

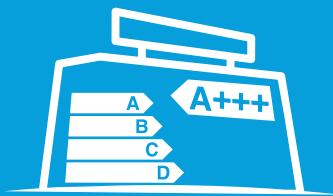


HECU sistema

The real capacity modulation for C-Stores

Hecu sistema for Convenience Stores

To achieve best results in terms of energy efficiency and quality, intended as system reliability and optimum food preservation



Hecu sistema is the CAREL solution designed specifically for convenience stores. Increasing attention to energy efficiency, in other words lower environmental impact and lower running costs, makes the CAREL solution the perfect response to market needs.

Hecu sistema ensures that the condensing units adopting this technology achieve maximum results in terms of energy classification.

Strengths of the proposed solution:

High energy efficiency

Hecu sistema guarantees very high levels of energy efficiency through the use of BLDC compressors and electronic expansion valves for oil and liquid injection. Serial communication with the showcases makes a further contribution to energy efficiency by providing real-time information on the operating conditions of each evaporator.

System reliability

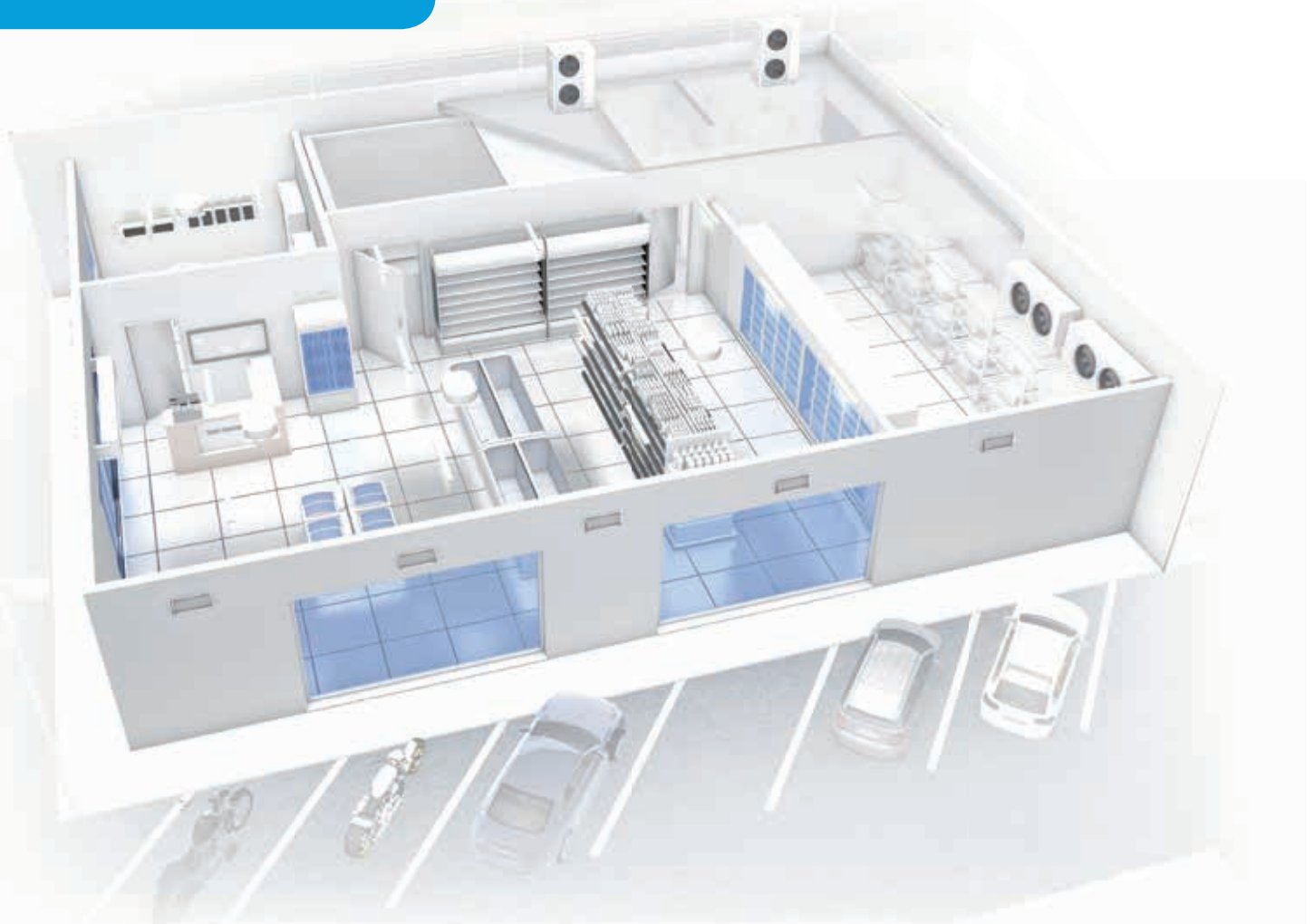
Hecu sistema manages BLDC compressors with the focus on reliability, adopting a series of software functions aimed at ensuring oil return to the compressor. Serial communication with the showcases also allows action to be taken directly on the evaporators, thus managing oil return even more effectively.

Extensive usability

Hecu sistema is designed with usability in mind. pRack Hecu comes with a wizard to assist unit configuration, and a fast commissioning procedure that automatically pre-configures the connection to the showcases and the related functions.

Optimum food preservation

With Hecu sistema, all the components are designed to work together, so as to obtain maximum performance in real operating conditions and in response to continuous changes in the system. These actions have the dual effect of reducing energy consumption and at the same time improving food preservation through fine temperature control.





pRack Hecu

The ideal controller for condensing units with BLDC compressors, low cost and high performance.

power+

CAREL Power+ for complete, efficient and reliable management of BLDC compressors.

Advanced user interface

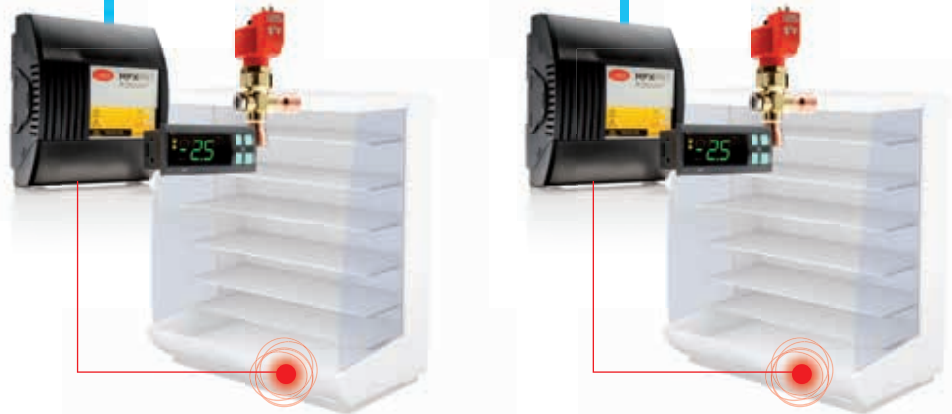
Simple and intuitive navigation allows users to quickly find the information they need.

RS 485

up to 5 showcases

MPXPRO with EEV

By installing an MPXPRO controller and EEV valve on the showcases, these can communicate via serial directly with the main controller, and interact to apply energy saving algorithms. Moreover, the EEV valves can be controlled directly, to assist oil return to the compressor.



High energy efficiency

Choosing Hecu sistema means reducing energy consumption and cutting running costs

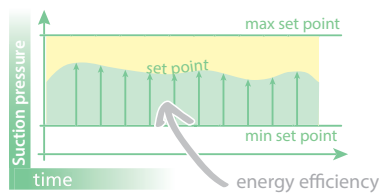
Real-time energy optimisation through continuous data exchange with the showcases (MPXPRO)

System energy efficiency is in large part the result of serial connection between pRack Hecu and the MPXPRO controllers on the showcases. Knowledge of the

real-time operating conditions of each showcase means the condensing unit can implement advanced energy saving algorithms and at the same time boost

performance of the entire system. A maximum of five showcases can be served, in both medium and low temperature applications.

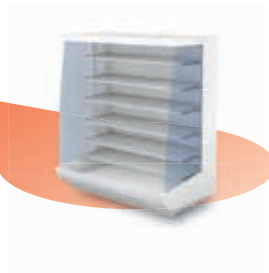
Floating suction



- Continuous modulation of the suction pressure set point
- ON-OFF cycles kept to the minimum
- High efficiency and stability with CAREL power+



...up to 5 showcases

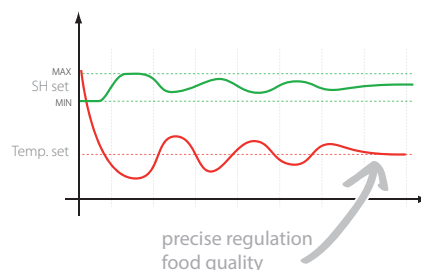


Excellent temperature stability

- Continuous variable speed compressor
- Proportional Electronic Expansion Valve

- Fieldbus connection with Modbus RS485 protocol;
- Showcase operating conditions communicated in real time to the condensing unit;
- Implementation of energy saving logic, such as floating suction pressure, which increases the system suction pressure set point;
- Fine control of both the condensing unit and the showcases;
- High quality food preservation.

Smooth lines

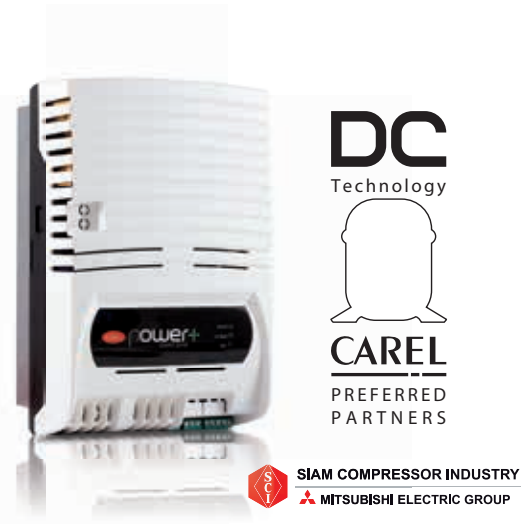


- Continuous modulation of the superheat set point
- Stable product temperature
- High efficiency and stability with CAREL electronic expansion valve

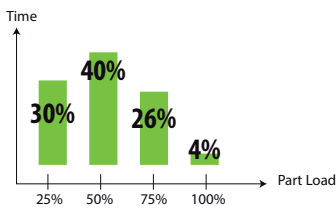
Excellent performance at part loads with BLDC technology and the power+ inverter

The use of BLDC compressors guarantees higher energy efficiency compared to any other available technology, with a very wide range of cooling capacity modulation. This requires a detailed and complete control system, with operating parameters exchanged continuously between inverter and motor. This complexity is managed internally by pRack Hecu, offering end users simplicity and reliability.

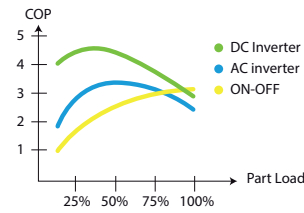
BLDC technology also features low noise, an excellent power-size ratio, low maintenance and long working life, due to the reduced number of ON-OFF cycles. CAREL guarantees full control of the unit, with many software functions designed to allow the compressor to work in ideal conditions and at maximum efficiency at all times.



Efficiency at part loads



A variable speed compressor can precisely meet system cooling demand...



guaranteeing maximum efficiency in terms of performance and COP compared to other available technology.

Comparison against other technology

Technology	Saving
AC inverter vs. On-Off	up to 9 %
BLDC power+ vs. On-Off	up to 25 %
BLDC power+ vs. AC INV	up to 15 %

BLDC technology: satisfies all present and future energy classification requirements.*

*CEN/TC 113, Date: 2014-01, prEN 13771-1:2014
Compressors and condensing units for refrigeration - Performance testing and test methods
Part 1: Refrigerant compressors

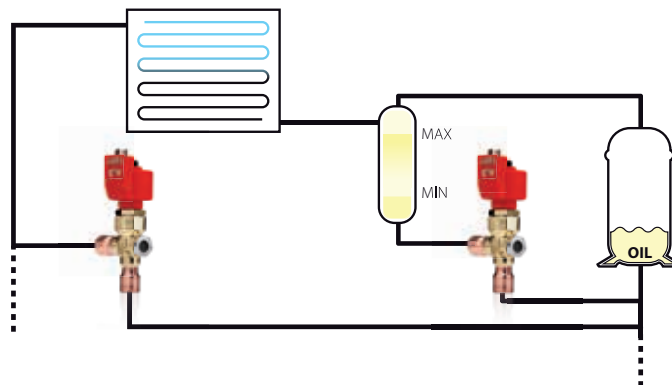
Protectors and safety features on BLDC compressors:

- Failed start-up management
- Compressor balancing at start-up
- Alarm management
- Corrective actions to keep the compressor inside optimum operating conditions

Minimum energy wastage with calibrated injection of oil and liquid using the CAREL E²V expansion valve

The oil/liquid injection algorithms ensure only the actual quantity needed by the system is injected, avoiding energy inefficiencies.

Liquid injection by electronic valve reduces the amount of refrigerant needed to lower the discharge temperature



By installing an advanced oil separator with double level sensor, the E²V valve control algorithm makes sure the exact quantity of oil required by the system is injected.

Injection of pure oil only, avoiding mixing with hot gas that causes energy inefficiency.

System reliability

Hecu sistema improves oil return to BLDC compressors even at low operating speed.

Oil return and recovery procedures

with the Speed Boost function

This software function makes the compressor work at a sufficiently high speed to assist oil return.

with showcase washing using the CAREL E²V expansion valve

This software function exploits communication with the showcases to lower the valve superheat set point and thus recover the oil that deposits on the evaporators, through periodical washing cycles.

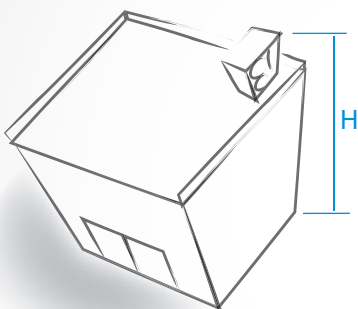
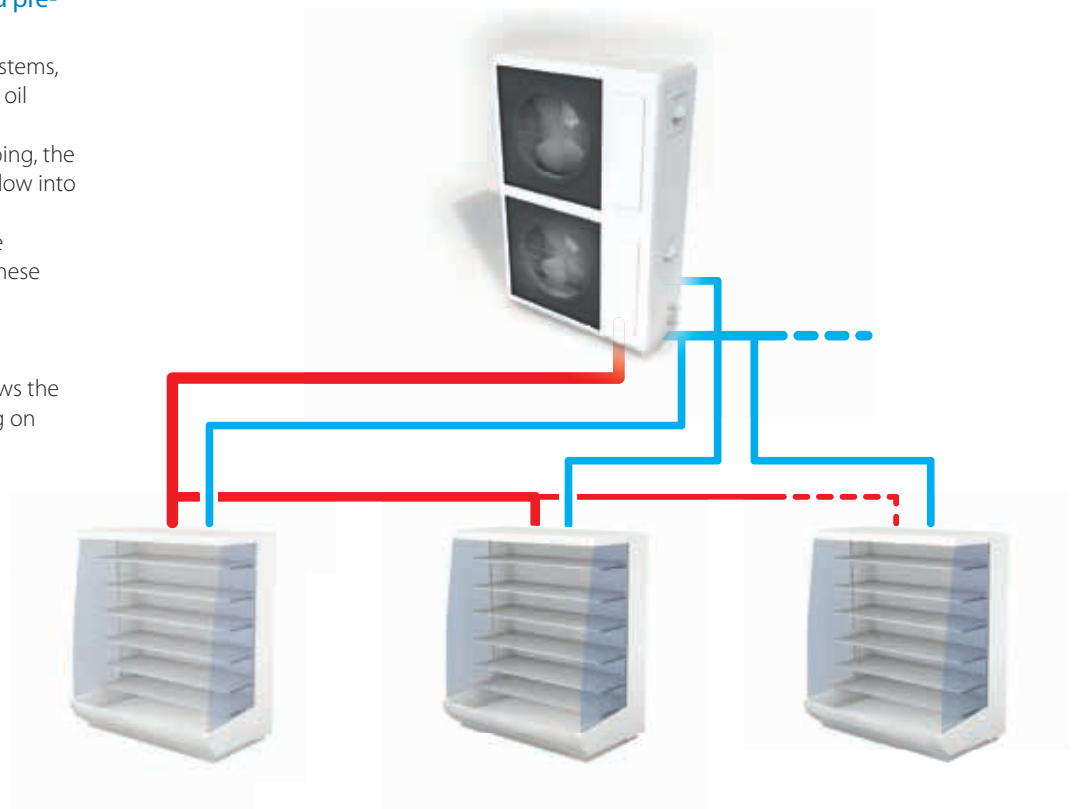


Better return oil flow and easy installation

with the multi-split system and pre-insulated piping

CAREL recommends multi-split systems, given the importance of piping in oil return to the compressors. This system uses low diameter piping, the same size in all suction lines that flow into the same manifold. In operating conditions where the compressor works at low speed, these conditions assist oil return to the compressor.

The small diameter moreover allows the use of pre-insulated piping, saving on installation costs.



No installation problems when working at a height:

- Advanced oil injection solution
- Communication with showcases to clean the evaporators
- Speed boost function
- Multi-split piping

Extensive usability

Fast configuration, easy commissioning and an advanced user interface are all strengths of the Hecu sistema.

Intuitive programming

with advanced PGD and pLD PRO user terminals

- Different access profiles make it possible to quickly find the parameters for each type of user.
- Navigation is simplified thanks to the menu divided by function and type of parameters
- Availability with both PGD and pLD PRO terminal

Easy set-up and optimisation

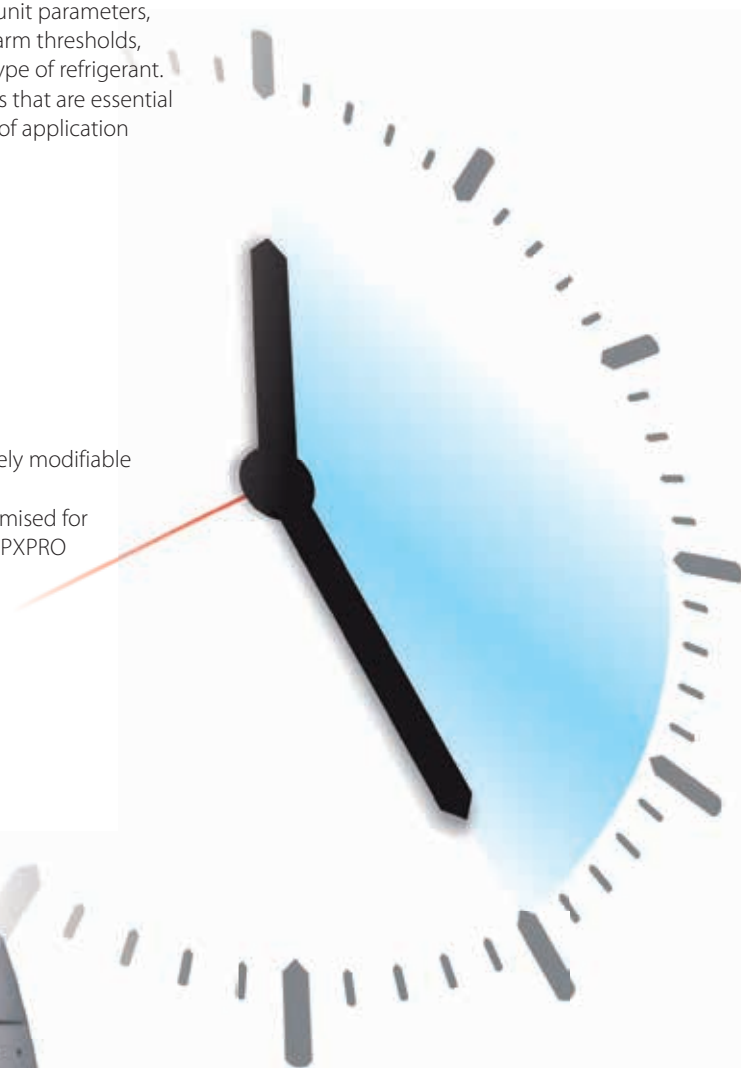
with the wizard procedure

- Fast condensing unit configuration using the wizard start-up procedure.
- Pre-setting of the main unit parameters, such as set point and alarm thresholds, based on the selected type of refrigerant.
- Pre-setting of the probes that are essential for control in each type of application

Extremely fast commissioning

thanks to automatic pre-configurations and simplified service menu

- Fast commissioning with default configuration for connection between condensing unit and showcases.
- Automatic pre-configuration of Floating Suction and Oil Recovery Washing function.
- Optimised and extensively modifiable default values.
- Control parameters optimised for showcases fitted with MPXPRO controllers.



Optimum food preservation

Hecu sistema combines high energy efficiency with highest quality food preservation

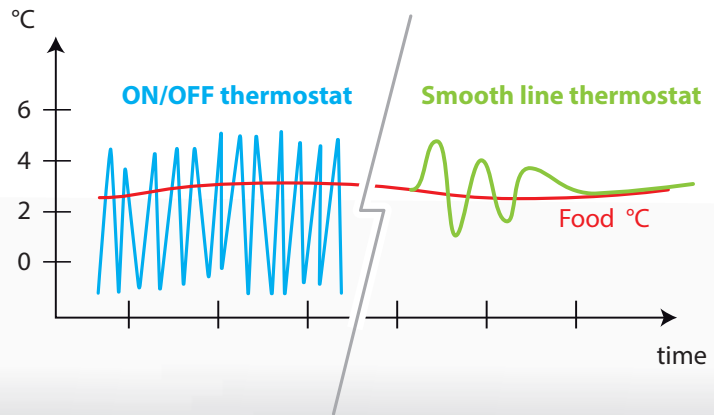
Very high quality food preservation

thanks to advanced algorithms and tight synchronisation between the components in the system



On a traditional condensing unit
suction temperature is fixed at the value needed by the unit with the highest demand. As a consequence, the system as a whole and the evaporators always work at a lower temperature than is actually necessary, at higher costs. The air is thus cooled excessively, and following a cooling cycle the system switches off in order to return to the set temperature, meaning the produce is subjected to heat-cool cycles with variations of several degrees around the ideal average value.

With Hecu sistema
on the other hand, condensing unit operation constantly reflects the demand of each unit connected, adapting dynamically to real conditions (floating-suction and floating-condensing), while the E²V valves on the units adjust refrigerant flow, and the MPXPRO controllers minimise fluctuations in temperature (smooth line thermostat) even in the most critical stages, such as when defrosting or in response to variations in load.



CAREL Hecu sistema products

The high performance of the individual components is maximised by the tight synchronisation introduced with Hecu sistema



1 pRack Hecu

pRack Hecu is the main controller that manages the logic of the Hecu sistema. It provides complete management of a condensing unit with BLDC compressor for low or medium temperatures, with advanced control functions, oil return, defrost and liquid or vapour injection. Serial connection to showcases fitted with MPXPRO controllers is a significant extra feature, due to advanced optimisation algorithms this ensures.

2 power+

power+ is a special inverter for controlling compressors with brushless permanent magnet motors (BLDC/BLAC). Integrated into Hecu sistema, this device can achieve significant energy saving by modulating compressor speed and consequently unit cooling capacity. Variations in load are managed precisely and with constant control of compressor envelope.

3 EXV Sistema

The Carel EXV electronic expansion valves stand out above all for their excellent flow control, even at very low flow-rates. Carel expansion valves have three main strengths: reliability over time, extremely precise control, perfect refrigerant tightness.

4 MPXPRO

MPXPRO is the complete control device for multiplexed showcases or cold rooms. Compact and flexible, with special focus on energy saving and user simplicity, this device can manage CAREL proportional EEV electronic expansion valves using ultracap technology to ensure closing in the event of power failures.

5 e-meter

Energy meter measures the main electrical and power parameters of the connected loads. Power consumption data are saved for complete and detailed analysis, allowing operators to identify when and where consumption occurs, any inadequate behaviour and incorrect use, faults and abnormal consumption, and evaluate the effects of the energy saving actions implemented

6 pwpro

PlantWatchPRO now has a new design, to better respond to the needs of small-medium systems. The new hardware allows different users, such as installers, maintenance personnel and store managers, to check and optimise their refrigeration and air-conditioning systems in a simple and intuitive way.

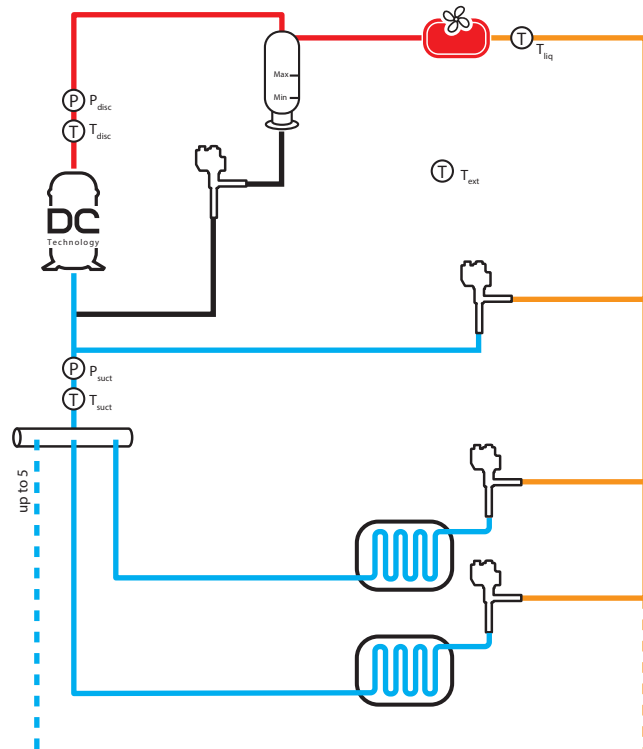
Medium temperature diagram

A medium temperature system can be managed as shown in the diagram alongside.

pRack Hecu can control:

- 1 BLDC compressor
- 1 optional backup compressor
- EEV, solenoid or capillary oil injection valve
- EEV or solenoid liquid injection valve
- Up to two fans
- Serial communication with up to five MPXPRO controllers

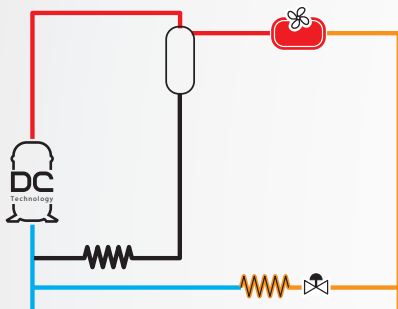
The probes most used in this system layout are highlighted in the table below.



Symbol	Description	Probe type for R404a	Probe type for R410a
T_{suct}	Suction Temperature	NTC	NTC
P_{suct}	Suction Pressure	0 to 5 Vdc - 1 to 9.3 bars	0 to 5 Vdc - 0 to 17.3 bars
T_{disc}	Discharge Temperature	NTC HT	NTC HT
P_{disc}	Discharge Pressure	0 to 5 Vdc - 0 to 34.5bars	0 to 5 Vdc - 0 to 45.0 bars
T_{liq}	Liquid Temperature	NTC	NTC
T_{ext}	Outside Temperature	NTC	NTC

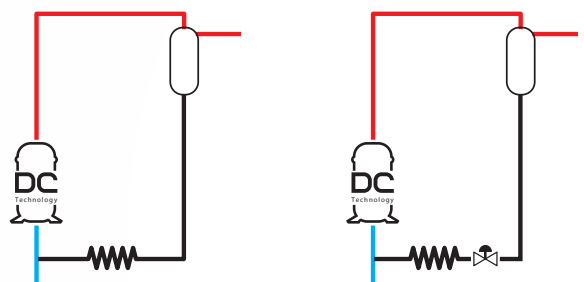
ALTERNATIVES TO THE SOLUTION PROPOSED

Medium temperature only



pRack Hecu can manage a solenoid valve as an alternative to the EEV valve for liquid injection.

Medium and low temperature



pRack Hecu can manage solenoid or capillary valves as alternatives to the electronic expansion valve for oil injection.

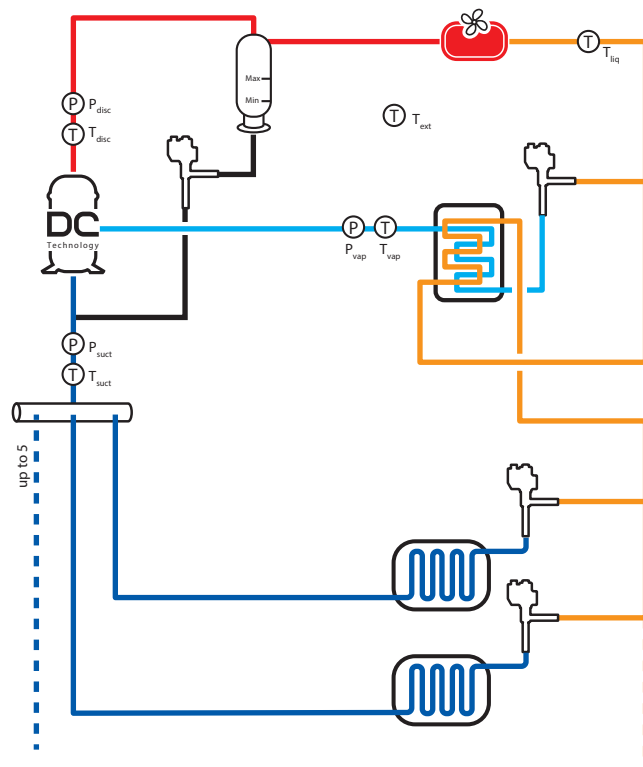
Low temperature diagram

A low temperature system can be managed as shown in the diagram alongside.

pRack Hecu can control:

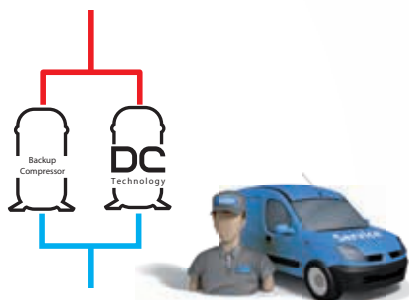
- 1 BLDC compressor
- 1 optional backup compressor
- EEV, solenoid or capillary oil injection valve
- EEV vapour injection valve
- Up to two fans
- Four-way valve for defrosting by reversing the cycle
- Serial communication with up to five MPXPRO controllers

The probes most used in this system layout are highlighted in the table below.



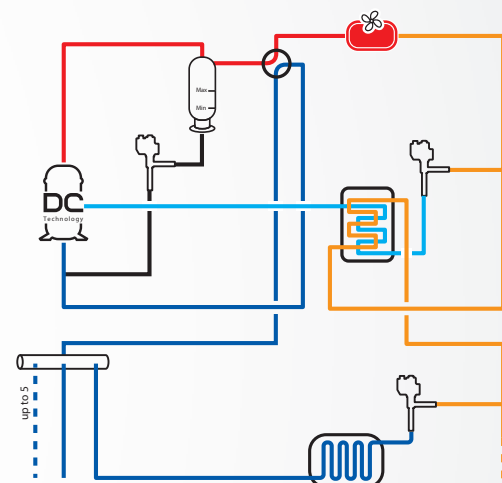
Symbol	Description	Probe type for R404a	Probe type for R410a
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P_{suct}	Suction Pressure	0 to 5 Vdc -1 to 9.3bars	0 to 5 Vdc - 0 to 17.3 bars
T_{disc}	Discharge Temperature	NTC HT	NTC HT
P_{disc}	Discharge Pressure	0 to 5 Vdc - 0 to 34.5 bars	0 to 5 Vdc - 0 to 45.0 bars
T_{liq}	Liquid Temperature	NTC	NTC
T_{ext}	Outside Temperature	NTC	NTC
T_{vap}	Vapor Injection Temp.	NTC HT	NTC HT
P_{vap}	Vapor Injection Pressure	0 to 5 Vdc - 0 to 34.5 bars	0 to 5 Vdc - 0 to 34.5 bars

Medium and low temperature



High service level with backup compressor activated only in the event of alarms or malfunctions on the main compressor. The system continues operating and service response times are less critical.

Low temperature only



pRack Hecu manages hot gas defrosts by reversing the cycle

C-Store total solution

remote**pro**



Maintenance
optimisation



Improved energy
performance



High-end
analytics

Remote monitoring



pChrono-CS

Compact **entry-level** optimisation

- Single control for all areas
- Ethernet interface for remote monitoring
- Configuration wizard
- Wireless options



pwpro

High-end monitoring

- Higher level to pChrono-CS
- Alarm notification
- In-store data analysis
- HACCP reports

Air Conditioning

Comfort and coordination now
also in small footprint stores

Lighting

Integrated optimisation guiding our
core competences in LED technology

arianna
a CAREL company

Refrigeration

Food quality and energy saving through
integrated and scalable solutions

HEcusistema

Energy and Environment

"You cannot manage what you cannot measure..."

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