

TECHNICAL DESCRIPTION of Cooling Plus Energy CHILLERS

Air cooled/Free-cooling chillers with Scroll compressors and R410A refrigerant



General description

New Hitema chillers destiny to Worldwide Market and available in different versions, are machines more energy efficient, more silenced and more compact.

The **ENR/ENRF, ENR-CB, CSE** and **SBS/SBSF** are chillers from our Cooling Plus Energy series with air cooled condensers operating on **R-410A**. These chiller are PED certificated TUV Italy number 0948, with air cooled condensers which can also come with complete "Free-cooling" sections (only for models ENRF and SBSF) to guarantee energy savings.

For models ENR/ENRF, ENR-CB, CSE the range includes units that cover a refrigeration capacity ranging from 1kW to 440kW in standard conditions. For models SBS/SBSF the refrigeration capacity ranging from 240kW to 1000kW in standard conditions.

The ENR/ENRF, ENR-CB and CSE units are equipped with either stainless steel plate type, self-cleaning coaxial or shell & tube evaporator, aluminum finned copper condenser, axial fans or centrifugal fans (only for models CSE) and rotary compressor (mod. 001÷005) or scroll compressors (mod. 008 ÷480, up to 4 compressors) installed on one refrigeration circuit (mod. 001÷100) or two independent refrigeration circuits (mod. 130÷480).

The SBS/SBSF models are all equipped with shell & tube evaporator, modular aluminum finned copper coil condensers, mounted in V configuration, axial fans and scroll compressors (up to 6 compressors) installed on two or on request, three independent refrigeration circuits.

ENR, ENR-CB and CSE are controlled and managed by the electronic controller XR30CX (mod.001÷022) or microchiller 2 (mod. 030÷480) microprocessor control. ENRF, SBS/SBSF is provided by pCO 3 microprocessor control.

All series are available in standard version with power supply 230V/1ph/50Hz (mod.001÷005) or 400V/3ph/50Hz (with neutral for mod.008÷018, without neutral for all the other models). The degree of electrical protection is IP54 for all the models.

Available Configurations

By combining the configurations described below with the accessories available as sales kits the units can be customized to meet a very broad range of plant requirements.

WARNING: when configuring the unit it should be remembered that not all combinations are possible.

REFRIGERANT:

- R410A (standard)
- R134a

POWER SUPPLY:

- 230V/1ph/50Hz (std for mod.001÷005)
- 400V/3ph+N/50Hz (std for mod.008÷018)
- 400V/3ph/50Hz (std at exception of mod.001÷018)
- 230V/1ph/60Hz* (for mod.003÷006)
- 460V/3ph/60Hz* (at exception of mod.003÷006)

*with or without UL certification

MINIMUM EXTERNAL AIR TEMPERATURE:

- STANDARD (+3°C)
- LT "LOW AMBIENT TEMPERATURE" (-25°C) : fan speed cut-phase regulator (RV), crankcase heaters (RC), electrical box heater (EB) included

FROST PROTECTION:

- ABSENT (standard)
- PRESENT: evaporator heater (RAGE) and tank heater (RAGT) included

NOISE LEVEL:

- STANDARD
- LN "LOW NOISE VERSION": compressors jacket and RV "fan speed cut-phase regulator" included
- SLN "SUPER LOW NOISE VERSION": compressors jacket, RV, bigger condenser included
- ELN "EXTRA LOW NOISE VERSION": compressors jacket, compressors boxes, RV, bigger condenser included (only for models SBS/SBSF)

TANK:

- PRESENT in carbon steel (standard)
- PRESENT in stainless steel
- ABSENT

PUMP:

- WP "P3 PUMP" (standard)
- PH "P5 PUMP"
- DP "DOUBLE PUMP P3" (std from mod.018): pump managements, valve between tank and pump included
- DPH "DOUBLE PUMP P5" (std from mod.030): pump managements, valve between tank and pump included
- ABSENT

FANS:

- AXIAL AC MOTOR (std ENR/ENRF, ENR-CB SBS/SBSF)
- CENTRIFUGAL (std CSE)
- AXIAL EC MOTOR (std from mod.130)

FANS CONTROL:

- ON/OFF (standard ENR, ENR-CB mod.001÷185 and CSE mod.030÷100)
- RV "FAN SPEED CUT-PHASE REGULATOR" (standard ENR, ENR-CB mod.230÷480 and ENRF, SBS/SBSF)
- IR "FAN SPEED INVERTER REGULATOR" (only for models CSE, standard CSE mod.130÷370)

CONDENSER COILS PROTECTION:

- ABSENT (standard)
- CV "EPOXY COATING PAINTING"
- CG "BLYGOLD"

HYDRAULIC CIRCUIT:

- ATMOSPHERIC OPEN CIRCUIT (standard ENR, ENR-CB, CSE mod.001÷100): manual filling
- CLOSED CIRCUIT (standard ENRF, SBS/SBSF; standard ENR, ENR-CB, CSE mod.130÷480)
- CLOSED CIRCUIT WITH AUTOMATIC FILLING SYSTEM (at exception of mod.001÷005): automatic feeder, expansion vessel, automatic air vent included

START COMPRESSORS:

- DIRECT (standard)

Construction and Panel

The Chillers are designed for outdoor installations at exceptions of models CSE (available for external application only on request). All structures are made in galvanised steel with additional protection given by the polyester powder paint (RAL 7035 and other RAL upon request). The structure is self-supporting and the panels can be remove easily to access the inside of the chiller for maintenance and repairs.

Scroll Compressors

The scroll compressors provided by COPELAND can be single, "twin" or "trio", depending on the chiller model. They are always complete with oil level switch, electronic and temperature protection of the motor, reverse rotation protection.



Evaporator

Hitema coaxial evaporator (standard for mod. 003÷100) contains a balance of flooded and falling film technology to optimize efficiency, minimize refrigerant charge and maintain reliable control.

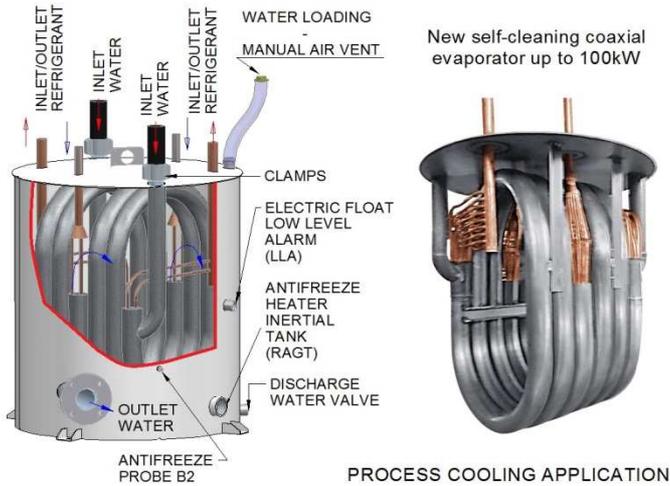
Shell and tube evaporator provided by ONDA are compliant with the requirements of the European and American pressure vessel codes.

Direct expansion, pure counter-flow for impressive heat exchanger effectiveness.

Low by-pass flow, thanks to strict mechanical tolerances of the components.

A specifically designed distribution system provides uniform refrigerant flow for optimum performance.

INTEGRATED FREE-COOLING (only for ENRF, SBSF series):



Finned pack type in aluminium with expanded copper pipes. Free cooling battery is installed in series at the condenser (on air side) and in series with the evaporator (on water side). It allows the use contemporary of mechanical refrigeration and free cooling mode. The particular installation of the coil permits easy cleaning of the finned pack.

Free Cooling and condenser coils are easily accessible to allow easy inspection and cleaning of the same, in this way they are always guaranteed the best conditions of operation.

All battery headers are provided with hose holder and special designed clamps in order to avoid loosening of rubber hoses, these type of connection ensure more operating reliability and easier maintenance.

Condensing Coil

Maximum heat transfer surface area resulting in a small unit footprint.

Fin and tube condenser coils manufactured from corrosion resistant copper tubes arranged in staggered rows and mechanically expanded into corrosion resistant aluminum alloy fin collars. The design working pressure is 45 bar and each coil is pressure tested to 49,5 bar.

Consider protecting coils from corrosive environments such a coastal, marine, urban and industrial.

More reliable than Aluminum exchangers because the Copper has better mechanical properties and lower thermal expansion coefficient than Aluminum (lower risk of failure in particular in case of high temperature range).



Axial Fans

Axial fans EBM-Papst, conforming to CE. New diffuser, a large part of the dynamic airflow energy is converted into static pressure. This greatly improves efficiency making it possible to reduce operating speed and this noise.

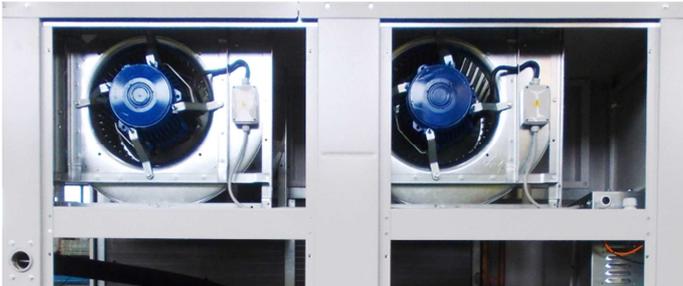
EC AXIAL FANS (as option):

To reduce electrical consumptions and the noise type EC axial fans are used (brushless motors and with inverter regulation). With EC motors the switch is by a control circuit that manages the closure and the opening of transient states of power. In EC motors brushes are replaced with electronic components, the advantages of this technology is high efficiency, low motor temperatures, short motor dimensions, independence of number of revolutions from frequency and voltage, ease of cabling compared to VFD AC motors.



Centrifugal Fans

Direct driven centrifugal fans provided by NICOTRA with forward curved impeller directly mounted on the shaft of the internal rotor motor. The advantages of this fans are: maintenance free, no transmission losses, long fan life time, high reliability, low operating costs.



Refrigeration Circuit

Each chiller is provided with 1, 2 or 3 (only for SBS/SBSF) completely independent refrigerant circuits for high reliability.

The refrigeration circuit is made in copper pipes and includes the following components:

- Capillary tube (mod.001÷005)
- Mechanical expansion valve with external equalization (ENR/ENRF, ENR-CB, CSE mod.005÷480, SBS/SBSF mod.240÷430, optional also electronic)
- Electronic expansion valve with external equalization (standard SBS/SBSF mod.470÷1000)
- Interchangeable filter-drier
- Solenoid valve
- Liquid and humidity indicator
- High pressure switch (standard from mod.004)
- Low pressure switch (standard from mod.008)
- High pressure safety valve (starting from mod.061)
- Low pressure safety valve (starting from mod.230)
- High pressure gauges (standard from mod.061, optional for mod.003÷055)
- Low pressure gauges (standard from mod.030, optional for mod.003÷022)
- Compressor suction and discharge valves (optional starting from mod.008)
- Hot gas by-pass with shut-off valve and solenoid valve (optional)
- Schrader service valves

Hydraulic Circuit

The hydraulic circuit in carbon steel is completely insulated with a new insulating material made up of 16 mm “closed cell” insulation and 3 mm of “open cell” insulation onto a special Anti-UV material is glued. Pumps can be Inverter Driven (as optional).

- Single or double pump and accessories
- Shut-off valve between tank and pump (optional from mod.003)
- Manifolds and connection pipes
- Evaporator with water discharge valve
- Air vent (manual for standard, automatic for optional)
- Flow switch (standard from mod.030)
- Pressure indicator with gauges
- Water safety valves (only in closed circuit)
- Evaporator inlet temp. sensor (std from mod.030)
- Evaporator outlet temp. sensor
- Free-cooling sensor (series ENRF, SBSF)
- 3-ways (up to mod.185) or 2-ways free-cooling valve and accessories (series ENRF, SBSF)
- Automatic by-pass (optional from mod.003)
- Internal by-pass (mod.001÷005)
- Expansion vessel (optional from mod.008)
- Automatic feeder with check valve and filter incorporated (optional from mod.008)
- Tank low liquid level alarm



Electrical panel

The electrical cabinet is designed and wired in compliance with the Low Voltage Directive 2006/95/EC, standard EN 60204-1 and electromagnetic compatibility directive 2004/108/EC. It is composed of an enclosure accommodating all the components secured to a mounting plate, with a hinged door having a perimeter seal mounted to the cabinet structure. The door is also equipped with the main disconnect switch with safety door lock (door cannot be opened until the electrical cabinet power has been disconnected). The electrical cabinet utilizes components sourced from premium manufacturers and ensures a level of weather protection that is commensurate with outdoor installation of the chiller (protection rating IP54). The power section includes automatic thermal-magnetic cut-outs for the protection of power devices such as compressors, fans and centrifugal pumps, a series of contactors and a phase monitor for protection of the unit from the absence of phase and from incorrect phase sequence (optional for ENR/ENRF, ENR-CB, CSE; standard for SBS/SBSF). The control section includes the transformer feeding the auxiliaries and the microprocessor circuit boards. A voltage-free general alarm contact is available from mod.030, a remote ON/OFF are also available from mod.008.



Control and safety devices

High pressure transducers: standard starting from the mod.230 and optional for mod.030÷185 equipped with electronic control of the fans. The pressure transducers measure the compressor discharge pressure with the resulting signal utilized by the electronic controller for the following functions: high pressure measurement and alarms, condensing pressure regulation through the fans electronic speed control.

Temperature probes: installed on the hydraulic circuit, they measure the temperature values of: evaporator outlet water (antifreeze function), evaporator inlet / tank water (temperature control function).

High and low pressure switches: they are installed on the refrigerant circuit high/low pressure side, respectively; they stop the compressor if anomalous working pressures are detected.

Fans pressure switch: used for ON/OFF control of the fans.

Flow pressure switch: is used to shut-down the unit if an insufficient water flow is detected.

Low level switch (optional): installed in the tank where it is used to shut-down the unit if an insufficient water level is detected.

Axial fans electronic control device: this device consists of an electronic controller board (Phase Cut) which changes the rpm of the axial fans on the basis of the condensation pressure detected by the high pressure transducer. This logic allows correct operation in cooling also with outside temperatures below -5 °C.

Anti-freezing heating elements (optional): these are heating wire elements wound around the evaporator, flanges, tank and pumps; their working is controlled electronically by means of an antifreeze probe.

Remote ON/OFF (OFR) (optional): this kit makes it possible to remotes the unit's ON/OFF up to a maximum distance of 150 m and consists of a plastic box with ON/OFF switch.

Remote Terminal (OFRC) (optional): this kit makes it possible to remotes all functions of the unit's onboard electronic controller up to a maximum distance of 250 m (shielded cable required - not supplied). This terminals

RS485 (RS485) (optional): RS485 serial option is used to connect the controller to a supervisor network via a standard RS485 serial line.

Microprocessor control

ENR, ENR-CB and CSE is controlled and managed by the electronic controller XR30CX for mod.001÷022 and microchiller 2 se for mod.030÷480. Thanks to the control menu it is possible to visualize the working conditions, the parameters and the possible alarms. The control is installed on the electrical panel and is protected by a flip-up polycarbonate cover.

ENRF, SBS/SBSF is provided by pCO 3 microprocessor control. The electronic chiller control is performed by a control system Carel software 3.7 is loaded. Programming and input the nominal values (operating data) are done directly on the display that also shows any malfunctions giving a description of it. There is also a visual alarm (and acoustic). The parameters set are maintained also in the event of a power cut.

XR30CX functions:

- Thermostatic control depending on the process fluid temperature in the tank (proportional)
- Process fluid temperature in the tank display
- Modbus serial interface (optional)
- Management of alarm messages:
 - general alarm (CA)



Microchiller 2 SE functions:

- Thermostatic control depending on the process fluid inlet temperature (proportional)
- Process fluid inlet temperature display
- Process fluid outlet temperature display for management of the antifreeze heaters (when present) and management of start-up of the pump under conditions of low temperature
- Management of the automatic rotation of the starting sequence of compressors for equalization of the operating times for each compressor (twin)

also performs the remote ON/OFF function.

- Measurement and display of the condensation pressure (STD ENR 220-480 optional ENR 030-185)
- Management of anti-freezing heaters and pump switch on with low ambient temperature;
- Display of the alarms
- Modbus serial interface (optional)
- Management of alarm messages:
 - high condensing pressure alarm
 - low evaporation pressure alarm
 - freeze alarm on water at evaporator outlet
 - compressor fault alarm
 - pump thermal protection alarm
 - flow switch alarm
- count of operating hours of the unit and of the individual compressors

A voltage-free contact is provided for remotization of a general alarm signal.



pCO 3 management of alarms:

Each alarm situation is detected by plantVisor PRO touch or tERA system management reported both in the local system and in the remote system.

You can send instant e-mail, fax, sms to inform the maintenance center about problems occurred.





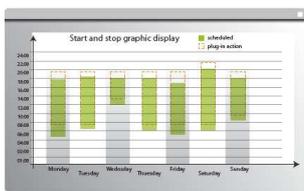
PlantVisor PRO

- Easy to use**
Flagdisplay concept for easy system configuration
- Maximum adaptability**
Suitable for all types of stores.
- Energy saving**
Optimise consumption, reducing waste.
- Energy Saving**
Optimisation and monitoring of system performance.
- Data analysis**
Detailed and complete graphs and reports on system variables.
- Alarm management**
Detection and signalling of all alarm situations.

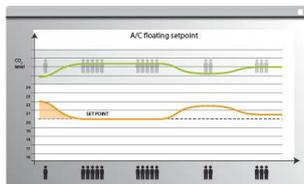
Energy control and conditioning/refrigerating integration

More and more attention is paid today to save energy. On this subject, PlantVisor PRO Touch offers a range of functions that to save energy and reduce plant management costs:

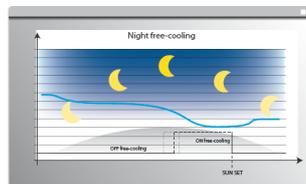
- **Smart start:** This optimizes on/off times using a preset scheduler. A special algorithm ensures the set point is reached by calculating system inertia and constantly monitoring indoor and outdoor temperature.
- **Smart set:** The set point is offset based on information processed by PlantVisor PRO supervisory system.
- **Smart night purge:** The system is switched on before the sun rises, for a calculated time; system inertia is calculated based on enthalpy values. This action aims to reduce heat load through free-cooling only.



Smart start



Smart set



Smart night purge

Effective maintenance

To be immediately informed it is an advantage. Your plants are always under control, and with a simple “click” ... they are within your reach. Thanks to remote system, many problems can be immediately solved without going in site.

Adding card as option to Carel control, it's allowed interfacing with Modbus, BACnet e LonWorks.



Environmental compatibility

High energy efficiency that provides a substantial reduction in energy consumption, has led to decrease in the equipment CO2 foot print. The use of ecological refrigerants further help to raise the environmental credentials of the products range.

Quality guarantee

Hitema's guarantee of quality and reliability is underpinned by the use of the very latest technology supported by constant research and products that are manufactured in accordance with very stringent standards.