

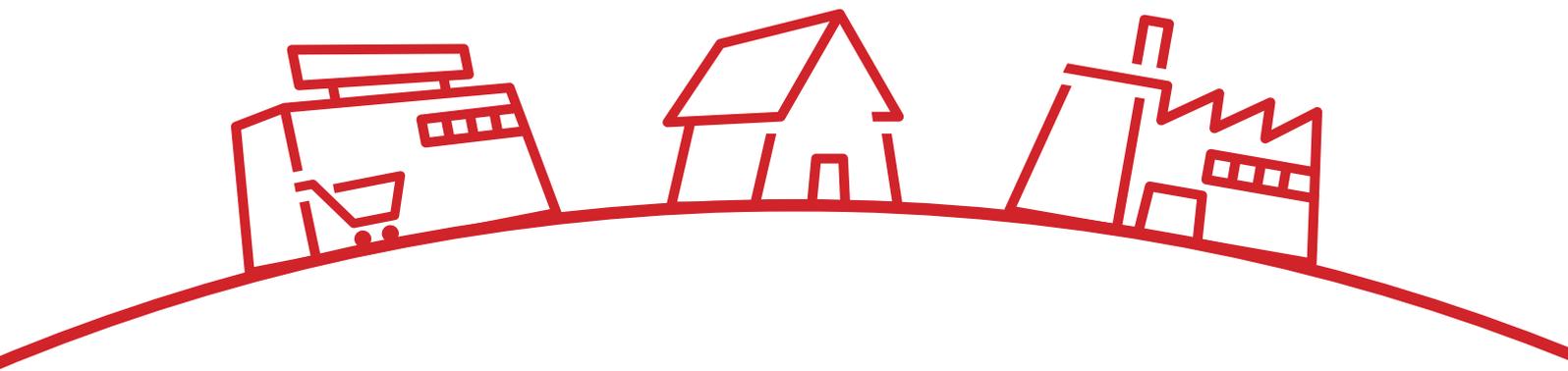
High  
Efficiency  
Solutions.

**CAREL**

# Solutions for refrigeration and retail units and systems

[carel.com](https://www.carel.com)

# Control Solutions and Humidification Systems for HVAC/R



# high efficiency solutions

## Can protecting the environment be reconciled with our industrialised society? Yes, today this is possible.

Indeed, this is the concept of sustainable development: improving the quality of the life, without overloading the supporting ecosystems that it depends on, now made possible by progresses in technology.

While until recently sustainable development was simply a desire, a cost and an obligation defined by legislators so as to bequeath a healthy planet to future generations, today it is the only plausible choice. Changing public awareness continues to focus on the more worthy companies, rewarding these with higher sales. A need has thus become an opportunity, a chance not to be missed to unite the need to develop products and services that save energy with the possibility to effectively reduce environmental impact.

To encourage sustainable development, many activities are underway as concerns both the environmental policies of individual nations and international organisations (above all the European Union), and specific research and development work.

Today, then, solutions to combat global warming and pollution, to live a sustainable existence, to make our cities more liveable and our factories more efficient and virtuous all exist: the technology is here.



CAREL has always developed and promoted evolved control systems, proposing innovative solutions in the HVAC/R sector. These are our “high efficiency solutions”, a clear response for environmental protection through optimised and integrated control systems, capable of bringing significant energy savings and consequently reducing environmental impact. These are new solutions for the market, yet the choices made are still in line with our tradition: we have always invested in R&D, right since we first started business, and we continued to do so despite the global recession.

These cutting-edge control solutions are now available, and their full potential is ready to be exploited, to achieve an effective competitive advantage on the world scene and be rewarded by the market.

Using CAREL “high efficiency solutions” today means doing something concrete to contribute to protecting the environment. It means looking to the future with confidence.

## More than saving energy... ...efficiency and sustainability

We have been supplying refrigeration solutions for four decades, guaranteeing the market increasingly high performance and innovation, integrating different devices and boosting system efficiency so as to achieve reduced energy consumption and a lower environmental impact.

Every kilowatt-hour saved not only means a reduction in running costs, but also lower greenhouse gas emissions.

CAREL today proposes innovative solutions for integrated and optimised control of refrigeration and air-conditioning systems, tested by leading research centres and used industrially in the field by the big names in the sector.

For instance, we have reduced power consumption in several supermarket groups by over 25%... and we are ready to take on other similar challenges.

Studies that have led to the use of new natural refrigerants, such as CO<sub>2</sub> or R744, the adoption of renewable energy sources rather than fossil fuel, energy saving and reduction in environmental impact brought about by innovative control solutions, aimed at achieving maximum energy efficiency in the management of refrigeration and air-conditioning systems. Yet all this is not enough, CAREL's choices go much further, considering the aspects related to grey energy, that is, the energy needed to manufacture our products. The energy saving solutions proposed by CAREL are thus developed using optimised and waste-free production systems, following the lean philosophy and adopting cutting-edge technology with an extremely low environmental impact.



**-30%**

CAREL Retail Sistema can integrate and optimise complete stores through just one point of access, with enormous benefits in terms of usability and energy saving, even for retrofit installations



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# Applications







## hypermarket

CAREL retail sistema allows complete control and monitoring of the site and the various sub-systems in more complex superstores, efficiently managing alarms and supervision and supplying the users with solutions that allow:

- energy saving and management of consumption;
- reduction of environmental impact via compatibility with the most recent system solutions;
- optimisation of management and installation times via specific vertical functionality for this market.

CAREL retail sistema reaps the benefits of CAREL's thirty years experience in the automatic controller sector, and the value given to the customer is based on:

- **safety**, ensured by independent controllers, which are optimised in the system, and integration, as the individual unit is perfectly independent in assuring its own functions;
- **user-friendliness**, important in emerging markets as in more mature ones, ensured by intelligent and semi-automatic programming functions, graphical and touch screen user interfaces and self-adapting energy

saving algorithms;

- the **reduction of energy consumption and environmental impact**, thanks to the functions developed in our thermodynamic research centre and the constant investments in innovation.

### Convenience store

Solutions for c-store where performance and usability of the superstores will be preserved but with more attention to costs.

For example the air conditioning and lights can be optimised in new or retrofit systems through the system supervisor and programmable solutions, thus guaranteeing simple control and tangible energy saving.



pRack  
"Solutions for  
compressor racks"  
p. 55



pGD Touch  
Unit and room  
terminals



ChillBooster  
Atomisers - evaporative  
cooling



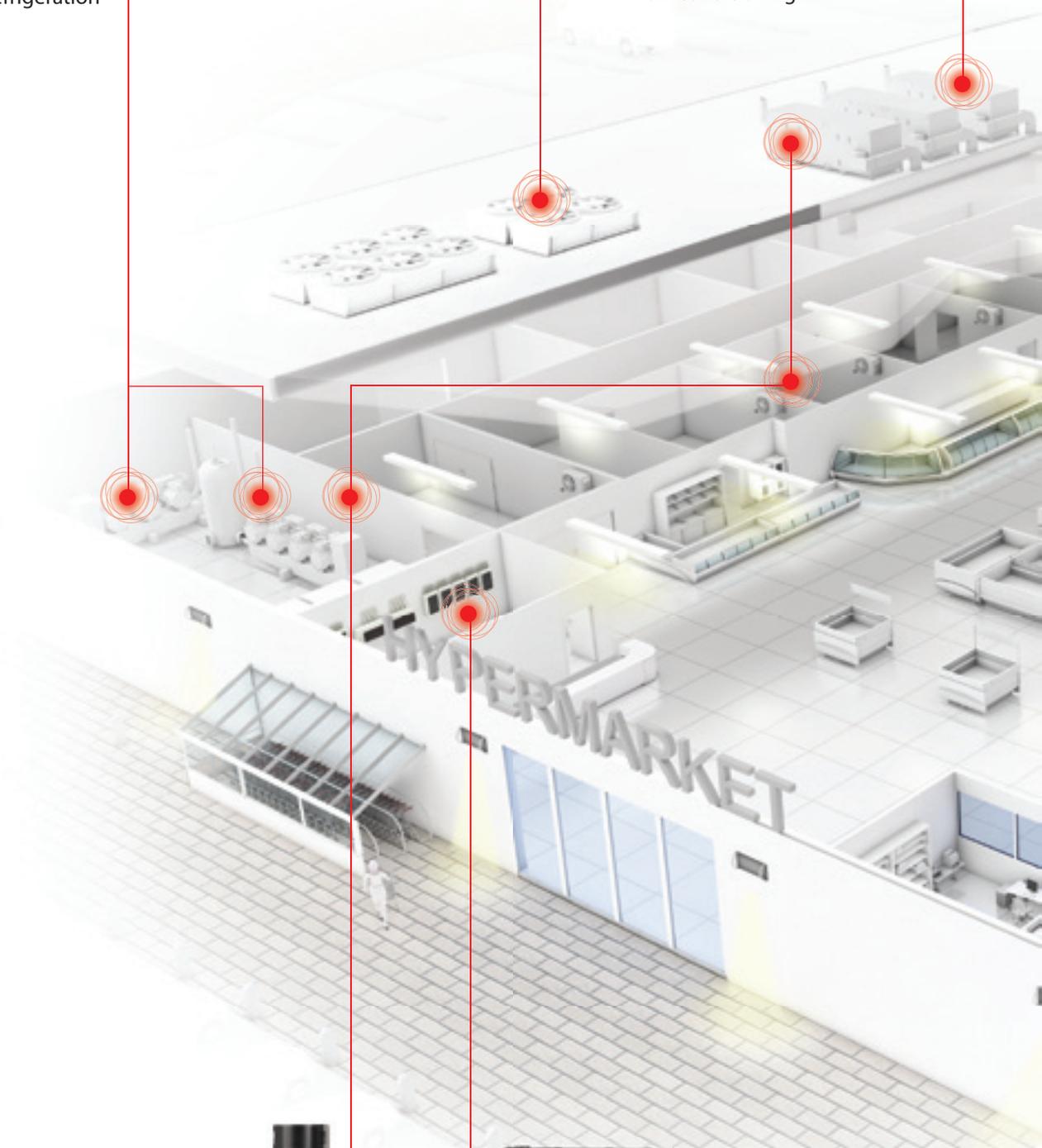
pGD Touch  
Unit and room  
terminals



pCO5+  
pCO sistema

refrigeration

air-conditioning



Refrigerant gas leak detector  
"Sensors and protection  
devices" p. 71



pLOADs  
"Energy optimisation" p. 59

Energy management



optiMist  
Atomisers - evaporative  
cooling



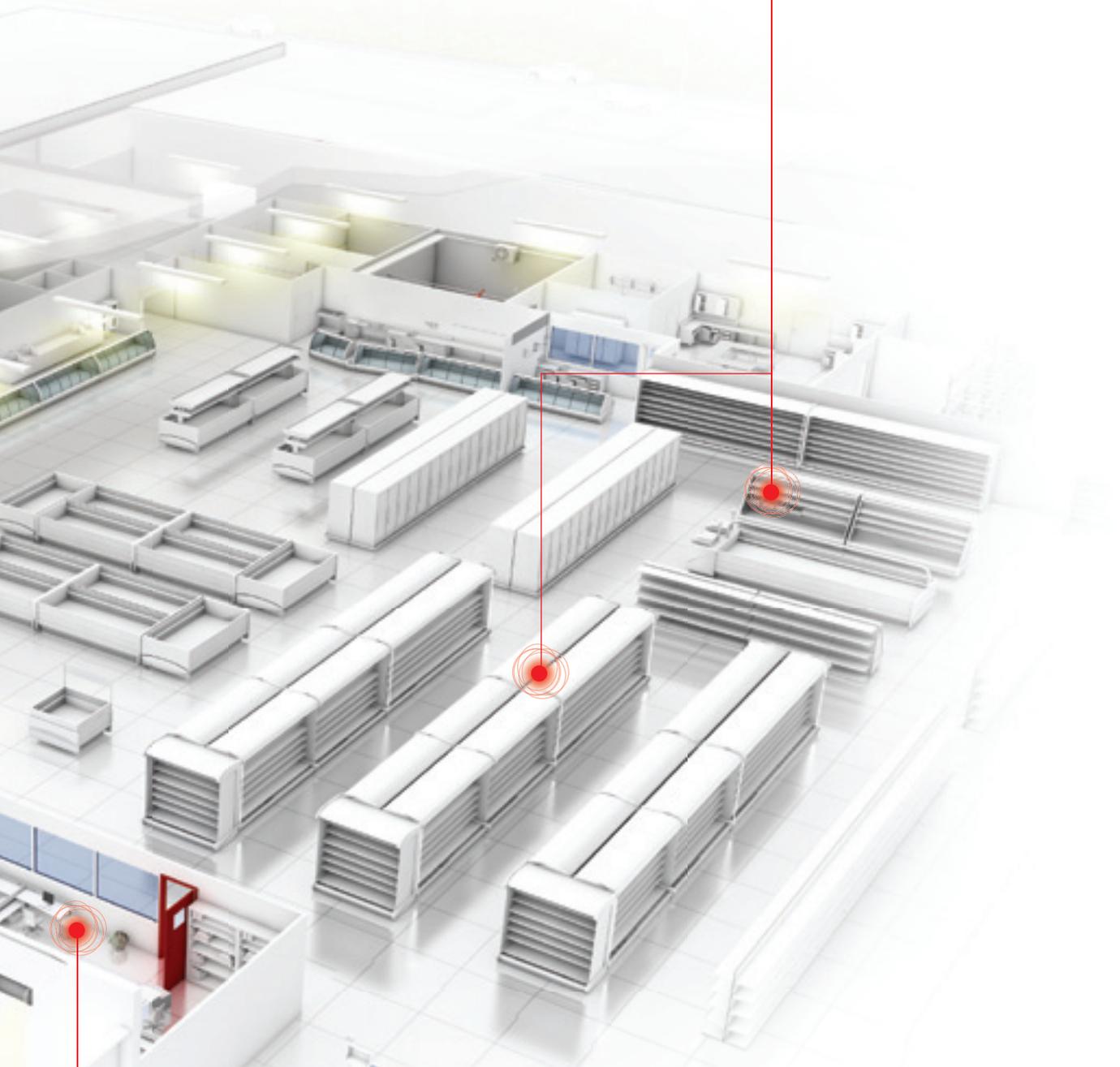
MPXPRO  
"Solutions for cabinets  
and cold rooms" p. 51



E<sup>2</sup>V  
"EXV sistema - electronic  
expansion valves and drivers"  
p. 105



Freshsonic



PlantVisorPRO Touch  
"Solutions for system monitoring and  
supervision" p. 97



Remote operative center



### Energy saving and reduction of environmental impact

The expectations of and on the market for active contribution with the reduction of environmental impact are always more pressing and demanding.

CAREL retail sistema has specific functions able to:

- use state-of-the-art system solutions, from transcritical CO<sub>2</sub> to BLDC compressors;
- accurately monitor any refrigerant leaks;
- automatically automate the systems via dedicated functions that push the performance of the connected systems to maximum (such as floating evaporation and condensing pressures, the continuous modulation of antisweat heaters and electronic expansion valves);
- monitor any offset in performance via specific analysis and report tools, such as the KPI plug-in, the Thermodynamic Debug or via the configuration of appropriate warnings and reports;
- check and prevent tampering by unauthorised configuration that can reduce performance via functions such as Plant Defence.



### Integrated solutions

In the CAREL philosophy, the various area controllers allow maximum integration of the different accessories and therefore maximum usability and performance: unique user interface, unique adjustment software in the various applications and complete management through system supervision.



### Supervision and remote surveillance

All of the solutions for the various areas of control are under the unique system supervisor, developed for 24/7 use, with user profiling and webserver with local or remote use.

The task assigned to our supervision and local energy optimisation solutions is to transfer information useful for maintenance to a remote station and cross-system verification via standard or highly customisable solutions for the most advanced Facility Management, Service Management, Energy Management centres or Call centres.

Wireless solutions exist for retrofit applications, which allow complete monitoring with low installation costs and with the possibility of energy saving initiatives.



### Air conditioning

CAREL is leader for air conditioning and air handling solutions and makes a complete range for rooftop control, air handling units and chiller/heat pumps, available for the retail market and specifically for superstores.

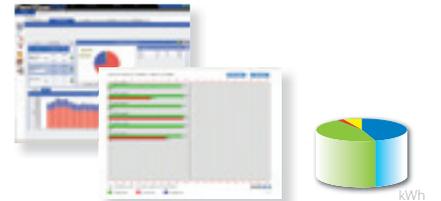
Both refrigeration and air conditioning can be integrated and optimised in unique management and supervision with immediate returns on investment in terms of capital and operating costs.

Synergy with our innovative adiabatic and humidification solutions allows large energy savings.



### Refrigeration

The CAREL retail sistema solution for refrigeration includes, integrates and optimises the control of the refrigeration unit, counters and connected cold rooms and the plug-in units within the sales area. The pRACK range, the latest development and in constant evolution, allows complete control of the latest generation refrigeration units with CO<sub>2</sub> refrigerant in subcritical, or cascade and transcritical mode. In the same way, the MPXPRO range for counters and cold rooms is compatible with the greatest energy saving requirements via direct management of electronic expansion valves (whether they are the innovative CAREL proportional valves or more traditional PWM valves), the continuous modulation of antisweat heaters and synchronised management of the lights, night curtains or night-time energy saving mode.



### Energy management

The availability of a powerful and flexible system supervisor allows monitoring and configuration of system consumption from a unique access point and trace it by area or time.

As well as monitoring, programming and scheduling of electricals loads such as lights and others are also possible, both with standard and customised solutions, often requested in the more complex systems.

Specific and pre-configured plug-ins easily allow control and consumption report functions and the comparison between different areas or, in the case of several systems, of several sales points, via a remote connection.



## restaurant chain

With a wide range of solutions for commercial refrigeration, CAREL offers itself as a reliable and innovative technological partner to manufacturers of refrigerated counters, display cases and cabinets used in catering, ice cream parlours, confectioner's, bars and restaurants. The objective is the total satisfaction of all sector operators (manufacturers, distributors, installers, system integrators and final users) through the offer of solutions dedicated to the control of refrigeration systems, aiming at user-friendliness, compliance with standards and energy efficiency.

### Usability

The in-depth knowledge of the sector application and market demands has allowed the design of new technologically advanced, user-friendly products, with particular attention to detail. As well as guaranteeing quality in the preservation of food, the CAREL solutions are intuitive for the user, have exquisite aesthetics and are easily assembled.

### Energy saving

Thanks to the continuous evolution of CAREL controllers, it is possible to guarantee suitable performance for new demands. On one hand, the replacement of mechanical thermostats with electronic versions, on the other hand the use of the electronic expansion valve in order to optimise performance of the refrigerating system depending on the different climatic conditions, which change throughout the year.

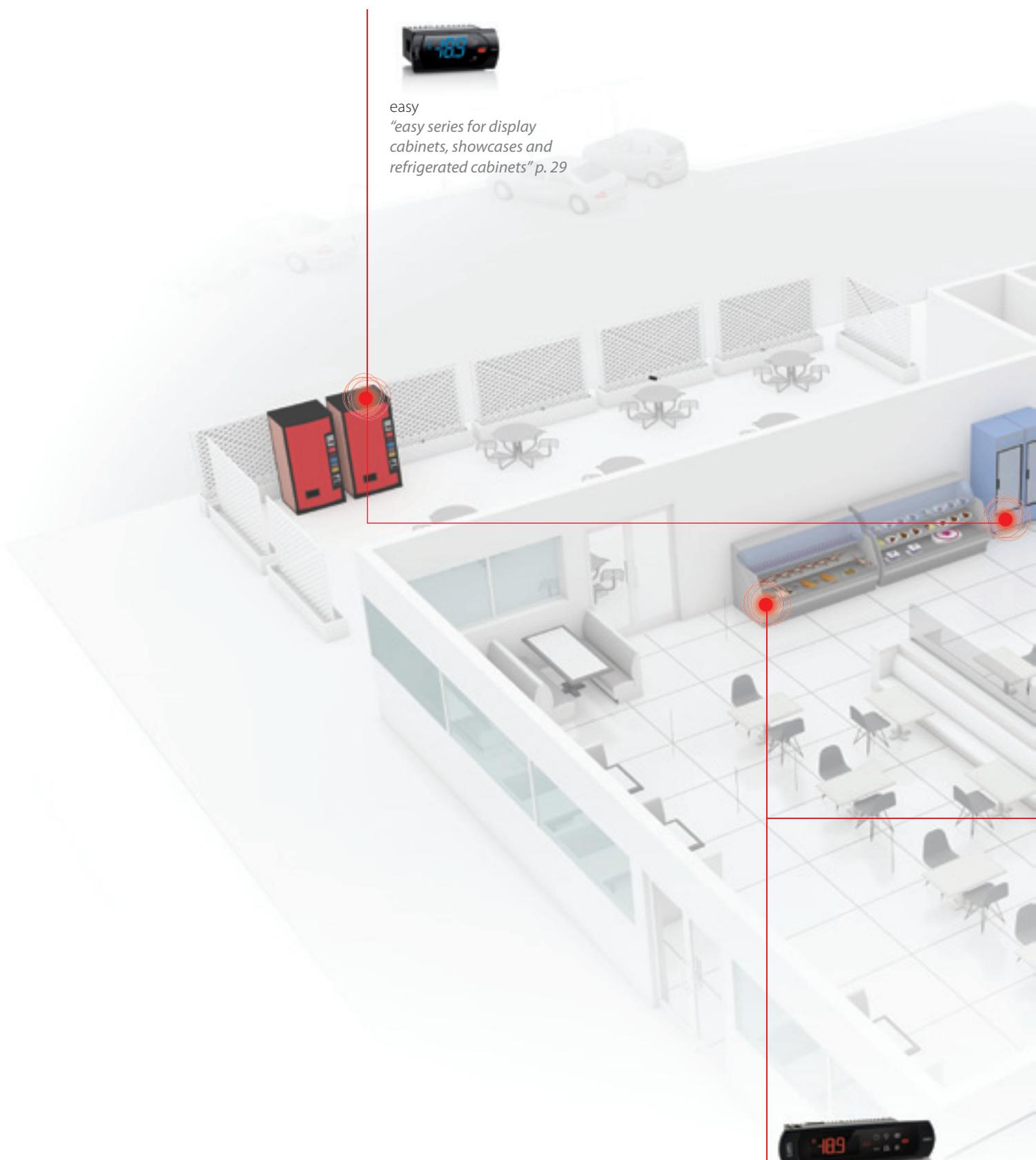
### Integration into the refrigerating unit

Manufacturers of counters, cabinets and refrigerated display cases always want to differentiate their offering. Using electronics and the user interface, manufacturers transmit the innovative content of their products. Therefore, having an intuitive user interface, on the application and integrated into the unit is a new critical factor for success.

Technical innovation and experience serving refrigeration, for increasingly more efficient units and systems. Optimisation of performance, lowering of running costs, energy saving and reliability.



easy  
"easy series for display  
cabinets, showcases and  
refrigerated cabinets" p. 29



easy wide  
"easy series for display cabinets,  
showcases and refrigerated  
cabinets" p. 29



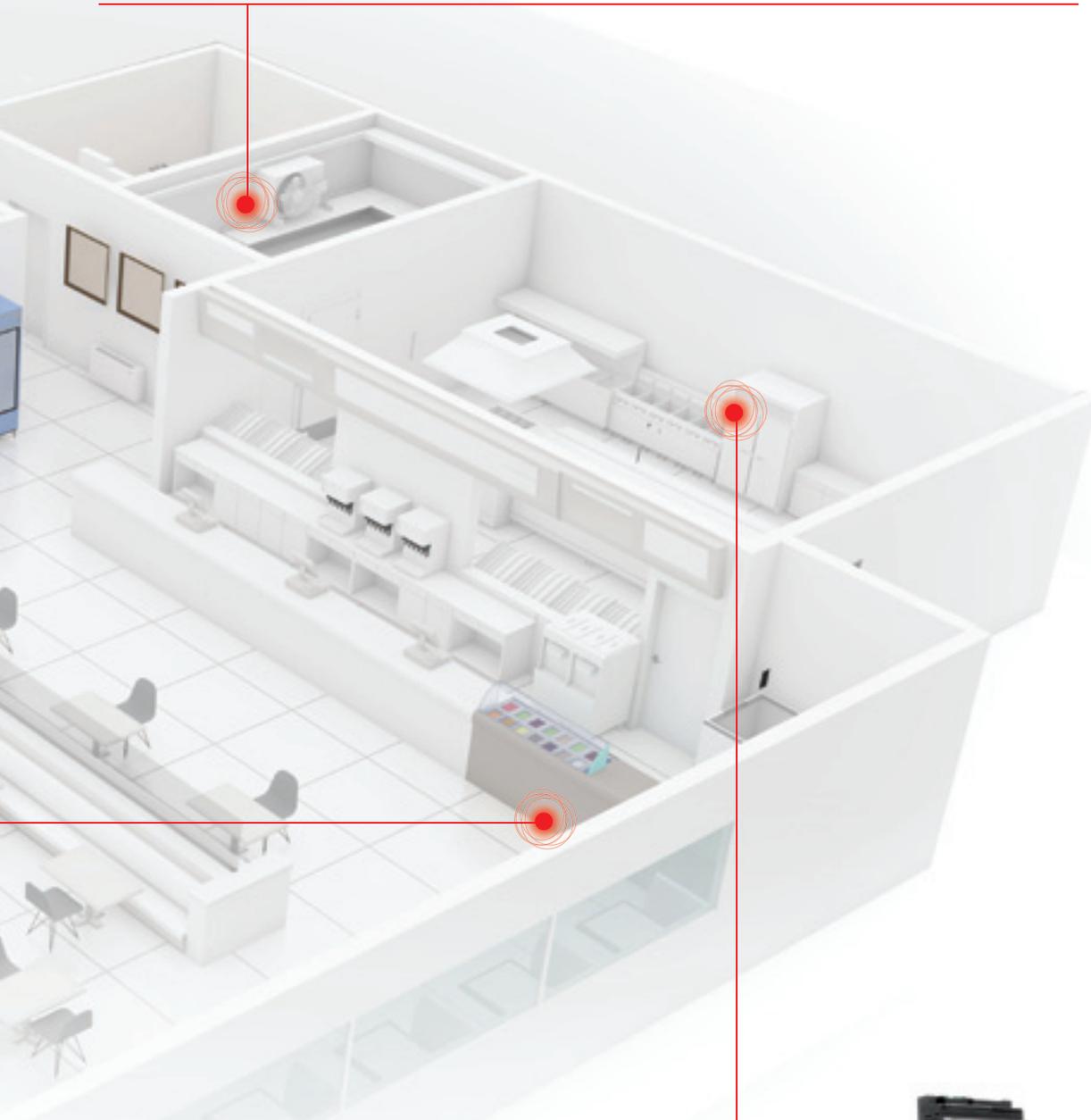
E<sup>2</sup>V and EVD evolution  
"EXV sistema - electronic expansion valves and drivers" p. 105



Refrigerant gas leak detector  
"Sensors and protection devices" p. 71



ColdWatch and MasterCella  
"MasterCella series" p. 43



ir33+  
"ir33+ series for commercial refrigeration" p. 23



easy wide  
"easy series for display cabinets, showcases and refrigerated cabinets" p. 29



BlastChiller  
"Solutions for blast chillers and freezers" p. 37



### ir33+

The ir33+ range is the natural evolution of the ir33 range. In-depth knowledge of the sector application and market demands has allowed the design of new technologically advanced, user-friendly products, with particular attention to detail and energy saving.

As well as guaranteeing preservation quality, ir33+ is intuitive for the user, aesthetically pleasant and also guarantees notable energy saving for the manager. Particular attention has been paid to the user interface; now in line with the most modern electronic instruments.



### easy

Con easy, CAREL offers the market a product designed specifically for the bar refrigeration, catering, refrigerated display case and counter sectors.

easy is a range with a wide choice of models, amongst which, one very compact model that is particularly suitable in environments where space is a critical element.

easy is the best choice because it can easily and efficiently manage the complex world of cooling control.

easy simplifies the initial configuration phase of the units and has new technology, which can be used to create special models with customised functions.



### Blast Chiller

Blast Chiller is the CAREL solution for blast chillers, which are usually used in professional kitchens to cool and/or deep freeze food products as soon as they have been cooked.

Blast Chiller is based on the pCO range programmable platform and has a graphic interface (pGD1 range), which offers a simple and complete menu (multilanguage).



### MasterCella

MasterCella represents the complete electronic solution for control of single phase, static or ventilated cold rooms. It directly manages single phase units with compressor up to 2Hp. Thanks to the large relays, it also controls all other actuators: the evaporator fans, defrosting, lights, the alarm relay and auxiliary output. Wiring is particularly easy thanks to the greater space for the cables, the disconnect switch and the optional board for converting voltage-free contacts into live contacts.



### ExV Sistema

With EXV sistema, CAREL offers a complete and integrated solution for controlling evaporation on air conditioning and refrigeration units, thanks to the use of the EXV electronic expansion valves and the new EVD evolution controller for superheat.



### Temperature and pressure sensors and combined sensors

CAREL offers a complete range of sensors for controlling temperature and pressure, both on the unit and in the environment. Each individual function (water temperature control, compressor discharge temperature or room temperature) finds a suitable response in the different versions available, which are distinguished by size, the protection of the sensitive element and the materials used for the casing.



## remote operation centre

A ROC (Remote Operation Centre) is a structure established on qualified human resources, computer systems and state-of-the-art technology.

The final target is to supply added-value services to several customers that have the same demands and requirements. The world of cooling and the world of comfort increasingly highlight opportunities linked to remote management and monitoring, leading to the creation of new service-oriented business models.

In order to give best support to customers and facilitate the development of these new markets, CAREL offers a complete and reliable solution, representing an application and technological partner at all levels of the supervision system chain. From controllers on site to the individual system up to central information systems.

### Connected anywhere

Thanks to the most modern computer technologies, CAREL offers user-friendly and quick configuration systems. Operators in the office or maintenance technicians on site can access the same information easily and quickly, thanks

to the integration of devices such as Smartphones or tablets.

### 24/7 System

The operator will have the real time situation of all alarms coming from the various systems available. Immediate viewing of times and maintenance notes assist with troubleshooting, in order to supply feedback to the user and improve the quality of service, thus creating a shared knowledge base at the same time.

### Added-value information

No longer data will be confined to individual systems but centralised for the creation of value-added information. The call centre offers services regarding reports, consultancy on optimisation, remote commissioning. Services that help customers concentrate on their business and find a reliable and successful partner in the call centre.

### Lowering operational costs

Optimises times and decreases operational costs by previously knowing system requirements.

A remote control specialist always at your side for the most critical interventions.

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remotepro  
"Solutions for system  
monitoring and  
supervision" p. 97



remote control  
maintenance  
technician



energy manager



call centre operator





### Facility Management

A range of “no core business” activities for the company, which have the purpose of managing instruments/devices that make up the company’s infrastructure, are often outsourced. A clear situation of what’s happening in the systems and case histories allow faults to be resolved very quickly: consequently operating and management costs are reduced. Thanks to its supervision system, CAREL represents a reference partner for this type of service. Starting from the local system with the PlantVisorPRO and PlantWatchPRO range, up to the data processing centre with the RemotePRO.

### Product quality

Ensuring product quality is a fundamental aspect that the customer takes for granted, but which a service must guarantee 24/7. Constant verification of the temperatures of the refrigerated counters and the generation of reports for conformity with standards (HACCP), are the instruments necessary to support these requirements. PlantWatchPRO and the CAREL rTM solution offer quick and accurate recording of temperature. The RemotePRO centralised system can generate temperature reports and archive them automatically for future reference.

### Energy Manager

A figure that is much more than a reference within the chain. Energy saving means environmental sustainability and reduction of operating costs. CAREL can supply the essential instruments to make it easier for the energy manager to make the right decisions in order to optimise energy consumption. All of this is possible due to the PlantVisorPRO system in the installation and its plug-ins for the generation of energy reports, and the RemotePRO centralised system and benchmarking function.

The image features a soft-focus background of a field of white crocuses. The flowers are in various stages of bloom, with some fully open and others as buds. The sky above is bright and hazy, with some faint, wispy clouds. The overall color palette is light and airy, dominated by whites, greys, and pale blues.

# Refrigeration solutions





## ir33+ series for commercial refrigeration

ir33+ represents the maximum technology that CAREL offers in the field of refrigeration applications.

The ir33+ series is the natural evolution of the ir33. In-depth knowledge of applications in the sector and the needs of the market has allowed CAREL to design products that are technologically advanced and simple to use, with careful attention to details and to energy saving.

The new range of products, as well as guaranteeing quality food storage, is user friendly, aesthetically refined and guarantees significant energy savings. Special focus has been placed on the user interface, now in line with the most modern electronic instruments.

ir33+ is perfectly compatible with ir33, both regarding the hardware (connections, power supply, inputs, relays), and software (functions, parameters, programming key).

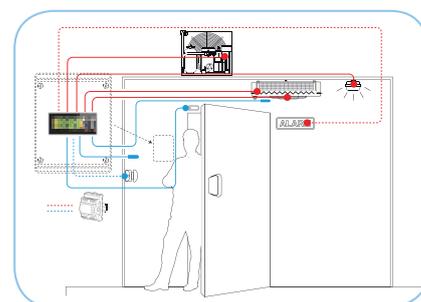
The range consists of ir33+, standard 29x74 mm format for panel installation, ir33+ wide for panel installation in the format compatible with powercompact (wide and small wide), and ir33 DIN, for DIN rail assembly.

### Benefits

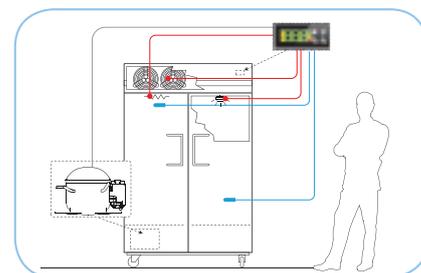
- pin-to-pin compatible with ir33 range: no changes to connections and wiring diagrams;
- compatibility of firmware and parameters. Two new functions have been added: direct display of defrost temperature and display of firmware version on power-up;
- the display is 27% larger than the previous series, available in green, red, blue and white (green in the standard versions);
- direct ON/OFF function on keypad;
- icon dedicated to alarms and direct muting of the buzzer;
- primary functions highlighted.

For managing device parameters, CAREL provides simple configuration software free-of-charge, called Visual Parameter Manager (VPM), downloadable from: [ksa.carel.com](http://ksa.carel.com)

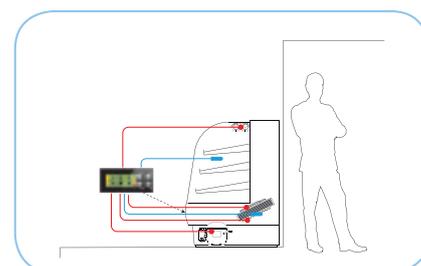
EN 13485, air, S, A, 1, -30 °C +30 °C  
The ir33 series, fitted with standard CAREL NTC probe, complies with the specifications of EN 13485 (thermometers for measuring the air and product temperature for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice cream), as required under EC regulation 37/2005 of 12 January 2005 on frozen food storage.



cold rooms



professional kitchens



plug-in showcases



## ir33+ and ir33+ power

IREV\*

ir33+ is the new range of controllers for managing refrigerating units, cold rooms, cabinets and showcases. Special attention has been focused on the user interface, now more attractive and intuitive, with a 27% larger display than the previous series, available in different colours, and the polycarbonate keypad. The surface of the controllers is perfectly flat and thin, allowing easy cleaning and ensuring the highest level of hygiene, in complete compliance with HACCP standards.

The keypad is touch sensitive. This new technology allows custom user interfaces to be created based on different requirements.

ir33+ is fitted with relays rated up to 16 A for controlling compressors. The top-of-the-range version comes with 4 relays and clock.

ir33+ power is fitted with a 2HP power relay to directly control high capacity refrigeration compressors. ir33+ power is available with 230 Vac power supply, and a maximum of 3 relays.

### Technical specifications

**Power supply:** 12 Vac, 12 to 24 Vac/12 to 30 Vdc, 115 Vac, 230 Vac, 115 to 230 Vac

**Operating conditions:** -10T60 °C, <90% RH non-condensing

**Degree of protection:** IP65 front panel

**Certification:** CE, UL, VDE, NSF, ATEX, EN13485

**Assembly:** panel mounted, from front or rear, with membrane keypad

**Number of I/Os:**

- **analogue inputs:** up to 4 NTC/PTC;
- **digital inputs:** 2, voltage-free contacts;
- **digital outputs:** up to 4 relays.

**Serial ports:** 1 for CAREL network

**Dimensions:** drilling template 71x29 mm, maximum depth 79,5 mm

**Connections:** screw, plug-in, spade terminals

## ir33+wide and small wide

PBEV\*

The ir33+ series is completed by the wide version: ir33+ wide, which represents the evolution of the powercompact wide family.

To ensure a perfect family feel, the icons on the ir33+ and ir33+ wide keypad buttons are identical. The surface of the controllers is perfectly flat and thin, and keypad is touch sensitive. This new technology allows custom user interfaces to be created based on different requirements. Available in standard (ir33+ wide, compatible with powercompact wide) and small format (ir33+ small wide, compatible with powercompact small wide).

### Technical specifications

**Power supply:** 12 Vac/12 to 18 Vdc, 115 Vac, 230 Vac, 115 to 230 Vac

**Operating conditions:** -10T65 °C, <90% RH non-condensing

**Degree of protection:** IP65 front panel

**Certification:** CE, UL, VDE, NSF, EN13485

**Assembly:** panel mounted, from front or rear, with membrane keypad

**Number of I/Os:**

- **analogue inputs:** up to 4 NTC/PTC;
- **digital inputs:** 2, voltage-free contacts;
- **digital outputs:** up to 5 relays.

**Serial ports:** 1 for CAREL network

**Dimensions:** drilling template 138,5x29 mm, maximum depth 79 mm

**Connections:** screw, plug-in, spade terminals

## ir33 DIN

DN33\*

ir33 DIN rail (DN33\*) is the CAREL proposal for the control of refrigeration units when a solution with DIN rail mounting is required. These devices are completely compatible with the ir33+ range in terms of both software and functions. The hardware supplied is very powerful and allows direct control of up to 2 HP compressors and management of defrost heaters with 16 A relays. The top-of-the-range version has 5 relays, while all models come as standard with 2 probe inputs and 3 digital inputs (the latter can be configured for probes, if required by the application).

### Technical specifications

**Power supply:** 12 Vac/12 to 30 Vdc, 12 to 24 Vac, 115 Vac, 230 Vac, 115 to 230 Vac

**Operating conditions:** -10T55 °C, <90% RH non-condensing

**Degree of protection:** IP40 front panel

**Certification:** CE, UL, EN13485

**Assembly:** DIN rail

**Number of I/Os:**

- **analogue inputs:** up to 5 NTC/PTC
- **digital inputs:** 3, voltage-free contacts
- **digital outputs:** up to 5 relays

**Serial ports:** 1 for CAREL network

**Dimensions:** 4 DIN module case 110x70x60 mm

**Connections:** screw, plug-in terminals

## Accessories and options



- ir33+ power  
 ir33  ir33DIN

### Remote control

(IRTRRES000)

The remote control has become more powerful and compact, as well as easier to use. This accessory provides direct access to the main functions and configuration parameters, allowing ir33 to be programmed from a remote position using a group of buttons that exactly repeat the instrument keypad.



- ir33+ power  
 ir33  ir33DIN

### Custom faceplate

(IROPZF\*10)

The controller faceplate can be customised with different logos and colours. This possibility is especially useful for manufacturers who wish to customise the instrument according to their own aesthetic requirements.



- ir33+ power  
 ir33  ir33DIN

### Programming key

(IROPZKEY\*)

This allows the ir33 to be programmed quickly, even when not powered, reducing the risk of errors. This accessory reduces the number of part numbers handled, is a rapid and effective tool for service operations, allowing the controller to be programmed in just a few seconds, even during the testing phase at the end of the production line. Up to six sets of parameters can be programmed. Versions are available with battery or external power supply.



- ir33+ power  
 ir33  ir33DIN

### Terminal display option

(IROPZDSP00 and IR00R\*0000 displays)

The configuration interface can be connected, via a special optional card, to a display for reading and controlling the values measured by the third probe, located in the hottest point of the cabinet, as specified by standard EN 441-13. The terminal displays are available in red (IR00RR0000) and green (IR00RG0000). PSTCON\*B0 connection cables are used, available in different lengths. Important: the 230 Vac models with built-in transformer do not support the repeater display.



- ir33+ power  
 ir33  ir33DIN

### RS485 serial connection

(IROPZ48500, IROPZ485S0)

This is easily fitted to the same connector that is normally used for the programming key; all models available can be connected to the supervisory system. Model IROPZ485S0 in particular is fitted with a microprocessor and can automatically recognise the TxRx+ and TxRx- signals. These options have been designed to remain outside of the controller and consequently can be installed at any time, even subsequently, if the system requires.



- ir33+ power  
 ir33  ir33DIN

### RS485 serial card

(IROPZSER30)

The IROPZSER30 card allows the ir33 DIN to be connected via the RS485 serial network to the PlantVisor supervisory system, as well as direct connection of the instrument to the repeater display using a PSTCON\*B0 cable.

## Table of ir33+ models

Features	IREVM00*	IREVM0E*	IREVS0*	IREVS0L*	IREV50E*	IREVVO*	IREVY0L*	IREVY0E*	IREVC00*	IREVC*L	IREVC*H*	IREVF*E*
<b>Power supply</b>												
12 Vac/Vdc -15/10%, 50/60 Hz	●		●			●			●			
12/24 Vac -15/10%, 50/60 Hz				●			●			●		
230 Vac -15/10%, 50/60 Hz		●			●			●				●
115/230 Vac (-15 to 10%), 50/60 Hz											●	
Power	4 VA	3 VA	4 VA	4 VA	3 VA	4 VA	4 VA	4 VA	4 VA	4 VA	6 VA	3 VA
<b>Precision</b>												
Std. CAREL NTC: -50T50 °C	1 °C											
-50T90 °C	3 °C											
High temperature NTC: -20T115 °C	1.5 °C (outside this range 4 °C)											
PTC: -50T50 °C	2 °C											
-50T150 °C	4 °C											
Control/defrost/product probe												
Std. CAREL NTC (10 kΩ at 25 °C), -50T90 °C	●	●	●	●	●	●	●	●	●	●	●	●
High temp. NTC (50 kΩ at 25 °C), -40T150 °C	●	●	●	●	●	●	●	●	●	●	●	●
PTC (985 kΩ at 0 °C), -50T150 °C	only on IR33*7* models											
<b>User interface</b>												
display	3 digit LED plus icons											
keypad	ergonomic 4-button											
<b>Outputs</b>												
compressor (depending on the model)			8 A, 16 A, 2 HP			16 A, 2 HP			16 A, 2 HP			8 A, 2 HP
defrost						16 A, 8 A			8 A			8 A
fan									8 A			5 A
aux/light			8 A on model IR33S0EA*			5 A on model IRY0EP*			8 A			
<b>Programming</b>												
keypad			●									
key		●										
<b>Special functions</b>												
HACCP / Real Time Clock			function can be enabled when Real Time Clock option available, models: IR*(C,B,L,T,S,U,Y,Z)*, and on IR33 power models: IR*(E,F,O,W)*									
buzzer	●	●	●	●	●	●	●	●	●	●	●	●
repeater display			standard for models with 12 Vac, 12/24 Vac, 115/230 Vac power supply. Important: the 230 Vac or 115 Vac models (built-in transformer) do not support the repeater display									
decimal point	●	●	●	●	●	●	●	●	●	●	●	●
CAREL serial network interface	●	●	●	●	●	●	●	●	●	●	●	●
<b>Other</b>												
Quality and precision: in-circuit testing	●	●	●	●	●	●	●	●	●	●	●	●
UL mark	●	●	●	●	●	●	●	●	●	●	●	●
VDE mark	●	●	●	●	●	●	●	●	●	●	●	●
EN 13485 (standard relating to thermometers)	●	●	●	●	●	●	●	●	●	●	●	●

Relay rating to EN60703-1:

8 A, 8 (4) A

16 A, 12(2) A

2 HP, 10(10) A

(\*) up to 60 °C room temperature

● standard

## Table of ir33+ power models

Features	IREV0EHA0	IREVY0EHA0	IREV3F0EHA0	IREVFOEFA0
<b>Power supply</b>	230 Vac			
<b>Outputs</b>				
compressor	2 HP, 12(10) A			
defrost		8 A	8 A	8 A
evaporator fans			5 A	5 A
<b>Inputs</b>				
room temperature	●	●	●	●
defrost temperature	●	●	●	●
digital input/probe 3	●	●	●	●
<b>Plus</b>				
HACCP				●
programming key	●	●	●	●
high efficiency display	●	●	●	●
buzzer	●	●	●	●
Real Time Clock				●
RS485 option	●	●	●	●

Relay rating to EN60703-1: 8 A, 8 (4) A; 16 A, 12(2) A; 2 HP, 10(10) A

(\*) up to 60 °C room temperature

- standard

## Table of ir33+wide models

Features	PBEVY0EVLG	PBEVC0HNLG	PBEVH0HNHG	PBEVH0HNHW	PBEVC0SNNG	PBEVC0SNNW
<b>Power supply</b>						
230 Vac, -15/10%, 50/60 Hz	●					
115 to 230 Vac, -15/10%, 50/60 Hz		●	●	●	● (small)	● (small)
<b>Precision</b>						
Std CAREL NTC: -50T50 °C 50T90 °C	1 °C 3 °C					
High temperature NTC: -40T-20 °C -20T115 °C 115T150 °C	4 °C 1.5 °C 4 °C					
Std CAREL PTC (only on IREV*7* models) -50T50 °C 50T150 °C	2 °C 4 °C					
User interface (3 digit LED display plus icons)	green			white	green	white
keypad	ergonomic 8-button					
<b>Outputs</b>						
compressor	16 A	2 HP	2 HP	2 HP	30 A	30 A
defrost	8 A	16 A	16 A	16 A	8 A	8 A
evaporator fans		8 A	8 A	8 A	5 A	5 A
aux1	8 A	8 A	8 A	8 A	5 A	5 A
aux2			8 A	8 A		
<b>Programming</b>						
keypad and key	●					
<b>Special functions</b>						
HACCP/Real Time Clock	function can be enabled when Real Time Clock available (models: PBEV*(C,L,S,Y)*)					
buzzer	●	●	●	●	●	●
repeater display		●	for models with 12 Vac, 12/24 Vac, 115/230 Vac power supply. Models with built-in transformer (230 Vac or 115 Vac) do not support the repeater display			
decimal point	●	●	●	●	●	●
CAREL serial network interface	●	●	●	●	●	●

- standard

## Table of ir33DIN models

Features	DN33S*0*	DN33S*L*	DN33S*E*	DN33S*H*	DN33C*L*	DN33C*H*	DN33F*E*	DN33H*0*	DN33H*H*
<b>Power supply</b>									
12 Vac/Vdc -15/10%, 50/60 Hz	●							●	
12/24 Vac -15/10%, 50/60 Hz		●			●				
230 Vac -15/10%, 50/60 Hz			●				●		
115/230 Vac -15/10%, 50/60 Hz				●		●			
<b>Power</b>	4 VA	4 VA	3 VA	6 VA	4 VA	6 VA	3 VA	4 VA	6 VA
<b>Precision</b>									
Std. CAREL NTC: -50T50 °C	1 °C								
-50T90 °C	3 °C								
High temperature NTC: -20T115 °C	1.5 °C (outside this range 4 °C)								
PTC: -50T50 °C	2 °C								
-50T150 °C	4 °C								
<b>Control/defrost/product probe</b>									
Std. CAREL NTC (10 kΩ at 25 °C), -50T90 °C	●	●	●	●	●	●	●	●	●
High temp. NTC (50 kΩ at 25 °C), -40T150 °C	●	●	●	●	●	●	●	●	●
PTC (985 kΩ at 0 °C), -50T150 °C	only on DN33*7* models								
<b>User interface</b>									
display	3 digit LED plus icons								
keypad	ergonomic 4-button								
<b>Outputs</b>									
compressor	16 A	16 A	16 A	2 HP	16 A	2 HP	16 A	16 A	2 HP
defrost					16 A	16 A	16 A	16 A	16 A
evaporator fans					8 A	8 A	8 A	8 A	8 A
aux/light	8 A on model DN33S*0A*		8 A on model DN33S*EA*	8 A on model DN33S*HA*	8 A	8 A	8 A on models DN33F*EA* DN33F*EL* Dn33F*ET*	8 A	8 A
<b>Programming</b>									
keypad	●	●	●	●	●	●	●	●	●
remote control	infrared sensor only featured on some models: DN*(R,B,M,T)*, and on the models DN33: DN*(I,F,K,W)*								
key	●	●	●	●	●	●	●	●	●
<b>Special functions</b>									
HACCP / Real Time Clock	function can be enabled when Real Time Clock option available, models: DN*(C,B,L,T)*, and on DN33 power models: DN*(E,F,O,W)*								
buzzer	●	●	●	●	●	●	●	●	●
repeater display	standard for models with 12 Vac, 12/24 Vac, 115/230 Vac power supply. <b>Important:</b> the 230 Vac or 115 Vac models (built-in transformer) do not support the repeater display								
decimal point	●	●	●	●	●	●	●	●	●
CAREL serial network interface	●	●	●	●	●	●	●	●	●
<b>Other</b>									
Quality and precision: in-circuit testing	●	●	●	●	●	●	●	●	●
UL mark	●	●	●	●	●	●	●	●	●
VDE mark	●	●	●	●	●	●	●	●	●
EN 13485 (standard relating to thermometers)	●	●	●	●	●	●	●	●	●

Relay rating to EN60703-1:

8 A, 8 (4) A

16 A, 12(2) A

2 HP, 10(10) A

(\*) up to 60 °C room temperature

● standard



## easy series for display cabinets, showcases and refrigerated cabinets

In-depth knowledge of applications in the sector and market needs has allowed CAREL to design a technologically advanced product with a simple approach. With easy, CAREL offers the market a product designed specifically for refrigeration control in bar, catering, display cabinet and refrigerated showcase applications.

easy is a range with a wide choice of models, including a compact version that is ideal for rooms in which space is a crucial element.

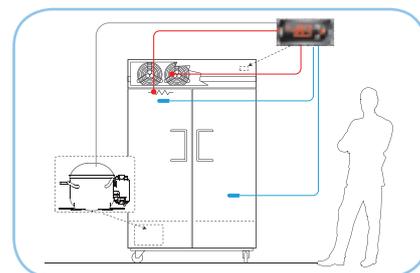
easy is the best choice for simply and effectively managing the complex world of refrigeration control.

easy simplifies the initial unit configuration phase and features new technology for creating special models with custom functions.

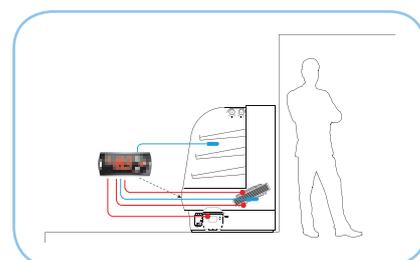
### Benefits

- easy programming of parameters, with 4 predefined sets of parameters available;
- easy installation using the front mounting system;
- easy wiring, thanks to the built-in transformer and relays with power rating up to 2 HP;
- easy to identify the best solution, thanks to the vast range of models available;
- even the software is easy to customise, thanks to its flexible design;
- easy to clean, thanks to the perfectly flat keypad;
- easy to read, high efficiency display and digits that are 27 % larger than traditional displays.

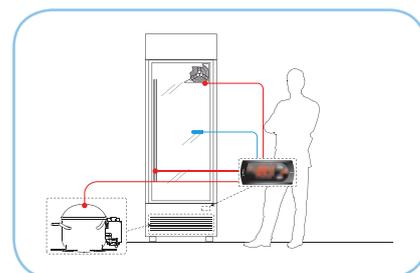
For managing device parameters, CAREL provides simple configuration software free-of-charge, called Visual Parameter Manager (VPM), downloadable from: [ksa.carel.com](http://ksa.carel.com)



professional kitchens



plug-in showcases



bottle cooler



## easy

PJEZ\*

easy represents a range of electronic microprocessor controllers with LED display developed for managing refrigerating units, display cabinets and showcases.

The unit can be switched on/off either from digital input or directly from the keypad.

The keypad is touch sensitive. The completely flat surface allows easy cleaning and ensures a greater hygiene, in complete compliance with HACCP standards.

### Technical specifications

**Power supply:** 12 Vac/Vdc, 115 Vac, 230 Vac

**Operating conditions:** -10T50°C, <90% rH non-condensing

**Degree of protection:** IP65 front panel

**Certification:** CE, UL, NSF, ATEX

**Assembly:** panel mounted, with brackets or screws from front

**Number of I/Os:**

- **analogue inputs:** up to 3 NTC / PTC;
- **digital inputs:** 1, voltage-free contact;
- **digital outputs:** up to 3 relays.

**Serial ports:** 1 for Carel network

**Dimensions:** drilling template 71x29 mm, maximum depth 71mm

**Connections:** screw, plug-in, spade terminals



## easy compact

PJEZ\*

The PJEZS\* compact models are designed for the management of static refrigerating units (no fan on the evaporator) operating at temperatures above 0 °C. The PJEZM\* compact models are the thermometer versions. easy compact is the ideal solution for applications where the space available for housing the controller is limited: the depth occupied internally is just 31 mm, while still featuring 2 HP relay outputs for the control of refrigeration compressors without requiring additional intermediate relays.

### Technical specifications

**Power supply:** 12 Vac/Vdc, 115 Vac, 230 Vac

**Operating conditions:** -10T50°C, <90% rH non-condensing

**Degree of protection:** IP65 front panel

**Certification:** CE, UL, NSF, ATEX

**Assembly:** panel mounted, with brackets or screws from front

**Number of I/Os:**

- **analogue inputs:** up to 2 NTC / PTC;
- **digital outputs:** 1 relay.

**Serial ports:** 1 for Carel network

**Dimensions:** drilling template 71x29 mm, maximum depth 31mm

**Connections:** screw, plug-in terminals



## easy milk chiller

PJS1\*

easy milk chiller has been designed to control the storage and refrigeration of milk, so as to guarantee its organoleptic qualities. easy milk chiller can be used to set variable duration stirring cycles that, by keeping the milk moving, guarantee storage at the right temperature.

The stirring cycles can be configured either dependent on or independent of the compressor, automatically or manually (from the keypad and/or digital input).

easy milk chiller is also suitable for other applications, such as: dryers, metering devices, mixers, etc... In these cases, the faceplate can be replaced with the CAREL standard.

### Technical specifications

**Power supply:** 230 Vac

**Operating conditions:** -10T50°C, <90% rH non-condensing

**Degree of protection:** IP65 front panel

**Certification:** CE, UL, NSF, ATEX

**Assembly:** panel mounted, with brackets or screws from front

**Number of I/Os:**

- **analogue inputs:** up to 3 NTC;
- **digital inputs:** 1, voltage-free contact;
- **digital outputs:** up to 3 relays.

**Serial ports:** 1 for Carel network

**Dimensions:** drilling template 71x29 mm, maximum depth 71mm

**Connections:** screw, plug-in, spade terminals



## easy clock, easy door

PJS3\*, PJS4\*, PJS5\*

This is an energy saving electronic controller for bottle coolers, open front cabinets and vending machines. The "energy saving" function ensures significant energy savings as it adapts to store opening times.

Energy is saved by optimising unit management, distinguishing between daytime and night-time operation. At night the lights can be switched off and the control set point increased without this affecting refrigerated product quality.

This consequently reduces energy consumption in periods when the store is not open to the public.

The shopkeeper or store manager thus doesn't need to unplug the units in the evening and, at the same time, eliminates the problem of peaks in consumption when the store opens again the next morning.

### easy clock (PJS3\*)

This mode comes with an internal clock (Real Time Clock) so as to manage the set point and light operation based on set time bands.

The time bands mean cabinet operation precisely reflects store opening times:

- independent time bands for the set point and the light, allowing set point and light operation in sync or at different time;
- defrosts and automatic day/night switching can be disabled during the IPD stage (Initial Pull Down).

### easy door (PJS4\*, PJS5\*)

Automatically adapts to the opening times by detecting when the display cabinet door is open.

When, during the day, the door is not opened for a certain set number of hours, the controller automatically switches to night mode:

- switching between night/day status

also corresponds to closing/opening the night blind on open front cabinets;

- special function for identifying any refrigerant leaks.

### Applications

- PJS4\*: medium temperature applications (compressors, fans and lights);
- PJS5\*: low temperature applications (compressors, defrost and lights).

### Technical specifications

**Power supply:** 115 Vac, 230 Vac

**Operating conditions:** -10T50°C, <90% RH non-condensing

**Degree of protection:** IP65 front panel

**Certification:** CE, UL, NSF, ATEX

**Assembly:** panel mounted, with brackets or screws from front

**Number of I/Os:**

- **analogue inputs:** up to 2 NTC;
- **digital inputs:** 1, voltage-free contact;
- **digital outputs:** up to 3 relays

**Serial ports:** 1 for Carel network

**Dimensions:** drilling template 71x29 mm, maximum depth 71 mm

**Connections:** screw, plug-in, spade terminals



## easy split

PJEZ\*8\*

easy split is an easy series controller designed for medium or low temperature refrigeration units with inside lighting. The user terminal, just 31 mm thick, is separate from the power board and is suitable for standard thickness insulation.

The built-in connectors on the power board simplify direct connection of the loads.

easy split can manage up to two compressors, controlling delayed activation in parallel or in two stages, including rotation.

Compressors are managed by the 30 A relay, UL certified up to 96 LRA.

Management of the light has been extended to include the door switch, thus differentiating between solutions for cabinets or cold rooms.

The connection cable between the power board and user interface can be ordered separately as an individual accessory and is available in different lengths, up to 10 m.

### Technical specifications

**Power supply:** 115 Vac, 230 Vac

**Operating conditions:** -10T60°C, <90% rH non-condensing

**Degree of protection:** power board fitted in box

**Certification:** CE, UL

**Assembly:** wall-mounted with box or open board

**Number of I/Os:**

- **analogue inputs:** up to 3 NTC / PTC;
- **digital inputs:** 1, voltage-free contact;
- **digital outputs:** up to 4 relays.

**Serial ports:** 1 for Carel network

**Dimensions:** display drilling template 71x29 mm, depth 31 mm; power board 117x98 mm

**Connections:** screw, spade terminals



## easy wide, easy small wide

PBEV\*

For the catering, pastry shop and ice cream parlour markets, the easy series is completed by a new product line: easy wide, representing the evolution of the PowerCompact wide family.

The new family, as well as guaranteeing quality food storage, is user-friendly, aesthetically attractive and guarantees significant energy savings. Special attention has been focused on the user interface, now more attractive and intuitive, with a 27% larger display than the PowerCompact family, available in several colours, and a polycarbonate keypad.

The surface of the controllers is perfectly flat and thin, allowing easy cleaning and ensuring the highest level of hygiene, in complete compliance with HACCP standards. For manufacturers of refrigerated cabinets and showcases, CAREL offers the possibility to customise the controllers according to the specific application. The new appearance and new types of assembly mean the controllers can be better integrated into the refrigeration unit, giving a decidedly more attractive and elegant end result.

The keypad is touch sensitive. This new technology allows custom user interfaces to be created based on different requirements. This characteristic, as well as guaranteeing better hygiene, also improves the appearance of the controllers, now in line with the most modern electronic instruments.

Available in standard (easy wide, compatible with powercompact wide) and small format (easy small wide, compatible with powercompact small wide).

### Technical specifications

**Power supply:** 12 Vac/Vdc, 115 Vac, 230 Vac

**Operating conditions:** -10T65°C, <90% rH non-condensing

**Degree of protection:** IP65 front panel  
**Certification:** CE, UL

**Assembly:** panel mounted, from front or rear, with membrane keypad or polycarbonate

**Number of I/Os:**

- **analogue inputs:** up to 4 NTC / PTC;
- **digital inputs:** 2 voltage-free contacts;
- **digital outputs:** up to 5 relays.

**Serial ports:** 1 for CAREL network

**Dimensions:** drilling template 165x29.2 mm, maximum depth 79 mm

**Connections:** screw, spade terminals

## Accessories and options



### Temperature probes with NTC thermistor

(NTC\*)

CAREL NTC probes are reliable, low cost transducers for measuring temperature. The technical solutions adopted and tests conducted on these products ensure significant precision and reliability.



### Removable faceplate

(PEOPZ\*)

Possibility of customise the appearance of the controller by simply replacing the faceplate, adding the desired colour or company logo.



### RS485 serial connection

(IROPZ48500, IROPZ48550)

This is easily fitted to the same connector that is normally used for the programming key; all models available can be connected to the supervisory system.

Model IROPZ48550 in particular is fitted with a microprocessor and can automatically recognise the TxRx+ and TxRx- signals. These options have been designed to remain outside of the controller and consequently can be installed at any time, even subsequently, if the system requires.



### Programming key

(IROPZKEY\*)

This allows the ir33 to be programmed quickly, even when not powered, reducing the risk of errors. This accessory reduces the number of part numbers handled, is a rapid and effective tool for service operations, allowing the controller to be programmed in just a few seconds, even during the testing phase at the end of the production line. Up to six sets of parameters can be programmed. Versions are available with battery or external power supply.

## Table of easy models

Features	PJZM0N010	PJZS002E0	PJZS00100	PJZS0P1E0	PJZS0P100	PJZS0G100	PJZS000E0	PJZS00000	PJZS0P000	PJZS0A000	PJZS0H000	PJZS0G000	PJZS0GG00	PJZS0GB00	PJZS2P000	PJZS2L000	PJZS2L100	PJZS6P000	PJZS6A000	PJZY00000	PJZY00010	PJZY0H000	PJZX00000	PJZC00100	PJZC00000	PJZC0P000	PJZC0M000	PJZC0MG00	PJZC0MB00		
<b>Power supply</b>																															
12Vac/Vdc (-15/10%), 50/60 Hz		●																													
115Vac, (-15/10%), 50/60 Hz			●	●	●	●										●								●							
230 Vac, (-15/10%), 50/60 Hz	●						●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
<b>Probes</b>																															
Std CAREL NTC: -50T90°C	●	●	●	●	●	●	●	●	●	●	●	●	●	●						●	●	●	●	●	●	●	●	●	●		
High temp. NTC: -40T150°C															●	●	●														
Std CAREL PTC: -50T150°C																	●	●													
<b>User interface</b>																															
display	red												green	blue	red												green	blue			
keypad	ergonomic 4-button																														
<b>Outputs</b>																															
compressor		8A	16 A	2Hp	8 A			8A	2 HP						16A	8 A	16A	8 A			2Hp	8 A			16A	2Hp					
defrost																															
evaporator fans																											8 A				
aux					8 A			8A	8 A						8 A		8A														
<b>Programming</b>																															
keypad	●																														
key	●																														
<b>Special functions</b>																															
Real Time Clock																												●	●	●	
buzzer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
decimal point	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
CAREL serial network interface	●		●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

● standard

## Table of easy compact models

Features	PJZMNI0E0	PJZSNP0E0	PJZSNP010	PJZSNP000	PJZSNH0E0	PJZSNH010	PJZSNH000
<b>Power supply</b>							
230 Vac, (-15/10%), 50/60 Hz	●	●	●	●	●	●	●
<b>Probes</b>							
Std CAREL NTC: -50T90°C	●	●	●	●	●	●	●
<b>User interface</b>							
display (3 digit LED plus icons)	red						
keypad	ergonomic 4-button						
<b>Outputs</b>							
compressor		16 A	16 A	16 A	2 HP	2 HP	2 HP
<b>Programming</b>							
keypad	●	●	●	●	●	●	●
key	●	●	●	●	●	●	●
<b>Special functions</b>							
decimal point	●	●	●	●	●	●	●

● standard

## Table of easy milk chiller models

Features	PJS1Y0P000	PJS1Y0V000
<b>Power supply</b>		
230 Vac, -15/10%, 50/60 Hz	●	●
<b>Probes</b>		
Std CAREL NTC: -50T90°C	●	●
<b>User interface</b>		
display (3 digit LED plus icons)	red	
keypad	ergonomic 4-button	
<b>Outputs</b>		
compressor	16 A	16 A
stirrer	8 A	8 A
aux		8 A
<b>Programming</b>		
keypad	●	
key	●	
<b>Special functions</b>		
change set point	●	●
buzzer	●	●
decimal point	●	●
CAREL serial network interface	●	●

- standard

## Table of easy clock & easy door models

Features	PJS3C0M000	PJS3C0MG00	PJS4C0H000	PJS4C0HG00	PJS4C0H100
<b>Model</b>					
easy clock	●	●			
easy door			●	●	●
<b>Power supply</b>					
115 Vac, -15/10%, 50/60 Hz					●
230 Vac, -15/10%, 50/60 Hz	●	●	●	●	
<b>Probes</b>					
Std CAREL NTC: -50T90°C	●	●	●	●	●
<b>User interface</b>					
display (3 digit LED plus icons)	red	green	red	green	red
keypad	ergonomic 4-button				
<b>Outputs</b>					
compressor	2 HP	2 HP	2 HP	2 HP	2 HP
evaporator fan	8 A	8 A	8 A	8 A	8 A
light	8 A	8 A	8 A	8 A	8 A
<b>Programming</b>					
keypad	●				
key	●				
<b>Special functions</b>					
Real Time Clock	●	●			
Energy saving	time bands		door status detection		
buzzer	●	●	●	●	●
decimal point	●	●	●	●	●
CAREL serial network interface	●	●	●	●	●

- standard

## Table of easy split models

Features	PJES8I050	PJEX8I040	PJZX8I050	PJZC8I040	PJZC8I050	PJZC8I140	PJZC8R050	PJZC8R140
<b>Model</b>								
without box		●		●		●		●
with box	●		●		●		●	
<b>Power supply</b>								
115Vac, -15/10%, 50/60 Hz						●		●
230 Vac, -15/10%, 50/60 Hz	●	●	●	●	●		●	
<b>Probes</b>								
Std CAREL NTC: -50T90°C	●	●	●	●	●	●	●	●
<b>User interface</b>								
display (3 digit LED plus icons)	red							
keypad	ergonomic 4-button							
<b>Outputs</b>								
compressor	30 A	30 A	30 A	30 A	30 A	30 A	30 A	30 A
defrost				16 A				
evaporator fan		16 A						
light	16 A	16 A	16 A	2 HP				
<b>Programming</b>								
keypad	●							
key	●							
<b>Special functions</b>								
Real Time Clock							●	●
buzzer	●	●	●	●	●	●	●	●
decimal point	●	●	●	●	●	●	●	●
CAREL serial network interface	●	●	●	●	●	●	●	●

● standard

## Table of easy wide models

Features	PBEV50EAAA	PBEVY0EVD0	PBEVC0HND0	PBEVC0HNBA	PBEVC0HCAA	PBEVH0HAAA	PBEVH0HNBO	PBEVH0HNBW	PBEV50SAFA	PBEVC0SNFA	PBEVC0SNFW
<b>Power supply</b>											
230 Vac, (-15 to 10%), 50/60 Hz	●	●									
115/230 Vac, (-15 to 10%), 50/60 Hz			●	●	●	●	●	●	● (small)	● (small)	● (small)
<b>Precision</b>											
Std CAREL NTC: -50T50°C	1 °C										
50T90°C	3 °C										
High temperature NTC: -40T-20°C	4 °C										
-20T115°C	1,5 °C										
115T150°C	4 °C										
Std CAREL PTC (Only on PBEV*7* models)											
-50T50°C	2 °C										
50T150°C	4 °C										
<b>User interface</b>											
display (3 digit LED plus icons)	blue	red	red	blue	blue	blue	red	white	blue	blue	white
keypad	ergonomic 8-button										
<b>Outputs</b>											
compressor	8 A	16 A	2 HP	2 HP	2 HP	2 HP	2 HP	2 HP	30 A	30 A	30 A
defrost		8 A	16 A	16 A	16 A	16 A	16 A	16 A		8 A	8 A
evaporator fans			8 A	8 A	8 A	8 A	8 A	8 A		5 A	5 A
aux1	8 A	8 A	8 A	8 A	8 A	8 A	8 A	8 A	8 A	5 A	5 A
aux2						8 A	8 A	8 A			
<b>Programming</b>											
keypad	●										
key	●										
<b>Special functions</b>											
HACCP/Real Time Clock	function can be enabled when Real Time Clock available, models: PBEV*(C,L,S,Y)*										
buzzer	●	●	●	●	●	●	●	●	●	●	●
repeater display			standard for models with 12 Vac, 12/24 Vac, 115/230 Vac power supply. Models with built-in transformer (115 V or 230 Vac) do not support the repeater display								
decimal point	●	●	●	●	●	●	●	●	●	●	●
CAREL serial network interface	●	●	●	●	●	●	●	●	●	●	●

● standard



## Solutions for blast chillers and freezers

Blast Chiller is the CAREL solution for the control of blast chillers and freezers, appliances used in professional kitchens to chill and/or freeze freshly cooked food. Blast Chiller is based on the pCO series programmable platform and features a graphic interface (pGD1 series) that offers a simple and complete menu (including multi-language).

### Benefits

- user friendliness: intuitive graphic display complete with icons that guides the user with instructions and tips;
- hygiene: easy to clean thanks to the user interface designed for food processing applications;
- customisation: wide choice of easy-to-customise options thanks to the plastic faceplate and membrane keypad;
- multifunction: standard or custom cycles with up to 3 completely configurable phases;
- standards compliance: availability of complete HACCP reports for monitoring foodstuffs;
- energy saving: by selecting or creating the most suitable cycle for the product.

### Energy saving & HACCP

Compared to traditional management, Blast Chiller guarantees a reduction in power consumption, thus reducing costs and respecting the environment. Once the most suitable chilling or freezing cycle has started, the controller ensures that the foodstuffs are brought to the desired temperature within the set time limits.

This solution guarantees control of the temperature of the foodstuffs stored in compliance with HACCP standards. If needed, serious alarms can be signalled relating to failure to meet temperature or time limits.

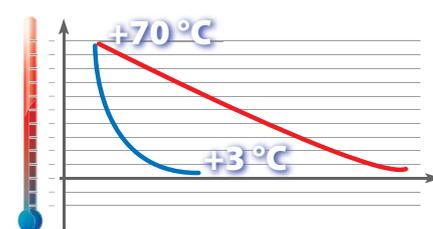
### Custom appearance

The removable plastic faceplate (6 buttons) for assembly from the front, and the membrane keypad (8 buttons + 3 LEDs) for assembly from the rear, completely customisable, allow the instrument to be installed in perfect harmony with the design of the application.

### Piercing probes (NTCINF\*, PT11NF\*)

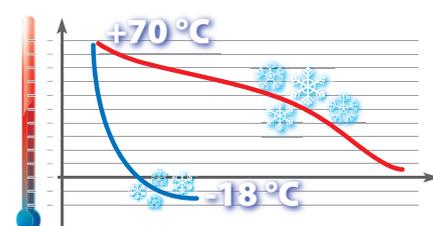
Piercing probes are available for measuring the temperature in the heart of the product, in versions with or without preheater.

### Quick chill



- without blast freezer
- with blast freezer: reduces the time that products are exposed to high-risk temperatures (for bacterial proliferation)

### Quick freeze



- without blast freezer
- with blast freezer: avoids the formation of macrocrystals, assisting the formation of microcrystals



## Blast Chiller

BC00\*

Main function:

- chilling and freezing cycles in compliance with standards (time or temperature, hard or soft);
- storage phase.

Management of special functions or settings:

- creation of completely customisable cycles;
- smart defrosts for energy saving;
- optimum time management thanks to the built-in clock.

The top-of-the-range version can also manage PT1000 sensors, allowing higher temperatures to be measured (in particular for the piercing probe).

### Technical specifications

**Power supply:** 24 Vac/Vdc

**Operating conditions**

- pCO3 small: -25T70°C, <90% RH non-condensing;
- pCOXS: -10T60°C, <90% RH non-condensing.

**Degree of protection:**

- IP65 with membrane keypad;
- IP40 with standard keypad;
- IP40 pCO board.

**Certification:** CE, UL

**Assembly:**

- pCO board: DIN rail (DIN 43880, IEC EN 50022);
- user terminal panel mounted with standard keypad or membrane keypad.

**Number of I/Os:**

- **analogue inputs:**
  - pCO<sup>3</sup> small: up to 5 NTC (2 PT1000);
  - pCO<sup>XS</sup>: up to 4 NTC.
- **digital inputs:**
  - pCO<sup>3</sup> small: up to 8, voltage-free contacts;
  - pCO<sup>XS</sup>: up to 6, voltage-free contacts.

• **analogue outputs:**

- pCO<sup>3</sup>: small up to 4;
- pCO<sup>XS</sup>: up to 3.

• **digital outputs:**

- pCO<sup>3</sup> small: up to 8 relays;
- pCO<sup>XS</sup>: up to 5 relays.

**Serial ports:**

- pCO<sup>3</sup> small: 2 for Carel network + 2 for supervisor/serial printer with additional card;
- pCO<sup>XS</sup>: 2 for Carel network + 1 for supervisor/serial printer with additional card.

**Dimensions:**

- pCO<sup>3</sup> small: 110x227.5x60 mm (13 DIN modules);
- pCO<sup>XS</sup>: 110x140x60 mm (8 DIN modules);
- user terminal 156x82x30 mm,
- display area 72x36 mm

**Connections:** plug-in terminals

## Table of Blast Chiller models

Features	low-end		high-end	
	BC00XPW000	BC00XMW000	BC00SPW000	BC00SMW000
Main board	pCO <sup>XS</sup>		pCO <sup>3</sup> small	
User terminal	pGD <sup>1</sup>	pGD <sup>1</sup> + membrane keypad	pGD <sup>1</sup>	pGD <sup>1</sup> + membrane keypad
Power supply	24 Vac, 24 to 48 Vdc, 50/60 Hz		24 Vac, 28 to 36 Vdc, 50/60 Hz	
Power	8 W		15 W	
Digital inputs	6 (voltage-free contact)		8 (voltage-free contact)	
Analogue inputs	4 NTC		5 NTC (2 PT1000)	
Digital outputs	5 relays		8 relays	
Analogue outputs	up to 3		up to 4	
Degree of protection	IP65 with membrane keypad IP40 with standard keypad			



## powersplit

powersplit is a controller for multiplexed cabinets with on-board compressors. powersplit is a range of products available in configurations with 4 or 6 outputs, with or without built-in clock and light sensor, and with the power board separate from the terminal.

On models fitted with clock, HACCP management is available as standard. This guarantees control of food storage temperature in compliance with HACCP guidelines.

### Benefits

- reduction in wiring and components inside the electrical panel;
- LAN management of synchronised defrosts (1 master + 5 slaves);
- user terminal with limited case depth;
- serial communication between the display and power boards to guarantee greater immunity against electromagnetic disturbance.

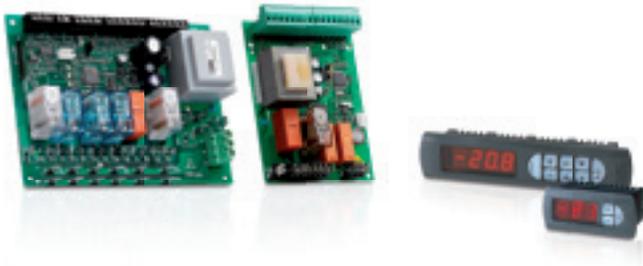
### Local network

powersplit can manage units as a series of sections via a local network.

The local network reduces wiring and rationalises management of the different sections. All the controls, i.e. light button, ON/OFF, manual defrost, continuous cycle and AUX can be centralised on just one display. The local network also allows alarms from the various controllers, i.e. the different sections of the cabinet, to be centralised onto just one terminal. In addition, the defrosts can be synchronised: the defrost starts at the same time in all the sections, and ends independently according to the status of each section.

### Certification

EN 13485, air, S, A, 1, -30T30 °C  
The powersplit series, fitted with standard CAREL NTC probe, complies with the specifications of EN 13485 (thermometers for measuring the air and product temperature for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice cream), as required under EC regulation 37/2005 of 12 January 2005 on frozen food storage.



## powersplit and powersplit small

PSB\*

Configurations are available with 4 (powersplit small) or 6 relay outputs (powersplit standard), with or without built-in clock. powersplit is designed to reduce wiring and related power components, and consequently reduce the number of part numbers managed and thus costs. The power board has been designed to eliminate the need for an additional terminal block.

In the model with 4 relays, the RS485 and clock serial cards have been integrated into the power board.

User terminals are available (PST\*), in the small (drilling template 29x71 mm) and large formats (drilling template 138.5x23 mm).

### Technical specifications

**Power supply:** 115/230 Vac, 230 Vac

**Operating conditions:** : -10T50°C, <90% RH non-condensing

**Degree of protection:**

- IP65 user terminal front;
- IP00 power board

**Certification:** CE

**Assembly:** wall-mounted board, panel-mounted user terminal

**Number of I/Os:**

- **analogue inputs:** 3 NTC;
- **digital inputs:** 2 voltage-free contacts;
- **digital outputs:** up to 6 relays,

**Serial ports:** 1 for CAREL network

**Dimensions:**

- drilling template user terminal 138.5x29 mm (large), depth 22 mm; 71x29 mm (small), depth 35 mm;
- power board 155x115 mm

**Connections:** screw, plug-in, spade terminals

## Accessories and options



**RS485 serial**  
(FCSER\*)

powersplit has been designed to manage plug-in cabinets and provides a local network serial connection as standard. The local network configuration optimises the operation of units with several evaporator sections.

By fitting the RS485 option, the local network connection to the PlantVisor supervisor and remote management system is no longer required.



**Display terminal**  
(PST\*VR\*)

This can be connected in parallel with the interface for setting the parameters.

It displays the temperature of the third probe located in the hottest point of the cabinet, as specified by standard EN 441-13.



**Light sensor**  
(PSOPZLHT\*)

This measures variations in light inside the refrigerated compartment, thus allowing the controller to activate the functions featured as a response to opening the door.

This represents a significant advantage, considering that just one sensor replaces a series of micro-switches on the doors.



**Large cover**  
(PBOPZCTR\*)

Transparent cover available in single and multiple packs.

## Table of powersplit PS\* models

Features	B*0000	B*1000	B*0100	B*1100	B*11100	powersplit small B*1S10
<b>Power supply</b>						
230 Vac ±10% 50/60 Hz	●	●	●	●		●
115 Vac ±10% 50/60 Hz					●	
<b>Inputs</b>						
room temperature	●	●	●	●	●	●
defrost temperature	●	●	●	●	●	●
product temperature	●	●	●	●	●	●
ON/OFF	●	●	●	●	●	
<b>Outputs</b>						
compressor	2 HP	8 A				
defrost	16 A	16 A				
alarm	16 A	16 A	10 A	10 A	10 A	
evaporator fan	10 A					
light/aux1			16 A	16 A	16 A	
aux2			10 A	10 A	10 A	
light						16 A
alarm/aux1						8 A
<b>Special functions</b>						
HACCP		●		●	●	●
easy link (key and serial card connectors)	●	●	●	●	●	●
Real Time Clock		●		●	●	●
LAN connection	●	●	●	●	●	●
RS485 option	●	●	●	●	●	●

● standard

## Table of PST\* user terminals

Features	VR1*	LR2*	LR4*	SR3*
<b>Inputs</b>				
room temperature				●
ON/OFF	●			●
<b>Special functions</b>				
quick mounting	●			●
backlit keypad	●		●	●
buzzer		●	●	●
RS485 option	●	●	●	●
infrared receiver		●		

● standard





## MasterCella series

MasterCella represents the complete electronic solution for single-phase/three-phase, static or ventilated cold rooms. It directly manages single-phase units with compressors up to 2HP. The powerful relays also control all other actuators: evaporator fans, defrost, lights, alarm relay and auxiliary output.

The high degree of protection - IP65 - means that MasterCella can also be installed in particularly humid environments. The case can be installed directly on the wall at the front of the cold room.

Wiring is simplified by the extra space available, the disconnect switch and optional card to convert voltage-free contacts to contacts with voltage signal.

Available in the compact version for small cold rooms with on-board condensers, and in the split version for larger cold rooms where the power board needs to be installed near the units and the user terminal near the door.

### Benefits

- simple and complete: user interface
  - large easy-to-read LED display;
  - system status signal;
  - user-friendly ergonomic keypad;
- possibility of programming by remote control;
- panel and/or wall mounting;
- HACCP compliant (versions with clock).

### Certification

EN 13485, air, S, A, 1, -30°C +30°C  
 The MasterCella series, fitted with standard CAREL NTC probe, complies with the specifications of EN 13485 (thermometers for measuring the air and product temperature for the transport, storage and distribution of chilled, frozen, deep-frozen/quick-frozen food and ice cream), as required under EC regulation 37/2005 of 12 January 2005 on frozen food storage.



## MasterCella

MD33\*

MasterCella represents one of the leading products in the refrigeration range offered by CAREL: the response to the need for integrated cold room solutions.

### Benefits

- more space available for wiring;
- possibility to install a main switch;
- cables enter from below or above;
- powerful relay ratings;
- simple and intuitive user interface;
- clock for real time defrosts;
- versions available with 24 A door interlock disconnect switch;
- HACCP; functions
- customisation options thanks to removable faceplate.

### Technical specifications

**Power supply:** 230 Vac

**Operating conditions:** -10T65 °C, <90% RH non-condensing

**Degree of protection:**

- IP65 front (with plastic case);
- IP54 panel mounted

**Certification:** CE

**Assembly:** wall-mounted or built-in with case

**Number of I/Os:**

- **analogue inputs:** up to 5 NTC/PTC;
- **digital inputs:** 3, voltage-free contacts;
- **digital outputs:** up to 5 relays.

**Serial ports:** 1 for CAREL network

**Dimensions:**

- plastic case 200x240x87 mm;
- main power board 178x86x40mm;
- terminal board 100x90x12mm

**Connections:** screw, spade terminals



## MasterCella split

MTSB\*, MTST\*, PST\*LR200 terminal

MasterCella split is the simple and complete solution for the control of single-phase/three-phase cold rooms with remote refrigeration unit.

MasterCella split can be configured using the keypad, or by using an electronic programming key.

The power board can be located up to 100 metres away, and can thus be housed in the condensing unit electrical panel. In this way, the MasterCella split user interface becomes the cold room panel. The power board is wired quickly, using spade connectors. The power board is fitted with 6 relays for complete control of: compressors up to 2HP, evaporator fans, defrost heaters, lights, auxiliary outputs, alarms.

### Technical specifications

**Power supply:** 230 Vac

**Operating conditions:** -10T50 °C, <90% RH non-condensing

**Degree of protection:**

- IP54 front;
- IP00 power board

**Certification:** CE

**Assembly:** wall-mounted with case or open board

**Number of I/Os:**

- **analogue inputs:** up to 3 NTC;
- **digital inputs:** 2, voltage-free contacts;
- **digital outputs:** up to 6 relays

**Serial ports:** 1 for CAREL network

**Dimensions:**

- user terminal 190x160x65 mm;
- power board 155x115 mm

**Connections:** screw, spade terminals



## ColdWatch

CM\*

The trapped personnel alarm kit is a safety system designed to be fitted inside low temperature cold rooms.

It allows personnel trapped inside the cold room to call for help by pressing an emergency button, thus activating the audible signal/warning light on the control panel.

The kit includes:

- control unit: to be fitted outside of the cold room; complete with siren and flashing light to signal the alarm, plus 3 relays (alarm, battery ok and battery fault);
- backup battery: housed inside the control unit, supplies power in the event of blackouts;
- emergency button: to be installed inside the cold room, made up of a mushroom-head button with light. The LEDs that light up the emergency button are on permanently so that the button can be identified in the dark.

The kit has been designed in compliance with standards in force.

### Technical specifications

**Power supply:** 230 Vac

**Operating conditions:**

- emergency button inside cold room -25T40°C, <90% RH non-condensing;
- module outside cold room -10T40°C, <90% RH non-condensing

**Degree of protection:**

- IP67 button inside cold room;
- IP43 module outside cold room

**Certification:** CE

**Assembly:** wall-mounted with case or open board

**Number of I/Os:**

- **digital inputs:** 1, voltage-free contact, for button inside the cold room;
- **digital outputs:** 3 relays

**Serial ports:** 1 for CAREL network

**Dimensions:**

- module outside cold room 200x240x87 mm;
- button inside cold room 80x70x73mm

**Connections:** screw terminals

## Accessories and options



- MCella new series  
 MCella split

### Door interlock disconnect switch

(0402512CEL: 32 A disconnect switch  
 0402515CEL: shaft h= 85 mm  
 0402517CEL: yellow/red indicators)

MasterCella can be installed with a 32 A interlock disconnect switch for complete unit on/off management; this device allows operation to be locked in the "OFF" position, guaranteeing complete safety during maintenance operations.



- MCella new series  
 MCella split

### Wiring terminal blocks

(MDOPZC\*000)

These are used to group together the neutral, live and earth connections on a single board installed inside MasterCella. The models available have 3 and 5 rows of terminals. Specifically, the latter option allows direct access to this board with the load cables (live, neutral, earth), avoiding having to take the connections during installation to the MasterCella auxiliary terminal block.



- MCella new series  
 MCella split

### RS485 serial cards

(IROPZSEM10/30)

The IROPZSEM10/30 cards are used to connect MasterCella (MD33\*) via the RS485 serial network to the PlantVisor supervisory system.



- MCella new series  
 MCella split

### Remote control

(IRTRRES000)

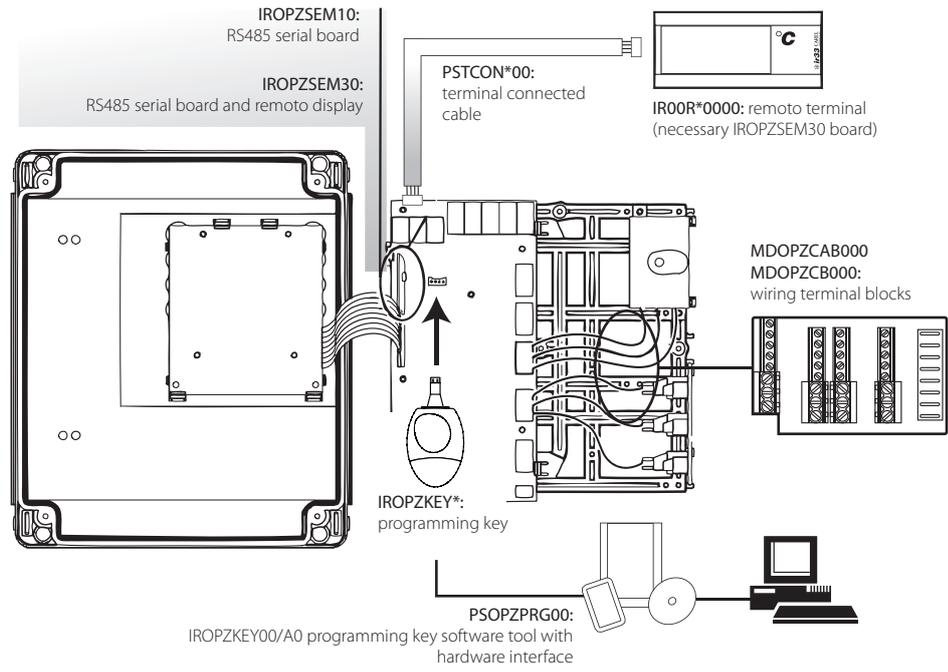
The remote control, which is essential for some applications, has become more powerful and compact, as well as easier to use. This accessory provides direct access to the main functions and configuration parameters, allowing the instrument to be programmed from a remote position.

## Table of MasterCella and MasterCella split models

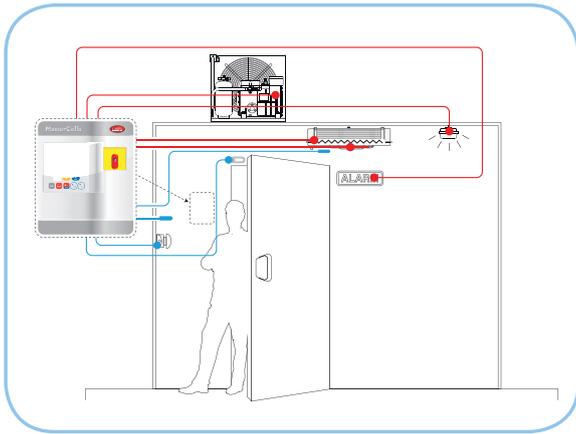
Features	MasterCella		MasterCella split
	MD33A*	MD33D*	MTSB*100
<b>Power supply</b>			
230 Vac ±10% 50/60 Hz	●	●	
<b>Power</b>	6 VA	7 VA	5 VA
<b>Probes</b>			
Standard CAREL NTC (range: -50T90 °C; error: 1 °C in -50T50 °C, 3 °C in 50T90 °C)	●	●	●
High temperature NTC (range: -40T150 °C; error: 1.5 °C in -20T115 °C, 4 °C in range east. -20T115 °C)	●	●	●
PTC (range: -50T150 °C; error: 2 °C in -50T50 °C, 4 °C in 50T150 °C)	●	●	●
digital input / probe 4	●	●	●
<b>User interface</b>			
4 green digits with 7 LED segments	●	●	
<b>Probe inputs</b>			
probe inputs	2	2	3
room temperature probe	●	●	●
defrost temperature probe	●	●	●
product temperature probe	●	●	●
light sensor	configurable		
<b>Outputs</b>			
compressor	16/30 A	16/30 A	2 HP
defrost		16 A	16 A
evaporator fan		8 A	8 A
aux1	8 A	8 A	2 HP
aux2	16 A/ 2 HP	16 A/2 HP	8 A
alarm			8 A
<b>Special functions</b>			
Real Time Clock	■	■	●
buzzer	●	●	
infrared	□	□	
programming key	●	●	●
high efficiency display	●	●	
optional hot point display	●	●	
optional RS485 card	●	●	
built-in door interlock		models MD33DF*	
<b>Operating conditions</b>			
open board	-10T65 °C <90% RH non-condensing		
with plastic case	-10T50 °C <90% RH non-condensing		

- standard;  
 □ optional

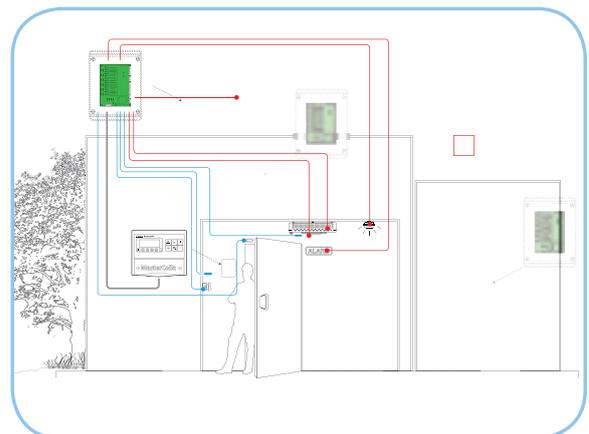
# OVERVIEW DRAWING MasterCella



## Application examples



cold room with MasterCella



cold room with MasterCella Split



## Datalogger

No need to worry about filing print-outs, replacing paper disks or pen points. The CAREL Datalogger stores all temperature values from the last year, automatically and in compliance with EEC directives, allowing them to be transferred to a PC using the download module. CAREL Datalogger continuously records the temperature from two probes, and immediately signals any malfunctions. The instrument is extremely simple and quick to install. The IP65 plastic case has been designed to resist condensate, at low and high temperatures.

The backlit LCD display shows the data saved even in poor light; the large buttons are extremely user-friendly.

### Advantages

- independent recording of two temperatures for over one year;
- possibility to look up the values saved directly on the display;
- dual data download mode: infrared and serial;
- possibility to store and print the data saved directly from a PC.

### Certification

Datalogger is compliant, as required by EC regulation 37/2005 of 12 January 2005, with standard EN 12380 on temperature recorders for the transport, storage and distribution of refrigerated, frozen and deep-frozen food and ice cream. Datalogger is also compliant with standard EN13485.



## Datalogger

DLOG2N0\*

The instrument saves the temperature from two points of measurement, at set time intervals.

The data can also be transferred to a PC in two different modes:

- by creating a fixed connection
- by transferring the data to a portable infrared receiver for subsequent downloading to a computer.

### Technical specifications

**Power supply:** 230 Vac

**Operating conditions:** 0T50°C, <90% RH non-condensing

**Degree of protection:** IP65 front panel

**Certification:** CE, EN13485, EN 12380

**Assembly:** panel or wall-mounted

**Number of I/Os:**

- **analogue inputs:** 2 NTC
- **digital inputs:** 2 voltage-free contacts
- **digital outputs:** 1 relay

**Dimensions:** panel opening 182x153mm

**Connections:** screw terminals

## Accessories and options



### PC connection kit

(DLOGSER\*)

DLOGSER allows data to be transferred from one or more Dataloggers to a PC, where it can then be examined and printed using the special WINLOG software (included).

Connecting Datalogger to the PC using this module also allows the Datalogger inputs, parameters and configuration to be monitored in real time, and the parameters to be modified from the PC.

The DLOGSER kit includes:

- telephone cable to connect DLOGSER to the Datalogger;
- RS485-RS232 converter;
- modem-PC cable (connects the converter to the PC)
- WinLog software
- 230 Vac/12 Vac, 3 VA transformer.



### IR download kit

(DLOGPC\*)

This is a portable electronic instrument that allows, by simply pressing one button, the data saved from a series of CAREL Dataloggers to be collected.

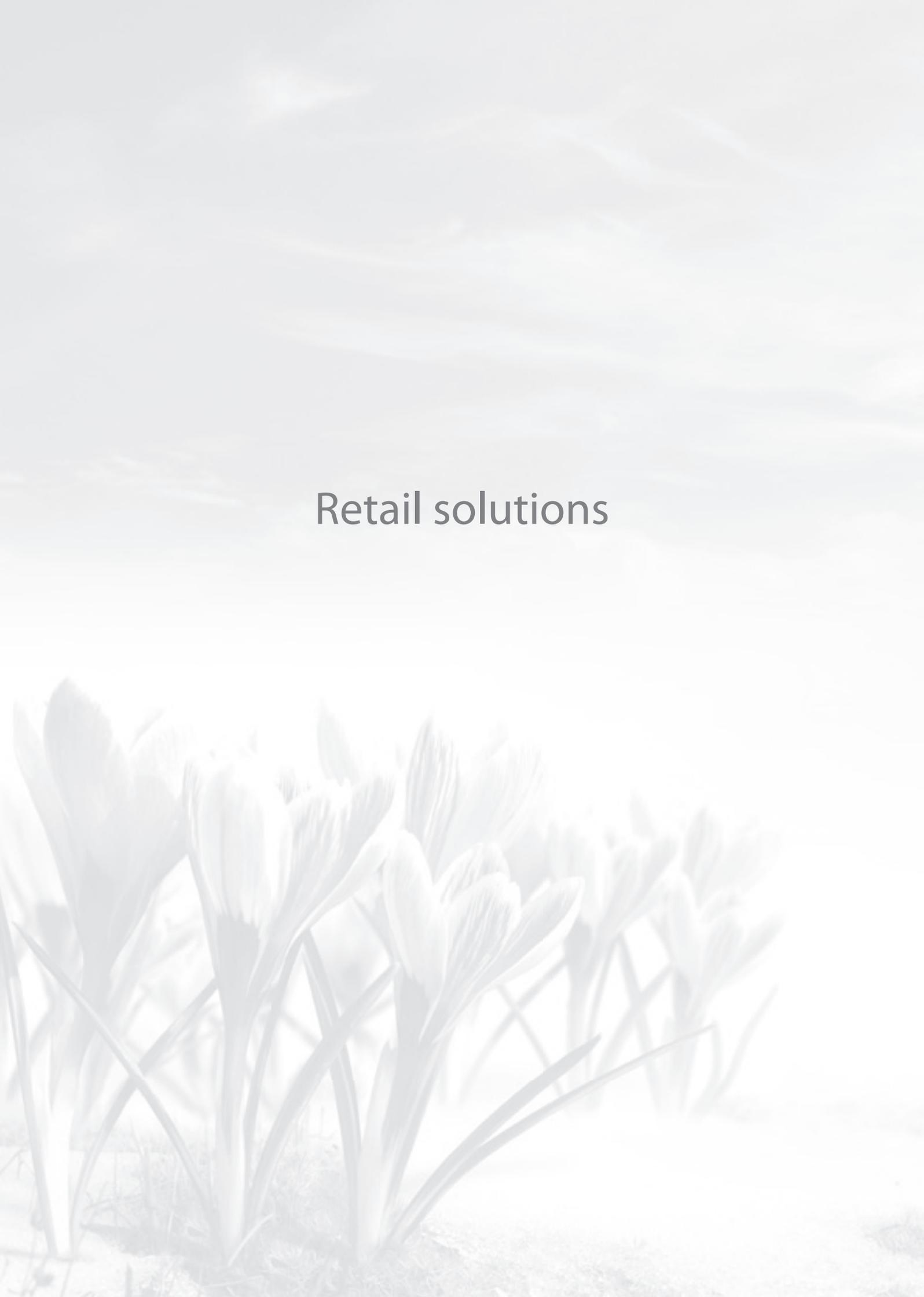
The DLOGPC kit contains: DOWNLOAD module to download the data saved from a series of Dataloggers (by infrared); IR port for the Datalogger (DLOGIR\*); modem-PC cable; WinLog software; 230 Vac/12 Vac, 3 VA transformer.



### NTC probe for Datalogger

(DLOGNTC\*)

This high precision NTC probe is ideal for the Datalogger series temperature recorders.



# Retail solutions





## Solutions for cabinets and cold rooms

The CAREL range of cabinet and cold room controllers in retail applications consists of:

- MPXPRO: cutting edge split solution for applications with electronic expansion valves;
- MPXPRO light: split solution for applications without electronic valves;
- irmpx: controller for simple applications with panel installation;
- ACC for retrofit installation with management of anti-sweat heaters.

### MPXPRO platform

This is the CAREL solution for large retail applications.

Available in various versions, these controllers can completely manage all multiplexed refrigeration units, offering potential energy savings, easy operation and installation.

### General features

The MPXPRO range is made up of very compact controllers (6 DIN modules) that can synchronise operation in master-slave networks of up to 6 devices. The master instrument can manage the other slaves, synchronising defrosts and light operation, sharing probes, digital inputs, user interface and supervisor commands, and acting as a router for the supervisor network (CAREL or Modbus® protocol). Each instrument features a maximum of 7 analogue inputs, 5 digital inputs, 5 digital outputs, 3 analogue outputs and an

output for the electronic expansion valve, a RS485 serial interface and inbuilt RTC.

### Energy saving

MPXPRO ensures energy savings by:

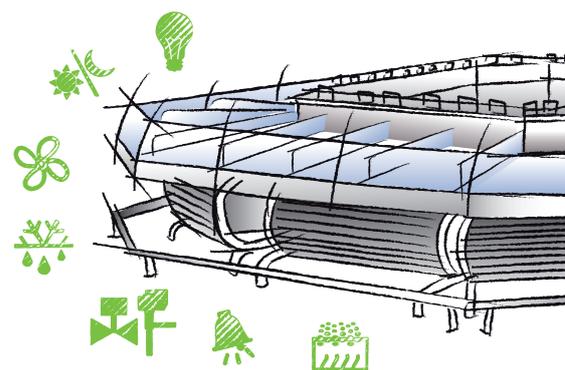
- using CAREL E<sup>V</sup> or PWM electronic expansion valves to improve evaporator management in different operating conditions and reduce the difference between suction and condensing pressure;
- modulating anti-sweat heater operation through comparison between dew point and glass temperature;
- modulating evaporator fan operation and management of different types of defrost (electric heater, hot gas and simple compressor shutdown) with different programming modes (scheduled, upon request, only when necessary).

### Easy operation

Guided setup procedures, pre-configured groups of parameters, direct PC connection, infrared remote control, all inputs and outputs readily configurable, safety and backup functions all assist instrument installation, operation and maintenance.

### Ultracap technology

MPXPRO features ultracap technology to ensure complete closing and tightness of CAREL E<sup>V</sup> electronic expansion valves in the event of power failures. This technology means solenoid valves no longer need to be installed upstream of the refrigerant circuit, thus reducing costs and simplifying instrument installation. MPXPRO ultracap technology only works with CAREL E<sup>V</sup> valves (for direct circuit control), normally used in retail display case applications.





## MPXPRO

MX3\*

MPXPRO is an instrument for complete and optimised management of multiplexed cabinets. Special importance in these applications is focused on managing the electronic expansion valve. MPXPRO stands out for its level of integration between valve management and normal cabinet control.

Built-in driver for managing CAREL EXV or PWM electronic expansion valves:

- optimised compressor rack operating pressure;
- maximum evaporator efficiency;
- stable temperature inside the cabinets by continuous modulation of refrigerant flow through the evaporator, avoiding the typical swings of traditional ON/OFF control cycles;
- corrective procedures to ensure operation even in critical conditions;
- if using CAREL expansion valves, MPXPRO ultracap technology ensures the benefits of continuous refrigerant modulation for the same over cost and with the same simple installation as other technology, however without restrictions, complications or additional components. Indeed no solenoid valves or auxiliary power supply circuits need to be installed.

Another energy saving function on MPXPRO involves modulation of anti-sweat heater operation: a specific function to prevent condensate forming on the glass of low temperature showcases, allowing real time modulation of anti-sweat devices based on the actual ambient and showcase conditions. Special care has been paid to installation costs, with the possibility to share values from common probes and estimates of values of hard-to-install probes.

Operation in multiplexed systems is guaranteed by the possibility to create master-slave networks, with subgroups of up to 6 units that can synchronise operation by sharing information and activating common procedures. The

subnetworks are managed by a master unit, which also acts as a gateway to the supervisor.

### Technical specifications

**Power supply:** 115/230 Vac

**Operating conditions:** -10T50 °C

**Degree of protection:** IP00

**Certification:** CE, UL

**Assembly:** DIN rail

**Number of I/Os:**

- **analogue inputs:** up to 7;
- **digital inputs:** up to 5;
- **analogue outputs:** up to 3;
- **digital outputs:** up to 5.

**Serial ports:** 1 RS485 CAREL-Modbus®

**Dimensions:** 109x137x85 mm (WxHxD)

**Connections:** plug-in screw terminals



## MPXPRO light

MX1\*

Basic version designed for all simple applications that do not use electronic valves, with anti-sweat heater modulation and protected panel installation (without plastic cover). Based on the MPXPRO platform, MPXPRO light has inherited the main features of stability, sturdiness and power, at a very competitive price.

### Technical specifications

**Power supply:** 230 Vac

**Operating conditions:** -10T50 °C

**Degree of protection:** IP00

**Certification:** CE

**Assembly:** DIN rail

**Number of I/Os:**

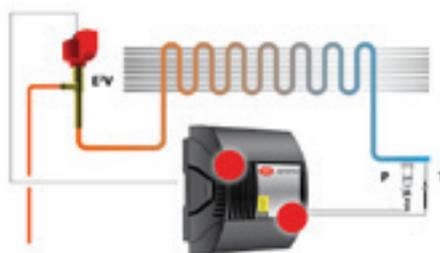
- **analogue inputs:** up to 7;
- **digital inputs:** up to 5;
- **analogue outputs:** 0;
- **digital outputs:** up to 5.

**Serial ports:** 1 RS485 CAREL-Modbus®

**Dimensions:** 105x111x46 mm (BxAxH)

**Connections:** plug-in screw terminals (optional)

### MPXPRO application diagram with ultracap

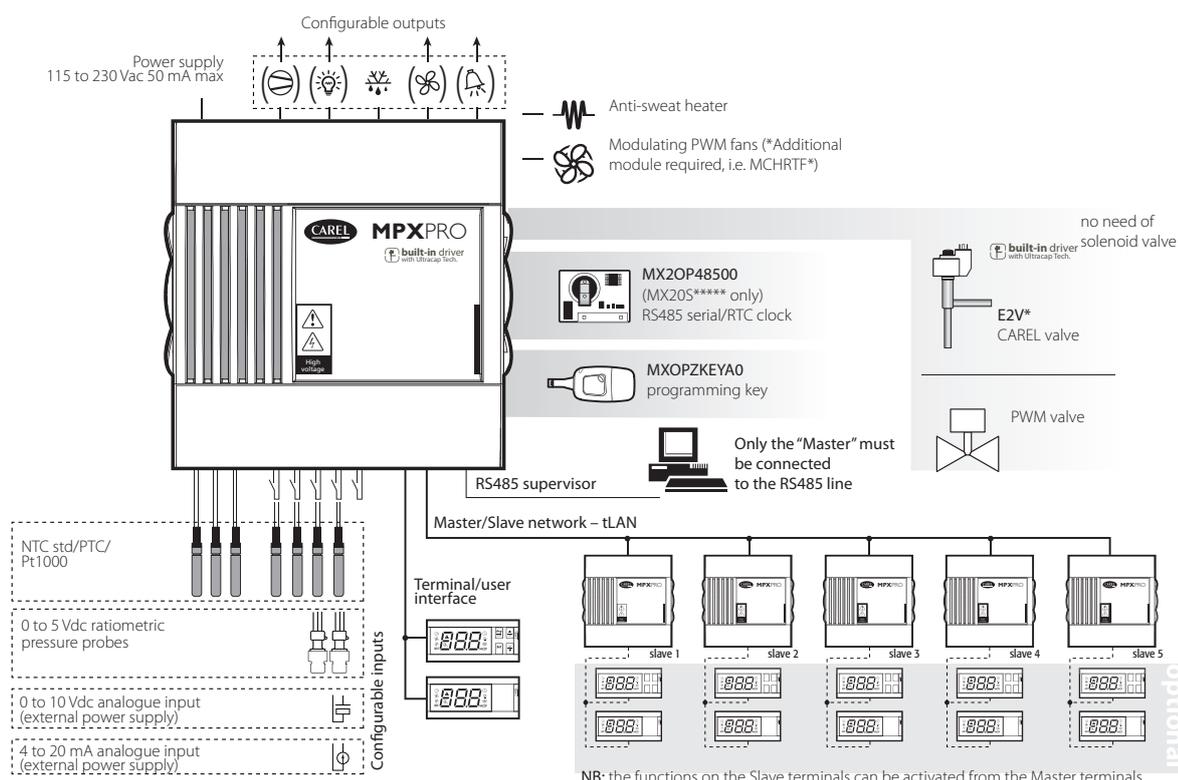


## Table of MPXPRO models

Features	MPXPRO light			MPXPRO			MPXPRO EEV built in			
	MX10M00*	MX10S00*	MX10S10*	MX30M21*	MX30S21*	MX30S31*	MX30M25*	MX30S25*	MX30M24*	MX30S24*
<b>Hardware</b>										
power supply	230 Vac			115/230 Vac						
relays (changeover)	5 (3)	5 (3)	3	5 (3)	5 (3)	3	5 (3)	5 (3)	5 (3)	5 (3)
NTC	7	7	7	7	7	7	7	7	7	7
PTC/PT1000				7	7	7	7	7	7	7
0.5 to 4.5 Vdc				2	2	2	2	2	2	2
4 to 20 mA				1	1	1	1	1	1	1
12 Vdc PWM				2	2	2	2	2	2	2
0 to 10 Vdc							1	1	1	1
CAREL E <sup>AV</sup>							1	1		
PWM									1	1
DIN	6	6	6	6	6	6	6	6	6	6
cover				●	●	●	●	●	●	●
terminal kit				●	●	●	●	●	●	●
RTC	●			●			●		●	
<b>Software</b>										
Master Slave network	●	●	●	●	●	●	●	●	●	●
defrost optimisation	●	●	●	●	●	●	●	●	●	●
remote control	●	●	●	●	●	●	●	●	●	●
pre-configurations	●	●	●	●	●	●	●	●	●	●
EEV management				□	□	□	●	●	●	●
anti-sweat heaters				●	●	●	●	●	●	●
fan modulation				● (PWM only)	● (PWM only)	● (PWM only)	●	●	●	●

- standard
- optional

## OVERVIEW DRAWING MPXPRO



## Accessories and options for MPXPRO



### CAREL EXV expansion card (MX30PSTH\*\*)

Optional card for control of a CAREL EXV electronic expansion valve with ultracap for automatic valve closing in the event of power failures, and 0 to 10 V modulating output for managing external actuators.



### PWM EEV expansion card (MX30PPWM\*\*)

Optional card for control of an AC/DC PWM electronic expansion valve with 0 to 10 V modulating output for managing external actuators.



### RTC and RS485 interface card (MX30P48500)

Optional card used to add RTC and RS485 interface functions to MPXPRO Slave models.



### Converters for programming key and commissioning tool

(IROPZPRG00, IROPZTLN00)

PC interface (via VPM) to a standard CAREL programming key (MXOPZKEYA0) or directly to the MPXPRO controller.



### Terminal and display

(IR\*\*U\*\*\*\*\* & IR\*\*X\*\*\*\*\*)

Remote user terminal with 3 digits and 4 buttons, or display only for viewing device status and parameter configuration.



### Remote control

(IRTRMPX000)

Instrument developed to simplify MPXPRO programming and setup. It can also override the status of outputs and inputs so as to completely test the connections.



## mpx

IRMPX

mpx is the entry-level solution for the management of multiplexed units or where local synchronisation is required for the management of defrosts and other shared functions; specifically designed for panel installation and space saving. Management of 1 Master and 5 Slaves, with the Master only connected to the supervisor network. Remote control with direct access to the control parameters for immediate configuration of the controller. Up to six sets of parameters for the pre-configuration of different control routines, with immediate availability for use in the field.

Models available:

- IRMPXMB000: 4 relays, RTC, RS485, buzzer;
- IRMPXMM000: 4 relays, RTC, RS485;
- IRMPX10000: 4 relays, RTC;
- IRMPX00000: 2 relays.

Molex® connectors available (MCHSMLCON\*) and kits of 24 cables (MCHSMLCAB\*) Molex® metal cable lugs.

### Technical specifications

**Power supply:** 12 Vac

**Operating conditions:** 0T50 °C

**Degree of protection:** IP65 (front)

**Certification:** CE

**Assembly:** panel mounted

**Number of I/Os:**

- analogue inputs: 3;
- digital inputs: 2;
- digital outputs: 4.

**Serial ports:** 1 RS485 CAREL

**Dimensions:** 75x33x71.5

**Connections:** Molex® terminals (wiring kits available with lugs already fitted)



## ACC

ACC

The ACC device is a microprocessor controller that prevents the formation of condensate on cold surfaces (e.g. showcase doors) by measuring ambient dew point and then heating the cold surface so as to keep it at a higher temperature than dew point. Heating is performed by controlling the voltage applied to special heaters, using the phase control output on the device.

Main features:

- dew point calculation;
- manual offset;
- programmable digital input (alarm or enable);
- Master/Slave function;
- serial interface for connection to supervisory systems or Master/Slave local network;
- auto-adaptation to mains frequency (50/60 Hz).

### Technical specifications

**Power supply:** 230 Vac -15/+10 % monofase 50/60 Hz;

**Operating conditions:** -10T50 °C, <90 % RH non-condensing

**Degree of protection:** IP43

**Certification:** CE

**Assembly:** panel mounted

**Number of I/Os:**

- analogue inputs: 3;
- digital inputs: 1;
- analogue outputs: 1

**Serial ports:** 1 RS485 CAREL

**Dimensions:** 139.8x134.8x88.95 mm

**Connections:** screw and spring-mounted terminals



## Solutions for compressor racks

The CAREL offering for compressor racks in retail applications consists of:

- pRack, a very versatile solution for all types of applications, including transcritical CO<sub>2</sub>;
- μRack for simple applications in small - medium systems.

The pRack platform is the CAREL solution for compressor racks in multiplexed installations for large retail applications. Its flexibility ensures management of all the most common applications used on the market, controlling different types of compressors, refrigerants, control schemes and logic.

Two versions are available, one for standard applications with traditional refrigerants or subcritical CO<sub>2</sub> cycles, and the other for transcritical CO<sub>2</sub> applications.

pRack is available in different sizes (compact, small, medium, large and extra large) with a different mix of analogue or digital inputs and outputs so as to cover the majority of market requirements. Different options are available: on-board or external user terminal, inbuilt RS485 serial interface, solid state relay outputs. The instrument is extremely flexible, indeed all inputs and outputs can be completely configured, meaning no restrictions when designing the systems and constructing the electrical panels. pRack can also manage two complete

compressor racks using just one instrument, or a series of instruments connected together. This allows better synchronisation between systems (DSS: double system synchronization), ideal above all for cascade or booster systems.

### Energy saving

Several operating modes and functions are available to save energy:

- modulation of compressor and fan operation with specific functions for inverters, Digital Scroll™ compressors, screw compressors with slide valves, and EC fans;
- the ESS package (Energy Saving Suite), which includes:
  - modulation of suction pressure set point, in coordination with supervisors, based on the instant operating conditions of the entire installation;
  - modulation of condensing pressure set point based on the trend in outside temperature
  - simple day/night and winter/summer set point compensation based on external signals or scheduler.

Together with these are integration and management of external devices, such as ChillBooster, economizer systems, liquid injection and heat recovery.

### Easy operation

The 8-row graphic user interface, the menu structure divided by functions, the screen layout and the different access levels via modifiable password mean any user can easily understand the information shown and browse the menus without needing to refer to the user manual.

A wizard is available for setting up the instrument, consisting of a list of questions used to configure the parameters needed for safe start-up. Alternatively, users can choose between a list of 13 pre-configurations already stored inside the instrument and described in the quick guide, or directly copy the configuration from another controller using a "SmartKey" or pRack Manager SW.

The instrument can also save a complete backup of the configuration, which can be recalled at any time in the event of accidental programming errors.



## pRack pR100

PRK100\*

pRack standard version is suitable for all traditional and subcritical CO<sub>2</sub> systems. Available in the compact, small, medium, large and extralarge versions, this can control both small systems (including two systems with the same instrument) and larger systems with a high number of inputs and outputs, by connecting up to 4 boards together. Based on the number and type of boards connected, the instrument can recognise the number of inputs and outputs available and adapt operation to the specific application.

Compatible with all the main types of compressors available on the market, the controller manages up to 12 piston or scroll compressors, with the first compressor controlled by inverter or Digital Scroll™; alternatively, up to 2 stepped operation, stepless or inverter-controlled screw compressors. It can manage compressors with different stages and different capacities.

A new high performance function is also available for managing modulating compressors (compressors with inverter control, Digital Scroll™, or stepless screw), with improved configurability so as to extend operation to new types of compressors available on the market, improved management of capacity modulation and innovative modulation functions inside the neutral zone to avoid swings.

Another interesting function is called DSS (double system synchronization), for synchronising operation of medium temperature and low temperature racks in cascade or booster applications.

Other generic functions are also very useful: these auxiliary functions can be completely configured so as to manage up to five thermostats with ON/OFF operation, two with modulation, two external alarms and a scheduler with the free inputs and outputs or internal variables. This type of logic means special functions can be managed on the standard model

that otherwise would have required the installation of further instruments, with consequent additional costs.

As well as traditional compressor and fan management, pRack adds auxiliary functions for the control of liquid injection systems, economizer operation, heat recovery and evaporative cooling. Specific functions developed allow integration of these functions to optimise operation of the entire rack.

### pLoads integration

pRack can interface with pLoads (code: PLO550\*) the load management standard controller. In fact, the integration of the two controllers allows to limit, or modulate, the maximum refrigerating power supply, optimizing the electrical consumption in order to avoid the maximum current peaks at the same time preserving the correct operation of the compressor rack.

### Technical specifications

**Power supply:** 24 Vac (±15%), 50/60 Hz or 22 to 40 Vdc

**Operating conditions:** -25T70 °C, 90% RH non-condensing

**Degree of protection:**

- IP20;
- front IP40.

**Certification:** CE, UL

**Assembly:** DIN rail

**Serial ports:** pLAN, BMS, FieldBus

**Dimensions:**

- 13 DIN (227,5x110x60 mm)
- 18 DIN (315x110x60 mm)

**Connections:** plug-in terminals



## pRack pR200T

PRK200T\*

This controller manages transcritical CO<sub>2</sub> systems, including control of HPV (high pressure valves) and RPRV (receiver pressure regulating valves), oil circuit, heat recovery and the possibility to connect the new pGD Touch touch screen display. Compatible with all valves available on the market, pRack pR200T optimises system COP in transcritical conditions, stabilises subcooling in subcritical conditions, maintains constant pressure inside the receiver and can adapt standard control algorithms to critical conditions.

Integrated oil circuit management optimises device operation and allows the supervisor to monitor correct operation, logging trends over time for more detailed analysis of performance.

The main feature of this controller is that it is the only device on the market that allows communication between low and medium temperature compressors and high pressure and flash gas valves. In this way, the system can operate in a coordinated manner and react uniformly to any problems or instability.

### Technical specifications

**Power supply:** 24 Vac, -15/+10%

50 to 60 Hz or 28 to 36 Vdc -20/+10%;

**Operating conditions:** -40T70 °C, 90% RH non-condensing

**Degree of protection:**

- IP20;
- front IP40.

**Certification:** CE, UL

**Assembly:** DIN rail

**Serial ports:** pLAN, 2BMS, 2 FieldBus

**Dimensions:**

- 13 DIN (227.5x110x60);
- 18 DIN (315x110x60).

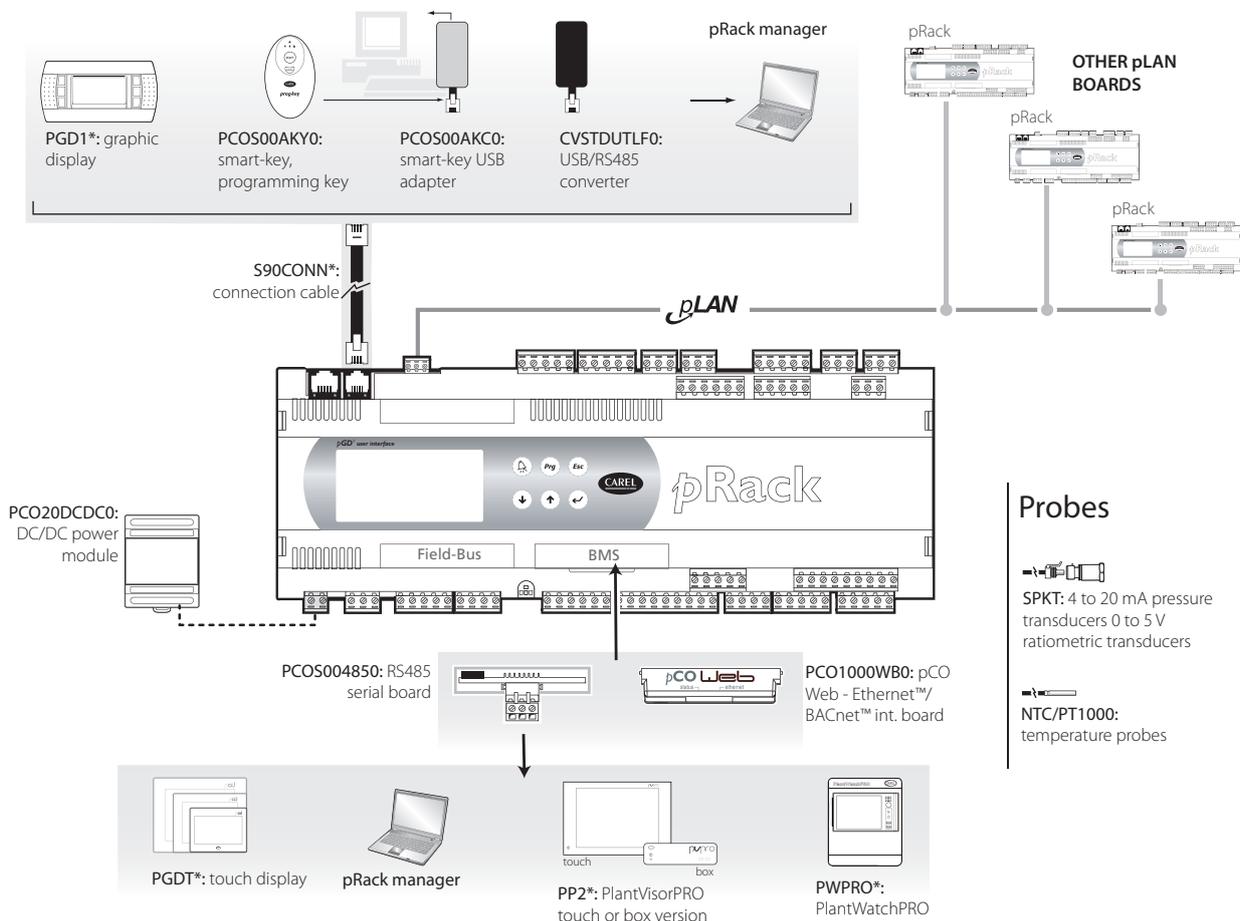
**Connections:** plug-in terminals

## Table of pRack models

Features	PRK100X*	PRK100S*	PRK100M*	PRK100L*	PRK100Z*	PRK20TM*	PRK20TL*
RTC	●	●	●	●	●	●	●
Integrated BMS	□					●	●
Built-in pGD <sup>1</sup> display	□						
Analogue inputs	8	5	8	10	8	8	10
PT1000	2	2	2	4	2	2	4
NTC	8	5	8	10	8	8	10
0 to 10 Vdc	4	3	6	6	6	6	6
4 to 20 mA	2	3	6	6	6	6	6
0 to 5 Vdc ratiometric	4	3	6	6	6	6	6
Digital inputs	6	10	16	22	16	16	22
24 Vac		8	14	18	14	14	18
230 Vac			2	4	2	2	4
free contact	6	2	2	4	2	2	4
Analogue outputs	2	4	4	6	4	4	6
0 to 10 Vdc	1	4	4	6	4	4	6
PWM	1						
Digital outputs	7	8	13	18	29	13	18
relay	7	8	13	18	29	13	18
SSR	2	2	2	4	4		

● standard  
□ optional

## OVERVIEW DRAWING pRack





## μRack

MRK000\*

μRack uses a high efficiency LED display to show the monitored values and status icons for the devices and operating modes.

Quick electrical connectors are used for fast and secure connection and to allow the use of cable kits for controllers fitted in mass production.

Using the PWM output, the instrument can also manage condenser fan speed control.

### Main functions

- suction pressure control;
- discharge pressure control;
- floating condensing pressure control;
- fan speed management;
- complete alarm management;
- supervisor connection;
- management of compressor racks with double suction and single condenser lines.

### Benefits

- compact dimensions;
- model for panel or DIN rail assembly;
- high reliability due to the use of a standard hardware platform;
- ergonomic, high efficiency display with icons;
- easy wiring;
- complete compressor rack management.

### Devices controlled:

- compressors (up to 4);
- fans (up to 4);
- alarm relay;
- PWM fan speed control.

### Programming

CAREL offers the possibility to configure all the unit parameters either from the keypad located on the front panel, using a hardware key (even when the unit is off) or via serial line.

### Parameters

- display and control measured values on high efficiency LED display;
- three access levels to display and program parameters: SEL (user), PRG (installer), SEL+PRG (manufacturer);
- possibility to move parameters from user to installer to manufacturer level.

The following part numbers are available:

- MRK0000000: panel version;
- MRK00000D0: DIN rail version;
- MRK0000AD0: DIN rail version with RS485.

### Technical specifications

**Power supply:** 24 Vac (-15/+10%), 50/60 Hz

**Operating conditions:** -10T55 °C, <90% RH non-condensing

**Degree of protection:** front IP55

**Certification:** CE, UL

**Assembly:** built-in or DIN rail

**Number of I/Os:**

- **analogue inputs:** 4 (2 NTC + 2 ratiometric inputs);
- **digital inputs:** 5, voltage-free contact;
- **analogue outputs:** 1 modulating PWM output;
- **digital outputs:** 5 relays with NO contact, 250 Vac 3 A res. 2 A.

**Serial ports:** RS485 CAREL

**Dimensions:**

- controller: 75x33x72 mm;
- 70x110x60 mm.

**Connections:** mini-fit and plug-in

## Accessories and options



### μRack kit

(MRK\*DK: kit with μRack DIN rail version, MRK\*OK: kit with μRack built-in version)

The complete CAREL solution for control of compressor racks is the kit version of μRack. This represents an advantageous solution above all for installers, who can order μRack and all the accessories needed with just one part number. Each kit comprises a μRack, either built-in or DIN rail version, transformer, pressure transducers, connection cables and connector kit in the more complete versions.



### RS485 serial card

(MCH2004850)

Used to interface μRack to a supervisor network over RS485. Part numbers vary depending on the type of installation (panel or DIN rail).



### Programming key

(PJOPZKEY\*)

The programming key is used to program the instrument quickly when not powered, with the certainty of avoiding errors. It reduces the number of part numbers handled and can be used to program the instrument in just a few seconds during testing at the end of production. Also an excellent technical service tool.



### Connector kit

(MCH2CON\*)

Connector kits are available for μRack built-in version (MCH2CON001) and for μRack DIN rail version



## Energy optimisation

Increased energy costs, strict international standards that require reductions in CO<sub>2</sub> emissions and the need to use alternative and renewable energy sources, mean we all need to optimise energy consumption of our buildings by increasing efficiency. Comfort and optimisation are not however mutually exclusive. Studies highlight how 30% energy savings in buildings can be achieved without affecting comfort. Analysis of consumption is the first step towards evaluating whether a certain action can reduce energy consumption. Imagine shopping at a supermarket where the prices of the products for sale are not shown. How can we decide whether purchasing certain products meets our expectation to spend less money? Feedback is precious, as it allows us to progressively move in the desired direction, optimising energy consumption, maximising efficiency and maintaining comfort conditions, just like shelf prices help us make alternative and informed decisions.

From this perspective, we believe that the first step in saving energy is awareness of what we actually spend. The possibility to analyse power consumption is therefore essential in order to obtain significant energy savings.

This is why CAREL offers its customers a range of products and solutions for improving the efficiency of its systems and optimising energy consumption in retail applications. Integration and interaction

are two fundamental steps for intelligent management of energy consumption. The resulting system is one based on information. This information, just like feedback, can be used to share rules and create synergies in which each individual instrument independently manages a specific part of the installation, but at the same time is an integral part of the overall system.

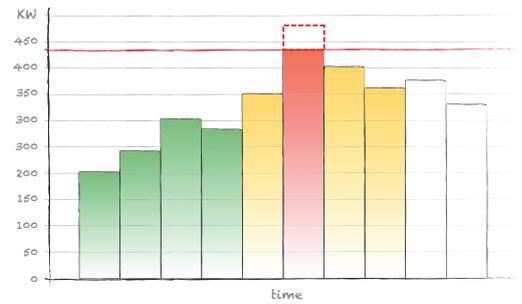
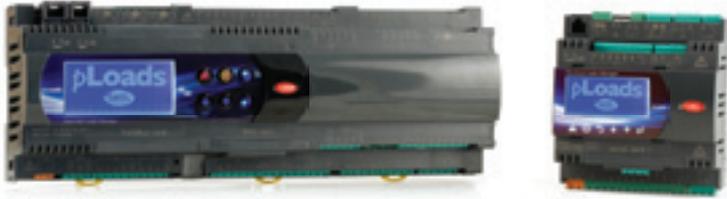
### Integration

All our products are conceived and designed to be interconnected. This means all the parameters can be supervised from the same BMS interface, such as the CAREL PlantVisorPRO or PlantWatchPRO. This brings considerable advantages in terms of installation, commissioning, maintenance, and, not least, product training costs.

### Interaction

Simple connection of different CAREL devices over a single serial line, and availability of CAREL or Modbus® protocols over an RS485 network allows instruments to interact with one another. Shared information can be used to increase the performance of individual instruments by creating an independent and intelligent system for managing critical situations, or alarms, without in any way affecting energy efficiency.

The versatility of the CAREL system, the programmability of its pCO sistema controllers, the usability of its programming tools, and extensive presence of specialist CAREL technical personnel internationally, ensure customers a range of solutions that can satisfy even the most innovative needs. Electrical loads, detailed scheduling, light management and integration of air-conditioning systems are just a few examples of what the Retail system can offer customers today.



## pLoads

PLO550\*

pLoads is the innovative CAREL controller for intelligent management of energy consumption, by significantly reducing waste.

Scheduling of loads, management of multiple energy meters, measurement of power/water/gas consumption and load cut-off are the main features of the new CAREL pLoads.

### Benefits of using pLoads:

- just one instrument to measure all the power values read by individual energy meters;
- display all power values on a single user interface;
- remote control of all measurements by PC, with several processing options;
- separate totals on individual lines for precise division of electricity usage and exact allocation of power costs;
- identify any abnormal usage and consequent energy wastage;
- alarms when exceeding pre-set thresholds;
- automatic load cut-off management;
- scheduling of loads based on specific and detailed time bands.

### Scheduling of connected loads

This controller allows scheduled operation of all connected loads with programmed on and off times. The time bands available are intended to represent business opening and closing times; each day can be labelled as "ordinary", "special", "short" or "closing". Each individual load can be associated with these time bands, together with additional operating flexibility that we have called "before opening" and "after closing". For even greater flexibility, as well as these general time bands, up to 15 special periods are available, which represent exceptions to the main times.

### Load cut-off

Users can create complex load deactivation logic so as to avoid exceed peak power limits agreed with the electricity supplier. Electrical loads can be cut-off when reaching power consumption and instant power thresholds.

A special algorithm controls the device outputs connected to the electrical loads, so as to reduce and where possible eliminate the possibility of exceeding contracted power limits. Deactivation of loads is managed according to specific priorities that can be set by the user, while special safety times avoid annoying rapid deactivation-activation cycles that would otherwise occur if the hysteresis for each individual load were not considered.

### Integration with pRack

pLoads can interface with the pRack standard compressor rack controller (PRK\*). Integration of these two controllers can in fact limit or modulate cooling capacity delivered, optimising power consumption so as to avoid peaks while at the same time ensuring correct operation of the compressor rack.

### Energy meter and consumption collector

pLoads can manage up to 12 electricity meters in a Modbus® network, and energy/water/gas meters that use digital inputs with transistor optocoupler. Electrical measurements such as current, voltage, cos-φ, active power, energy, etc. can be viewed on the built-in graphic interface. Below is a list of Modbus® compatible energy meters:

- Gavazzi CPT-DIN;
- Ducati Energia Smart più;
- IME Nemo 96HD;
- IME Nemo D4;
- Electrex FEMTO D4;
- Socomec.

All readings are available to the supervisor and in predefined models for PlantVisorPRO, for clearer understanding and to offer an overall view. Interaction with the Energy plug-in offers detailed reports for precise summaries of consumption over time; detailed reports are available to optimise system operation. Information on reductions CO<sub>2</sub> emissions thanks to the CAREL system is managed simply by the plug-in.

For the details on the energy plug-in energy, refer to the software package available in PlantVisorPRO.

### Technical specifications

**Power supply:** 24 Vac, -15/+10%

**Operating conditions:** -10T60 °C, 90% RH non-condensing

**Degree of protection:** IP40 on front panel only

**Certification:** CE, UL

**Assembly:** DIN rail

**Number of I/Os:**

- **digital inputs:** up to 16
- **digital outputs:** up to 14

**Serial ports:** optically-isolated RS485

**Dimensions:**

- compact: 105x60x115 mm
- large: 315x60x110 mm

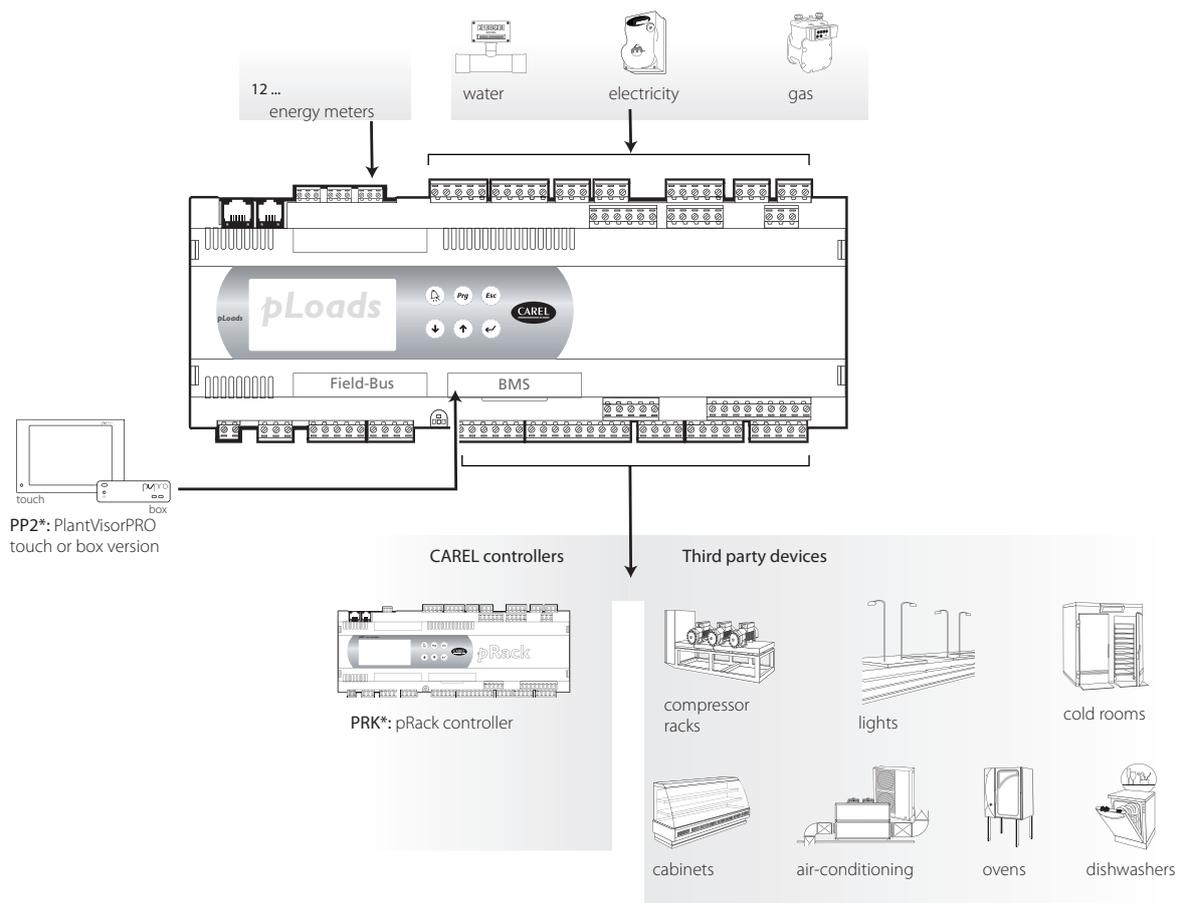
**Connections:** plug-in terminals

## Table of pLoads models

Features	PLO550X30U00	PLO550L30UB00
RTC	●	●
BMS	●	●
Built in pGD <sup>1</sup> display	●	●
Digital inputs	2	16
Analogue inputs (ON/OFF contact)	1	4
Digital outputs	5 + 1 with transistor optocoupler	13 + 1 with transistor optocoupler

● standard

## OVERVIEW DRAWING *pLoads*





## Light management and device scheduling

Supermarket lighting accounts for a considerable part of total power consumption. Correct scheduling of the times when lights are on, supported by the use of twilight sensors, can significantly reduce wasted energy. The continual need to reduce power consumption and improve environmental impact has led CAREL to offer its customers standard or custom solutions for dynamically and intelligently controlling supermarket lights. Connection of these applications to a supervisory system, such as PlantVisorPRO, allows users to easily, intuitively and quickly set time bands for the various different loads. An easy-to-use calendar can then be populated with exceptions to manage closing periods. In a complex installation such as a supermarket, interaction between lights and the more complex “food cooling” or “comfort cooling” systems creates synergies that help best manage critical alarm situations or other specific requirements. Lights, recirculation or return fans, fill pumps, dampers and doors are all devices that, if automated, can lead to significant reductions in maintenance and running costs, and significant energy savings due to intelligent operation of utilities that avoids waste and prevents malfunctions or improper use. CAREL in this case too offers standard or specific solutions, aimed at integrating all devices that can operate based on time bands, enabled manually or automatically, tailoring an offer to meet effective customer needs.

## Air-conditioning management

A supermarket is not just “food cooling”; “comfort cooling” is likewise important, and like food accounts for a major portion of power consumption. CAREL has always worked in the air-conditioning market, and can offer customers standard solutions or specific custom applications for the retail sector. These applications can be easily interfaced to CAREL centralised supervisory systems. Simple interconnection of CAREL devices brings limitless benefits: reduction in installation, maintenance and setup costs, with further savings ensured by the fact that all CAREL instruments can share information so as to implement special functions, such as dynamic set point or scheduling based on occupancy, air quality, perceived temperature, etc. The level of detail of information available to customers can be customised thanks to the flexibility of proprietary and free software tools. Complex retail applications thus become intuitive and managed “at a click”, with detailed and interactive web pages providing users the desired information in custom levels of detail. As highlighted, integrated air-conditioning systems can interact with other devices, even those with different functions. Integration and interaction thus bring food cooling and comfort cooling closer together. Both are placed on the same level, interacting and sharing information so as to optimise efficiency and maximise energy saving. “Optimum” logic accentuates the features and unique aspects of each application.

CAREL proposes standard and easily customisable applications for the following types of units:

- chillers;
  - air handling units;
  - rooftop;
  - heat pumps (including ground source).
- Each of these applications features models for PlantVisorPRO and PlantWatchPRO that can be adapted to the specific installation, with 3D and animated graphics. The CAREL system also provides OEM customers standard solutions for managing devices using variable frequency drives or inverters; specifically:
- solution for compressors:
    - BLDC motors (brushless DC motors);
    - AC motors;
    - digital scroll.
  - solution for fans and pumps:
    - EC (electronic commutation);
    - VFD (variable frequency drives).

Continuous research into creating innovation, and optimisation of power consumption, has seen CAREL design solutions with a low environmental impact and very high efficiency; one example is the intelligent use of water as a source of heat exchange:

- ChillBooster;
  - evaporative cooling,
- the benefits of which in terms of energy saving, easy installation and maintenance make these products CAREL’s showpiece in terms of environmental friendliness and customer satisfaction.



# Temperature, humidity and pressure control solutions





## Universal controllers

The “infrared universale” series is a range of instruments for controlling the temperature, pressure and humidity values in air-conditioning, refrigeration and heating units. They can however also be used in other contexts, as the voltage or current inputs can support various different types of sensors. In addition, the PT100 probes or thermocouples have an operating range up to 800 °C and can comfortably manage common oven or furnace temperature control processes. The wide range of models can satisfy all requirements:

The models are divided into two families:

- the first with **temperature only inputs**, and consequently suitable for temperature control in HVAC/R and/or generic applications that require a thermostat in the range –50T150 °C;
- the second **with universal inputs** (NTC, NTC-HT, PTC, PT1000, PT100, J/TC K, voltage and current).

The following sensors can be connected to the “temperature only” models:

- NTC with range –50T90 °C;
- NTC-HT with range –40T150 °C;
- PTC with range –50T150 °C;
- PT1000 with range –50T150 °C.

The following sensors can be connected to the “Multi-in” models:

- NTC with range –50T90 °C;
- NTC-HT with range –40T150 °C;
- PTC with range –50T150 °C;
- PT1000 with range –50T150 °C;
- PT1000 with range –199T800 °C;
- PT100 with range –199T800 °C;
- J/K TC with range –100T800 °C;
- Voltage: 0 to 1 V, -0.5 to 1.3 V, 0 to 10 V, 0 to 5 V rat;
- current: 0 to 20 mA, 4 to 20 mA.

The type of probe is selected by configuration parameter.

Main functions include::

- PID with autotuning;
- two independent control loops;
- clock management for logging alarms;
- working cycles.

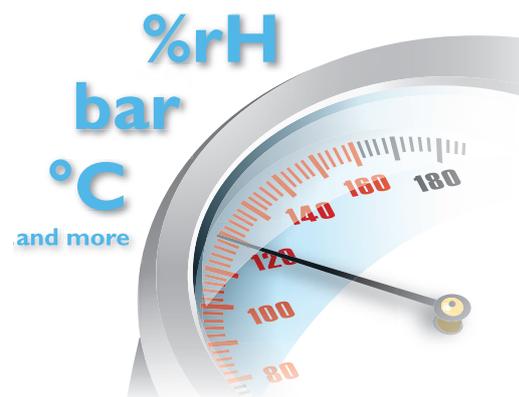
Types of outputs: relays, 0 to 10 Vdc, or control of external SSRs.

Type of power supply: models are available for mains power supply (115 to 230 Vac), or alternatively operating at 12 to 24 Vac/Vdc or 24 Vac/Vdc

Panel or DIN rail mounting: all models are available for both classic panel installation with IP65 front protection, or for DIN rail mounting (4 modules).

Backward compatibility: the list of parameters is compatible with the previous “ir32 universale” range

Other functions: 2 configurable digital inputs, IR receiver and buzzer available on all models; some versions also feature a real time clock (RTC).





## IR/DN33: universal thermostats

IR33\*7\* and DN33\*7\*

This series of "universal" thermostats can connect two temperature probes (NTC, PTC, PT1000). The second probe can be used for a second control loop, independent from the first, or alternatively for temperature compensation (summer or heating), differential operation (difference between the two temperatures), or free cooling. They feature two digital inputs that can be configured to manage functions such as an immediate external or delayed alarm, and remote ON/OFF. Programming is made extremely simple by the 9 selectable operating modes (e.g.: direct, reverse, neutral zone, PWM, etc.). All controllers feature a PID algorithm with AutoTuning and some versions are available with RTC (real time clock). A low consumption switching power supply is used on both the 12/24 Vac/Vdc and 115/230 Vac versions.

### Technical specifications

**Power supply:** 115/230 Vac -15/10% 50/60 Hz 6 VA or 12/24 Vac -10/10% 50/60 Hz 4 VA, 12/30 Vdc 300 mA max

**Operating conditions:** -10T60 °C, 10 to 90% RH non-condensing

#### Front panel degree of protection:

- panel ver.: IP65
- DIN rail ver.: IP40

**Certification:** CE, UL (panel ver.)

**Assembly:** panel or DIN rail

#### Number of I/Os:

- **analogue inputs:** 2 (NTC/HT, PTC, PT1000)
- **digital inputs:** 2
- **analogue outputs:** up to 2 x 0 to 10 Vdc
- **digital outputs:** 1, 2 or 4 relays

**Serial ports:** 1 via external option

#### Dimensions:

- panel version: 76x34x75 mm
- DIN version: 70x110x60 mm

**Connections:** plug-in terminals



## IR/DN33: universal multi-input

IR33\*9\* and DN33\*9\*

This series of controllers can connect two universal probes (NTC, NTC-HT, PTC, PT1000, PT100, J/K TC, 0 to 1 V, -0.5 to 1.3 V, 0 to 10 V, 0 to 5 V rat., 0 to 20 mA, 4 to 20 mA) for managing common values in HVAC/R applications, as well as any other sensor whose output is supported by the controller. The second probe can be used for a second control loop, independent from the first, or alternatively temperature compensation, differential operation, or free cooling. They also feature two digital configurable inputs. Programming is made extremely simple by the 9 selectable operating modes (e.g.: direct, reverse, neutral zone, PWM, etc.). All controllers feature a PID algorithm with AutoTuning and some versions are available with RTC (real time clock). A low consumption switching power supply is used on both the 24 Vac/Vdc and 115/230 Vac versions.

### Technical specifications

**Power supply:** 115/230 Vac -15/10% 50/60 Hz 9 VA or 24 Vac -10/10% 50/60 Hz 12 VA, 24 Vdc -15/15% 450 mA max.

**Operating conditions:** -10T50 °C, 10 to 90% RH non-condensing

#### Front panel degree of protection:

- panel ver.: IP65
- DIN rail ver.: IP40

**Certification:** CE, UL

**Assembly:** panel or DIN rail

#### Number of I/Os:

- **analogue inputs:** 2 configurable
- **digital inputs:** 2
- **analogue outputs:** up to 2 x 0 to 10 Vdc
- **digital outputs:** 1, 2 or 4 relays

**Serial ports:** 1 via external option

#### Dimensions:

- panel version: 76x34x93 mm
- DIN version: 70x110x60 mm

**Connections:** a morsetti estraibili



## clima

ADC\*

Electronic instrument for controlling ambient temperature and humidity. It can be used in various operating modes. Special attention has been focused on advanced algorithms for heating, cooling or automatic operation and for the control of underfloor heating/cooling and temperature compensation functions. Timer and RTC clock for day and night operation (optional, depending on the model). The remote control option (by purchasing accessory IROPZ48500) allows the data from the instrument to be monitored and saved using a supervisor.

### Technical specifications

**Power supply:** 24 Vac -15/10% 50/60 Hz 1 VA, 24/32 Vdc 1 W

#### Operating conditions:

0T60 °C, 10 to 90% RH non-condensing

**Degree of protection:** IP20

**Certification:** CE, UL

**Assembly:** wall-mounted

#### Number of I/Os:

- **analogue inputs:** room temperature and/or humidity and outside temperature
- **digital inputs:** 1
- **analogue outputs:** 1 x 0 to 10 Vdc
- **digital outputs:** 1 or 2 relays

**Serial ports:** 1 via external option

**Dimensions:** 135x86x36 mm

**Connections:** terminals

## Accessories and options



### Programming key

(IROPZKEY\*)

This key allows the ir33 to be programmed quickly, even when not powered, reducing the risk of errors. The accessory reduces the number of part numbers handled, is a rapid and effective tool for service operations, allowing the controller to be programmed in just a few seconds, even during the testing phase at the end of the production line. Versions are available with battery or external power supply.



### Special modules

(CONV\*)

These have been developed to be connected directly to the Infrared Universale series instruments (version A). They can in any case be used with other controllers, for example with the  $\mu$ chiller series.

There are two models available:

- CONV0/10A0: converts the PWM signal supplied by the instrument into a standard analogue signal (0 to 10 Vdc or 4 to 20 mA);
- CONVONOFF0: converts the PWM signal into an ON/OFF signal via relay.



### Remote control

(IRTRUES000)

The remote control, which is essential for some applications, has become more powerful and compact, as well as easier to use. This accessory provides direct access to the main functions and configuration parameters, allowing ir33 to be programmed from a remote position using a group of buttons that exactly replicate the instrument keypad.



### "Comtool" programming tool

(downloadable from <http://ksa.carel.com>)

With this useful tool, the controller can be programmed from any PC, saving the different configurations to files that can be loaded during the final programming stage, creating custom sets of parameters for faster programming and setting different user profiles with access protected by password.



### RS485 serial connection

(IROPZ48500, IROPZ485S0)

These fit directly into the connector that normally is used for programming via key; all models available can be connected to a BMS that uses the CAREL or Modbus® protocol. Model IROPZ485S0 in particular can automatically recognise the TxRx+ and TxRx- signals.



### RS485 serial card

(IROPZSER30)

The IROPZSER30 card is used to connect the DN33 universale via the RS485 serial network to a supervisory system that uses CAREL or Modbus® protocol.

Table of IR33/DN33 universale part numbers

assembly		power supply			inputs			outputs			other		
panel	DIN rail	115/230 Vac	12/24 Vac/Vdc	24 Vac/Vdc	digital	temperature	multi-input	relay	to control SSR	0 to 10V	Real Time Clock	PID - Autotuning	buzzer/IR
<b>Universal thermostats</b>													
IR33V7HR20	DN33V7HR20	●			2	2		1				●	●
IR33V7HB20	DN33V7HB20	●			2	2		1			●	●	●
IR33V7LR20	DN33V7LR20		●		2	2		1				●	●
IR33W7HR20	DN33W7HR20	●			2	2		2				●	●
IR33W7HB20	DN33W7HB20	●			2	2		2			●	●	●
IR33W7LR20	DN33W7LR20		●		2	2		2				●	●
IR33Z7HR20	DN33Z7HR20	●			2	2		4				●	●
IR33Z7HB20	DN33Z7HB20	●			2	2		4			●	●	●
IR33Z7LR20	DN33Z7LR20		●		2	2		4				●	●
IR33A7HR20	DN33A7HR20	●			2	2			4			●	●
IR33A7HB20	DN33A7HB20	●			2	2			4		●	●	●
IR33A7LR20	DN33A7LR20		●		2	2			4			●	●
IR33B7HR20	DN33B7HR20	●			2	2		1		1		●	●
IR33B7HB20	DN33B7HB20	●			2	2		1		1	●	●	●
IR33B7LR20	DN33B7LR20		●		2	2		1		1		●	●
IR33E7HR20	DN33E7HR20	●			2	2		2		2		●	●
IR33E7HB20	DN33E7HB20	●			2	2		2		2	●	●	●
IR33E7LR20	DN33E7LR20		●		2	2		2		2		●	●
<b>Universal multi-input</b>													
IR33V9HR20	DN33V9HR20	●			2		2	1				●	●
IR33V9HB20	DN33V9HB20	●			2		2	1			●	●	●
IR33V9MR20	DN33V9MR20			●	2		2	1				●	●
IR33W9HR20	DN33W9HR20	●			2		2	2				●	●
IR33W9HB20	DN33W9HB20	●			2		2	2			●	●	●
IR33W9MR20	DN33W9MR20			●	2		2	2				●	●
IR33Z9HR20	DN33Z9HR20	●			2		2	4				●	●
IR33Z9HB20	DN33Z9HB20	●			2		2	4			●	●	●
IR33Z9MR20	DN33Z9MR20			●	2		2	4				●	●
IR33A9HR20	DN33A9HR20	●			2		2		4			●	●
IR33A9HB20	DN33A9HB20	●			2		2		4		●	●	●
IR33A9MR20	DN33A9MR20			●	2		2		4			●	●
IR33B9HR20	DN33B9HR20	●			2		2	1		1		●	●
IR33B9HB20	DN33B9HB20	●			2		2	1		1	●	●	●
IR33B9MR20	DN33B9MR20			●	2		2	1		1		●	●
IR33E9HR20	DN33E9HR20	●			2		2	2		2		●	●
IR33E9HB20	DN33E9HB20	●			2		2	2		2	●	●	●
IR33E9MR20	DN33E9MR20			●	2		2	2		2		●	●

● standard

The background of the slide is a faded, grayscale image of a field of tulips. The tulips are in various stages of bloom, with some fully open and others as buds. The sky above is filled with soft, wispy clouds. The overall tone is light and airy, with the text centered in the middle of the image.

# Sensors and protection devices





## Sensors and protection devices

CAREL offers increasingly advanced and complete global solutions.

For this reason, CAREL has designed an entire range of probes that respond to the needs of HVAC/R installers and manufacturers, as well as for the control of CAREL's own line of humidifiers.

The range envisions temperature and humidity sensors with different uses, housed in sockets, ducted, residential or industrial environment, pressure transducers, smoke, fire and flood detectors, air quality probes, gas leak detectors for refrigerant units, guaranteeing performance and compatibility with all CAREL controllers.

The range has been enhanced with the most innovative technological solutions, offering new international standards at increasingly competitive prices.

### Advantages

CAREL probes, as well as being characterised by the acknowledged performance that sets them apart, are very versatile and can satisfy various market requirements.

In fact, all the probes have been especially designed to be compatible not only with all CAREL controllers, but also with the most commonly used standards worldwide.

The temperature and humidity probes, offering a great choice between active and passive technology, are available in different operating ranges and also in specific versions for corrosive or polluting environments.

The pressure transducers are available in a ratiometric version, 0 to 5 V and 4 to 20 mA, also in a sealed version (to be installed without capillary directly onto the piping) offering improved performance in terms of precision.

The air quality sensors offer a new and important accessory to installers and manufacturers of AHUs, absolutely in line with CAREL quality.

The smoke/fire and flood detectors are small devices with auto-calibration function, thus adapting to different environmental conditions without losing activation accuracy.

For the detection of CFCs, HFCs and CO<sub>2</sub> gas refrigerants, CAREL offers a range of sensors designed to satisfy requirements in the industrial refrigeration and air-conditioning for supermarkets, shopping centres, and other public places.



## Temperature, humidity and temperature/humidity probes.

DPW\*: for installation in the room  
 DPD\*: for installation in the duct

This probes are particularly suitable for civil and commercial environments where particular attention is paid to design. They are used in heating and air conditioning systems that use ducts. The range also envisions models with RS485 connection with CAREL and Modbus® protocol.

### Technical specifications

**Power supply:** 12/24 Vac -10/15%  
 9 to 30 Vdc ±10%

**Operating conditions:**

- DPW\*: -10T60 °C, <100% R.H. non cond.;
- DPD\*: -10T60 °C, -20T70, <100% R.H. non cond.

**Protection rating:**

- DPW\*: IP30;
- DPD\*: IP55, IP40 sensor.

**Assembly:**

- DPW\*: wall-mounted;
- DPD\*: duct;

**Number of I/Os:**

- **analogue outputs:** -0.5 to 1 V, 0 to 1 V, 0 to 10 V, 4 to 20 mA

**Serial Ports:** RS485 (specific model)

**Dimensions:**

- DPW\*: 127x80x30 mm;
- DPD\*: 98x105x336 mm.

**Connections:** screw terminal board for cables up to 1.5 mm<sup>2</sup>



## Active temperature/humidity probes

DPP\*: for industrial environment

Specifically designed to measure high levels of humidity with great accuracy. The range also envisions models with RS485 connection with CAREL and Modbus® protocol.

### Technical specifications

**Power supply:** 12/24 Vac -10/15%,  
 9 to 30 Vdc ±10%

**Operating conditions:** -10T60 °C, -20T70,  
 <100% R.H. non cond.

**Protection rating:**

- IP55 (container);
- IP54 (sensor).

**Assembly:** wall-mounted

**Number of I/Os:**

- **analogue outputs:** -0.5 to 1 V, 0 to 1 V, 0 to 10 V, 4 to 20 mA

**Serial Ports:** RS485 (specific model)

**Dimensions:** 98x170x44

**Connections:** screw terminal board for cables up to 1.5 mm<sup>2</sup>



## Active immersion temperature probes

ASIT\*: immersion

The ASIT\* immersion probes are used in cases where it is necessary to measure the temperature inside cooling and heating circuits. They are particularly adaptable where the sensitive element must be in direct contact with the fluid being controlled.

### Technical specifications

**Power supply:** 12/24 Vac -10/15%,  
 9...30 Vdc ±10%

**Operating conditions:** -10T70 °C, <100%  
 R.H. non cond.

**Protection rating:**

- IP55 (container);
- IP67 (sensor).

**Assembly:** direct or with housing

**Number of I/Os:**

- **analogue outputs:** -0.5 to 1 V, 4 to 20 mA

**Dimensions:** 94x102x176

**Connections:** screw terminal board for cables up to 1.5 mm<sup>2</sup>



## Active universal temperature probes

ASET\*: universal

The universal temperature probes are used for many applications; in particular the ASET03\* version has an electronic amplifier, protected by a container with IP55 protection rating, which allows remote control up to 200 m with 4 to 20 mA output.

### Technical specifications

**Power supply:** 12/24 Vac -10/15%,  
9...30 Vdc  $\pm 10\%$

**Operating conditions:** -30T90 °C or 30T150 °C, <100% R.H. non cond.

**Protection rating:**

- IP55 (container);
- IP67 (sensor).

**Assembly:** directly in socket

**Number of I/Os:**

- **analogue outputs:** -0.5 to 1 V, 4 to 20 mA

**Dimensions:** 94x102x176

**Connections:** screw terminal board for cables up to 1.5 mm<sup>2</sup>



## VOC, CO<sub>2</sub>, CO<sub>2</sub>+VOC air quality probes

DPWQ\*: for installation in the room

DPPQ\*: for installation in the duct

These analyse the quality of the air and are ideal for air ventilation and handling systems in domestic and commercial areas.

### Main functions:

- measurement of air quality;
- quantitative analysis of contamination by parts of polluting gases;
- setting of a sensitivity threshold depending on that envisioned;
- for the ventilation of rooms only when necessary, contributing to a large energy saving.

### Technical specifications

**Power supply:** 24 Vac/dc  $\pm 10\%$ , 50/60 Hz

**Operating conditions:** 0T50 °C,  
10/90% R.H. non cond.

**Protection rating:**

- IP55 (container);
- IP67 (sensor)

**Assembly:**

- DPWQ: wall-mounted;
- DPPQ: duct

**Number of I/Os:**

- **analogue outputs:** 0 to 10 V, 4 to 20 mA

**Dimensions:**

- DPWQ\*: 95x97x30 mm; 79x81x26 mm;
- DPPQ\*: 108x70x262.5 mm;  
64x72x228.4 mm.

**Connections:** screw terminal board for cables up to 1.5 mm<sup>2</sup>



## Refrigerant gas leak detector

DPWL\*

The refrigerant gas detection sensor is a device that indicates leaks of the most common gases (R22, R134a, R404a, R407c, R410a and CO<sub>2</sub>). It can be used in stand-alone applications, integrated with Carel controllers or with third party devices. It envisions connection with the CAREL controller via the analogue, digital output or via RS485 Modbus<sup>®</sup> serial connection. When a leak above a certain concentration is detected, the sensor informs the controller of the alarm and locally activates an audible and visual signal and a relay (SPDT) at the same time. It offers the advantage of intervening immediately on gas leaks, thus preventing unit standstill and guaranteeing the safety of persons in the vicinity.

Its installation ensures compliance with the European F-GAS and EN378 and ASHRAE 15 standards.

### Technical specifications

**Power supply:** 12 to 24 Vac/Vdc  $\pm 20\%$   
50/60 Hz

**Operating conditions:**

- semicond. ver. -20T50°C;
- infrared ver. -40T50°C 80% R.H. non condensing.

**Protection rating:**

- semicond. ver. IP41;
- infrared ver. IP66.

**Assembly:** wall-mounted

**Number of I/Os:**

- **analogue outputs:** configurable 0 to 5 V,  
1 to 5 V, 0 to 10 V, 2 to 10 V, 4 to 20 mA;
- **digital outputs:** 1 amp at 24 Vac/Vdc.

**Serial Ports:** RS485 Modbus<sup>®</sup>

**Connections:** disconnectable clamps,  
0.5 mm<sup>2</sup> cable cross-section



## Temperature probes with NTC thermistor

NTC\*HP\*, NTC\*WP\*, NTC\*WH\*, NTC\*WF\*,  
NTC\*HF and NTC\*HT, NTCINF\*, NTC\*PS\*

CAREL offers a range of sensors with different features for the various controllers, suitable for different applications mainly in the HVAC/R market sector.

The accuracy obtained thanks to the technical solutions used in developing the sensor, the reliability as a result of the tests to which they are subjected, mean that CAREL NTC probes are reliable transducers for measuring temperature at a low cost.

Probes for socket assembly are available in strips for installation on piping for pass-through with or without pre-heater, to measure the core temperature of the product, and a sensor for estimating product temperature.

### Technical specifications

**Operating conditions:** -50T105 °C

**Protection rating:** IP67 and IP68

**Assembly:** depending on the model

**Dimensions:** depending on the model



## Immersion probes

TSN\* and TSC\*= NTC version  
TST\* and TSM\*= Pt1000 version  
TSOPZ= accessories (connectors, fittings, housing...)

CAREL offers a range of TS\* series immersion probes in NTC and Pt1000 models, suitable exclusively for hydronic applications.

Quick installation, fast response of the sensor an excellent price/performance ratio are features on which this product range is based.

Connectors are available with cables, fittings and the socket as accessories.

### Technical specifications

**Operating conditions:** -40T90 °C,  
-40T120 °C

**Assembly:** on piping

**Dimensions:**

- TSN\* and TSC\*: 1/8" GAS x 5 mm
- TST\* and TSM: M14 x23 mm with 2 m cable



## Temperature probes with PTC, Pt100, Pt1000 sensor

PTC\*

The PTC temperature probes represent a possible solution for both cooling and heating applications, used to measure temperature within the operating range, -50T100 °C and 0T150 °C.

PT100\*

The PT100 probes represent the ideal solution for all applications in which it is necessary to measure temperatures within the range from -50 to 400 °C (depending on the models).

PT1\*HP\*, PT1\*WP\*, PT1\*WF\*, PT1\*HF\*,  
PT1\*HT\*, PT1\*PS; TSQ\*

The Pt1000 probes (PT1\* and TSQ\*) are suitable for all those applications in which it is necessary to measure temperatures in a range from -50 to 250 °C (TSQ\*) and from -50 to 105 °C (PT1\*), maintaining accuracy also over long distances..

Probes for socket assembly are available in strips for installation on piping for pass-through with or without pre-heater, to measure the core temperature of the product, and a sensor for estimating product temperature.

### Technical specifications

**Operating conditions:** -50T105 °C,  
-50T250 °C, -50T350 °C

**Protection rating:** IP65 and IP67

**Dimensions:** depending on the model



## Pressure transducers 4 to 20 mA series C and D

SPKT\*C\*, SPK1\*, SPK2\*, SPK3\*, SPKT\*D\*

The pressure transducers supply an analogue current signal (4 to 20 mA). They are used particularly in refrigeration and air conditioning to measure pressure in cooling circuits, but their high performance allows their use in almost all other applications. Compatible with all types of refrigerant. They are available with male and female connection for the C series and only female for the D series.

### Technical specifications

**Power supply:** 8 to 28 Vdc  $\pm 20\%$

**Operating conditions:**

- -25T80 °C (male);
- -40T135 °C (female).

**Protection rating:** IP65 (IP67 with built-in connector)

**Number of I/Os:**

- analogue outputs: 4 to 20 mA

**Dimensions:** depending on the model

**Connections:** Packard



## Ratiometric pressure transducers 0 to 5 V series S

SPKT\*S\*

The Carel 5 V ratiometric pressure transducers (Sealing) have been developed to be used in commercial refrigeration and air conditioning applications. They are completely hermetic and can be installed directly in contact with the piping, in conditions with the refrigerant fluid lower than the dew point (it is not necessary to use the capillary positioned between piping and sensor). Available with female connection only

### Technical specifications

**Power supply:** 5 Vdc

**Operating conditions:** -40T125 °C

**Protection rating:** IP67

**Number of I/Os:**

- analogue outputs: 0.5 to 4.5 V

**Dimensions:**  $\varnothing 21 \times 51$  mm

**Connections:** Packard



## Ratiometric pressure transducers 0 to 5 V series R

SPKT\*R\*

These pressure transducers supply a 0 to 5 V ratiometric signal (automotive standard). They can be used in air conditioning and refrigeration systems, with exception to those containing ammonia. Available with female connection only.

### Technical specifications

**Power supply:** 4.5 to 5.5 Vdc

**Operating conditions:** -40T135 °C

**Protection rating:** IP65

**Number of I/Os:**

- analogue outputs: 0.5 to 4.5 V

**Dimensions:** 20x51.6 mm

**Connections:** Packard



## Combined pressure-temperature transducer

SPKP\*

The combined pressure and temperature transducer has been developed for applications in the refrigeration and air conditioning sectors. The sensor-pressure transducer is 0 to 5V ratiometric, while the temperature sensor is NTC. It offers the advantage of having a single component with a quicker and more accurate measurement. Typical use is in combination with a driver for electronic expansion valves in refrigeration and air conditioning applications.

### Technical specifications

**Power supply:** 4.5 to 5.5 V

**Operating conditions:** -40T120 °C

**Protection rating:** IP67

**Number of I/Os:**

- **analogue outputs:** 0.5 to 4.5 V and NTC 10K at 25°C (non STD)

**Dimensions:** Ø= 23.80 x 65 mm

**Connections:** 4-way AMP

Micro-Quadlok System connector



## Differential pressure transducers

SPKD\*

The differential pressure transducers use a ceramic sensor that supplies a voltage or current signal that is calibrated and compensated by temperature. They are particularly suitable for measuring low pressure values in air conditioning systems, laboratories and clean rooms (non-corrosive air and gas)

The main features are:

- compact construction;
- easy and simple installation;
- model can be configured for 4 different pressure ranges.

### Technical specifications

**Power supply:** 15 to 36 Vdc

**Operating conditions:** 0T50 °C

**Protection rating:** IP65

**Assembly:** panel

**Number of I/Os:**

- **analogue outputs:** 4 to 20 mA

**Dimensions:** 70x108x73.5 mm

**Connections:** screw terminal board for

cables up to 1.5 mm<sup>2</sup>



## Differential pressure switch

DCPD0\*0\*00

Device used to control the differential pressure of the air for filters, fans, air ducts, air-conditioning and ventilation units. The pressure switch is particularly suitable for control and safety in air-conditioning systems for indicating fan shutdown and clogging of the filters. It is applied in environments with non-aggressive and non-flammable air and gases, also in the version with assembly kit.



## Anti-freeze thermostat

DCTF000320

This manages heat exchanger (evaporation coils) and electric heater protection for air conditioning and refrigeration systems. It can be used in all applications where it is necessary to control the temperature in a certain point of the system in order to prevent it dropping below a pre-established safety value. Moreover, the thermostat offers self-protection if the sensitive element should breakdown.



## Airflow switch

DCFL000100

Flow switch for controlling air or non-aggressive gas flow inside the distribution ducts for air conditioning and air handling units. It signals the lack of or excessive decrease in flow rate in the duct, thus activating the switch.



## Flood detector

FLOE\*

The flood sensor device can detect the presence of water in an environment. It is usually used for the protection against the flooding of datacentres, offices, laboratories, special rooms. It is made up of a detector (normally positioned on the electric control board) and a sensor (positioned on the point to be controlled).

When the water comes into contact with the sensor, the detector immediately signals an alarm, switching over relay status.



## Smoke and fire detector

SFF\*

The smoke and heat detectors are electronic devices that can quickly detect dangerous and sudden temperature changes or the increase in fumes. Their peculiarity lies in the self-calibration, i.e. the possibility to maintain the guarantee of activation over time, adapting perfectly to the different environmental conditions, without losing sensitivity.

## Active temperature and humidity probes

Models	temper. range	temper. range	output
<b>Active probes for rooms, power supply 9 to 30 Vdc/12 to 24 Vac</b>			
DPWT010000	-10T60 °C		selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPWT011000	-10T60 °C		NTC 10 K at 25 °C
DPWC111000	-10T60 °C	10...90% R.H.	• NTC 10 K at 25 °C (temperature) • selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA (humidity)
DPWC110000	-10T60 °C	10...90% R.H.	selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPWC115000	-10T60 °C	10...90% R.H.	• NTC 10 K at 25 °C (temperature) • 0 to 10 Vdc (humidity)
DPWC112000	-10T60 °C	10...90% R.H.	0 to 10 Vdc
DPWC114000	-10T60 °C	10...90% R.H.	opto-isolated RS485 serial
DPWT014000	-10T60 °C		opto-isolated RS485 serial

<b>Active probes for industrial environments, power supply 9 to 30 Vdc/12 to 24 Vac</b>			
DPPT010000	-20T70 °C		selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPPT011000	-20T70 °C		NTC 10 K at 25 °C
DPPC111000	-10T60 °C	10...90% R.H.	• NTC 10 K at 25 °C (temperature) • selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA (humidity)
DPPC110000	-10T60 °C	10...90% R.H.	selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPPC210000	-20T70 °C	0...100% R.H.	selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPPC112000	-10T60 °C	10...90% R.H.	0 to 10 Vdc
DPPC212000	-20T70 °C	0...100% R.H.	0 to 10 Vdc
DPPT014000	-10T60 °C	10...90% R.H.	opto-isolated RS485 serial
DPPC114000	-10T60 °C	10...90% R.H.	opto-isolated RS485 serial
DPPC214000	-20T70 °C	0...100% R.H.	opto-isolated RS485 serial

<b>Active probes for ducts, power supply 9 to 30 Vdc/12 to 24 Vac</b>			
DPDT010000	-20T70 °C		selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPDT011000	-20T70 °C		NTC 10 K at 25 °C
DPDC111000	-10T60 °C	10...90% R.H.	• NTC 10 K at 25 °C (temperature) • selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA (humidity)
DPDC110000	-10T60 °C	10...90% R.H.	selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPDC210000	-20T70 °C	0...100% R.H.	selectable 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPDC112000	-10T60 °C	10...90% R.H.	0 to 10 Vdc
DPDC212000	-20T70 °C	0...100% R.H.	0 to 10 Vdc
DPDT014000	-20T70 °C		opto-isolated RS485 serial
DPDC114000	-10T60 °C	10...90% R.H.	opto-isolated RS485 serial
DPDC214000	-20T70 °C	0...100% R.H.	opto-isolated RS485 serial

Container protection rating:	IP55 for DPD, DPP IP30 for DPW	for duct and technical environment) (wall-mounted)
Sensitive element protection rating	IP30 IP40 IP54	for DPW for DPD for DPP
Time constant, temperature	in still air in ventilated air (3 m/s)	300 s 60 s
Time constant, humidity	in still air in ventilated air (3 m/s)	60 s 20 s

Models	temperature range	output
<b>Active probes for immersion and power supply environment 9 to 30 Vdc/12 to 24 Vac</b>		
ASIT030000	-30T90 °C	selectable -0.5 to 1 Vdc/4 to 20 mA
<b>Active probes for universal power supply use 9 to 30 Vdc/12 to 24 Vac</b>		
ASET030000	-30T90 °C	selectable -0.5 to 1 Vdc/4 to 20 mA
ASET030001	-30T90 °C	selectable -0.5 to 1 Vdc/4 to 20 mA
ASET030002	-30T150 °C	selectable -0.5 to 1 Vdc/4 to 20 mA

## Passive temperature probes

Models	range	accuracy	constants (time) in fluid	IP
<b>NTC*</b>				
NTCI*HP**	-50T105 °C	25 °C: ±1%	25 s	IP67
NTCI*WF**	-50T105 °C	25 °C: ±1%	10 s	IP67
NTCI*WP**	-50T105 °C	25 °C: ±1%	30 s	IP68 limited
NT*WG**	-50T105 °C	25 °C: ±1%	20 s	IP67
NT*HT**	0T150 °C	±0.5 °C; -10T50 °C - 25 °C: ±1.0 °C; -50T85 °C ±1.6 °C; +85T120 °C - ±2.1 °C; +120T150 °C	30 s	IP55
NT*HF**	-50T90 °C	±0.5...25 °C; ±1.0 °C from -50T90 °C	50 s	IP55
NT*WH*	-50T105 °C	25 °C; ±1%	30 s	IP68 permanent
NTC*PS*	-50T105 °C	25 °C: ±1%	50 m	IP67
NTCINF	-50T110 °C	25 °C: ±1%	45 s	IP67
TSN*	-40T120 °C	25 °C: ±1%	30 s	IP68
TSC*	-40T90 °C	25 °C: ±1%	45 s	IP68
<b>PT100*</b>				
PT100000A1	-50T250 °C	IEC 751 class B	20 s	IP65
PT100000A2	-50T400 °C	IEC 751 class B	20 s	IP65
<b>PT1000</b>				
PT1*HP*	-50T105 °C	IEC 751 class B	10 s	IP67
PT1*WF*	-50T105 °C	IEC 751 class B	15 s	IP67
PT1*WP*	-50T105 °C	IEC 751 class B	25 s	IP68 limited
PT1*HF*	-50T105 °C	IEC 751 class B	15 s	IP67
PT1*HT*	-50T250 °C	IEC 751 class B	20 s	IP67
PT1*PS*	-50T105 °C	IEC751 class B	50 m	IP67
TSQ15MAB00	-50T250 °C	IEC 751 class B	10 s	IP65
TST*	-40T120 °C	IEC 751 class B	10 s	IP68
TSM*	-40T90 °C	IEC 751 class B	10 s	IP68
<b>PTC</b>				
PTCO*0000	0T150 °C	±2 °C; 0T50 °C - ±3 °C; -50T90 °C - ±4 °C; 90T120 °C	15 s	IP65
PTCO*W*	-50T100 °C	±2 °C; 0T50 °C - ±3 °C; -50T90 °C - ±4 °C; 90T120 °C	15 s	IP67
PTCO3000*1	-50T120 °C	±2 °C; 0T50 °C - ±3 °C; -50T90 °C - ±4 °C; 90T120 °C	15 s	IP67

## Air quality probes

Models	type	output
<b>For rooms, 24 Vac/15 to 36 Vdc</b>		
DPWQ306000	V.O.C.	0 to 10 Vdc or 4 to 20 mA
DPWQ402000	CO2	0 to 10 Vdc
DPWQ502000	V.O.C. and CO2	0 to 10 Vdc
<b>For ducts, 24 Vac/15 to 36 Vdc</b>		
DPDQ306000	V.O.C.	0 to 10 Vdc or 4 to 20 mA
DPDQ402000	CO2	0 to 10 Vdc
DPDQ502000	V.O.C. and CO2	0 to 10 Vdc

## Pressure transducers

Models	power supply:	operating temperature	range	accuracy	output signal	constants (time)	IP
<b>SPKT00-R0: 0 to 5 V ratiometric - female series R</b>							
*53*	4.5 to 5.5 Vdc	-40T135 °C	4.2 relative bar	±1,2%	0.5 to 4.5 V	10 ms	IP65 <sup>1</sup>
*13*	4.5 to 5.5 Vdc	-40T135 °C	9.3 relative bar	±1,2%	0.5 to 4.5 V	10 ms	IP65 <sup>1</sup>
*33*	4.5 to 5.5 Vdc	-40T135 °C	34.5 relative bar	±1,2%	0.5 to 4.5 V	10 ms	IP65 <sup>1</sup>
*43*	4.5 to 5.5 Vdc	-40T135 °C	17.3 relative bar	±1,2%	0.5 to 4.5 V	10 ms	IP65 <sup>1</sup>
*B6*	4.5 to 5.5 Vdc	-40T135 °C	45.0 relative bar	±1,2%	0.5 to 4.5 V	10 ms	IP65 <sup>1</sup>
*F3*	0.5 to 5.5 Vdc	-40T135 °C	20 relative bar	±1,2%	0.5 to 4.5 V	10 ms	IP65 <sup>1</sup>
*E3*	0.5 to 5.5 Vdc	-40T135 °C	12.8 relative bar	±1,2%	0.5 to 4.5 V	10 ms	IP65 <sup>1</sup>
<b>SPK*: 4 to 20 mA - male series C</b>							
*1000000	8 to 28 Vdc	-25T80 °C	-0.5 to 7 bar	±1% fs	4 to 20 mA	-	IP67
*240000	8 to 28 Vdc	-25T80 °C	-1 to 24 bar	±1% fs	4 to 20 mA	-	IP67
*2500000	8 to 28 Vdc	-25T80 °C	0 to 25 bar	±1% fs	4 to 20 mA	-	IP67
*3000000	8 to 28 Vdc	-25T80 °C	0 to 30 bar	±1% fs	4 to 20 mA	-	IP67
<b>SPK*C*: 4 to 20 mA - female series C</b>							
*T0021C0	8 to 28 Vdc	-40T135 °C	-0.5 to 7 bar	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65 <sup>1</sup>
*T0011C0	8 to 28 Vdc	-40T135 °C	0 to 10 bar	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65 <sup>1</sup>
*T0031C0	8 to 28 Vdc	-40T135 °C	0 to 30 bar	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65 <sup>1</sup>
*T0041C0	8 to 28 Vdc	-40T135 °C	0 to 18.2 bar	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65 <sup>1</sup>
*T00B1C0	8 to 28 Vdc	-40T135 °C	0 to 44.8 bar	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65 <sup>1</sup>
*T00G1C0	8 to 28 Vdc	-40T135 °C	0 to 60 bar	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65 <sup>1</sup>
*T00D8C0	8 to 28 Vdc	-40T100 °C	0 to 150 bar	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65 <sup>1</sup>
<b>SPK*: 4 to 20 mA - female series D</b>							
*T0021D0	8 to 28 Vdc	-40T135 °C	-0.5 to 7 bar	±1% fs; 0T40 °C	4 to 20 mA	<10 ms	IP65
*T0011D0	8 to 28 Vdc	-40T135 °C	0 to 10 bar	±1% fs; 0T40 °C	4 to 20 mA	<10 ms	IP65
*T0041D0	8 to 28 Vdc	-40T135 °C	0 to 18.2 bar	±1% fs; 0T40 °C	4 to 20 mA	<10 ms	IP65
*T0031D0	8 to 28 Vdc	-40T135 °C	0 to 30 bar	±1% fs; 0T40 °C	4 to 20 mA	<10 ms	IP65
*T00B1D0	8 to 28 Vdc	-40T135 °C	0 to 44.8 bar	±1% fs; 0T40 °C	4 to 20 mA	<10 ms	IP65
<b>SPK*: 0 to 5 V - female series S</b>							
*T0051S0	0.5 to 4.5 Vdc	-40T125 °C	-1 to 4.2 bar	±1% fs; 0T50 °C	0.5 to 4.5 V	<10 ms	IP67
*T0011S0	0.5 to 4.5 Vdc	-40T125 °C	-1 to 9.3 bar	±1% fs; 0T50 °C	0.5 to 4.5 V	<10 ms	IP67
*T00E1S0	0.5 to 4.5 Vdc	-40T125 °C	-1 to 12.8 bar	±1% fs; 0T50 °C	0.5 to 4.5 V	<10 ms	IP67
*T0041S0	0.5 to 4.5 Vdc	-40T125 °C	0 to 17.3 bar	±1% fs; 0T50 °C	0.5 to 4.5 V	<10 ms	IP67
*T00F1S0	0.5 to 4.5 Vdc	-40T125 °C	0 to 20.7 bar	±1% fs; 0T50 °C	0.5 to 4.5 V	<10 ms	IP67
*T0031S0	0.5 to 4.5 Vdc	-40T125 °C	0 to 34.5 bar	±1% fs; 0T50 °C	0.5 to 4.5 V	<10 ms	IP67
*T00B1S0	0.5 to 4.5 Vdc	-40T125 °C	0 to 45 bar	±1% fs; 0T50 °C	0.5 to 4.5 V	<10 ms	IP67

<sup>1</sup> with built-in IP67 connector

## Differential air pressure transducers

Models	power supply:	input current	differential pressure range	differential pressure accuracy full scale	output signal	filtered signal	IP
SPKD00C5N0	15 to 30 Vdc	≥20 mA	-50 to 50 Pa -100 to 100 Pa 0 to 50 Pa 0 to 100 Pa	±3%	4 to 20 mA	selectable 1 or 10 s	IP65
SPKTD00U5N0	15 to 30 Vdc	≥20 mA	0 to 1000 Pa 0 to 2000 Pa 0 to 3000 Pa 0 to 5000 Pa	±3%	4 to 20 mA	selectable 1 or 10 s	IP65

## Pressure switches and flow switches

Operating conditions	sensor	range	accuracy	maximum current	output signal	contacts	IP
<b>DCPD0*0100: pressure switch for duct</b>							
-25T85 °C max 50 mbar	silicone membrane	0.5 to 5 mbar	0.2 ± 15% mbar	1.5 (A) 25 Vac 0.1 A 24 Vac	NO...NC voltage-free contact	AgCdO contacts watertight switch	IP54
<b>DCPD0*1100: pressure switch for duct</b>							
-20T85 °C max 50 mbar	silicone membrane	0.2 to 2 mbar	0.2 ± 15% mbar	1.5 (A) 25 Vac 0.1 A 24 Vac	NO...NC voltage-free contact	AgCdO contacts watertight switch	IP54
<b>DCFL000100: flow switches</b>							
-40T85 °C	silicone membrane	2.5 to 9.2 m/s (start) 1 to 8 m/s (stop)		15 (8) A 24/250 Vac	NO...NC voltage-free contact	watertight switch	IP65

\*: "1" with assembly kit



## Wireless devices for monitoring temperature, humidity, light and energy

The CAREL rTM monitoring system, is used to monitor temperature, humidity, light intensity and pulse counters from energy meter modules, in combination with CAREL supervisory systems or programmable controllers with special software.

### Benefits

Ideal for retrofits on existing systems, being easy to install:

- no electrical connections required;
- flexible layout in the event of structural modifications;
- simple installation and maintenance;
- existing controllers do not need to be replaced, as the system is completely independent and can be integrated into any installation;
- simplifies monitoring of the installation (including over remote connections). In the event of alarms, operating status can be notified via SMS, email, FAX;
- supervisory systems can be used to process and send customised reports and data log files;

### Composition

- Battery or mains powered sensors for measuring the temperature of cabinets and cold rooms (°C). Available in versions with built-in sensors (BP) and external sensors (EP);
- Battery powered sensors for measuring temperature, humidity, light intensity in

rooms, type SA (°C - RH%) or SI (°C - r.H.% - Lux).

- Pulse counter from energy meter modules for monitoring electricity, water and gas consumption, battery powered (CI) or mains powered (RC).
- RA (Router-Actuator) I/O module, to measure the status of the inputs and activate general loads. Can be configured as a thermostat with direct/reverse logic.
- RB (Router-Bridge) to connect instruments locally over Modbus® RS485 that are not accessible to cabled lines.

The devices use a 2.4 GHz wireless connection (16 channels, 2405 to 2480 MHz) with ZigBee communication protocol and MESH networks with up to 7 hops, automatic adaptation of communication between devices, optimising wireless communication routes when the devices are not directly reachable from the Access Point, so as to guarantee continuous communication. Battery or mains powered sensors. The battery powered sensors require no electrical connection and typical battery life is 5/8 years; mains powered devices require no routine maintenance. All wireless sensors send the data measured to the Access Point via radio; this acquires information from the sensors and then forwards it to the CAREL supervisory system or controller, over the Modbus® RTU RS485 serial network.

The system can be easily extended and modified following installation.

Handheld configuration devices are available for simple configuration and installation.

To increase wireless coverage, Routers are available that extend the area of transmission. These devices are available as Router only, RO, or combined with other functions:

- EP1 Router-Sensor (same functions as the EP sensor);
- RB Router-Bridge type (to extend the RS485 wired network);
- RA Router-Actuator, to manage I/Os via a remote connection or used as a local thermostat monitored via the wireless network.



## BP - temperature sensor

WS01U01M0\*

Sensor suitable for installation in refrigeration cabinets. The local button disables the high temperature signal alarm when the cabinet is off or being cleaned. The sensor is ready to be installed directly inside the cabinet with its own fastening bracket. The rear wall has metal shielding that, combined with thermal insulation inside the shell, offers better heat insulation, eliminating the influence of the surface of the refrigerated cabinet.

### Functions implemented

- instant temperature;
- product simulation temperature;
- monitoring of temperature thresholds for high temperature (HACCP) or low temperature alarm signals (to prevent products from freezing);
- disable high temperature alarm from local "Clean" button;
- battery level control in mV and residual charge in mAh;
- wireless signal level control.

### Technical specifications

**Power supply:** 3.6 V lithium battery 2500 mAh, "AA" size

**Operating conditions:** -40T50 °C 80% r.H. non-condensing

**Degree of protection:** IP65

**Assembly:** wall-mounted on bracket

**Dimensions:** 83.9x71.6x34 mm



## EP - temperature sensor

WS01W02M00

The EP sensor (External Probe) is used inside cabinets or cold rooms to monitor temperature in combination with supervisory systems. It transmits temperature data measured by the two NTC probes, and the status of two digital inputs, configurable as "door status" and "defrost status" or for generic use.

### Functions implemented

- instant temperature read by the two sensors;
- monitoring of temperature thresholds for high temperature (HACCP) or low temperature alarm signals;
- battery level control in mV;
- wireless signal level control;

### Technical specifications

**Power supply:** 3.6 V lithium battery 2500 mAh, "AA" size

**Operating conditions:** 0T50°C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Number of I/Os:**

- **analogue inputs:** 2 NTC 10 K at 25°C
- **digital inputs:** 2 (voltage-free contact)

**Dimensions:** 94x102x40 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## SA - room temperature and humidity sensor

WS01G01M00

The SA wireless room sensor is battery-powered and is installed inside rooms to monitor temperature and humidity.

### Functions implemented

- instant temperature;
- instant humidity;
- monitoring of temperature and humidity thresholds;
- battery level control in mV;
- wireless signal level control.

### Technical specifications

**Power supply:** 3.6 V lithium battery 2500 mAh, "AA" size

**Operating conditions:** -10T60°C 80% r.H. non-condensing

**Degree of protection:** IP30

**Assembly:** wall-mounted

**Dimensions:** 127x80x30 mm



## SI - temperature, humidity and light sensor

WS01F01M00

The SI wireless industrial sensor is battery-powered and is installed inside rooms to monitor temperature, humidity and light intensity.

### Functions implemented

- instant temperature;
- instant humidity;
- instant light intensity;
- monitoring of temperature, humidity and light intensity thresholds;
- battery level control in mV;
- wireless signal level control.

### Technical specifications

**Power supply:** 3.6 V lithium battery 2500 mAh, "AA" size

**Operating conditions:** -20T70°C 80% r.H. non-condensing

**Degree of protection:** IP55 case, IP40 sensor cap

**Assembly:** wall-mounted

**Dimensions:** 94x153x40 mm



## CI - pulse counter

WS01E02M00

The CI battery-powered wireless pulse counter is a device used together with energy meters to measure electricity, gas, or water consumption, without the need to install electrical cables.

It can manage two energy meters using two digital inputs, and is ready for connection of two external NTC temperature probes. Closing of the contacts on the digital inputs activates two separate pulse counters.

The number of pulses is converted to an energy value (KW, m<sup>3</sup>) by the CAREL supervisor or controller with special software, so as to total and monitor energy utility consumption. It can manage up to two energy meters configured to send pulse signals.

### Functions implemented

- two separate pulse counters;
- battery level control in mV;
- wireless signal level control;
- instant temperature read by two NTC probes;
- temperature difference between NTC probes.

### Technical specifications

**Power supply:** 3.6 V lithium battery 2500 mAh, "AA" size

**Operating conditions:** 0T50°C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Number of I/Os:**

- **analogue inputs:** 2 NTC 10 K at 25°C;
- **digital inputs:** 2 (voltage-free contact)

**Dimensions:** 94x108x40 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## Access Point

WS01AB2M20

This device acquires data via the wireless signals sent by the sensors or Routers over the ZigBee™ network, and then forwards these over a Modbus® RTU RS485 serial line. A CAREL supervisor (PlantVisorPRO or PlantWatchPRO) or controller can be used to manage the rTM system variables. Up to 30 sensors can be bound to each Access Point, and a maximum of 60 when adding one or more Routers. Up to 7 Access Points can be connected to the same Modbus RS485 serial network, for a total of 111 sensors on each serial line.

### Technical specifications

**Power supply:** 12/24 Vac/Vdc ±10%;

**Operating conditions:** 0T50°C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Serial ports:** RS485 Modbus®

**Dimensions:** 94x300x40 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## RO - router

WS01RC1M20

This device is used when the distance between sensor and Access Point exceeds 30 m, or alternatively the number of network nodes (sensors) exceeds a total of 30. A maximum of 60 Routers can be installed in the wireless network, 48 of which can be accessed by the supervisor. The Access Point automatically assigns the serial address in the order in which these are "bound" (from 200 to 247).

### Technical specifications

**Power supply:** 230 Vac -20/+10 %;

**Operating conditions:** 0T50 °C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Dimensions:** 98x300x44 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## RB - router bridge

WS01RB2M20

This device is used to connect Modbus® RS485 instruments via radio when these are not accessible using cabled lines, using a wireless connection to send data from the instruments to the supervisor.

The instruments are connected locally on the serial line, which acquires data and forwards them to the Access Point.

The Access Point is physically connected to the supervisor, and the instruments connected locally to the Router-Bridge devices are logically assigned to the main network (where the Access Point is physically connected).

This is an excellent solution for all refrigeration and air-conditioning applications and others with similar needs.

The device is a solution for binding all wired devices that require wireless communicate.

It also includes the Router function.

### Technical specifications

**Power supply:** 12/24 Vac/Vdc ±10%;

**Operating conditions:** 0T50 °C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Serial ports:** RS485 Modbus®

**Dimensions:** 94x300x40 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## EP1 - router sensor

WS01VB2M10

This integrates the same functions as the EP battery-powered sensor and the RO Router, and features two network addresses (one for the sensor and one for the router).

### Functions implemented

- instant temperature read by the two sensors;
- monitoring of temperature thresholds for high temperature (HACCP) or low temperature alarm signals;
- wireless signal level control;

### Technical specifications

**Power supply:** 12/24 Vac/Vdc ±10%;

**Operating conditions:** 0T50 °C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Number of I/Os:**

- **analogue inputs:** 2 NTC 10 K at 25°C;
- **digital inputs:** 2 (voltage-free contact)

**Dimensions:** 94x300x40 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## RC - router/pulse counter

WS01N02M20

This integrates the same functions as the CI pulse counter and the RO Router, and features two network addresses (one for the pulse counter and one for the router).

### Functions implemented

- management of two separate pulse counters;
- wireless signal level control;
- instant temperature measurement by two NTC probes;
- temperature difference between NTC probes.

### Technical specifications

**Power supply:** 12/24 Vac/Vdc  $\pm 10\%$ ;

**Operating conditions:** 0T50 °C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Number of I/Os:**

- **analogue inputs:** 2 NTC 10 K at 25°C;
- **digital inputs:** 2 (voltage-free contact)

**Dimensions:** 94x300x40 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## RA - router actuator

WS01H02M20

This module can be configured as a wireless I/O actuator for managing loads and reading generic inputs. It can be configured as a thermostat with heat-cool operating logic. When used as an I/O module, the outputs are managed directly by Modbus variables (via CAREL supervisor or controller with special software). When used as a thermostat, it sends the I/O status to the supervisor for monitoring. It also integrates the Router function and features two network addresses (one for the I/O module - thermostat and one for the router).

### Configured as an I/O module it manages:

- 2 digital inputs;
- 2 digital outputs, 1 A/24 Vac;
- 1 analogue inputs (NTC 10 K at 25°C)

### Functions implemented

- management of remote loads, reading analogue and digital inputs;
- activation of digital outputs from digital input;
- thermostat management (heat – cool);
- wireless signal level control;

### Technical specifications

**Power supply:** 12/24 Vac/Vdc  $\pm 10\%$ ;

**Operating conditions:** 0T50 °C 80% r.H. non-condensing

**Degree of protection:** IP55

**Assembly:** wall-mounted

**Number of I/Os:**

- **analogue inputs:** 1 NTC 10 K at 25°C
- **digital inputs:** 2 (voltage-free contact)
- **digital outputs:** 2 (1 A, 24 Vac)

**Dimensions:** 118x300x40 mm

**Connections:** plug-in terminals, wire size 0.5 mm<sup>2</sup>



## Handheld configuration device

WS01L01M00

The rTM handheld is a useful device for installation, commissioning and service of CAREL ZigBee™ wireless networks for the rTM system.

### Functions implemented

- reading of wireless channels occupied, performed before wireless system installation (in the field);
- measurement of wireless signal intensity from Access Point or Router;
- simplified opening and closing of the wireless network during commissioning;
- reset default parameters on Access Point and Router;
- assign serial address (ID) to the BP Sensor.

### Technical specifications

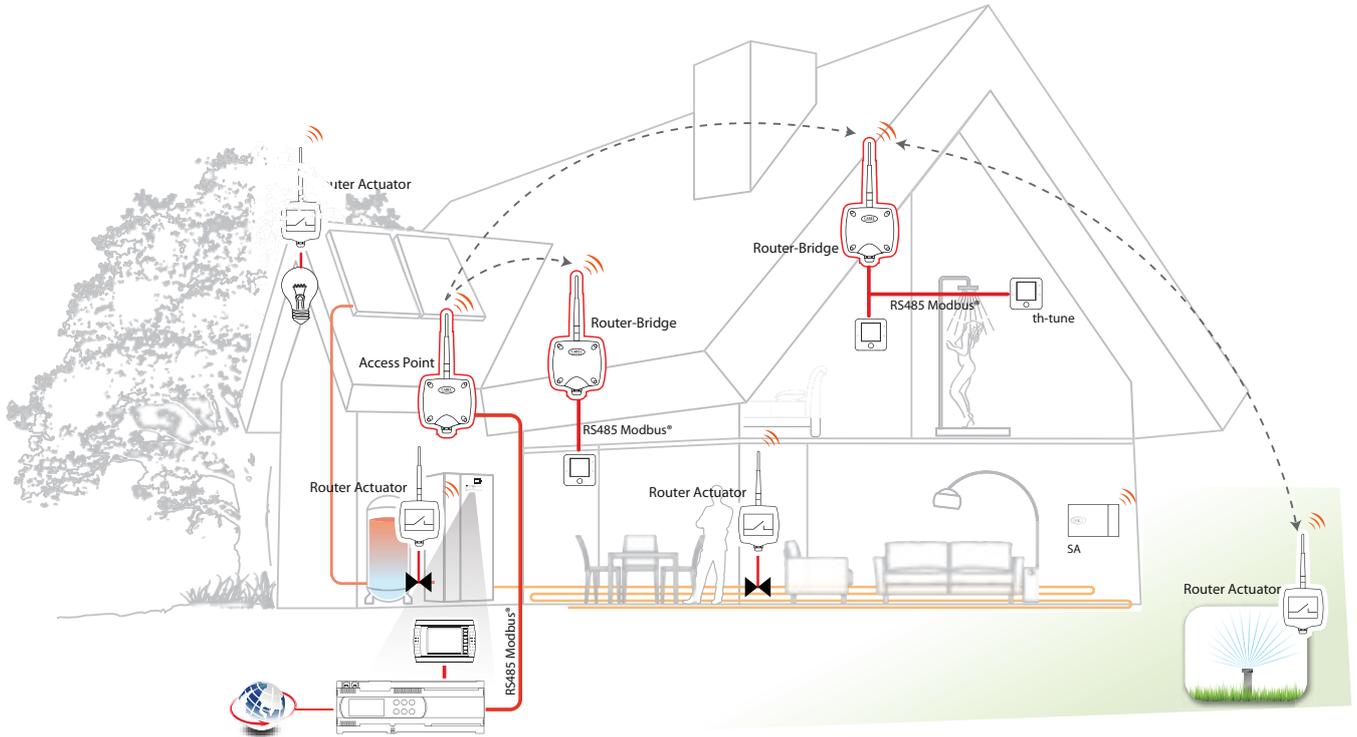
**Power supply:** 1.5V "AAA" size batteries

**Operating conditions:** 0T50 °C 80% r.H. non-condensing

**Degree of protection:** IP40

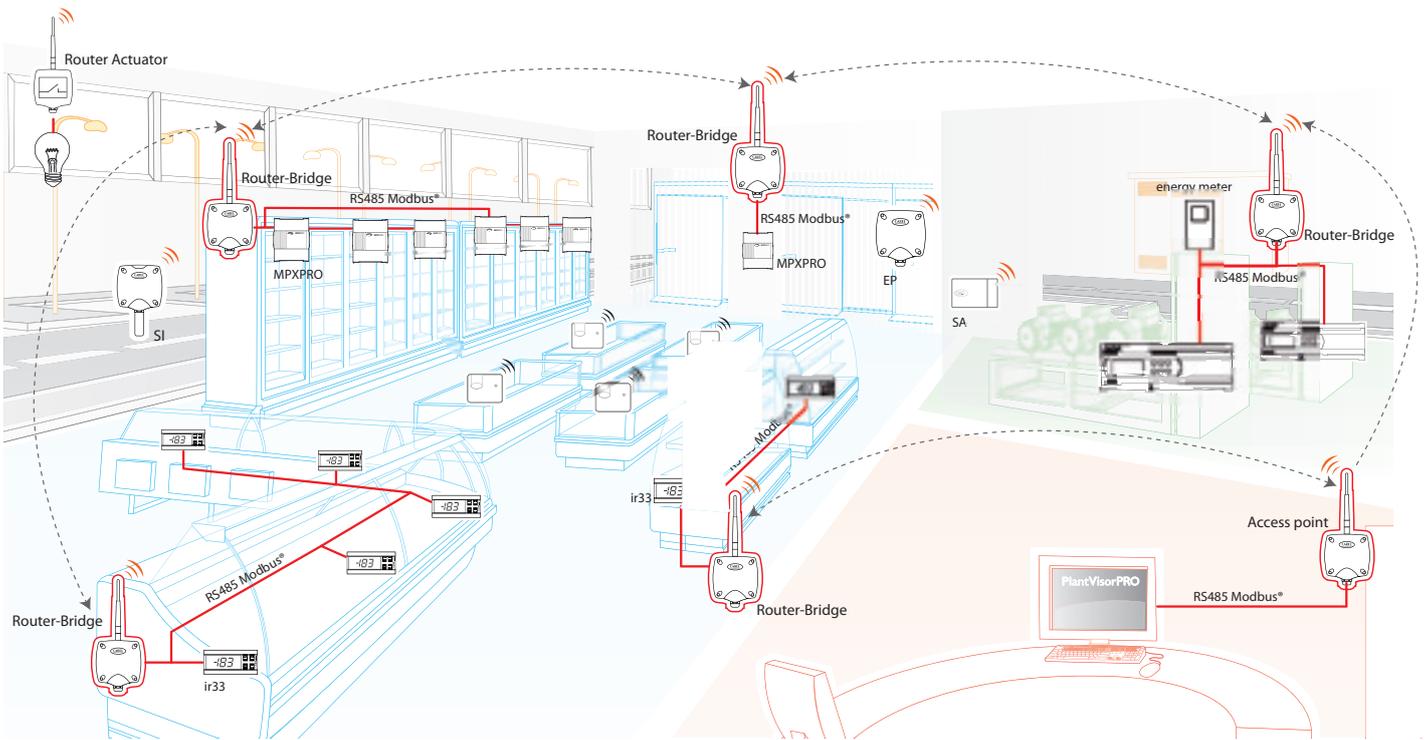
**Dimensions:** 72,5x167,5x28 mm

### Air-conditioning application example



*solution to be implemented in the application program*

### Retail application example



*solution to be evaluated according to the number of devices installed*



# Remote management and communication solutions





# Connectivity

Connectivity is the result of CAREL's years of experience in the design and production of serial devices for controlling HVAC/R units. CAREL is continuously engaged in technological evolution in the communications industry, paying attention to certain fundamental concepts.

## Connectivity

Interfaceability and compatibility with the most widespread BMS (Building Management Systems): BACnet™, LonWorks®, Modbus®, Konnex, SNMP. It thus becomes easy to:

- manage the unit remotely via modem and Internet, even with a simple browser;
- inform authorised personnel, wherever they might be, of any alarm situations, even via SMS and email;
- construct alarm logs and graphs for prompt unit diagnostics.

## Interoperability

The ability to work in distributed intelligence and with integrated solutions, acquiring and sharing information to and from third party devices for:

- better unit management;
- a higher degree of efficiency of the system (energy savings).

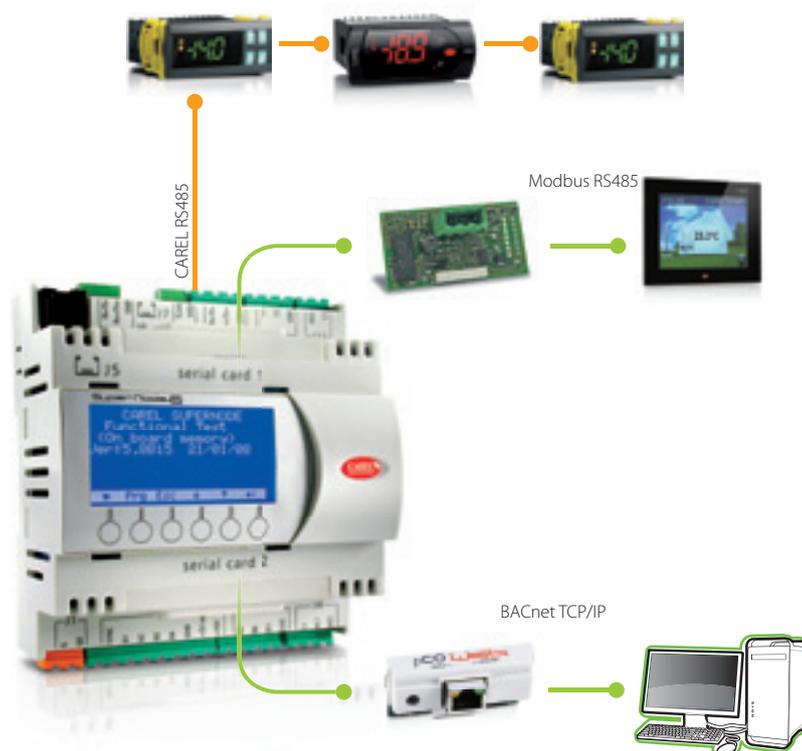
## Security

Absence of risks in transmitting information and exchanging important data, especially across networks that can be accessed by everyone.

CAREL devices, through the supervisory systems, can be equipped with:

- differentiated access to the unit according to whether the person is authorised for maintenance or supervision;
- secure access via internet or VPN (virtual private network).

## Application example





## Supernode

SN\*

Supernode, the programmable controller for managing a large flow of information. Compact (6 DIN modules) with built-in 132x64, pixel blue negative display. The keypad, located horizontally under the display and without screen printing, allows customisation of the functions for each key (shown in the last row on the display) differentiating them from screen to screen.

Supernode has 6 serial ports:

- 2 integrated RS485, one of which is opto-isolated;
- 2 slots for BMS plug-in cards;
- 2 USB ports (Master and Slave).

The fast digital input that is standard on all versions allows direct reading of energy meters.

Ideal as a system coordinator, access for two supervisory systems at the same time and masters with several serials ports makes it adaptable to all types of applications and needs.

### Technical characteristics

**Power supply:** 24 Vac -15/10%, 50/60 Hz o 48 Vdc (36 Vmin to 72 Vmax)

**Operating conditions:** -10T60 °C, 90% RH non condensing

**Protection rating:** IP20 –Front IP40

**Certification:** CE / UL

**Assembly:** DIN rail

**I/O Number:**

- **analogue inputs:** from 6 to 8
- **digital inputs:** from 4 to 6
- **analogue outputs:** 2
- **digital outputs:** 2

**Serial Ports:** pLAN, 2BMS, 1FieldBus

**Dimensions:** 6 DIN (105x110x60)

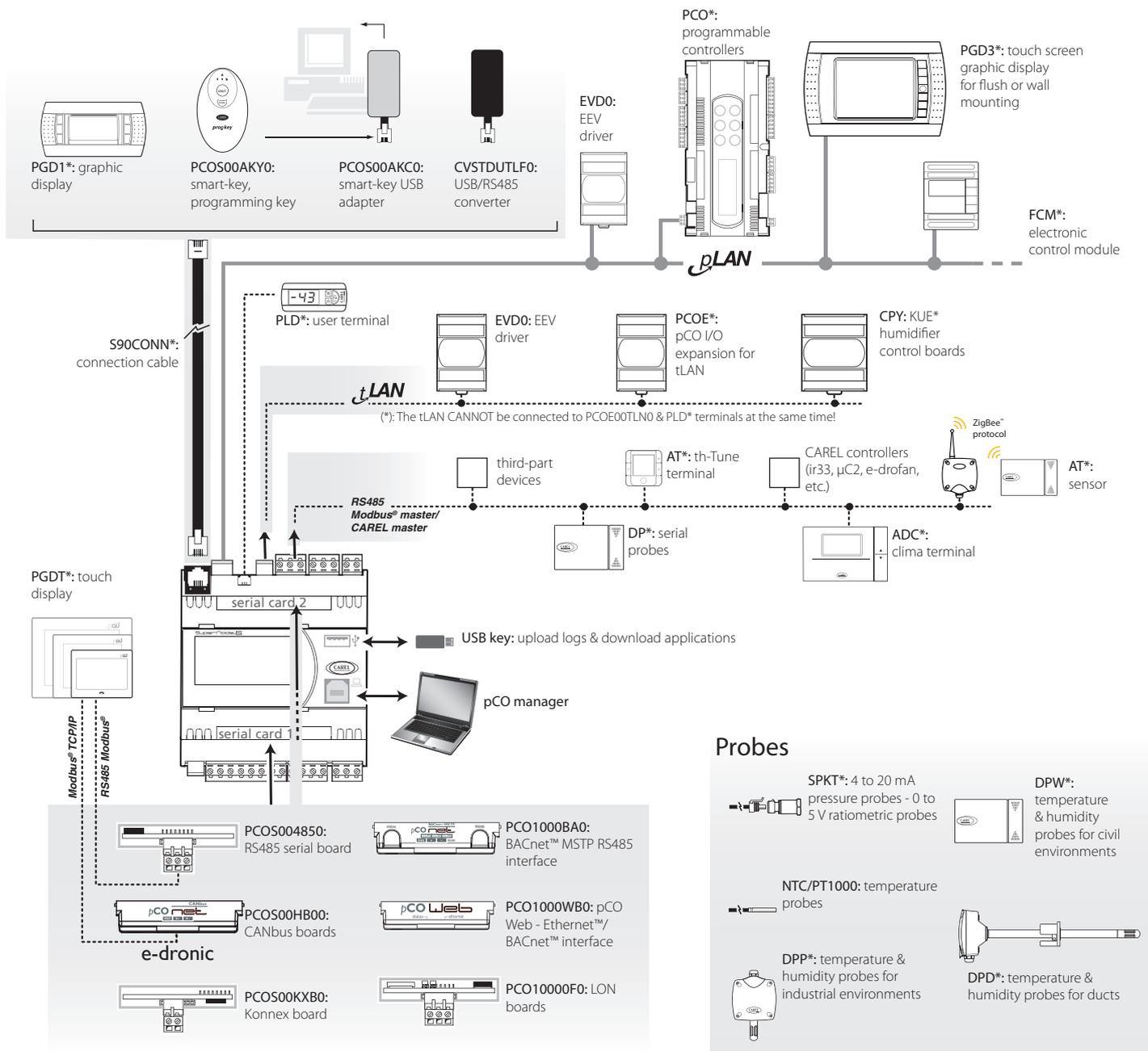
**Connections:** plug-in terminals

Features	SNS*M
Flash Memory 4 Mb	●
Ram 512 kb	●
Nand Flash 32 Mb	●
Real Time Clock	●
Max no. serial ports	6
pLAN	●
RS485 opto-isolated/tLAN/PST-PLD	●
Serial 1 card connector	●
Serial 2 card connector	●
USB Master Port	□
USB Slave Port	□
Preset programming key	●
Built-in 132x64 pixel blue negative display	□
Built-in 6 LED + 1 key user interface	□
Black box	●
Maximum no. inputs	7
PT1000 inputs	2
Inputs 0 to 10V	6
Inputs 0 to 1V	6
Inputs 4 to 20mA or 0 to 20mA	2
NTC inputs	6
Inputs 0 to 5 Vdc, ratiometric	6
Voltage-free contact digital inputs	3
Fast digital inputs for pulse counter	1
Input selection via software	●
Max no. analogue outputs	2
0 to 10 Vdc outputs	1
PWM outputs (cut-off)	1
Max no. digital outputs	2
SPST relay outputs	1
SPDT relay outputs	1
Max no. SSR outputs	2
Power supply 48 Vdc	●
Power supply 24 Vdc	●

● standard

□ optional

# OVERVIEW DRAWING Supernode



pCOWeb/Net

LONWORKS

Konnex®

RS485



SNMP

Modbus® TCP/IP

remotepro



Modbus® RTU



RS485  
CAREL

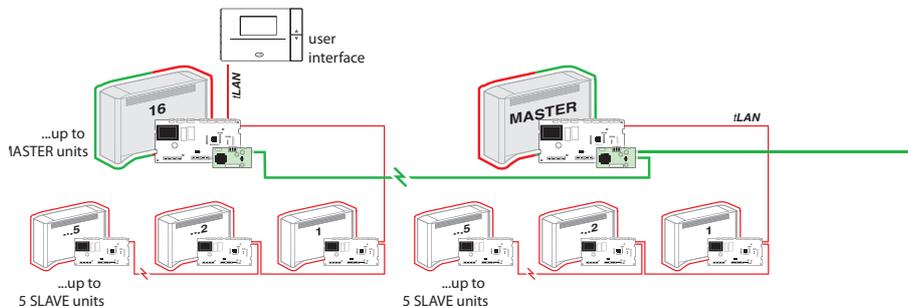
RS485 Modbus®



## FieldBus connectivity

For the purpose of communication between controllers from different manufacturers, CAREL offers a wide variety of solutions that allow pCO controllers to interface with devices in the field such as valves, VFDs, serial

sensors, Belimo actuators, etc. In this way, the pCO sistema controller manages not only the individual unit but also the entire air conditioning/cooling system.



### CANbus

(BMS: PCOS00HB0, FieldBus: PCOS00HBFO)

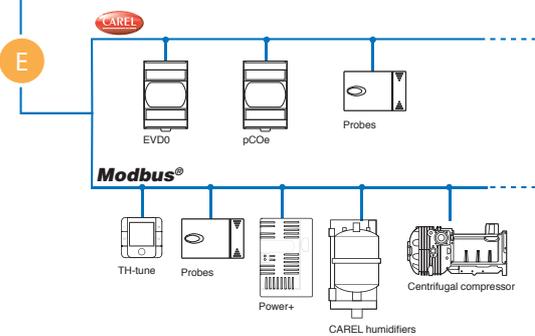
With the CANbus option, pCO controllers can be connected to the CAREL system to manage fan coils (e-drofan), thus allowing easy management of the system and optimising comfort and operating costs through synergy between controllers. Available for both FieldBus and BMS.



### RS485

(PCO100FD10)

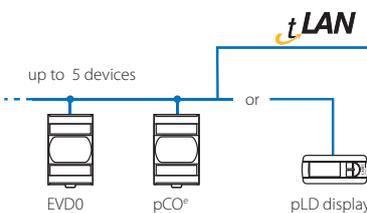
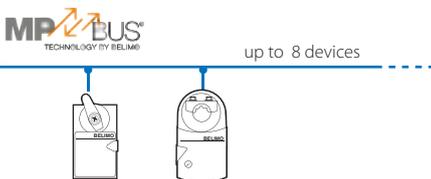
The RS485 serial option on the FieldBus serial device can be used with the Modbus® Master or CAREL Master protocol to manage intelligent devices.



### MP BUS

(PCO100MPB0)

With the MP-BUS® protocol, a maximum of 6 Belimo servocontrols can be managed via a single 2-wire cable.



### tLAN

(PCO100TLN0)

The tLAN options allows connection with CAREL devices such as the I/O expansions (pCOe) or driver for managing the electronic valve (EVD0), up to a maximum of 5. Alternative PLD display

## BMS connectivity

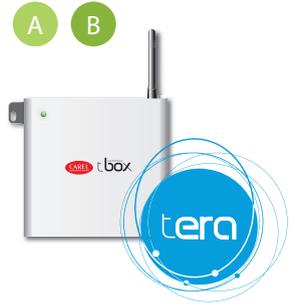
Connecting CAREL controllers with the BMS can be done as follows:

- directly, thanks to the capacities of the pCO series system for selecting the protocol to use (CAREL, Modbus®);
- through the connection with a serial

card that communicates with the protocol used by the BMS (BACnet™, SNMP, LON...);

- by integrating the drivers for managing the CAREL proprietary protocol (OP® server) in the BMS.

### Modbus®



**RS485**  
(PCOS004850)

The RS485 for serial BMS interfaces with the supervisor system through the CAREL slave or Modbus® RTU slave protocols.



The CAREL slave protocol is for interfacing with PlantVisorPRO, PlantWatchPRO or OPC server supervisor systems.

## Modbus®

Modbus is a serial communication protocol that has become a standard in industrial communication. It is the most widespread connection protocol among industrial electronic devices and in BMS (Building Management Systems). Controls for the pCO sistema family are Modbus®-native.



It is an industrial standard created by a consortium of companies in collaboration with Microsoft® for standardising drivers towards proprietary devices. Using the CAREL OPC server (which can be downloaded from ksa.CAREL.com), any Windows® OPC client application can communicate with all CAREL devices.



**LONWORKS®**

**LON**  
(PCO10000F0)

LonWorks is a digital communication technology developed by Echelon following rapid distribution in building automation systems. The LonWorks technology was later established in the industrial sector and is now even used in home automation. The electrical standard supported by CAREL is FTT10. The LONset tool (which can be downloaded from ksa.carel.com) allows the creation of LON files (NXE and XIF) for customised profiles. For info: lon@carel.com.



**KNX®**

**Konnex®**  
(BMS: PCOS00KXB0, FieldBus: PCOS00KXF0)

Konnex is a standard communication protocol designed for domotics and automation applications inside buildings.

CAREL is a member of the KNX Association ([www.knx.org](http://www.knx.org)).

The Konnex CAREL card is compatible with all KNX/EIB devices and can be installed on ports:

- BMS of the pCO sistema or e-drofan controllers;
- FieldBus for pCO sistema controllers.

The K-Set tool (which can be downloaded from ksa.CAREL.com) allows the creation of an XML file for customised profiles.

For info: [konnex@carel.com](mailto:konnex@carel.com)



**Modbus®**

A B



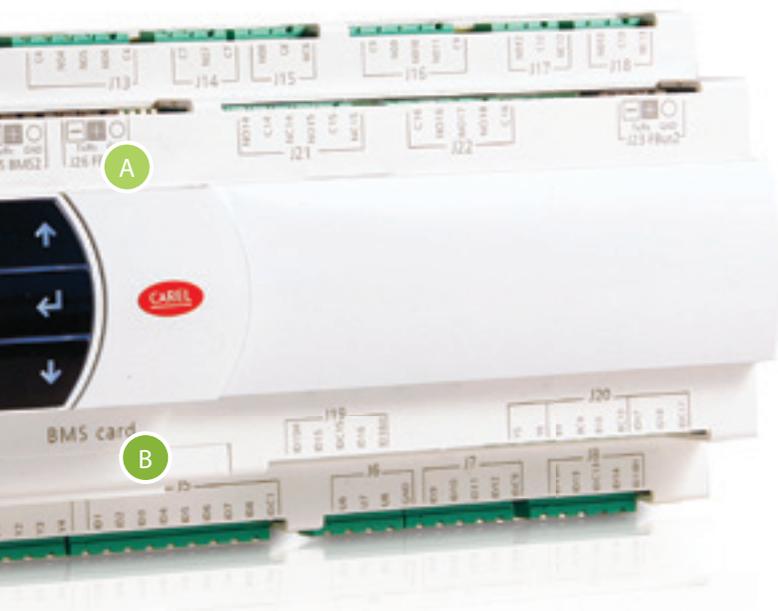
**Modbus®**

A B





A B



A

B



B

**pCOWeb**

(PCO1000WB0)

Based on the physical Ethernet™ standard, it allows connection to the following networks:

- SNMP v1,v2, with TRAP;
- BACnet™ Ethernet, BACnet™ /IP;
- Modbus® TCP/IP
- local LANs or Internet.

With pCOWeb's Web-Server capacity, the user can manage the system through a browser. The embedded LINUX™ operating system allows applications (plug-ins) to be added that can be developed by the user to meet their own requirements. It is currently possible, with maximum security, to download the pCO application from a remote location through the Ethernet network. It also has an internal logger to create data logs and graphs and send them via email.

For info: [pcoweb@carel.com](mailto:pcoweb@carel.com).



B

BACnet is a standard protocol designated in 1995 according to the ASHRAE, ANSI and ISO standards. BACnet was designed to allow communications between different devices for heating, air conditioning, ventilation, lighting and security systems that are found inside buildings.

Versions supported by CAREL:

- BACnet™ Ethernet™ ISO8802-2 over 8802-3 (pCOWeb);
- BACnet™/IP (pCOWeb);
- BACnet™ MS/TP; EIA-485 (pCOnet) communication standard.

The BACset tool (which can be downloaded from [ksa.carel.com](http://ksa.carel.com)) allows cards to be configured and tested. pCOWeb and pCOnet have obtained approval from BTL laboratories with the B-AAC profile (BACnet Advanced Application Controllers). [www.bacnetinternational.net/btl](http://www.bacnetinternational.net/btl) (BACnet Test Laboratory)

**pCOnet**

(PCO1000BA0)

Interface with the BACnet™ MS/TP protocol based on the EIA-485 physical standard. For info: [pcoweb@carel.com](mailto:pcoweb@carel.com)



B

**SNMP**

B

Simple Network Management Protocol (SNMP) is a network protocol that belongs to the family of Internet protocols defined by the IETF (Internet Engineering Task Force). The protocol allows for the management and supervision of devices connected to an Ethernet network.

## Connectivity of parameter controls

All CAREL controllers offer the possibility of connecting to CAREL or third party monitoring systems via the CAREL and Modbus® RTU protocols.



-  CAREL
-  Modbus®

**Supernode:** to create gateway solutions between CAREL or Modbus® RTU and more advanced protocols or area control units.

**PlantVisorPRO:** to monitor CAREL controllers and/or with third party Modbus® RTU.

**Third party BMS:** to integrate controllers from different protocols and functions in a single monitoring system.

**Webgate:** Gateway between the CAREL protocol and a local TCP/IP network with SNMP v1 protocol or Webserver, with the possibility of customising the HTML page.



## Solutions for system monitoring and supervision

The use of a global monitoring and supervision system is always more essential, due to the necessity to manage alarms quicker and more efficiently and to optimise the routine and special maintenance of systems.

In addition, standards in force and the trend towards energy saving make these systems a key to success and differentiation.

CAREL solves these requirements by offering field instruments fitted with RS485 interface for connection to local and centralised supervision systems.

Depending on the various types of system and requirements, CAREL offers:

- PlantWatchPRO: compact embedded solution for small refrigeration and air conditioning systems up to a maximum of 30 devices.
- PlantVisorPRO: embedded solution for medium and large systems up to a maximum of 300 devices.
- RemotePRO: software solution for centralised server in order to manage the system installed quicker and in an optimised manner.

### Advantages

The CAREL supervision systems use modern WEB technology, making remote access always much quicker and more secure at the same time.

The data is memorised inside a database, thus guaranteeing integrity and reliability of the information.

The embedded plug&play solution and the software made to measure for the user, greatly reduce installation and configuration times in the system.

The user-friendliness, the complete control of the systems, the sophisticated configuration for the notification of alarms and the tools for analysis are all features that make CAREL supervision a winning solution.

### Certification

#### EN12830

PlantVisorPRO and PlantWatchPRO are compliant, as required by EC regulation 37/2005 of 12 January 2005, with standard EN 12380 on temperature recorders for the transport, storage and distribution of refrigerated, frozen and deep-frozen food and ice cream.

#### Underwriters Laboratories®

PlantVisorPRO complies with the UL Standard, which guarantees product certification for the North American Market.



## PlantVisorPRO

PP2ST\*

PlantVisorPRO is the CAREL monitoring and supervision system that allows complete control and optimisation of refrigeration and air conditioning systems.

It offers an intuitive and customisable interface for the display and configuration of the system.

PlantVisorPRO guarantees remote access to all devices connected to it via the LAN or MODEM connection.

The system is available as a complete all-in-one solution: the product integrates all field connections, digital inputs and output relays.

The installation formats are defined as follows:

Version	No. of Instruments	Variable log
STANDARD	90	1400
HYPER	300	3500

### Energy Saving

Optimisation and monitoring of system performance: specific functions for the increase in installation efficiency and for the analysis of energy consumption trends.

### Floating Suction Pressure Control

Automated modification of the refrigeration unit set point depending on the cooling request from the refrigerated counters it serves.

### Dew Point Broadcast

Propagation of the information relative to room temperature and humidity in order to calculate the dew point and modulate the use of antisweat heaters.

### Parameter Control

Recording and notification of the unauthorised modifications on critical system parameters in order to preserve optimum operating configuration.

### Data analysis and optimisation

Manual and scheduled creation of graphs

and detailed reports, relating to system variables.

### KPI – Key Performance Indicator

Control of the effective controlling capacity of a device depending on the operating set point, the differential and any defrosting performed.

### Energy

Analysis of CO<sub>2</sub> emissions, power consumption and the cost of energy per pricing zone in order to identify energy optimisation areas.

### Simplified commissioning

Reduction of installation times in the system and control of the installation.

### Thermodynamic debug

Analysis of the thermodynamic behaviour of the refrigerated counters.

### Configuration propagation

Propagation of system configurations from one to "n" devices.

### Alarm management

Detection and signalling of every alarm situation, with remote interaction for efficient management of maintenance and after-sales service operations.

## PlantVisorPRO packets

PP2ST\*P\*

PlantVisorPRO is a scalable solution that offers the user the possibility to activate specific function packages according to requirements.

Below is the offering of packages for the solution and the relative functions activated:

GREENRETAIL	Floating Suction
	Dew Point Broadcast
	Parameter control
	KPI
	Energy
SAFETY	Parameter control
	RemotePRO connection
	ModbusSlave
EXTENDED	Logical devices
	Custom algorithm
ENERGY	KPI
	Energy
SAVING	Floating Suction
	Dewpoint Broadcast





## PlantWatchPRO

PWPRO\*

PlantWatchPRO is a CAREL solution developed for the supervision of small-medium systems.

Complete possibility of network and alarm configuration, easy to navigate and attractive design are some of the characteristics that make PlantWatchPRO the state-of-the-art product in its category. A colour LCD, touch screen and the use of practical menus guide the user easily and intuitively, thus supplying an easy solution. Other innovative features of PlantWatchPRO are:

- possibility of connecting and controlling up to 30 devices;
- use of CAREL or Modbus® protocols for connection;
- recording of 100 variables sampled every 15 minutes, for over one year;
- IP65 protection rating;
- 3 output relays, for signalling alarms or activation of lights and defrost;
- graphical displays;
- possibility to access system management by several users, with different control privileges;
- tool suitable for technical environments, no moving parts are present;
- remote access via LAN or PSTN modem.

PlantWatchPRO is also available in a version with internal modem.

## Accessories



### PC-Gate

(CVSTD00000)

The PC-Gate converter is used as hub for Y-connections or amplifier to extend the length of the line beyond a kilometre.



### USB converter

(CVSTDUMORO)

Where necessary, the USB/RS485 converter can increase the number of lines connected to the PlantVisorPRO.

### GSM Modem

(PLW0PGSM00)

GSM modem for the notification of alarms via SMS.



## I/O management module

IOM\*

This can be connected in parallel to controllers made by other manufacturers or to electro-mechanical controllers in order to acquire the main operating parameters from refrigeration units, air conditioning systems and condensing units. It manages:

up to 4 NTC temperature probes, or 2 NTC probes and 2 x 4 to 20 mA or 0 to 5 Vdc transducers;  
digital contacts: 2 opto-isolated, 2 voltage-free contacts (or one NTC);  
a relay output to activate actuators or manage a local alarm.

It can be connected to PlantVisor, PlantWatch and Web-GATE.

### Technical specifications

#### Power supply:

- IOM\*230\*: 230 Vac;
- IOM\*115\*: 115 Vac;
- IOM\*024\*: 24 Vac  $\pm$ 10%, 50/60 Hz

**Operating conditions:** 0T50 °C, 20/80% R.H. non cond.

**Protection rating:** IP20 for device not incorporated in electric control board

**CE UL, certification:**

**Assembly:** DIN rail

**Number of I/Os:**

- **analogue inputs:** 2 (4);
- **digital inputs:** 2 (4);
- **digital outputs:** 1

**Serial Ports:** RS485, CAREL protocol

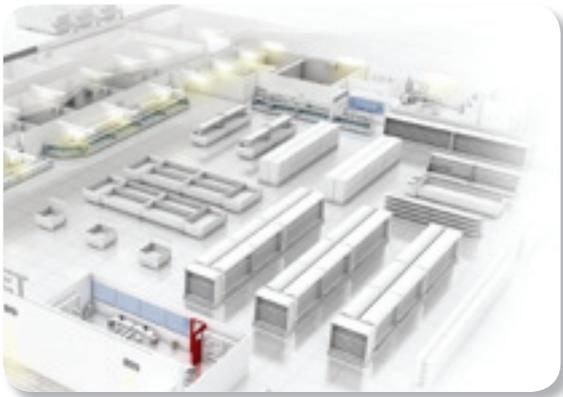
**Dimensions:** 72x88x70max mm

**Connections:** clamps



retrofit

For monitoring of refrigerated counters, CAREL offers a battery-powered radio sensor, to be installed on the counter in order to record the temperature and coupled to a CAREL supervisor system. Ideal for retrofit applications, being easy to install and connect.



convenience store service area

PlantWatchPRO is the ideal solution for monitoring temperatures and managing refrigeration unit alarms present in small installations such as service areas or small supermarkets, where the demand for control is the same as large areas. Thanks to the GSM modem connection, it is possible to send notifications to the service network via SMS.





Air-conditioning

building

PlantVisorPRO, thanks to its easy customisation and integration, is the idea solution for centralised control of air conditioning in a building.



hypermarket

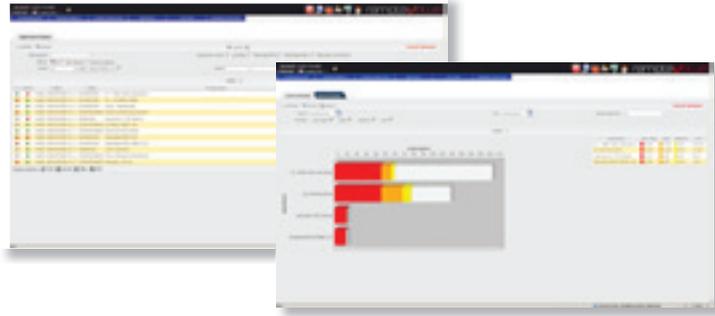
PlantVisorPRO is the ideal solution for large areas where there are a large number of units and advanced control and management are required.



Refrigeration utilities

Refrigeration units

Air-conditioning



## remotePRO

### RVSTD\*

The remote supervision system allows analysis and comparison of the data collected by local supervisors on each installation, using just one interface. Whatever your application, CAREL remote is a secure and reliable tool for keeping systems installed in different locations under control. All local supervision products offered by CAREL can be connected to the remote supervisor:

- PlantVisorPRO;
- PlantWatchPRO;
- pCOWEB.

via LAN or modem connection.

### Maintenance

Centralised control of all systems in order to reduce management costs of the sites and guarantee the level of security

required by the customer. Centralised notification of alarms and comparative analysis between the systems.

### Data analysis

KPI comparisons for evaluation of system operation: alarms, energy, temperature report. Offline reports without having to connect to the individual sites.

### Call Centre

Advanced tool for the management of routine and special system maintenance.

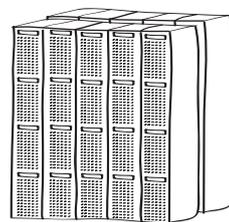
### Versions

- RVSTDDS000 – Remote Control Maintenance Technician: dedicated to the persons in charge of maintenance on sites where correct operation must always

be guaranteed. It offers the possibility to be notified immediately regarding any malfunctions and includes all tools necessary for solving problems in the field directly from the office;

- RVSTDDM000 – Centralised data management: dedicated to whoever wants to support their customers with comparative analyses of the different system data. Offers reports, graphs and statistical calculations on the variables transferred from the local supervisors.

Version	No. of sites	Variables
RVSTDDS000	50	---
RVSTDDM000 plugin to activate on RVSTDDS000	50	7.000



If it is necessary to control the numerous installations from remote, CARELA offers dedicated instruments for centralised management. PlantWatchPRO allows the automatic synchronisation of data and alarms with RemotePRO and RemoteValue in order to keep the situation of all systems under control on a unique interface.



The image features a soft-focus background of a field of white crocuses. The flowers are in various stages of bloom, with some fully open and others as buds. The sky above is filled with light, wispy clouds, creating a bright and airy atmosphere. The overall color palette is muted and monochromatic, dominated by whites, greys, and soft blues.

E<sup>x</sup>V sistema





## E<sup>X</sup>V sistema - electronic expansion valves and drivers

### Technology

The E<sup>X</sup>V family valves manage refrigerant expansion through a variable valve port, created by a fixed calibrated opening and a conical movable element.

The linear movement of the closing element is achieved through the combined action of a stepper motor and a worm screw transmission, which produces precise and regular movement by minimising friction.

Control precision and stability are ensured by rotating elements supported by stainless steel ball bearings. The entire mechanism is very robust, thanks to the motor block suspended on harmonic steel springs, and a technopolymer chassis that guarantees high mechanical performance and light weight.

All this is made possible by careful construction, the use of quality materials, and a production process with final testing on each and every product, in accordance with the highest quality standards.

### Performance

The care paid to the design and production of our valves ensure market-leading performance:

- high maximum operating pressure (Ps):
  - 45 barg on entire E<sup>X</sup>V range;
  - 140 barg on models for CO<sub>2</sub> (R744) ;
- extended operating temperature range:

- 40T65 °C (-40T149 °F) for the refrigerant;
- -30T50 °C (-22T122 °F) for the system;
- operation guaranteed in both directions so as to simplify refrigerant circuit layout on reverse-cycle heat pumps and reduce installation costs: just the one valve is required, without needing to install non-return valves.

In addition, thanks to the effect combined of:

- Teflon gasket for perfect tightness;
- calibrated spring and extra closing steps to ensure tightness seal even with high pressure differentials;
- ultracap to guarantee closing even in the event of blackouts.

E<sup>X</sup>V sistema is the only solution available on the market that can fully carry out the function of solenoid valve.

### Energy saving and precision

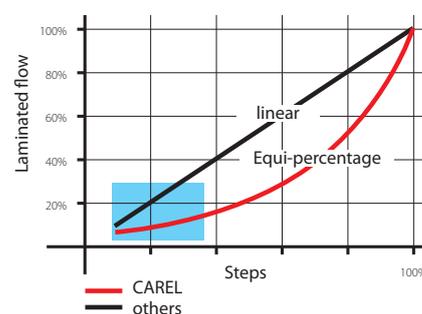
The extended range of operation and precision in terms of control (from 10 to 100% of rated capacity) allow significant energy savings.

The extended control range of the E<sup>X</sup>V allows refrigeration unit operation with floating condensing pressure, significantly increasing compressor COP at medium and low room temperatures. This special function - only available with electronic expansion valves - brings considerable energy savings in all refrigeration

applications.

E<sup>X</sup>V sistema provides excellent control performance, with a typical control curve that ensures high control precision in all applications, even at low flow-rates. This feature is very useful in circuits featuring compressors managed by inverters, and in general on circuits with variable flow-rates.

### E<sup>X</sup>V typical control curve





## E<sup>2</sup>V smart

E2V\*

The CAREL E<sup>2</sup>V smart series electronic expansion valves bring together the renowned reliability of the CAREL E<sup>3</sup>V and the versatility of a removable cartridge, plus the option of a convenient integrated sight glass.

The motor block can be dismantled to simplify welding, thus preventing the risk of overheating and damage.

A movable element with Teflon gasket, plus a calibrated spring seal mechanism, are the heart of the CAREL system that ensures unrivalled tightness, meaning the valves can work with very high pressure differentials.

E<sup>2</sup>V smart also offers a removable metal filter to trap solid residues that may damage the valve or cause a decline in efficiency.

The family of E<sup>2</sup>V smart valves comes in 8 sizes and covers a wide range of capacities:

- air-conditioning: 0.3 to 58 kW (R410A, tev= 4.4 °C, tcond= 38 °C, sc= 1K)
- refrigeration: 0.15 to 38 kW (R404A, tev= -12 °C, tcond= 45 °C, sc= 3 K).

### Technical specifications

#### Limit pressure values:

- maximum working pressure (MWP): 45 bars (653 psi)
- maximum operating pressure differential (MOPD): 35 bars (508 psi)
- PED: not applicable, group 2 fluids, art. 3, par. 3

#### Operating conditions:

- refrigerant side: -40T65 °C (-40T149 °F)
- installation environment: -30T50 °C (-22T122 °F)

Closing steps: 550

Control steps: 480



## E<sup>3</sup>V and E<sup>4</sup>V

E3V\*, E4V\*

Two families of valves with similar architecture, covering a consecutive range of capacities, with elbow connectors, usable indifferently on the inlet or outlet. Complete installation freedom is further supported by that fact that the various components, stator, motor block and liquid sight glass, can be fully dismantled.

As well as on the E<sup>4</sup>V, the liquid sight glass is now also available on the E<sup>3</sup>V. Fitted with moisture indicator, this is very useful for verifying correct refrigerant flow and valve operating conditions.

Both E<sup>3</sup>V and E<sup>4</sup>V can operate in both directions, representing the ideal solution for reverse-cycle applications by ensuring simple installation and saving on installation of a solenoid valve and liquid indicator.

E<sup>3</sup>V and E<sup>4</sup>V offer solutions for all needs in the following applications:

- air-conditioning: 12 to 290 kW (R410A, tev= 4.4 °C, tcond= 38 °C, sc= 1K)
- refrigeration: 8 to 260 kW (R404A, tev= -12 °C, tcond= 45 °C, sc= 3 K).

### Technical specifications

#### Limit pressure values:

- maximum working pressure (MWP): 45 bars (653 psi)
- maximum operating pressure differential (MOPD): 35 bars (508 psi)
- E<sup>4</sup>V95= 24 bars (349 psi)
- PED: E<sup>3</sup>V= not applicable, group 2 fluids, art. 3, par. 3; E<sup>4</sup>V= group 2 fluids, Category 1

#### Operating conditions:

- refrigerant side: -40T65 °C (-40T149 °F)
- installation environment: -30T50 °C (-22T122 °F)

Closing steps: 550

Control steps: 480



## E<sup>5</sup>V, E<sup>6</sup>V and E<sup>7</sup>V

E5V\*, E6V\*, E7V\*

CAREL also offers a complete range of high capacity valves, where energy efficiency is essential and precision control is one of the best ways to ensure this.

Unrivalled tightness in closing and the built-in sight glass mean separate solenoid valves and liquid indicators are not required, while the possibility to completely dismantle the parts ensures accurate welding without the risk of damage.

On chillers and large air-conditioning units having a valve that can be dismantled means only the valve body needs to be handled when installing the piping, and the motor and stator can be fitted later when the unit is being completed.

Three models of valves with inline fittings and copper connectors, each with an extended operating range:

- E<sup>5</sup>V: Ø35/35mm, up to 530 kW\*
  - E<sup>6</sup>V: Ø42/42mm, up to 890 kW\*
  - E<sup>7</sup>V: Ø54/54mm, up to 1850 kW\*
- (\*) R134a, tev=2 °C; tcond= 45.0 °C; sc= 3

### Technical specifications

#### Limit pressure values:

- maximum working pressure (MWP): 45 bars (653 psi)
- maximum operating pressure differential (MOPD): E<sup>5</sup>V= 35 bars (508 psi), E<sup>6</sup>V, E<sup>7</sup>V= 28 bars (406 psi)
- PED: group 2 fluids, Category 1

#### Operating conditions:

- refrigerant side: -40T65 °C (-40T149 °F)
- installation environment: -30T50 °C (-22T122 °F)

Closing steps: 550

Control steps: 480



## E<sup>2</sup>V for CO<sub>2</sub>

### E<sup>2</sup>V\*\*C

The E<sup>2</sup>V (amily (which can comfortably handle operating pressures up to 45 barg) has been further extended to include a product developed specifically for use with transcritical CO<sub>2</sub> systems.

A powerful motor, thicker walls and highly resistant materials are just some of the reasons why these valves have achieved record levels of performance, with operating pressures and differentials that are hard to find in products made by other manufacturers.

Designed for transcritical CO<sub>2</sub> applications, these can naturally also be used for subcritical cycles, where higher pressure resistance - exceeding 45 barg - and very precise control are required.

Complete tightness guaranteed by a Teflon gasket, and continuous and regular movement are the outstanding features of the E<sup>2</sup>V platform that are also available in this E<sup>2</sup>V for high operating pressures.

E<sup>2</sup>V\*\*C comes in five sizes, covering subcritical cycle cooling capacities up to 20 kW (R744, tev= -10 °C, tcond= 20 °C, sc= 5 K.

### Technical specifications

#### Limit pressure values:

- maximum working pressure (MWP): 140 bars (2030 psi)
- maximum operating pressure differential (MOPD): 120 bars (1740 psi)
- PED: not applicable, group 2 fluids, art. 3, par. 3

#### Operating conditions:

- refrigerant side: -40T65 °C (-40T149 °F)
- installation environment: -30T50 °C (-22T122 °F)

Closing steps: 550

Control steps: 480



## EVD evolution

### EVD\*

Based on CAREL's extensive experience in electronic valve drivers, EVD evolution is available as a "single" and "twin" driver, the latter able to control two valves independently, with the most commonly-used refrigerants (see the instruction sheet). Simple graphics and a series of LEDs offer an immediate overview of operating status and the main driver functions.

A powerful removable graphic display (EVDIS\*\*0) can be used to configure the driver, providing clear and immediate information on operating status and allowing the controller to be started the first time after selecting just four parameters:

- refrigerant used;
  - valve model;
  - type of pressure probe;
  - application (chiller, cabinet, etc.).
- EVD evolution can operate in stand-alone mode, or connected to a pCO or the PlantVisorPRO supervisor.

EVD evolution can also manage other functions in addition to superheat control, such as hot gas bypass, evaporation pressure control (EPR), valve control for gas coolers in transcritical CO<sub>2</sub> circuits.

### Technical specifications

**Power supply:** 24 Vac 50/60 Hz, 24 Vdc (±15%)

**Operating conditions:** -10T60 °C, 90% RH non-condensing

**Degree of protection:** IP20

**Assembly:** DIN rail

**Number of I/Os:**

- **inputs:** 2 digital
- **outputs:** 2 voltage-free contacts

**Serial ports:** 1

**Dimensions:** 70x110x60 mm (4 modules DIN)



## Ultracap for EVD evolution

### EVD0000UC0

Ultracap is the new emergency power supply device for electronic valves, the natural completion of the EVDEvo, both single and twin versions, ensuring complete closing of the valves even when there are sudden mains power failures. Exploiting ELDC (Electric Double Layer Capacitor) technology, Ultracap can supply immediate, reliable and clean emergency energy, representing a major step forwards compared to conventional battery-based systems, including as regards disposal of used materials.

Ultracap has been designed to give 10 years' trouble-free silent operation, without requiring periodical checks or having to replace batteries.

Ultracap means immediate energy: just 5 minutes (4 minutes for CAREL valves) after power is restored, the system is already recharged and active (in practical terms the same time the compressor takes to restart...).

The extreme reliability of Ultracap combined with the exceptional tightness of CAREL valves, eliminates the need for solenoid valves even in the most critical applications.

Ultracap can be connected to the EVDEvo as well as all the pCO<sup>5</sup> family controllers, with extremely simple installation, just like connecting a battery module.

### Technical specifications

**Power supply:** 24 Vac 50/60 Hz, 24 Vdc (±15%)

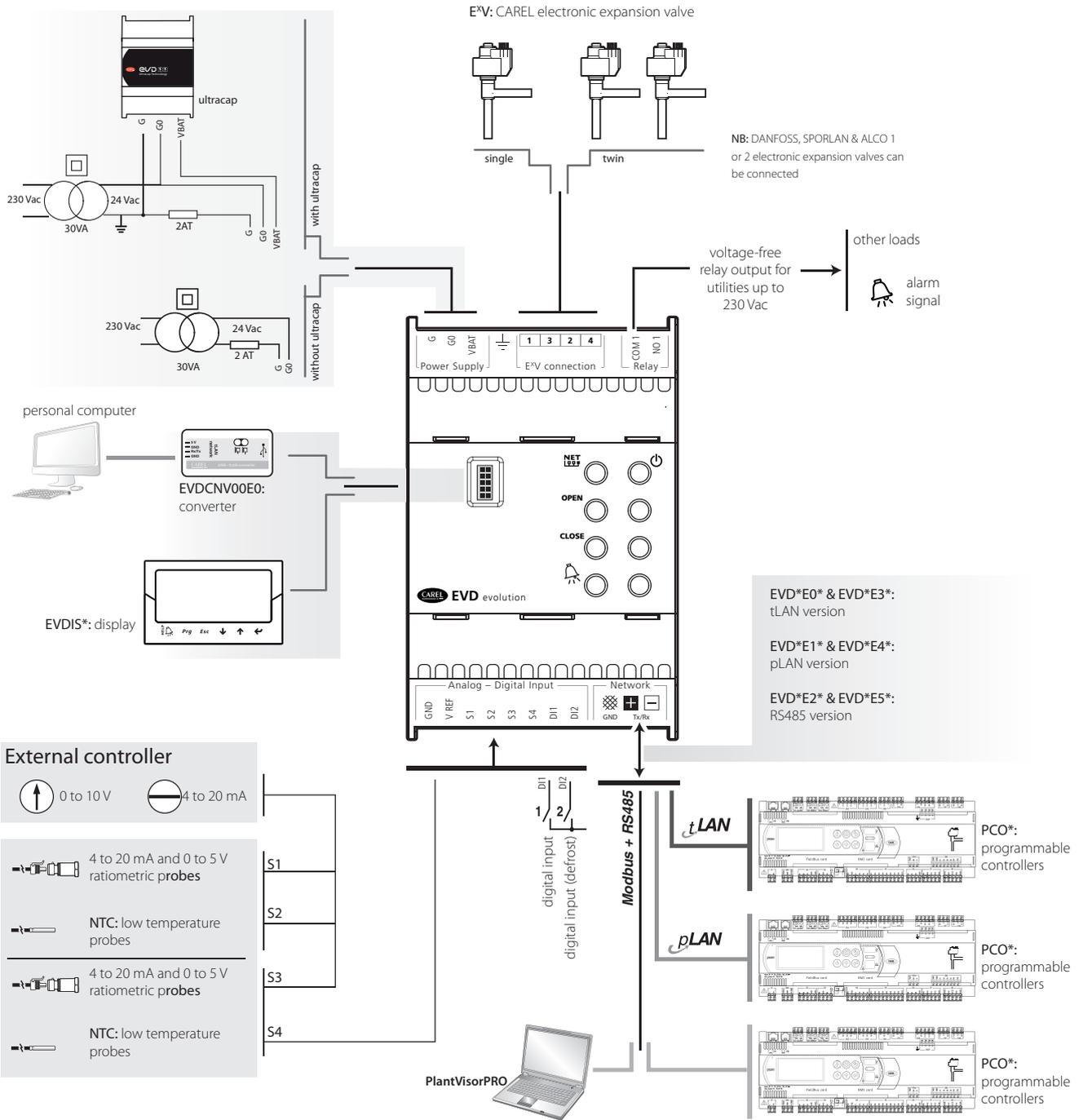
**Operating conditions:** -25T50 °C, 90% RH non-condensing

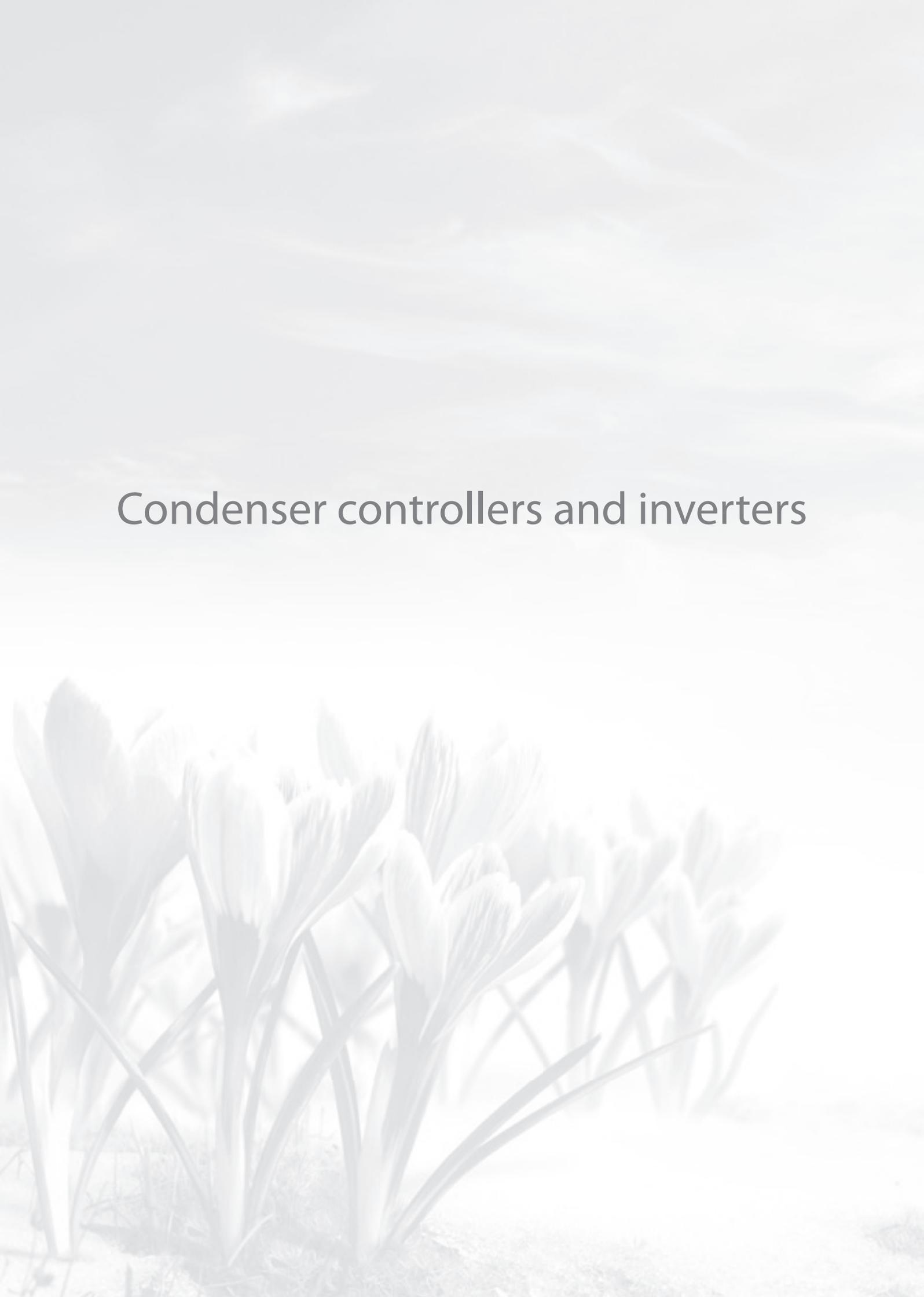
**Degree of protection:** IP20

**Assembly:** DIN rail

**Dimensions:** 70x110x60mm (4 modules DIN)

# OVERVIEW DRAWING EVD evolution





# Condenser controllers and inverters





## Speed controllers and inverters

To complete its range of products, CAREL offers a series of modules suitable to satisfy different particular applications of HVAC/R units, for fan, pump and compressor speed control.

In fact, optional modules are available that have been specially designed, and therefore optimised, for increasingly important functions in today's air conditioning and refrigeration units.

As regards condensing pressure control, the fcs range of controllers is available, allowing the possibility to be used in stand-alone configuration or connected to a controller in the pCO sistema range. This range of controllers is available for all requirements: single and three-phase versions exist.

Regarding parametric controllers, such as the  $\mu$ chiller range, CAREL offers a range of controllers with single phase power supply in the MCHRTF range, which are more suitable for this type of controller. These speed controllers are also compatible with programmable pCO sistema controllers. They can manage single phase 230 Vac fans with 8, 10 and 12 A current.

The inverter represents one of the state-of-the-art solutions regarding energy saving. The CAREL inverter offer can boast two product families: The VFD NXL range, suitable for driving fans,

pumps and compressors fitted with asynchronous three phase motors and the innovative power+, it can control BLDC/BLAC brushless motors with permanent magnets, which are used in new generation compressors.

In particular, compressor modulation allows significant results in terms of energy saving and at the same time optimise operation of all unit components. Modulation of flow rate of the refrigerant and primary fluids exploits the full capacity of heat exchangers at reduced load and decreases compression ratio at the same time. To exploit the modulation capacities of these compressors in full, the use of the latest generation electronic expansion valve is essential. For this reason, pCO sistema represents the complete system made-to-measure for the new generation of high efficiency units.

The range of VFD, NXL series variable frequency drives, is developed specifically for applications with:

- variable flow rate on air handling unit fans;
- modulation of compressor speed;
- variable flow rate on system supply pumps and evaporator pumps on the chillers;
- control of condensing pressures on ventilation units.

The use of inverters with electric motors applied on the water pumps or on fans allows modulation of load and accurate and efficient process control from an energy point of view.



## DC inverter: power+

PSD\*

power+ is an inverter that can control compressors with BLDC/BLAC brushless motors with permanent magnets without the aid of a position sensor, thanks to the use of "sensorless" technology. The integrated functions of Power+ are focused on controlling the compressors:

- the acceleration ramp, programmable in steps, respects the requirements of every application;
- a PTC input guarantees heat protection of the compressor.

power+ also has an STO input (Safe Torque Off), which can be used to cut-off the compressor power supply in the event of an emergency, for example following activation of a high pressure switch. Moreover, power+ can manage the compressor in an intelligent manner in extreme conditions: algorithms are available for automatic reduction of the switch-over frequency or rotation speed in order to prevent the compressor stopping in high temperature conditions.

In household use, noise is limited to a high frequency switch-over, up to 8 kHz. The electromagnetic compatibility (EMC), is such to allow use in the home, also respecting the strictest standards regarding harmonic emissions.

Product installation is made easier by the flat design of the electronics, as well as availability of removable brackets for fixing. In this way, the heat sink necessary to dispose of the heat up to 60°C in the environment, can be positioned behind the control board, thus greatly reducing the space occupied inside the control board. The IP protection rating and the protection gasket guarantee a protection rating of IP44 on the heat sink side.

power+ has also been tested with most BLDC compressors available on the market: SCI (Siam Compressor Industries), Samsung, Hitachi, Toshiba.

The configuration of power+ for a BLDC

compressor tested by CAREL can be completed with a click, if used with the controllers of the pCO sistema. The CAREL controller not only manages the electric parameterisation of power+ but also the complete thermodynamic control of the compressor according to the requirements of the compressor manufacturer.

### Technical specifications

#### Power supply:

- single-phase: 200 to 240 V 12 A or 16 A;
- three-phase: 380 to 480 V 14/18 A (50 °C) or 22.5 A;

**Operating conditions:** 60 °C 95% R.H. non condensing

**Protection rating:** IP20/IP44

**CE UL, certification:**

**Assembly:** panel or semi-builtin

#### Number of I/Os:

- **digital inputs:** 1 STO (Safe Torque Off) and 1 PTC;
- **digital outputs:** 1 voltage-free contact configurable relay up to 240 Vac 5 A

**Serial Ports:** RS485/Modbus®

**Dimensions:** 164x183x265 mm max.

**Connections:** screw clamps



## AC inverter: NXL

NXL\*

The NXL range is available in power ratings from 0.37 to 30 kW, with single-three phase power supply and three phase output, protection rating up to IP54, for all applications with variable capacities. Control is via 0 to 10V or 4 to 20 mA analogue signal or via Modbus® serial communication, which can integrate the device functions with the pCO range controllers management software or the PlantvisorPRO supervisor.

Other advantages are: wide operating range, easy installation and use, low noise emissions, high protection rating against electromagnetic interference and particularly compact book-like" design. The NXL range is the ideal solution for all operating environments, for completion and integration of the range of CAREL products in order to obtain maximum efficiency and energy saving in HVAC/R systems.

### Technical specifications

#### Power supply:

- single-phase: 208 to 240 V from 0.37 kW to 1.5 kW;
- three-phase: 380 to 500 V from 0.55 kW to 30 kW;

**Operating conditions:** -10T50°C 95% R.H. non condensing

**Protection rating:** IP20, IP21, IP54

**CE UL, certification:**

**Assembly:** panel

#### Number of I/Os:

- **analogue inputs:** 2 x 0 to 10 V or 0 to 20 mA
- **digital inputs:** 3 programmable
- **analogue outputs:** 1 x 4 to 20 mA
- **digital outputs:** 1 NO/NC relay

**Serial Ports:** RS485/Modbus®

**Dimensions:** 195x519x237 mm max.

**Connections:** screw clamps



## Stand-alone speed controllers

FCP\*

FCP is a speed controller for single phase fans on stand-alone units with up to 2 circuits. It manages the fan depending on the pressure variation in the condenser circuit, in order to maintain the set point value, using a 0 to 5 V signal from the ratiometric pressure transducer (SPKT\*R0) positioned in the water circuit. It is used on condensing units. It can manage asynchronous axial motors (specific for the phase cut controller), on loads up to 8 A/230 Vac. Available in the master/slave version or power device (as current MCHRTF80A0, in IP54 version).

### Technical specifications

**Power supply:** 230 Vac -15/10%, 50/60 Hz with autosensing

**Operating conditions:** -20T50 °C, <85% R.H. non condensing

**Protection rating:** IP54

**Assembly:** panel

**Number of I/Os:**

- **analogue inputs:** 2 ratiometric  
0 to 5 Vdc, 1 NTC 10 K at 25 °C
- **digital inputs:** 1 configurable
- **analogue outputs:** PWM

**Serial Ports:** RS485 (with additional optional board)

**Dimensions:** 139.8x134.8x89 mm

**Connections:** spring clamps for cables with cross-section of 1.5 mm<sup>2</sup>



## Single phase 4, 8, 10 and 12 A speed controllers

FCSM\*, MCHRTF\*

The range of FCS and MCHRTF single phase controllers has been developed to control fan speed on condensing units depending on the signal sent from the controllers. In particular, the FCS range, receives a 0 to 10 V signal, while the MCHRTF, pCO, µchiller, ir33 universal and pRack range controllers, receive a PWM signal.

### Technical specifications

**Power supply:** 4, 8, 10 and 12 A/230 Vac

**Operating conditions:** -10T50 °C

**Protection rating:** IP00

**Assembly:** panel

**Number of I/Os:**

- **analogue inputs:** 0 to 10 V or PWM

**Dimensions:** 82x107x58 mm max.

**Connections:** screw clamps for cables with cross-section of 1.5 mm<sup>2</sup>



## FCS: IP55 three phase speed controllers

FCS3\*00

The IP55 three phase range, suitable for outdoor environments, can be controlled by a 0 to 10 Vdc analogue signal or with PWM signal (phase width modulation). The range, which envisions the control of motors with current draw of 6 to 40 A, is fitted with a control board, able to supply power to the load, in linear or square mode, with cut off, threshold, minimum and maximum speed functions, using the trimmer on the board.

### Technical specifications

**Power supply:** 400 Vac -15/10%, 50/60 Hz

**Operating conditions:** -10T50 °C

**Protection rating:** IP55

**Assembly:** panel

**Number of I/Os:**

- **analogue inputs:** 0 to 10 V or PWM

**Dimensions:** 198x265x178 mm max.

**Connections:** screw clamps for cables with cross-section of 1.5 mm<sup>2</sup>



## FCS: IP20 three phase speed controllers

FCS3\*10

The IP20 range, suitable for installation on the control board, can be managed by controllers with 0 to 10 Vdc analogue signal or PWM signal (phase width modulation). This envisions the control of motors with current draw of 9 to 40 A, and a control board, which supplies power to the load, in linear or square mode, with cut off, threshold, minimum and maximum speed functions, using the trimmer on the board.

### Technical specifications

**Power supply:** 400 Vac -15/10%, 50/60 Hz

**Operating conditions:** -10T50 °C

**Protection rating:** IP20

**Assembly:** panel

**Number of I/Os:**

- **analogue inputs:** 0 to 10 V or PWM

**Dimensions:** 245x340x200 mm max.

**Connections:** screw clamps for cables with cross-section of 1.5 mm<sup>2</sup>

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