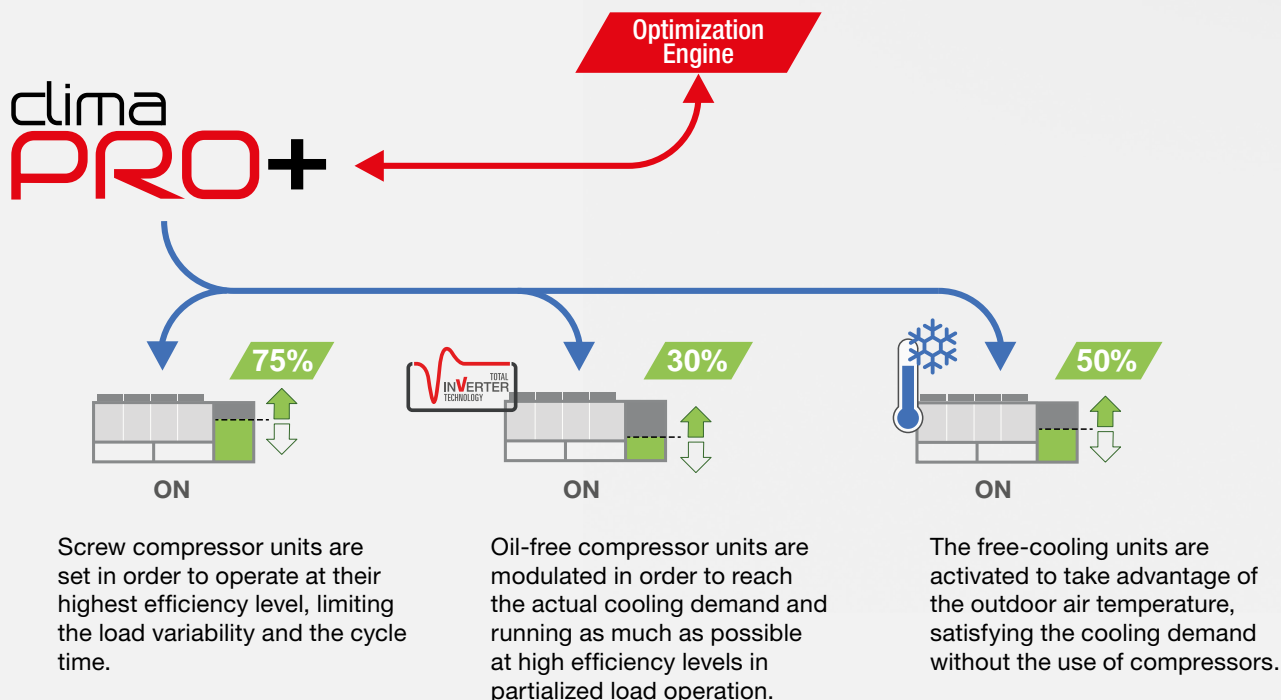
This results in minimum energy consumed by the plant equipment and almost zero energy waste when energy can be reutilised through heat recovery systems.

BENEFITS

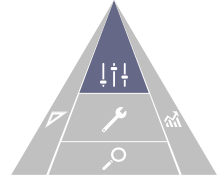
- ▶ Intelligent staging and sequencing of chillers, heat pumps, 4-pipe systems, according to the performance profile of each HVAC unit
- ▶ Efficient and effective integration of non-homogeneous technologies (scroll, screw and centrifugal compressors, various refrigerant types, fixed and variable speed, air and water source)
- ▶ Reliable management of redundancies in mission-critical applications
- ▶ Increase of system uptime
- ▶ Smart activation of the best operating condition of each HVAC unit to reduce energy consumption



OPERATING MODE

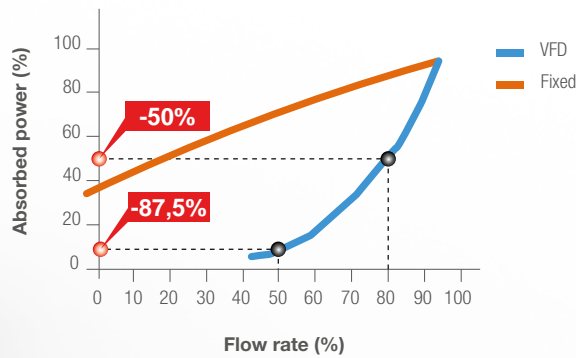


CONTROL AND OPTIMIZATION



PUMP OPERATION OPTIMIZATION

ELECTRICAL ENERGY REDUCTION



ClimaPRO+ controls the water flow on both primary and secondary circuits in order to reduce energy consumption by 80%.

BENEFITS

- ▶ Reduced energy costs related to pumping activities
- ▶ Δt is continually maintained at optimal temperatures thus improving the overall energy efficiency of all units.
- ▶ Increase of water flow control accuracy thanks to the direct acquisition of water system pressures based on the energy demand on the user-side (VPF systems)
- ▶ Greater unit operation stability in case of low load conditions by direct control of by-pass valves (VPF systems)
- ▶ Improved systems calibration by eliminating the «Low Delta T Syndrome» derived from poor water flow control across the primary-to-secondary decoupling lines.

SOURCE SIDE OPTIMIZATION

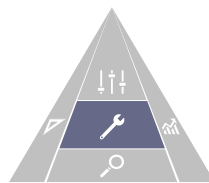
ClimaPRO+ manages the source-side water system by directly controlling temperatures, pressure, and water flow.

It also actively manages dry coolers and cooling towers by optimizing their pumps as well as the by-pass valves.

BENEFITS

- ▶ Reduced energy costs related to the pumping activities
- ▶ Enhanced efficiency in any weather condition
- ▶ Autonomous unit operation adaptability according to the source devices available
- ▶ Automatic staging of the cooling tower set-points
- ▶ Reduced inlet water consumption to meet local environmental regulations

clima PRO+



MAINTENANCE AND DIAGNOSTICS

Thanks to a redesigned interface aimed at improving the user experience, **ClimaPRO+** ensures the immediate visualization of the units' status, in order to prevent system failures or efficiency losses. This function is key for downtime analysis and supporting early service activities.



EASY-TO-READ COLOUR VISUAL

that intuitively displays live conditions of each unit, by detecting those deviating from design operating conditions.

- Unit operating at ideal design conditions
- Unit deviating from design conditions
- Unit operating outside of design conditions

TREND GRAPHICS

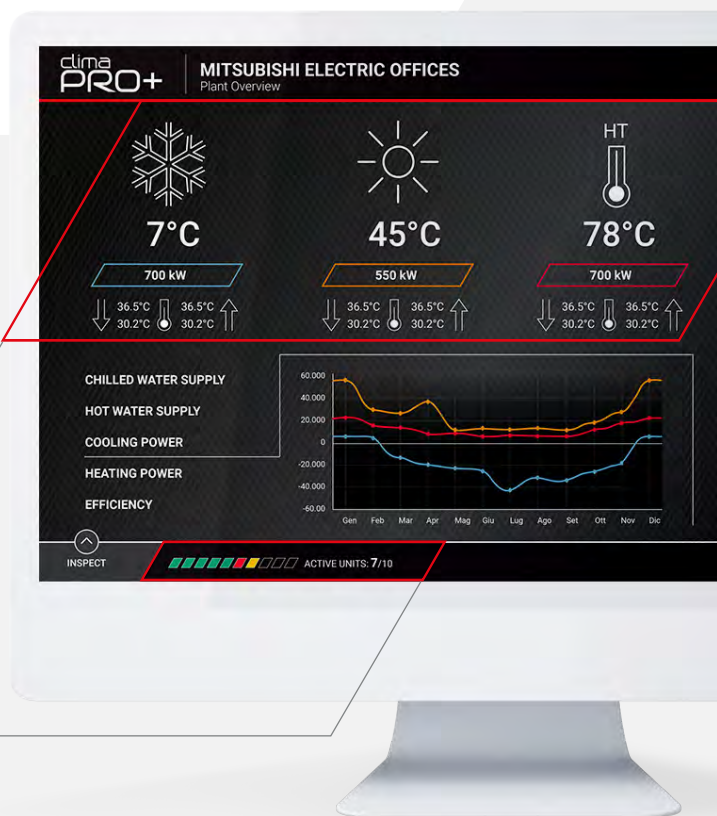
Show the main operating variables

INSPECTION BAR

Inspection bar for real-time display and analysis of each unit.

Early warning system

Plant efficiency and electrical power absorption

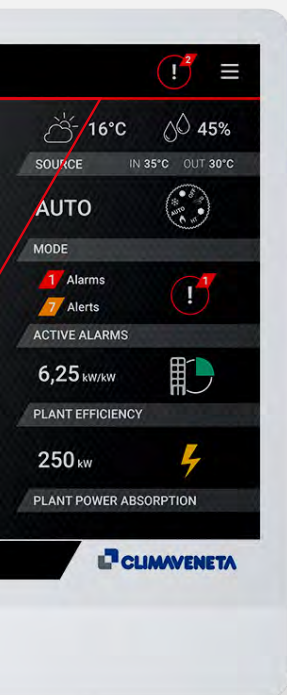
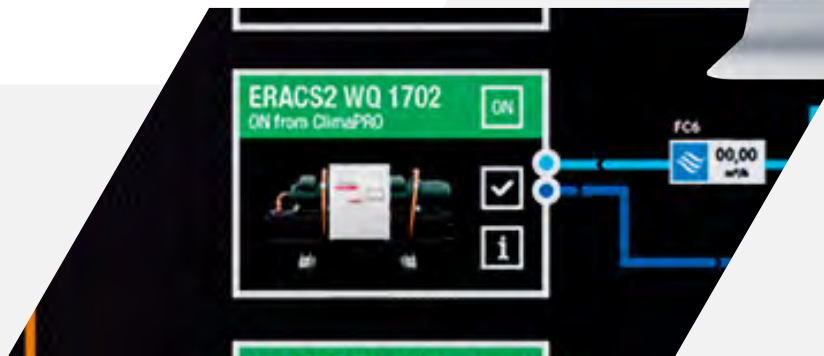
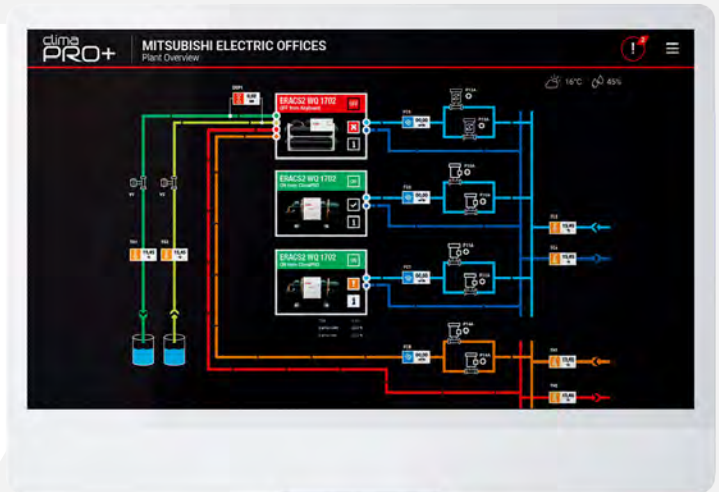




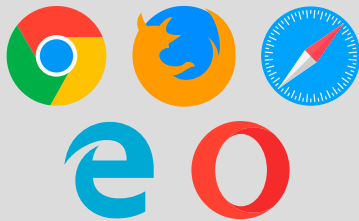
MANAGEMENT AND MONITORING

Through simple, easy-to-read colour graphics, **ClimaPRO+** automatically displays the real performance of key components in each individual HVAC unit, including those in stand-by.

- ▶ Web-based access
- ▶ Redesigned interface for better user experience
- ▶ Local or remote access from any laptop connected to a LAN network
- ▶ Real-time display of main operating variables
- ▶ Stand-alone operation or integrated in third-party software



YOUR PLANT AT YOUR FINGERTIPS



ClimaPRO+ presents a new fully responsive interface, suitable for any type of mobile device.

From tablets, to computers, to mobile phones, the monitoring and management of your HVAC plant has never been so simple.



clima PRO+

ClimaPRO+ calculates the performance levels of the single units in real time and verifies their efficiency compared to the design data.

OPERATING DATA OF THE COOLING CIRCUIT

Detection of the compressor status and circuit's operating pressure



ENERGY CONSUMPTION

FREE ENERGY

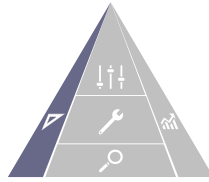
ClimaPRO+ can estimate the free energy recovered by the single heat pump producing hot and cold water simultaneously.

This value provides an indicator of the system capacity to increase efficiency by recovering useful energy that would otherwise be rejected into the atmosphere.

REAL-TIME MEASUREMENT OF UNIT EFFICIENCY

-  Unit operating at ideal design conditions
-  Unit operating out of design conditions

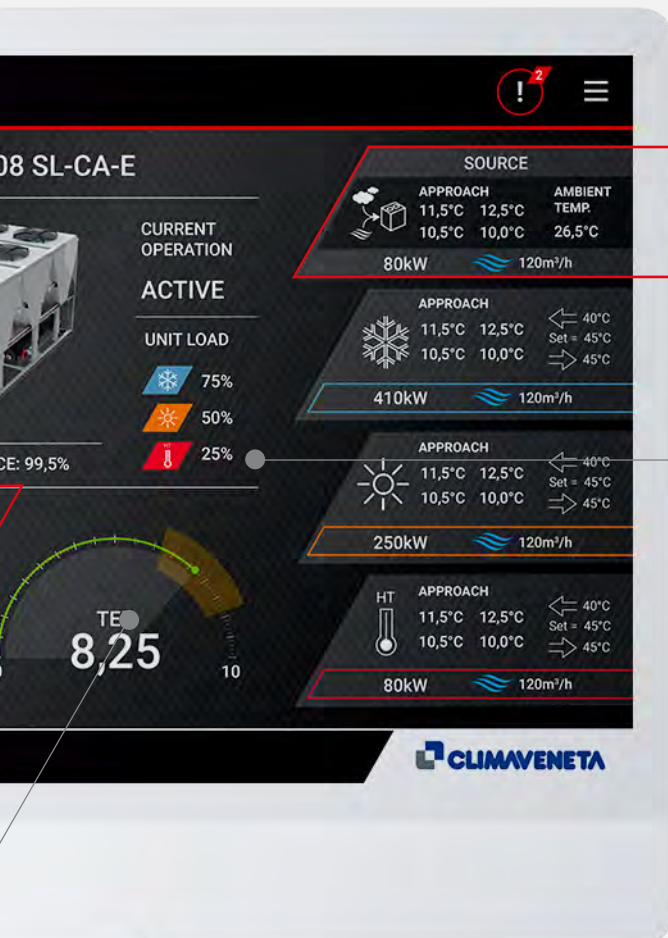




MEASUREMENT AND PERFORMANCE VERIFICATION

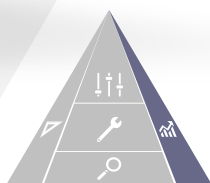
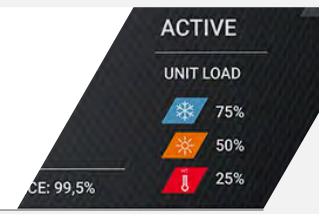
OPERATING DATA OF THE EXCHANGERS

Measurement of inlet/outlet temperature, water flow, and approach.



Load percentage for each unit section

The load percentage of each unit section provides users a clear and graphical analysis tool to easily evaluate which units can operate with simultaneous loads, thus reducing energy rejected into the atmosphere and increasing the system's efficiency.



REPORTING

ClimaPRO+ reporting allows the user to receive a monthly report containing operating data and analysis. The reports can be either downloaded to your laptop or stored in the software's memory.

MONTHLY REPORT		Date: 04-Dec-19 5:49 PM CET	
Cooling Energy	1562.6 kW-hr		
Heating Energy	1186.2 kW-hr		
DHW energy	565.8 kW-hr		
Free Energy (Energy produced by simultaneous heating and cooling)	561.0 kW-hr		
Total Power Absorption	706.9 kW-hr		
Total Plant Efficiency: 4.69			
GP01		Climaveneta NECS-WQ 1104	
Cooling Energy	840.1 kW-hr	Free Energy	341.8 kW-hr
Heating Energy	529.0 kW-hr	Unit Power Absorption	263.3 kW-hr
Average Unit Performance	5.2		
GP02		Climaveneta NECS-WQ 1104	
Cooling Energy	722.5 kW-hr	Free energy	219.2 kW-hr
Heating Energy	657.2 kW-hr	Unit Power Absorption	287.4 kW-hr
Average Unit Performance	4.8		
PDC01		Climaveneta EW-HT 0612	
Heating Energy	241.7 kW-hr	Average Unit Performance	3.8
Unit Power Absorption	63.6 kW-hr		
PDC02		Climaveneta EW-HT 0612	
Heating Energy	324.1 kW-hr	Average Unit Performance	3.5
Unit Power Absorption	92.6 kW-hr		
Monthly Report			

The applicability of some of the functions listed in these sections may not be compatible with some units. Check the available functions according to the unit selected for each specific HVAC plant with your local Mitsubishi Electric Sales Branch.

PLANT CONFIGURATIONS Some examples

Mixed-use buildings

4-Pipe units for the simultaneous and independent production of hot and cold water.

WHY ClimaPRO+

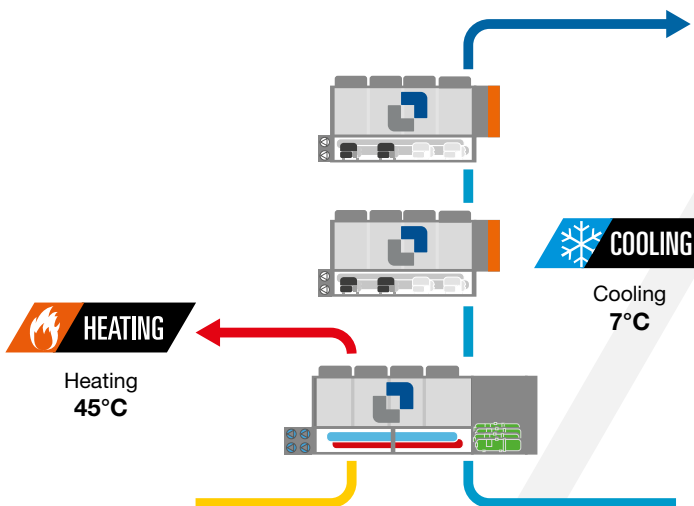
- ▶ Ensures simultaneous and independent hot and cold water production.
- ▶ Intelligently manages significant building loads between Summer and Winter seasons.

OPTIMIZATION STRATEGY

- ▶ According to the efficiency curves, the heat pumps are set in order to always ensure simultaneous loads (energy is always recovered whenever possible).

BENEFITS

- ▶ Reduced initial investment thanks to the integration among units featuring non-homogeneous technologies.
- ▶ The highest level of efficiency thanks to the smart energy recovery management.
- ▶ Automatic switch between Summer and Winter mode.



4-pipe units (or chillers)

Hotels

6-Pipe units for the simultaneous and independent production of hot, cold, and very hot water.

WHY ClimaPRO+

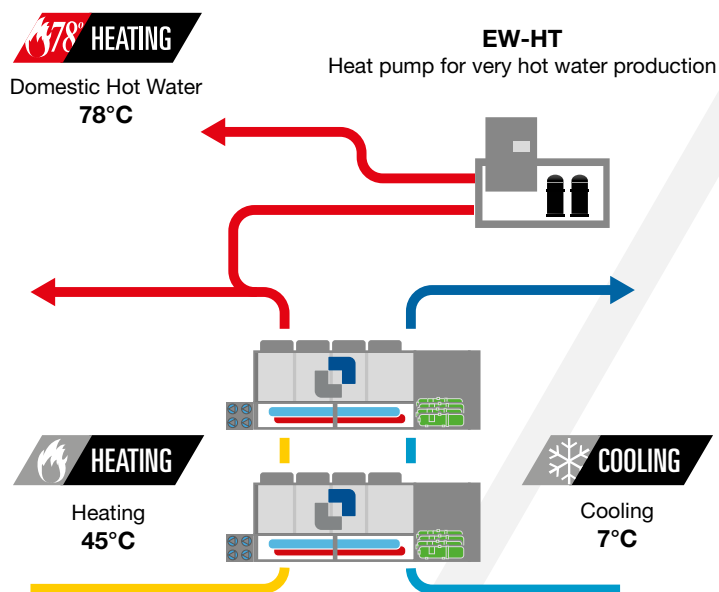
- ▶ Ensures simultaneous and independent hot and cold water production.
- ▶ Produces high temperature hot water for domestic use.
- ▶ Intelligently manages significant load variability between Comfort and Domestic Hot Water production.

OPTIMIZATION STRATEGY

- ▶ According to the efficiency curves, the heat pumps are set in order to always ensure simultaneous loads (energy is always recovered whenever possible).

BENEFITS

- ▶ Reduced initial investment thanks to the integration among units featuring non-homogeneous technologies.
- ▶ The highest level of efficiency thanks to the smart energy recovery management.
- ▶ Automatic switch between Summer and Winter mode.
- ▶ No need for boilers.
- ▶ Significant reduction of maintenance and service costs.



4-pipe units combined with heat pumps for very hot water production

Large comfort applications

Oil-free compressor units combined with air source and water source chillers.

WHY ClimaPRO+

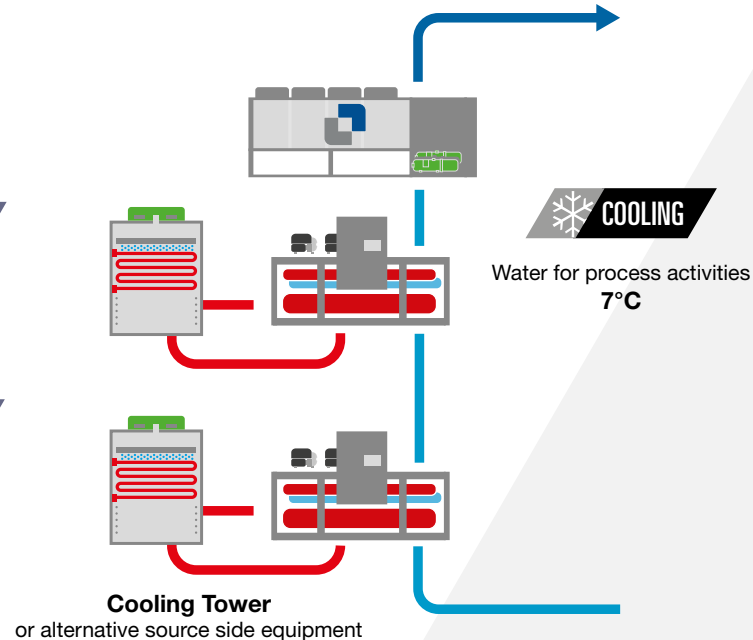
- ▶ Ensures automatic selection of the kind of unit according to the outdoor conditions, especially when it is possible to utilize water as source.
- ▶ Maintains the highest efficiency levels, even in extreme weather conditions.

OPTIMIZATION STRATEGY

- ▶ According to the efficiency curves.
- ▶ According to the availability of the source side units, always considering the pumping costs.

BENEFITS

- ▶ Reduced initial investment (CAPEX) thanks to the integration among units featuring non-homogeneous technologies.
- ▶ Precise control of the water temperature in process cooling applications.
- ▶ Reduced pumping costs on the source side.
- ▶ The highest reliability and longer uptime.



Chillers with non-homogeneous source side equipment

Process applications and IT infrastructures

Chillers with non-homogeneous technologies (oil-free compressor units and screw compressor units).

WHY ClimaPRO+

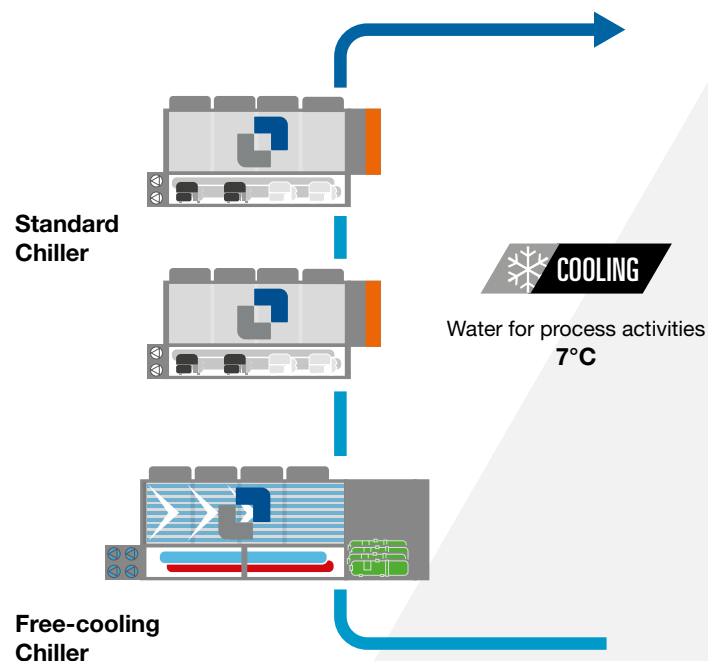
- ▶ Takes advantage of low outdoor temperatures to cool water for process activities.
- ▶ Ensures very low initial investments.
- ▶ Manages variable load fluctuations.

OPTIMIZATION STRATEGY

- ▶ According to the efficiency curves.
- ▶ Reduction of the on/off cycles due to load variations.
- ▶ Free energy production thanks to the free-cooling units.
- ▶ Almost zero energy waste thanks to a very precise operation according to load conditions.

BENEFITS

- ▶ Reduced initial investment (CAPEX) thanks to the integration among units featuring non-homogeneous technologies.
- ▶ Reduced energy consumption in the cold water production.
- ▶ Precise control of the water temperature in process cooling applications.
- ▶ The highest reliability and longer uptime.



Chillers with homogeneous source side equipment

“ BY FAR THE BEST PROOF IS EXPERIENCE ”

Sir Francis Bacon
British Philosopher (1561 - 1626)

CAVOTEC

2017 Nova Milanese - Italy

Application:

Office Buildings

Cooling capacity:

1303 kW

Installed units:

2x TX-W HFO/H/S 1B00,
1x TX-W HFO/H/S 2B00,
1x EW-HT 0412,
ClimaPRO

Plant type:

Hydronic System

Heating capacity:

1605 kW



PROJECT

Cavotec is a leading engineering group that designs and manufactures automated connection and electrification systems for ports, airports, and industrial applications worldwide.

CHALLENGE

Its innovative technologies ensure safe, efficient, and sustainable operations. Cavotec is committed to minimizing its environmental impact through the development of innovative technologies for customers, and at the same time, its own environmental footprint.

SOLUTION

In line with this challenging target Cavotec's production plant in Milan has been provided with an innovative and sustainable cooling system based on 2 TX-W HFO/H/S 1B00, 1 TX-W HFO/H/S 2B00 and 1 EW-HT 0412, Climaveneta branded. These large chillers have been provided with HFO green refrigerant, offering an eco-friendly alternative to HFC and granting, at the same time, an efficient energy performance of the whole plant. The system is managed and optimized by ClimaPRO to combine the most reliable cooling conditions with the highest energy efficiency.

ASPEN SOUTH AFRICA

2015 Port Elizabeth - South Africa

Application:
Chemical & pharmaceutical

Cooling capacity:
4374 kW

Plant type:
Hydronic System

Installed units:
6x FOCS2-WH, 2xFOCS3-W, x ClimaPRO



PROJECT

Located in South Africa, this manufacturing facility refurbished its chiller plant, specifically to recover part of the condensing hot water generated by the plant, to save energy, as this heat is typically rejected into the atmosphere in process cooling applications.

CHALLENGE

The chiller plant has to ensure continuity of production, while adapting the cooling capacity output as rapidly as possible to match fluctuations in the cooling demands, ensuring perfect temperature control at all times and in every condition in two cooling circuits which supply two independent process loops.

SOLUTION

The project included the installation of 6 FOCS2-WH, 2 FOCS3-W water-cooled chillers and the ClimaPRO control system able to optimize the entire process cooling plant by activating the most efficient chiller sequences based on each individual unit's performance. 4 FOCS2-WH and 2 FOCS3-W chillers are connected to a conventional cooling towers circuit in order to reject the exceeding heating produced by the cooling process while 2 FOCS2-WH chillers recover this heat through a dedicated heating circuit hydraulically connected for a separate and independent process.

ARCADIA CENTER

2019 Milan - Italy

Application:
Office Buildings

Cooling capacity:
1354 kW

Installed units: 2x FX-WQ/S 2602,
1x EW-HT 0262, ClimaPRO

Plant type:
Hydronic System

Heating capacity:
1603 kW

Certifications:
LEED - Silver



PROJECT

The Arcadia Center headquarters is a new landmark in the Gallarate suburb of Milan. An amazing building, designed by architect Giuseppe Tortato for InvestiRE SGR. The restoration is the result of an ambitious urban renewal project.

CHALLENGE

The project is an excellent example of retrofitting, and includes the redevelopment of two adjacent factory structures, with a total area of 23,000 square meters, distributed over two basement levels that are used for technical rooms and warehouses, a mezzanine floor that houses the reception and common spaces and finally 5 above ground floors mainly reserved for offices.

SOLUTION

The new air conditioning system, supplied by Mitsubishi Electric and designed by Tekser, is based on 2 Climaveneta-branded multipurpose heat pumps FX-WQ/S 2602 with groundwater as a source, and a heat pump for the production of very high-temperature water, EW-HT /0262, also Climaveneta branded. The HVAC plant is controlled by ClimaPRO, the management and optimization system for every single component directly involved in the production and distribution of heating and cooling.

CAJAMAR ALMERIA

2014 Almeria - Spain

Application:
Office Buildings

Cooling capacity:
1805 kW

Installed units: 2x TECS2/SL-CA-E/S 0512,
1x i-FX-Q/SL-CA/S 0802, 1x ClimaPRO

Plant type:
Hydronic System

Heating capacity:
856 kW

Certifications:
LEED - Gold



PROJECT

Cajamar Caja Rural is the first cooperative and rural bank in Spain with more than 1.3 million associates and more than 3.9 million customers. The headquarters are located in the Parque Científico-Tecnológico of Almeria. This 19,600 square meter architectural colossus is able to accommodate over 990 workers and has obtained the LEED GOLD certification.

CHALLENGE

Many architectural and plant engineering choices were carried out starting from the building envelope that has been designed considering the orientation of the building and the possibility of making the maximum use out of the natural sunlight and the weather characteristics of the area.

SOLUTION

The HVAC system is based on a 4-pipe air to water system, set with variable speed. Going into detail, they have installed one multi purpose i-FX-Q/SL-CA 0802 unit for the simultaneous production of heating and cooling with inverter driven compressors and two TECS2/SL-CA-E 0512 chillers with magnetic levitation compressors, selected in super silent class A version. The whole HVAC system is managed by ClimaPRO, the chiller plant control with active optimization.



for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.



mitsubishi electric hydronics & it cooling systems S.p.A.

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