High
Efficiency
Solutions.

CAREL

25%
time to market
improvement

60+
qualified BLDC
compressors

30%
higher efficiency

c.pcosistema

connected efficiency

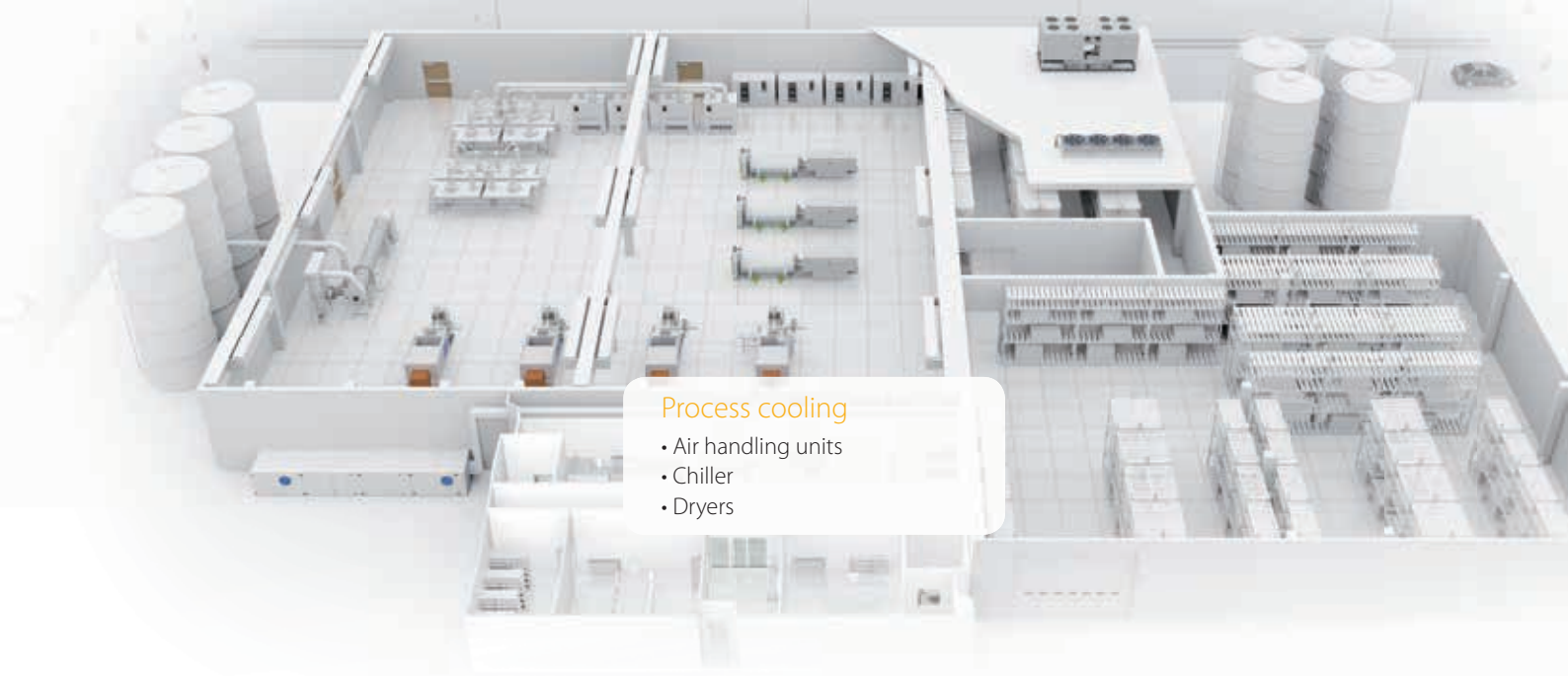
c.pcosistema

Connecting DC inverter technology

Carel solution for high efficiency HVAC applications

Commercial air conditioning

- Air handling units
- Rooftop units
- Chiller and hydronic

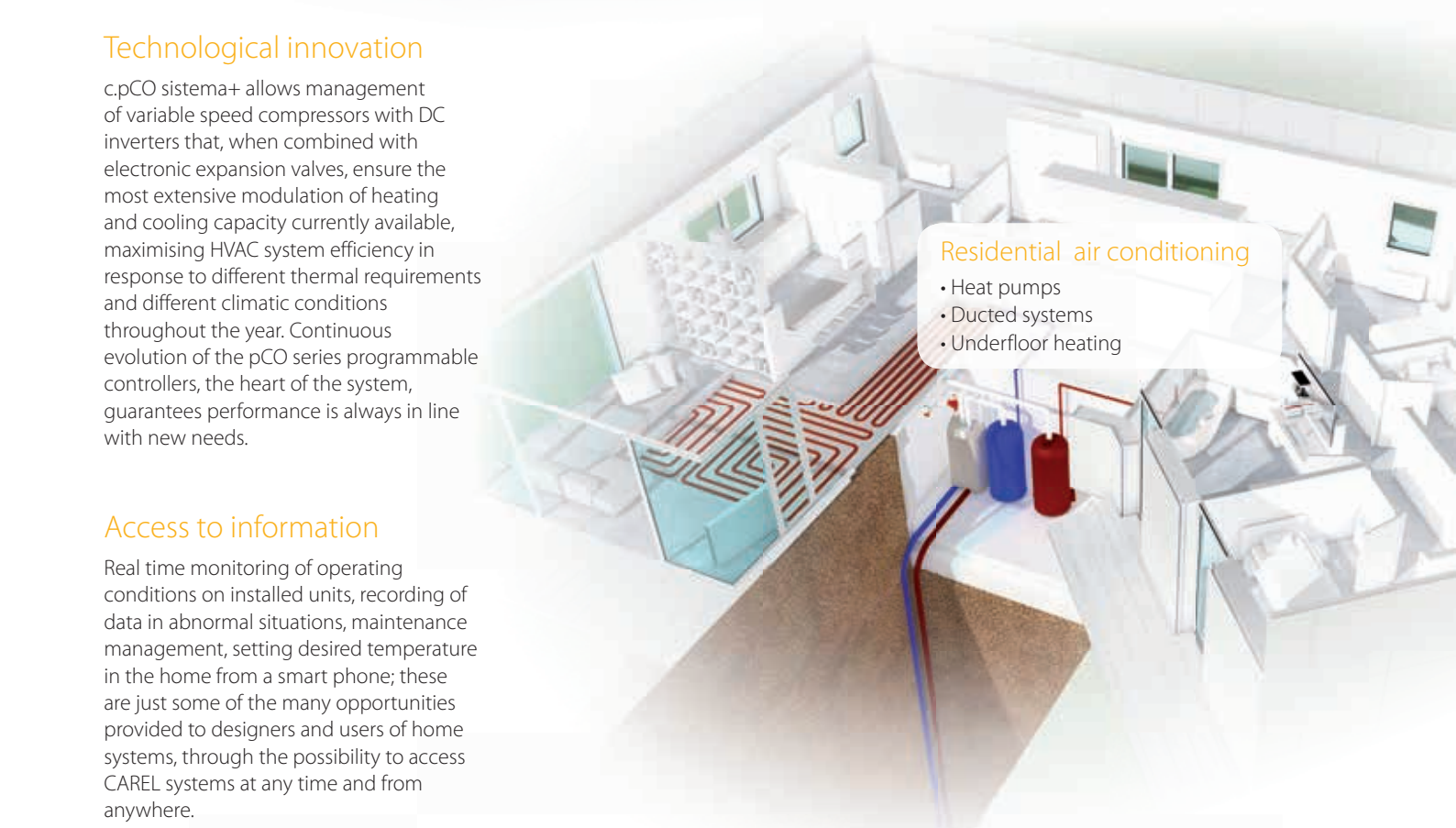


Process cooling

- Air handling units
- Chiller
- Dryers

Technological innovation

c.pCO sistema+ allows management of variable speed compressors with DC inverters that, when combined with electronic expansion valves, ensure the most extensive modulation of heating and cooling capacity currently available, maximising HVAC system efficiency in response to different thermal requirements and different climatic conditions throughout the year. Continuous evolution of the pCO series programmable controllers, the heart of the system, guarantees performance is always in line with new needs.

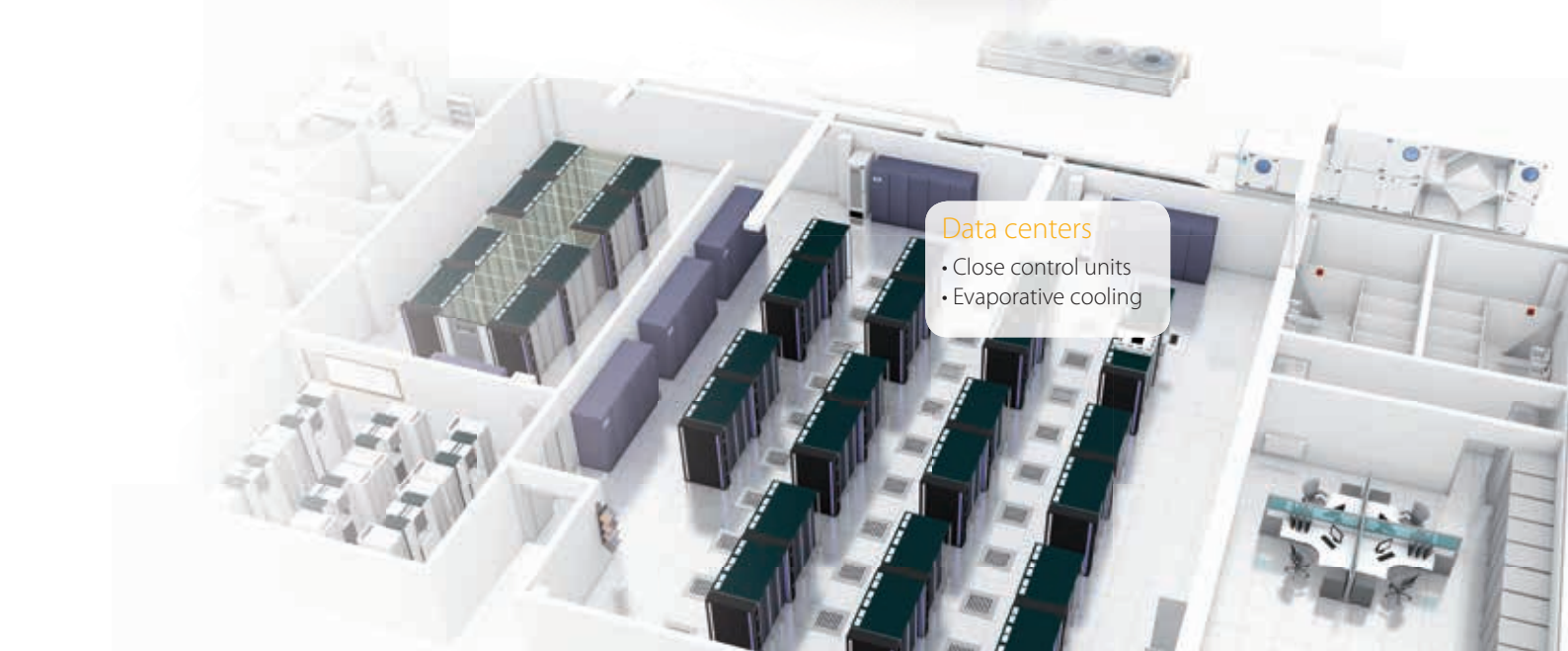


Residential air conditioning

- Heat pumps
- Ducted systems
- Underfloor heating

Access to information

Real time monitoring of operating conditions on installed units, recording of data in abnormal situations, maintenance management, setting desired temperature in the home from a smart phone; these are just some of the many opportunities provided to designers and users of home systems, through the possibility to access CAREL systems at any time and from anywhere.



Data centers

- Close control units
- Evaporative cooling

The new family of connected programmable controller

The c.pCO controller family represents the evolution of pCO5+ towards unprecedented networking capabilities.
Thanks to a Multitasking Operating System and the adoption of standard protocols, local and remote connectivity are the key innovation of the new c.pCO system.

Integrated Ethernet Interfaces

Two built-in 10/100 MB/s switched ports
Build networks without external switches
Wide range of integrated services

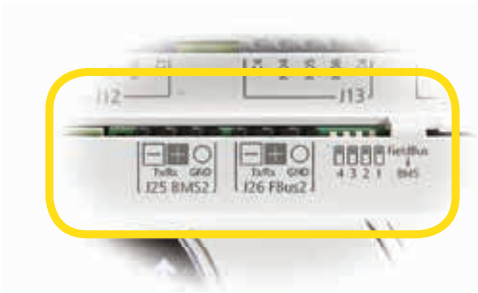
- Web Server with dynamic content
- FTP Server for upgrades and file upload
- Modbus/TCP Master and Slave
- BACNet/IP B-BC profile
- On-target debugging
- tERA cloud connections

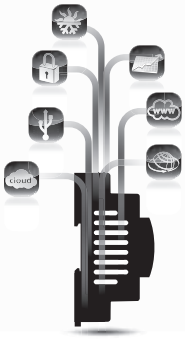
Integrated USB interface

Two built-in USB 2.0 standard ports
USB Host for storage devices
USB Devices for PC connection

- Upload application and OS upgrade packages
- Upload Web pages and generic user documents
- Download data logger CSV files
- Download user documents
- Application Cloning with encryption and digital signature
- On-target debugging

- 5 different sizes to better fit all applications
- ranging from 16 to 55 I/O points
- new controller size: c.pCO mini
- great I/O flexibility with Carel ASIC solution
- integrated BMS, Fieldbus, USB interfaces
- builtin Ethernet ports with Web server, FTP and tERA connection
- open protocols: Modbus®, BACnet™ , HTTP, FTP
- integrated energy saving with Valve Driver and Ultracap





BMS & Field Bus connectivity

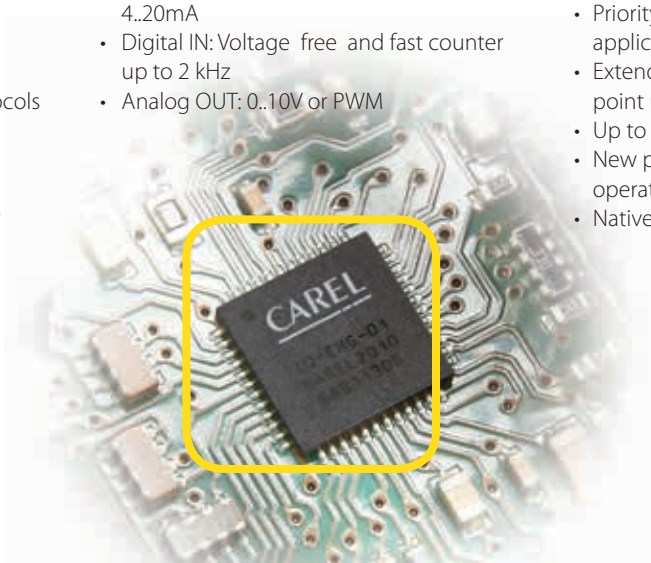
Two built-in RS485 interfaces
Expandable with two additional optional cards.
Multitasking independent protocol engines

- RS485 high speed interfaces up to 115200 bps
- Modbus® RTU Master and Slave protocols
- CAREL optimised Master and Slave protocols
- BACNet™ MSTP B-BC profile
- Custom protocol (Function blocks for Direct RS485 access)

Flexible I/O

Up to 10 Universal I/O channels
CAREL ASIC proprietary silicon technology

- Analog IN: NTC, PTC, PT100, PT500, PT1000, 0..1V, 0..5V, 0..10V, 0..20mA, 4..20mA
- Digital IN: Voltage free and fast counter up to 2 kHz
- Analog OUT: 0..10V or PWM



New Operating system

New Multitasking Operating System
New Virtual Machine for application logic
Optimal usage of onboard system resources.

- Priority management to guarantee application loop speed
- Extended datatypes: 32bit and floating point numbers
- Up to 5x speed increase on pCO5+
- New protocol engines for independent operation
- Native TCP/IP multitasking protocol stack

c.suite

The new programming tool suite to enable efficient team-work

The new programming software for the C.pCO family controllers, designed as a suite of interdependent modules, one for each stage in the development of the HVAC/R system. C.Suite allows a team of professionals with different skills to work as a team on the same project, increasing the efficiency of each team member.

c.strategy

The development tool that most closely follows the concept of the previous 1Tool. With c.strategy, expert programmers of thermodynamic algorithms can prepare the heart of the application logic.

c.mask

With c.mask, the interface developer can work in a specific environment used only for creating the user interface.
c.mask can be linked to the c.strategy project, so that any changes made by the algorithm expert are available in real-time to the UI designer.

c.design

This is the real revolution compared to 1Tool. Once the application logic has been completed, and the User Interface defined, these important parts can be subsequently expressed as different unit or system configurations.

c.web

c.web is a very useful tool for creating HTML5 websites to be loaded onto c.pCO. No specific knowledge of web technology is needed, this is a simple visual object tool with a workflow similar to 1Tool Touch Editor.

c.factory

A completely new tool designed for the OEM production line. It is used to program the controllers in the production flow, loading applications and the appropriate unit configuration on assembly.

c.field

c.field is the ideal tool for field maintenance personnel, used to simply and efficiently monitor unit operation.

Cloud services

Tailor -made solution for each user

tERA is the CAREL service-focused platform that exploits the latest technology to provide remote services for HVAC/R applications. The tERA platform not only has the purpose of providing data, but rather transforms raw information into value for all types of users. It can thus represent a remote graphic interface to a controlled system, or provide statistical analysis on thousands of units installed all over the world: all users can access a service that has been made-to-measure to suit their needs

The tERA platform is designed for different targets, with different skills and interests. For this reason, tERA is proposed as platform comprising several services, so as to offer specific solutions for each user.

Secure connectivity

In compliance with international standards

Integrated connectivity

Plug & play solution: all tERA services are available,
just plug in the Ethernet connector.
No need for an external box, no router configuration.

Simple and fast access to all the information you need; optimise your work and become more competitive; offer your customers a cutting-edge proposal using the most advanced technology and your own unique skills

tDisplay

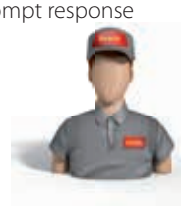
Remote connectivity

Dedicated service for remote control:
- customised installation view
- real-time control for main parameters
- highlight any alarms

tService

Centralized data collection

Dedicated service for maintenance optimisation:
- real time control with remote parameter setting
- alarm notification for prompt response
- graph and report tolls for default analysis



tTrace

Cloud computing

Dedicated application for data analysis
- Linear, bar, pie chart for checking system performance
- Scheduled reports with custom dashboard layout

c.pco mini

Heat Recovery Units and compact Air Handling Units

Integrated solutions for energy saving

The new CAREL software for active/passive Heat Recovery Units and compact Air Handling Units:

- Based on c.pco mini programmable controller
- Benefiting from the features of the new c.suite development environment
- Leveraging on Carel know-how in High Efficiency Solutions

We developed a comprehensive platform for the management of the most advanced units available in the market, featuring:

- EC fans for precise regulation of the air flow
- Integrated refrigerant circuit, in particular with BLDC compressors, to maximize energy recovery from the exhaust air
- High efficiency CAREL devices for maximum energy savings: power+ inverters, EEVs, adiabatic humidifiers
- Thermal wheel and cross plate heat exchangers

Among the many functionalities provided by the software we can list:

- Dehumidification on dew point
- Advanced defrost for the heat exchanger and the condensing coil
- Freecooling/freeheating, with control of indoor air quality
- Management of different HMIs: pGD1, pLDPro, ThTune
- additional IOs through c.pCOe expansion board

DC Technology CAREL PREFERRED PARTNERS

EC Technology CAREL PREFERRED PARTNERS

All the features of c.pco mini and c.suite are available (depending on the version of controller in use):

- Real Time Operative System for high performances
- Great flexibility: 10 universal channels in just 4 DIN modules
- Built-in Ethernet port for native plug&play tERA connection; web based advanced services and serial communication with standard protocols as Modbus and BACnet
- Serial ports for field devices and BMS communication
- Integrated driver for unipolar EEVs
- Ultracap module for safe electronic valve closure in case of power failure
- NFC tag for machine settings configuration through mobile devices
- USB host and device ports on the same Micro USB connector
- Optimization in programming, thanks to the functionalities provided by c.suite both on machine configuration and sw deployment in the production line

Humidifiers

CAREL humidifiers management for fine humidity control and green cooling.

EXV sistema

Full range of proportional expansion valves for high-efficiency units.
For conventional and new refrigerants.

power +

Maximum system efficiency thanks to precise modulating load management.
New widened range with 10 and 35 VA models.

CH/HP with scroll and DC compressors

A complete solution for high-efficiency units

The CAREL solution for chiller and heat pumps units with EEV technology, BLDC compressors (Inverter DC technology) and scroll compressors has been developed around the c.pCO range of programmable controllers.

The application can manage both air/water and water/water units with fixed DC technology compressors combined together in the same circuit. The maximum configuration includes up to 3 compressors for each circuit (max 1 BLDC compressor for circuit), with up to 2 circuits.

The distinctive feature of this product is dynamic control of the compressor operating limits: suction and discharge pressure are read at all times, thus determining the compressor operating point. Software implements corrective actions on the various unit devices (compressor capacity, electronic valve, condenser devices) to maintain compressor operation within the limits in case of necessity. This function thus ensures greater compressor protection and reliability and, at the same time, high unit efficiency.

Main Functions:

- Double PID (Startup, Running)
- Low noise (for fan)
- FreeCooling
- Defrost management
- Setpoint compensation
- Oil management (Destabilization, Recovery and Equalization)
- Anti lock (for the devices)
- Anti frost for cold climate (for fan)
- Import/Export parameters, alarm history, logs

The application can be used as starting point for development of customized solution to best fit the unit manufacturer request. A special version focused on residential AC units is going to be released to integrate most important and dedicated functions requested from market.

User interfaces

Wide range of HMIs designed for intuitive programming and service.

Phase-cutting speed controllers

CAREL's wide series of phase-cutting speed controllers is suitable for different fan modules offering stable condenser control management.

E^{X}V sistema

E^{X}V management guarantees energy efficiency through precise control in various outside temperature and load conditions.

power +

The use of DC compressors driven by Power+ guarantees higher energy efficiency than any other technology available on the market, with a very wide range of cooling capacity modulation.

exvsistema
Electronic Expansion Valve

power+
speed drive

The CAREL products for high-efficiency HVAC/R applications

E^XV electronic expansion valves

The E^XV family valves, together with their control systems, represent the first example in the world of using sophisticated stepper motor technology in refrigeration applications.
CAREL has scaled down the size, capacity and price of technology that was already used in medium and high capacity air-conditioning systems (hundreds of kW) to introduce a reliable high-tech product into a market dominated by mechanical expansion systems. Compared to the latter, E^XV valves provide fine control and optimization of evaporator operation and lower superheat, prevent temperature swings, reach steady operation much faster, and above all bring enormous benefits in terms of maximizing efficiency. Energy savings of 30% can be obtained with E^XV when compared to mechanical expansion systems, with a return on

investment of less than one year. To certify its measurement methods, CAREL has partnered important organizations, such as the CNR (Italian Research Council) and the University of Padova, as well as major international supermarket chains.
In the air-conditioning market, the E^XV family offers the widest range of stepper valves in terms of cooling capacity, from 1 to more than 2000 kW, with the reliability of each model guaranteed for over one billion steps. The most significant features include perfect tightness for protecting the compressor, a closing time of 3.2 seconds and optimized resolution according to the control position, thanks to the equipercentile profile designed for variable-capacity systems (fine control at low refrigerant flow-rates and high reactivity at high flow-rates).

Power Plus inverters for DC compressors

Compressors with permanent magnet motors controlled by DC inverters are one of the most efficient technologies available in the world for HVAC/R applications. This technology, originating from Japan, is becoming the market standard in home air-conditioning and heating applications. For almost 10 years, CAREL has been helping to disseminate this technology in applications like heat pumps, air-conditioners for data centers, condensing units and refrigerated showcases. The results are astonishing: energy savings of up to 40% thanks to the adapting cooling demand in real time, with minimum power consumption. All of this would not be possible however without the Power Plus family of inverters, the only devices available on the market that can control more than 80 different models of DC compressors, made by the world's leading manufacturers. That's not all: when combined with the pCO and

c.pCO series controllers, the CAREL system integrates the compressor's electrical and thermodynamic characteristics: maximum efficiency and total reliability are guaranteed by in-depth lab tests made in collaboration with the compressor manufacturers and by dynamic control of the compressor envelope, the area in which correct operation is guaranteed.
CAREL's experience in this sector has allowed the Power Plus to be upgraded with exclusive functions to protect and optimize the compressor and the entire refrigeration system: the new series integrates "class B" safety software, which allows customers to certify the unit in accordance with international safety standards, and "crankcase heater" function to maintain temperature and prevent oil from freezing, both without requiring additional components.
The entire CAREL control system is integrated into the final application to ensure the technology meets the needs of the end user.

boss

The new mobile ready local supervisor

The local supervision solution has evolved by integrating the latest technologies available on the market and exploiting these for all refrigeration and air-conditioning applications. The experience with PlantVisorPRO has thus given rise to BOSS!

This new system inherits all the alarm management and energy saving functions that have been amply field-tested with PVPRO, making them accessible even more quickly and intuitively.
The new interface allows the supervisor to be accessed directly from a smartphone or tablet, over the Wi-Fi network created by the supervisor itself. BOSS thus simplifies access to system information for all users, while continuing to guarantee the highest data security standards and integrity of the local infrastructure.
From initial site setup and configuration to periodical access for controlling the system, the interface is optimised for mobile access thanks to its new graphics and the use of new maps.

The new HW on BOSS further increases the level of supervisor reliability. In a way that is typical of industrial applications, the new product guarantees correct operation even in critical environmental conditions, such as the presence of dust or in tight spaces.

BOSS thus confirms its role as the main point of access to the entire site, for controlling operation and correctly configuring each individual element.
It provides service technicians complete and secure management of alarms, and implements logic and scheduling functions for optimising site energy consumption.

High Efficiency Solutions.

CAREL

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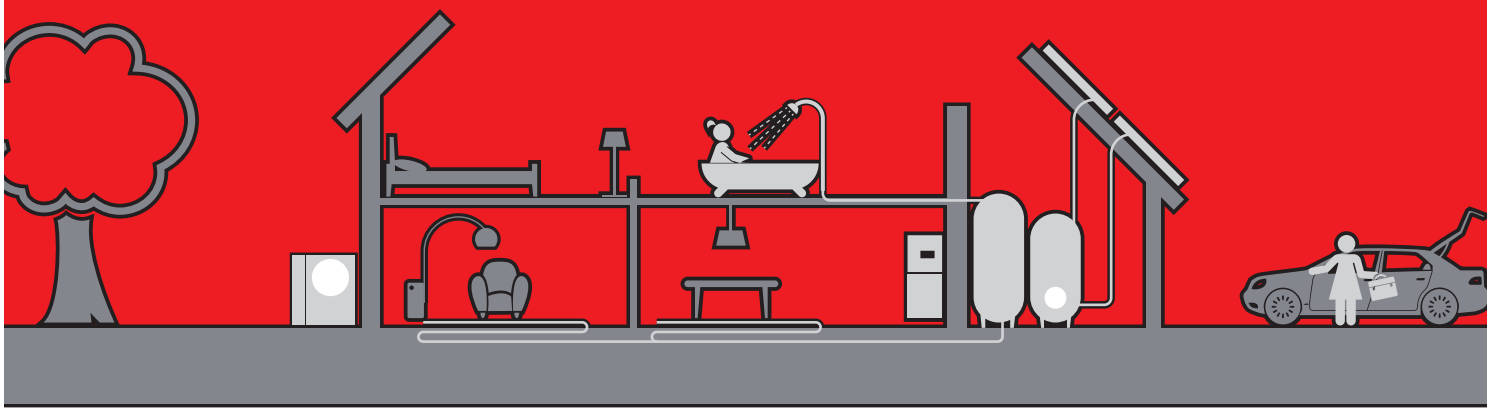
c.pcosistema

High efficiency management for residential heat pumps

60+
BLDC compressors managed

65%
development time reduction

40%
energy savings



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