

## Product selection guide

air-conditioning controllers

connectivity/telemaintenance/monitoring systems

thanos-risair-conditioning



integrated control solutions & energy savings

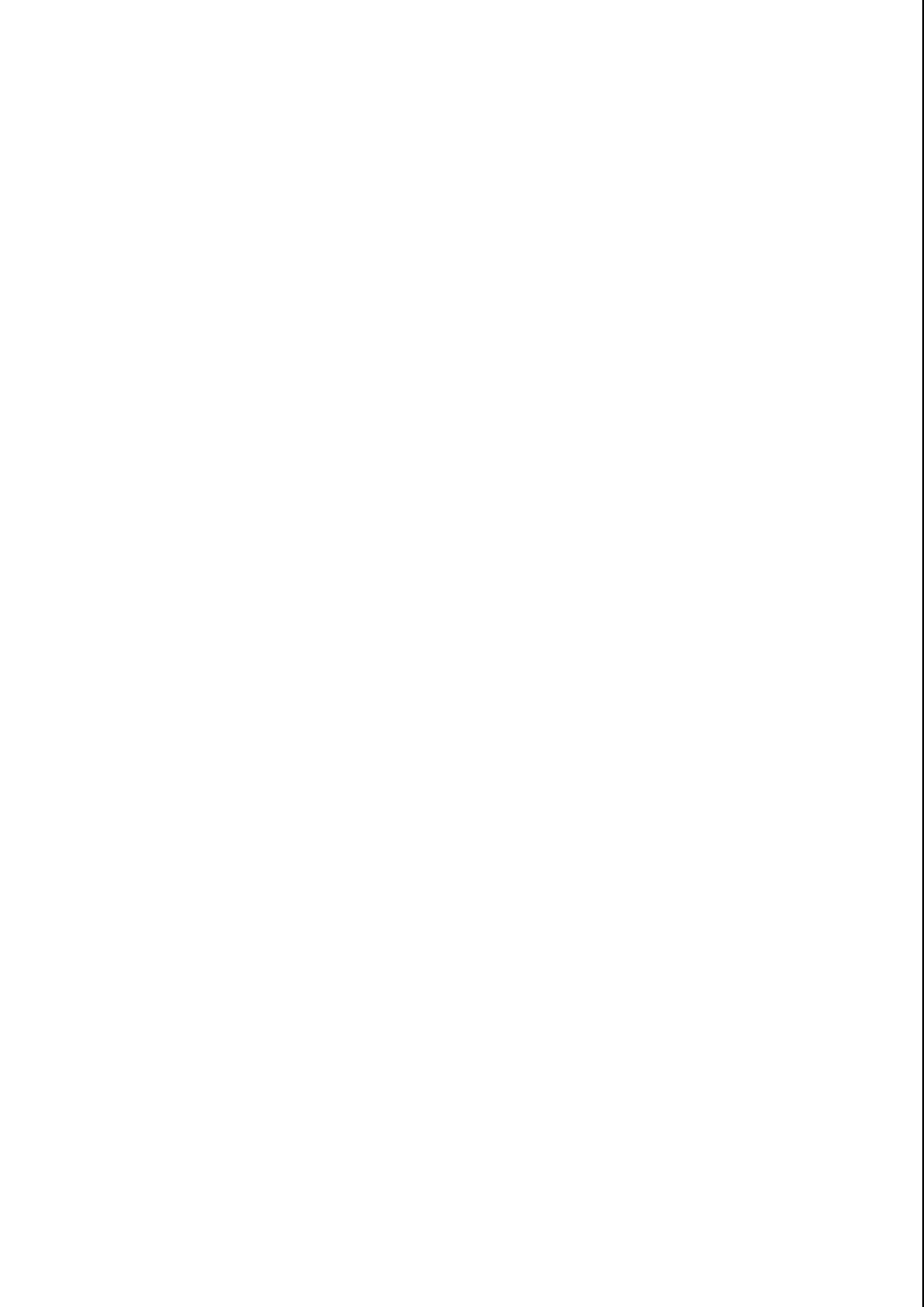




## **Product selection guide**

air-conditioning controllers

connectivity/telemaintenance/monitoring systems



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# Programmable controllers

CAREL released its first programmable controller over twenty years ago, and today has the widest range available in the sector.

pCO sistema represents CAREL's response to the demand for controllers with programmable logic for HVACR applications.

pCO sistema offers numerous advantages to manufacturers of air-conditioning and refrigeration units and systems:

- reduced assembly and wiring times (DIN rail mounting);
- real time management of the fastest transients, using powerful microprocessors;
- possibility to save events (alarms, temperature, pressure, ...) even for extended periods, in the flash memory;
- flexible and customisable appearance;
- simple connection to more commonly-used communication standards using the resident multi-protocol software;
- considerable flexibility in defining the functions and algorithms, using the 1tool development package.

All easily interfaced to the most widely-used Building Management Systems, or integrated into the proprietary supervisory system.



Integrated Control Solutions & Energy Savings



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EN13485



POCC IT.AI50.B09036



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## pCO sistema

pCO sistema consists of programmable controllers, user interfaces, gateways, communication interfaces and remote management systems that offer the OEMs working in HVACR a control system that is powerful yet flexible, can be easily interfaced to the more widely-used Building Management Systems, and can also be integrated into proprietary supervisory system. pCO sistema guarantees reliability, while being easily modifiable, so as to differentiate between the air-conditioning and refrigeration unit in terms of both appearance and functions.

A range of sizes is available, according to the number and the type of the inputs and outputs, the use of the built-in terminal and the amount of flash memory available. The plastic cases with DIN rail mounting guarantee high mechanical protection of the board, reduce the risk of electrostatic discharges and can also host a built-in user interface.

### Interfaces

The pCO series terminals are available in panel or wall-mounted versions, with alphanumeric and graphic LCD displays, allowing the messages to be shown in Chinese, Cyrillic, Arabic and Japanese.

### Communication

The pCO series controllers can interface to the most widely-used communication standards, either directly or via gateways (Modbus®, BACnet™, Johnson METASYS®, DLL for Windows®, TCP/IP, SNMP, LonWorks®, TREND). In addition, the pCO sistema controllers are able to receive and send SMS messages using a GSM modem.

All the pCO sistema components can be connected to multi-master pLAN local networks, without requiring additional boards, thus allowing the implementation of extended applications with distributed intelligence.

### High Technology

The microprocessor controller guarantees high program running speed, including control of faster transients. The parameters can be protected by various password levels. Thanks to the high capacity of the flash

memory and the clock with battery, all the main values controlled can be saved, even for extended periods.

### Programmability

The 1 tool development system allows the software to be customised. The software can then be transferred directly from a personal computer or alternatively using a "plug & play" electronic key.

### Applications

The programmability of the pCO series means that applications are possible for chillers, air-conditioners, shelters, roof top units, compressor racks and air handling units.





## pCO<sup>3</sup>

pCO<sup>3</sup>\*

pCO<sup>3</sup> represents the most advanced offering by CAREL in the field of programmable controllers. pCO<sup>3</sup> is designed for many air-conditioning and refrigeration applications. It comes in various sizes, according to the I/O and power requirements (Small, Medium, Large, Extra Large).

All the boards feature a 16-bit microprocessor as well as ample flash memory and RAM, and consequently the calculation power and operation processing speed have been significantly increased. As for all the pCO series controllers, pCO<sup>3</sup> comes in a plastic case that ensures a high index of protection and reduces the risk of electrostatic discharges due to incorrect handling.

In addition, assembly is simplified by the DIN rail mounting system, allowing significant saving in wiring and assembly times.

Given the increasing demand for integration, pCO<sup>3</sup> can interface with many of the most

commonly-used serial communication standards, and, using optional cards, can be integrated into the most widespread BMS systems..

pCO<sup>3</sup> also features connection to ratiometric pressure sensors; integration of pGD technology for the built-in terminal; a new microprocessor-based programming key; 3 serial ports: one as standard for the pLAN, plus two optional ports, FieldBus and BMS, available with various communication protocols.

All of these features ensure a level of excellence in responding to the needs of the HVAC/R market

### Technical specifications

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

**Power input:** 40 VA or 15 W

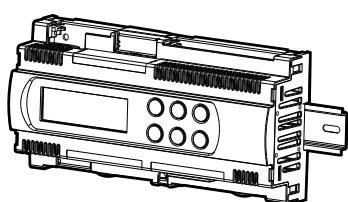
**Operating conditions:** -25T70 °C, 90% rH non-condensing

**Storage conditions:**

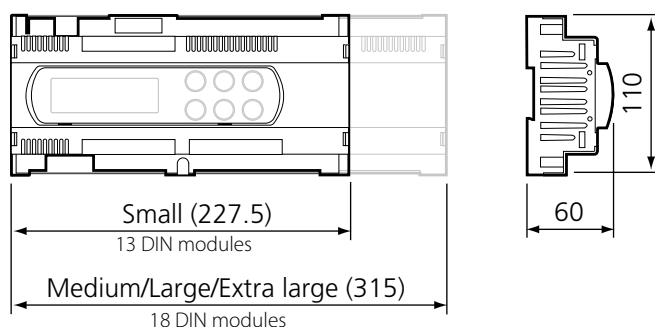
-40T80 °C, 90% rH non-condensing

**Index of protection:** IP20 - front panel IP40

### DIN rail mount



### Dimensions (mm)





## pCO<sup>1</sup>

PCO1\*

The pCO<sup>1</sup> series has been designed for the purpose of providing the significant innovations introduced by the pCO sistema to all those applications that require greater competitiveness in terms of price. All the pCO<sup>1</sup> series controllers feature a 16-bit microprocessor, and 2 MB flash memory (multi-language, multi-protocol).

The pCO<sup>1</sup> series controllers are also supplied in plastic cases that guarantee the high mechanical protection of the board and reduce the risk of electrostatic discharge due to incorrect handling; quick DIN rail mounting means faster assembly and wiring.

The pCO<sup>1</sup> controllers are available in two different sizes, according to the I/O and power requirements: pCO<sup>1</sup> Small, pCO<sup>1</sup> Medium.

Some models feature an SSR to control the devices that require frequent starts and stops.

The pCO<sup>1</sup> inputs can be configured using dipswitches, allowing the characteristics of the inputs to be adapted to the more common market standards (NTC, ratiometric, 0 to 20 mA, 4 to 20 mA, ON/OFF).

### Technical specifications

**Power supply:** 24 Vac ( $\pm 15\%$ )  
or 22 to 40 Vdc, 50/60 Hz  
**Power input:** 35 VA or 13 W  
**Operating conditions:**  
-10T60°C, <90% rH non-condensing  
**Storage conditions:**  
-20T70°C, <90% rH non-condensing  
**Index of protection:** IP20 - front panel IP40

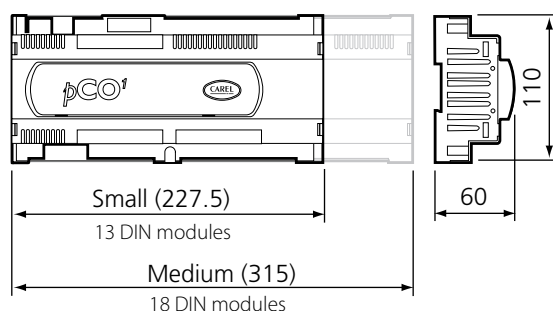
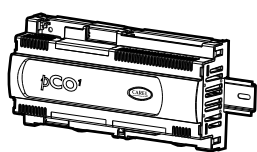
## pCO<sup>XS</sup>

PCO1\*X\*

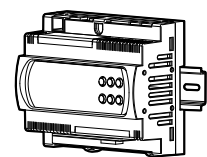
pCO<sup>XS</sup> has been designed to resolve the need for compactness and reliability in the control of chillers and heat pumps, small roof-top units and single-circuit precision air-conditioners, which until now have been covered only by parametric controllers. The flexibility of the pCO<sup>XS</sup> allows the rapid and extended customisation of the software, while maintaining complete compatibility with the existing pCO sistema controllers and user interfaces and the other pLAN network modules (FCM speed controllers, drivers for electronic expansion valves, aria series controllers). The compactness of the controller (8 DIN modules) and the number of inputs and outputs (18 in total) make the pCO<sup>XS</sup> a versatile and competitive solution for manufacturers of air-conditioning units. pCO<sup>XS</sup> is also ideal for the manufacturers of air handling systems, with a special version featuring the MP-BUS (Belimo) protocol for easy connection, using a single two-wire cable, to all the servo controls in the

DIN rail mount

Dimensions (mm)



DIN rail mount





installation (maximum of 8), as well as an active or passive sensor for each servo control. pCO<sup>CS</sup> consequently allows the management of large air handling systems for limited costs.

#### Technical specifications

**Power supply:** 20/60 Vdc & 24 Vac (±15%), 50/60 Hz

**Power input:** 10 VA or 8 W

**Operating conditions:**

-10T60 °C, <90% rH non-condensing

**Storage conditions:**

-20T70 °C, <90% rH non-condensing

**Index of protection:** IP20; IP40 front panel

## pCO<sup>c</sup>

PCOC\*

Designed to protect the investments of customers who use the pCO<sup>B</sup> CAREL has developed a new version, the pCO<sup>c</sup>, more powerful and upgraded to include 3.3V technology that maintains the same dimensions and the same layout in terms of I/Os as the pCO<sup>B</sup>.

pCO<sup>c</sup>, exploiting the possibility to use the EasyTools system on the same 16-bit microprocessor platform as the pCO<sup>3</sup> and pCO<sup>1</sup>, controllers, features improved memory and processing capacity and thus allows management of multi-language applications, multi-protocol communication and SMS messages.

By using the pCO<sup>c</sup> manufacturers can upgrade their units in terms of electronics, without needing to modify the wiring in any way.

This demonstrates the attention CAREL pays to protecting its customer's investments.

#### Technical specifications

**Power supply:** 24 Vac (±15%), 50/60 Hz

**Power input:** 35 VA or 13 W

**Operating conditions:**

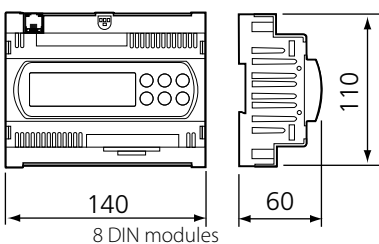
0T50 °C, <90% rH non-condensing

**Storage conditions:**

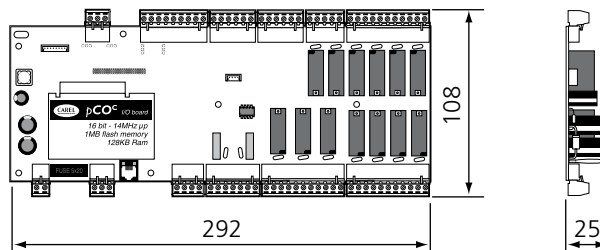
-10T70 °C, <90% rH non-condensing

**Index of protection:** IP00

Dimensions (mm)



Dimensions (mm)



## Accessories and options



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### Interface for OEM series humidifiers (PCOUMI2000)

This interface allows fundamental parameters of the OEM humidifiers produced by CAREL (water level and conductivity in the cylinder, TAM current sensor) to be controlled directly by the pCO sistema controllers. The values measured by the sensors are converted into signals read by the inputs on the control board.

The board is managed by the application program loaded on the pCO sistema controllers.



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### Driver for electronic expansion valves (EVD\*200, EVD\*300 & EVD\*4\*\*)

The EVD200 & EVD4\* drivers control the superheat of the refrigerant by managing most of the electronic expansion valves with stepper motors available on the market, for both refrigeration and air-conditioning applications.

Fitted with rechargeable backup battery.



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### LonWorks® serial board (PCO10000F0)

Used to interface the controllers to a LonWorks® network. The type of interface on the LonWorks®, network side is FTT-10A 78 kbs (TP/FT-10).  
info: lon@carel.com



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### BACnet™ MSTP RS485 interface board (PCO1000BA0)

Used to interface the pCO controllers with the BACnet™ MSTP, protocol, an emerging standard in the HVAC industry.  
info: pcoweb@carel.com



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### Programming key (PCOS00AKY0)

A new universal programming key has been made for the pCO controllers. This is used to transfer the programs from the key to the pCO and vice-versa.



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### CANbus serial board (PCOS00HBB0)

Allows communication using the CANbus protocol to the CAREL e-dronic system for managing fan coils.



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### Ethernet™ interface board (PCO1000WB0)

Used to interface the pCO controllers with the BACnet™ Ethernet™, IP, SNMP V1, 2, 3, FTP & HTTP.  
info: pcoweb@carel.com



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### USB/RS485 converter (PCOS00AKC0)

Used to connect the smart key to a PC via a USB port.



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### RS232 serial board (PCO100MDM0)

The RS232 option is used to interface with a PSTN or GSM modem, thus allowing control over a remote station and the transmission/reception of SMS messages (GSM only), or alternatively connection to a serial printer.



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### Konnex board on FieldBus (PCOS00KXF0)

The KNX technological standard is now widely used in building automation and control for commercial and residential use. CAREL is member of the KNX Association ([www.knx.org](http://www.knx.org)).

The CAREL Konnex board is compatible with all KNX/EIB devices and can be installed on the FieldBus port on the pCO<sup>3</sup> controllers.

The K-Set tool (available for download from [ksa.carel.com](http://ksa.carel.com)) is used to create an XML file for the custom profiles.  
info: konnex@carel.com



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### RS485 serial board (PCOS004850)

Used to interface directly to an RS485 network with optical isolation. The maximum baud rate available is 19200 baud (settable via software). The CAREL and Modbus RTU protocols are available.



- pCO<sup>3</sup>  pCO<sup>XS</sup>
- pCO<sup>1</sup>  pCO<sup>C</sup>

### TREND serial board (PCO100CLP0)

Provides communication with the TREND interface, a commonly-used building management system in English-speaking countries.  
For orders and information contact [trend@carel.com](mailto:trend@carel.com).



- pCO<sup>3</sup>  pCO<sup>1</sup>  pCO<sup>XS</sup>  pCO<sup>C</sup>  
 shelter applications  
 pCO<sup>3</sup>  pCO<sup>1</sup>  pCO<sup>XS</sup>  pCO<sup>C</sup>

### PCO RS485 I/O expansion board (PCOE004850 & PCOE00RS10)

This has been designed to increase the number of I/O on the pCO family controllers. It is connected using the RS485 protocol and can be installed up to 600 m away. Also available for mobile telephone applications (shelters).



- pCO<sup>3</sup>  pCO<sup>1</sup>  pCO<sup>XS</sup>  pCO<sup>C</sup>  
 shelter applications  
 pCO<sup>3</sup>  pCO<sup>1</sup>  pCO<sup>XS</sup>  pCO<sup>C</sup>

### PCO tLAN I/O expansion board (PCOE00TLN0 & PCOE00TL10)

This has been designed to increase the number of I/O on the pCO family controllers. It is connected using the tLAN protocol and can be installed up to 10 m away. Also available for mobile telephone applications (shelters).



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### DC/DC module (PCO2DCDC00)

Using the DC/DC power supply module, the entire range of pCO controllers can be powered using the 48 Vdc storage batteries that are typical of telephone applications. The input voltage can range from 21 to 58Vdc, while the output voltage is 24±1 Vdc / 0.7 A or 30±1 Vdc / 0.6A. DIN rail mounting is made possible by the 4 DIN module plastic case.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### Clock board (PCO100CLK0)

Option used to manage the time and date and provide RAM with battery backup for the application program.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### CANbus board on FieldBus (PCOS00HBF0)

Allows communication using the CANbus protocol to the CAREL e-dronic system for managing fan coils.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### RS485 serial board on FieldBus (PCO100FD10)

Allows RS485 communication via the FieldBus serial port with a compatible external electronic device. The CAREL and Modbus RTU protocols are available.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### Modem board on FieldBus (PCOS00FD20)

Used to interface the controller with a PSTM or GSM modem or a serial printer via the FieldBus serial port.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### tLAN serial board on FieldBus (PCO100TLN0)

Provides communication with a compatible external electronic device using the CAREL tLAN proprietary protocol.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### MP-BUS<sup>®</sup> board on FieldBus (PCO100MPB0)

Provides communication with BELIMO actuators using the MP-BUS<sup>®</sup> protocol.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### Impulse converter module (PCO208DI00)

The module is used to read signals on the pCO\*, controller digital inputs that switch at higher speeds than normally managed by the controller. The module can manage a maximum of two external devices.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### Optional logger board (PCO100CEF0)

Used to save data and event logs. These functions must be managed by the application program on the controller.



- pCO<sup>3</sup>  pCO<sup>XS</sup>  
 pCO<sup>1</sup>  pCO<sup>C</sup>

### Konnex board on BMS (PCOS00KXB0)

The KNX technological standard is now widely used in building automation and control for commercial and residential use.

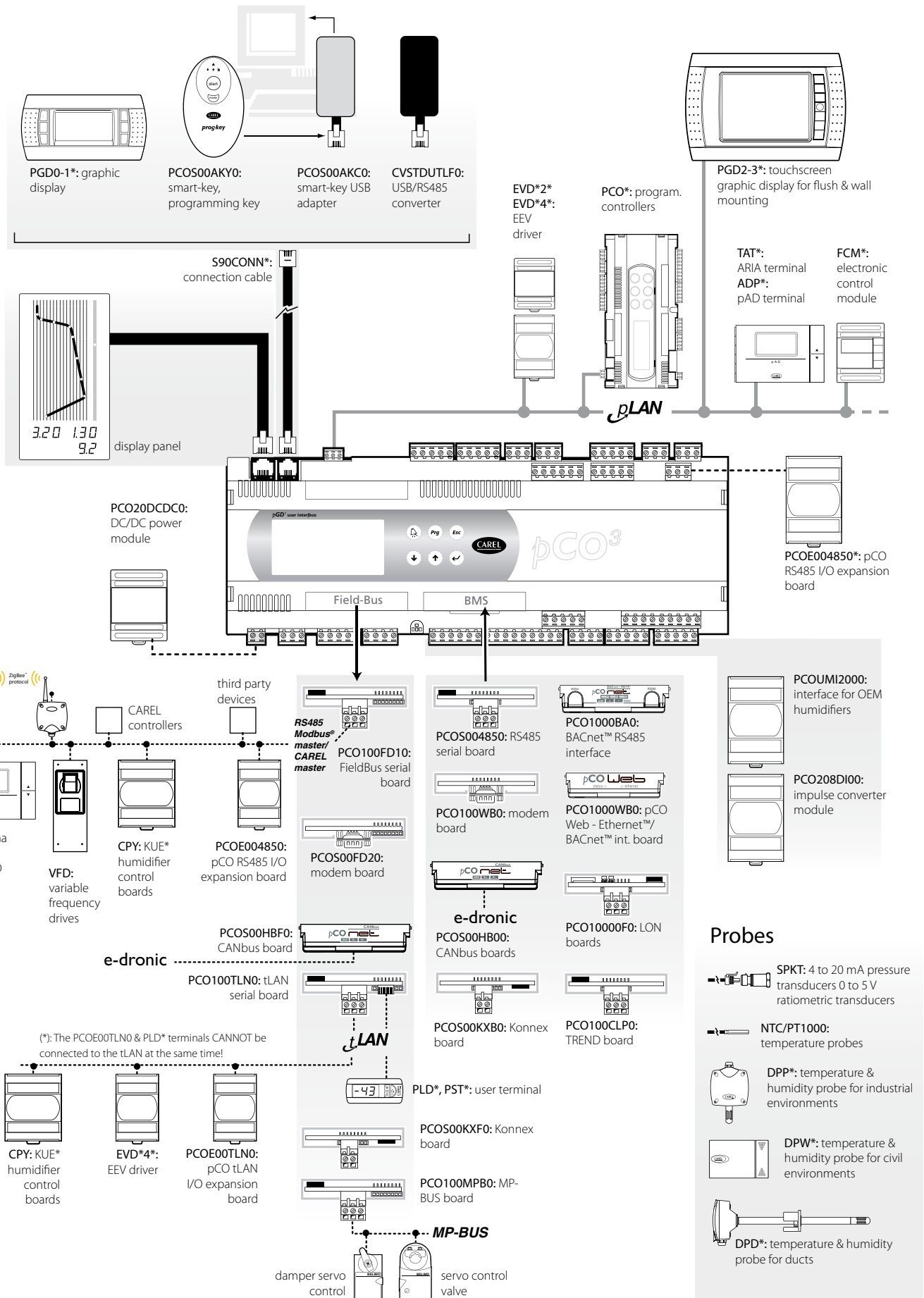
CAREL is member of the KNX Association ([www.knx.org](http://www.knx.org)).

The CAREL Konnex board is compatible with all KNX/EIB devices and can be installed on the BMS port on the pCO sistema or e-drofan controllers. The K-Set tool (available for download from [ksa.carel.com](http://ksa.carel.com)) is used to create an XML file for the custom profiles.

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

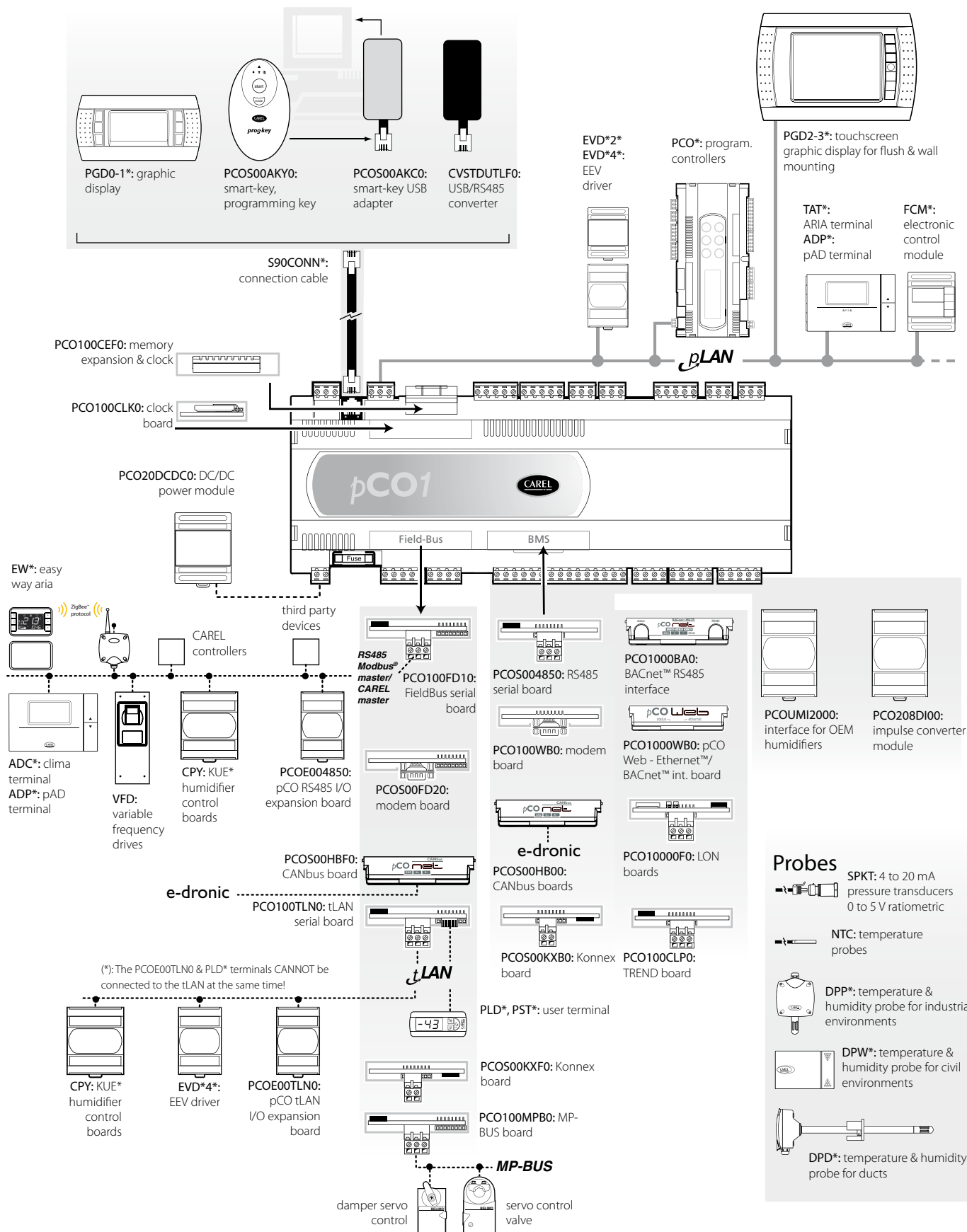
# OVERVIEW DRAWING

pCO<sup>3</sup>



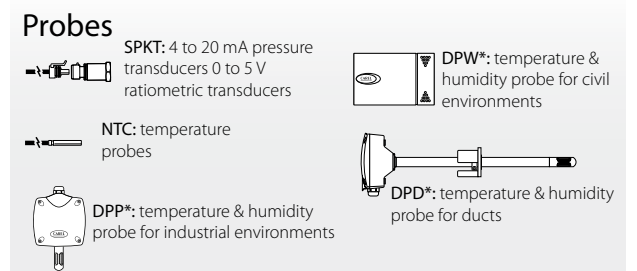
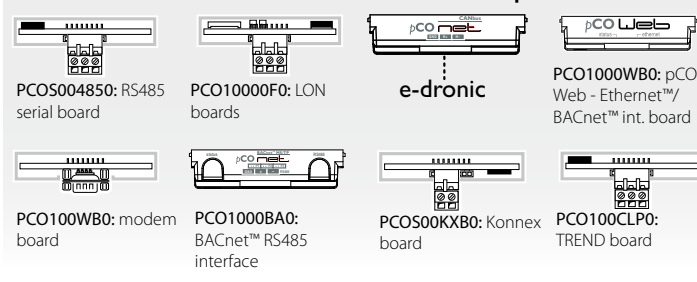
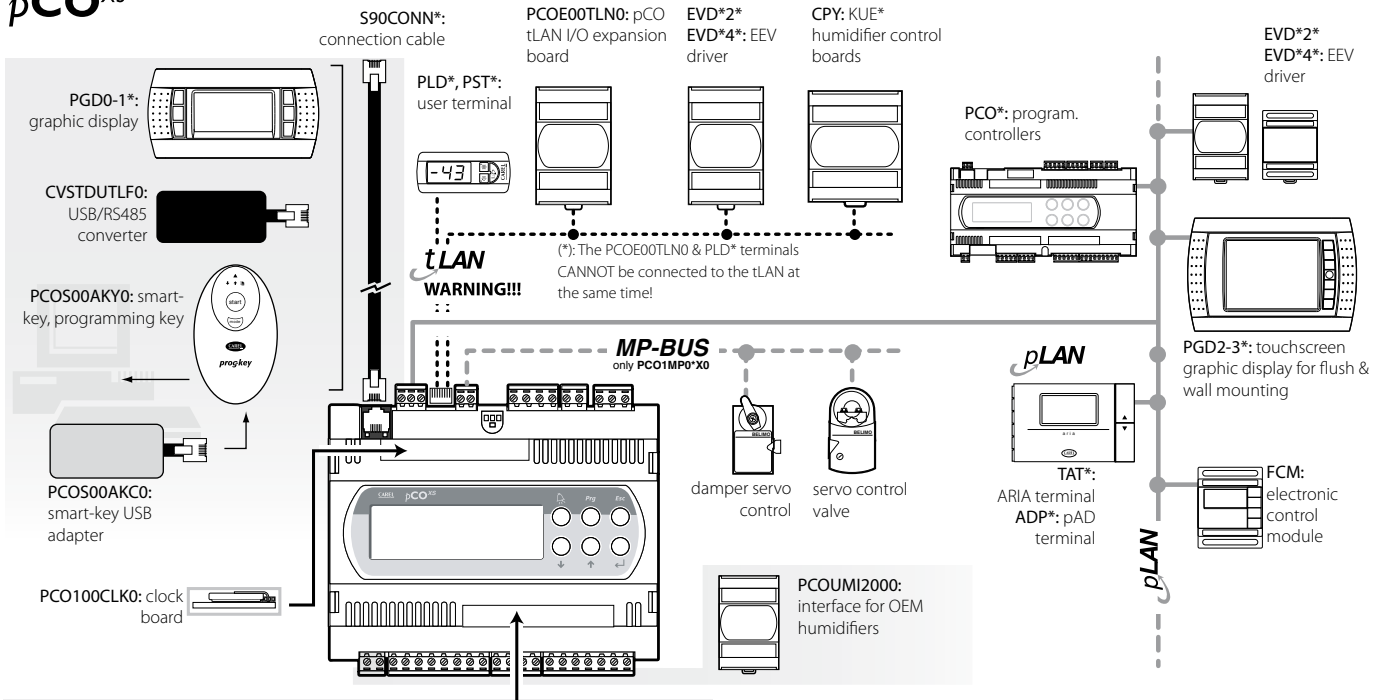
# OVERVIEW DRAWING

pCO<sup>1</sup>

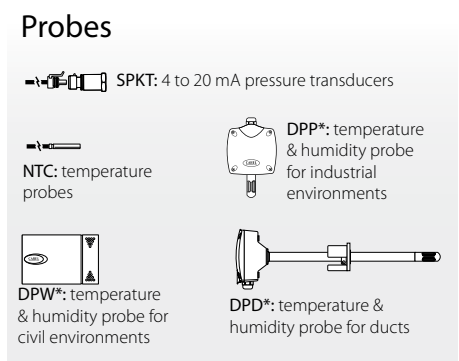
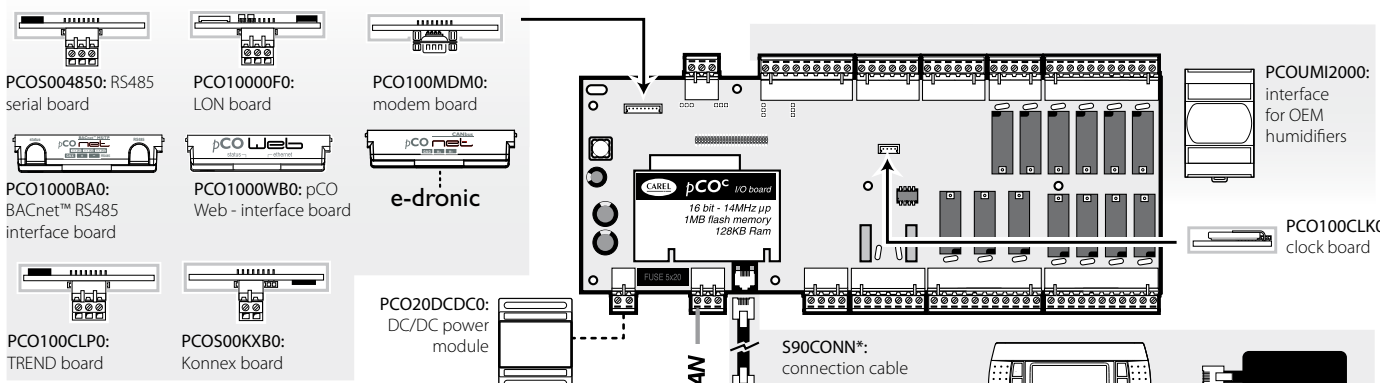


# OVERVIEW DRAWING

**pCO<sup>XS</sup>**



**pCO<sup>C</sup>**







### Models

Specifications	PCO3*S	PCO3*M	PCO3*L	PCO3*XL NO ver.	PCO3*XL NC ver.	PCO1*S	PCO1*M	PCO1*X	PCOC*
Maximum flash memory capacity	4 MB	4 MB	4 MB	4 MB	4 MB	2 MB	2 MB	2 MB	2 MB
NAND Flash	■	■	■	■	■				
Real Time Clock	●	●	●	●	●	■	■	■	■
pLAN	●	●	●	●	●	●	●	●	●
Opto-isolated pLAN	■	■	■	■	■				
tLAN	■	■	■	■	■	■	■	●	■
Ready for programming key	●	●	●	●	●	●	●	●	●
Built-in PGD0 display	■	■	■	■	■				
Built-in PGD1 display	■	■	■	■	■				
Built-in 4x20 display								■	
LED display panel	■	■	■	■	■				
Serial port for managing I/O expansion	■	■	■	■	■	■	■	■	
Black box	●	●	●	●	●	■	■	■	
CAREL protocol	●	●	●	●	●	●	●	●	●
Konnex protocol	■	■	■	■	■	■	■	■	■
Modbus® RTU protocol	●	●	●	●	●	●	●	●	●
LonWorks® protocol	■	■	■	■	■	■	■	■	■
BACnet™ Ethernet™ protocol	■	■	■	■	■	■	■	■	■
BACnet™ MS/TP protocol	■	■	■	■	■	■	■	■	■
HTTP/FTP/SNMP protocol	■	■	■	■	■	■	■	■	■
CANbus protocol	■	■	■	■	■	■	■	■	
MP-BUS Belimo	■	■	■	■	■	■	■	●	
Ready for modem, modem GSM, SMS	●	●	●	●	●	●	●	●	●
Max. no. of analogue inputs	5	8	10	8	10	6	8	4	8
PT1000 inputs	2	2	4	2	4				
0 to 10 Vdc inputs	3	6	6	6	6				
0 to 1 Vdc inputs	3	6	6	6	6	4	4	2	4
4 to 20 mA or 0 to 20 mA inputs	3	6	6	6	6	4	4	2	4
NTC inputs	5	8	10	8	10	6	8	4	8
0 to 5 Vdc ratiometric inputs	3	6	6	6	6	4	4	4	
Select AIN via software	●	●	●	●	●			●	
Select AIN via dipswitch						●	●		●
Max. no. of digital inputs	8	14	18	14	14	8	14	6	12
24 Vac/Vdc inputs	8	14	18	14	14	8	14		12
230 Vac/Vdc inputs		2	4	2	2	8	2		2
Voltage-free contact inputs	2	2	4	2	4	2	2	6	
Max. no. of analogue outputs	4	4	6	4	4	4	4	3	2
0 to 10 Vdc outputs	4	4	6	4	4	2	2	2	2
PWM outputs (phase control)						2	2	1	
Max. no. of digital outputs	8	13	18	29	27	8	13	5	13
SPST relay outputs	7	10	13	26	24	7	10	4	10
SPDT relay outputs	1	3	5	3	3	1	3	1	3
Max. no. of SSR outputs	2	4	6	6	6	2	4	2	
48 Vdc power supply	■	■	■	■	■	■	■		■

● standard - ■ optional



CAREL<sup>®</sup> US

E242824



POCC IT.AI50.B09036

## pCO sistema: unit terminals

The structure and the modularity of the pGD family displays always ensure the right solution for different requirements in terms of performance, cost and appearance.

The pGD<sup>2</sup>-pGD<sup>3</sup> series is designed for high level applications that require touchscreen technology combined with an elegant design.

The pGD<sup>0</sup>-pGD<sup>1</sup> series is focused on applications that require a good compromise between performance, competitiveness and appearance.

The pLD series (programmable LED display) is ideal for applications where the main requirements of the user interface are reductions in costs and the space required for installation.

### Design & technology

The pGD<sup>2</sup>-pGD<sup>3</sup> series interfaces represent the most high-tech CAREL product offering in this area.

The 5.7" touchscreen display with 1/4 VGA resolution, and the 32-bit microprocessor allow the management of graphic objects measuring up to 320x240 pixels, animated icons, non-proportional fonts in Unicode format, alarm logs, graphs showing the trend of the values in the application, with 256 colour definition.

The touchscreen function helps the end user move easily around more complex system diagrams, without losing the overall view, thanks the immediate and user-friendly navigation scheme.

The interface system is completed by a keypad on the side of the display. The pGD<sup>2</sup> and pGD<sup>3</sup> also provide more demanding manufacturers in the HVAC/R market various possibilities for product customisation and differentiation.

Its attractive and modern design make the user interface also suitable for residential applications.

### Performance at competitive costs

The pGD<sup>0</sup> and pGD<sup>1</sup> series is the first family of interfaces with graphic LCD to be designed for the pCO sistema controllers.

The interfaces offer great versatility and extensive customisation possibilities, while maintaining a high aesthetic standard. When designing these instruments, CAREL focussed special attention on the simplicity of programming and the quality of performance.

pGD<sup>0</sup> and pGD<sup>1</sup> manage graphics with 120x32 pixel and 132x64 pixel resolution respectively, and can display graphic symbols of different sizes and in the main international alphabets, such as Greek, Chinese, Cyrillic and Scandinavian languages.

pGD<sup>0</sup> is completely compatible with the software developed for the CAREL 4x20 user interfaces.



## Design & technology: graphic touchscreen user interface

PGD2\*: black & white graphic touchscreen display

PGD3\*: colour graphic touchscreen display

pGD<sup>2</sup> and pGD<sup>3</sup> are two extremely high-tech user interfaces, featuring a 5.7" touchscreen display with 1/4 VGA resolution, and a 32-bit RISC microprocessor that allows the management of complex graphic images (up to 320x240 pixels in size and with up to 256 colours), animated icons, non-proportional fonts in Unicode format, graphs of the alarm trends, temperature, humidity, pressure values and air speed.

The touchscreen function makes it easy for the user to manage more complex installation diagrams, without losing the overall view of the installation, as well as ensuring that the pages can be browsed in a fast and straightforward manner, thus reducing the use of instruction manuals. A keypad on the side of the display can be used in all applications where the touchscreen is not the preferred solution.

pGD<sup>2</sup> and pGD<sup>3</sup> can be connected to external keypad modules, thus offering more demanding manufacturers in the HVAC/R market various possibilities for customisation and differentiation.

The higher technological content is also expressed by the appearance of this device, designed to exploit the wide screen and the shape that can be easily adapted to any installation (on board the unit or in the room). For lower-end applications, the black and white version is available, which still supports the same functions as the colour version.

### Technical specifications

**Power supply:** 24 Vac  $\pm$ 15%, 50/60Hz or 30 Vdc  $\pm$  25%

**Power input:** 20 VA or 10 W

**Operating conditions:**

- PGD2: 0T50 °C, 0 to 85% rH non-condensing;
- PGD3: 0T45 °C, 0 to 85% rH non-condensing

**Storage conditions:**

-10T70 °C, 0 to 85% rH non-condensing

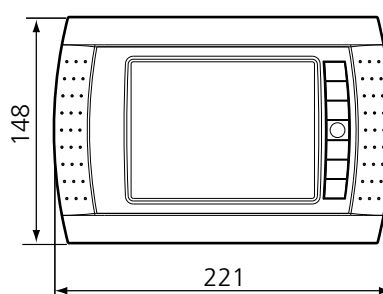
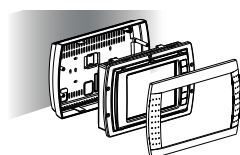
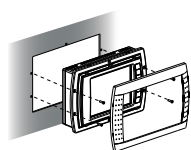
**Installation:** wall & flush mounted

**Index of protection:** IP40

Flush mount

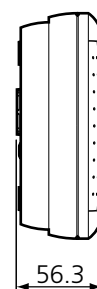
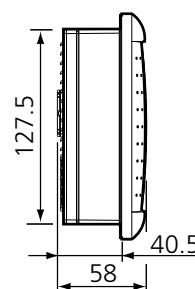
Wall mounted

Dimensions (mm)



flush mount

wall mounted





### pGD<sup>1</sup> white

The pGD<sup>1</sup> terminals are now also available in the new version with white LED backlighting. The hardware and software features are identical to the models with green backlighting

## Performance and competitive costs: semi-graphic LCDs

PGD0\*: semi-graphic LCD, 120x32

PGD1\*: semi-graphic LCD, 132x64

The new CAREL proposal in terms of the pCO sistema user interfaces is the innovative series of terminals designed with graphic LCDs so as to offer greater versatility and customisation options.

When designing these terminals, CAREL focussed special attention on the simplicity of programming and the quality of performance, while maintaining a high aesthetic standard.

The display recalls the shape and the dimensions of the already existing 20x4 display, yet features graphic representation on 120x32 pixels (PGD0\* version).

The "large" version, 132x64 pixels, is also available, code PGD1\*.

PGD0-1\* can display graphic symbols of various sizes and the main international alphabets.

The PGD0-1\* also respond to the logic of flexibility and ease of customisation that is the basis for the design of this series of

CAREL products, offering more demanding customers several customisation possibilities at affordable costs even for limited quantities.

### Technical specifications

**Power supply:** from power board via telephone cable (code S90CONN00\*) or from external source 18 to 30 Vdc via TCONN6J000

**Power input:**

- PGD1: 1.2 W;
- PGD0: 0.8 W

**Operating conditions:**

-20T60 °C, <90% rH non-condensing

**Storage conditions:**

-30T70 °C, <90% rH non-condensing

**Index of protection:**

- IP65 when flush mounted;
- IP40 when wall mounted.



### Touchscreen

The touchscreen function provides a user-friendly and simple method for browsing the various pages, thus helping the end user have a good overall view of the units or the area managed by the pCO sistema family programmable controllers

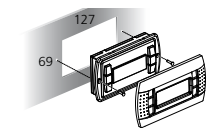


### IP65

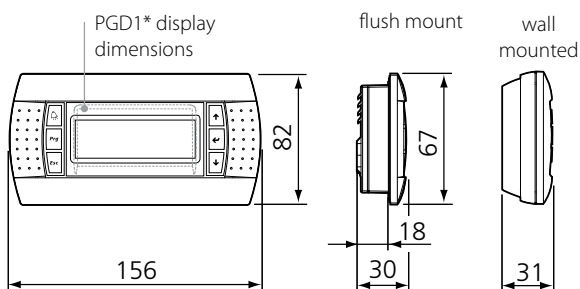
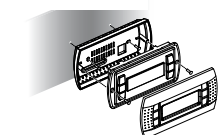
The high index of protection (IP65) and the wide range of operating temperatures (-20T60) ensure a high standard of safety against the elements. The different assembly solutions (wall or flush mounting), the plastic frame and the customisable glass ensure flexibility and reduced costs, even for minimum quantities.

### Flush mount

### Dimensioni (mm)



### Wall mounted





## The entry level solution

PLD\*: LED display with buttons

For all those applications where the cost and compact dimensions represent important aspects of the application, CAREL offers the pLD terminal (programmable LED display) in the small and large sizes, with 3 and 4 digit display respectively.

The ease of customisation of the pLD and the programmability using the EasyTools environment guarantee a competitive solution.

In addition, as the pLD terminal is connected to the tLAN port, the use of this terminal does not however not preclude the possibility to connect another pGD family terminal (e.g. remote terminal) to the pLAN port (in this case, the two displays cannot operate at the same time).

### Technical specifications

**Power supply:** from power board via telephone cable (code S90CONN00\*) or from external source 18 to 30 Vdc via TCONN6J000

**Power input:** 0.8 W

**Operating conditions:**

-20T60 °C, <90% rH non cond.

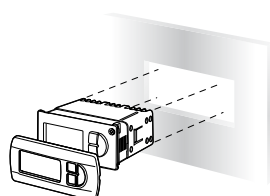
**Storage conditions:**

-20T70 °C, <90% rH non cond.

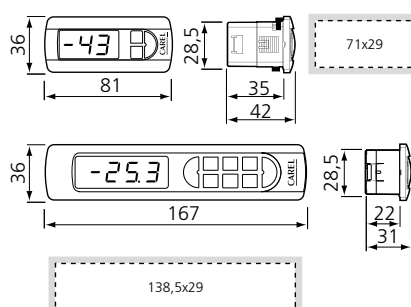
**Index of protection:**

- IP65 when flush mounted;
- IP40 when wall mounted.

Flush mount with fastening from front



Dimensions (mm)



## Models

Specifications	pGD <sup>3</sup>	pGD <sup>2</sup>	pGD <sup>1</sup>	pGD <sup>0</sup>	pLD	pAD
Resolution	320x240	320x240	132x64	120x32	3-4 digit	-
Type of LCD	STN	STN	FSTN	FSTN	LED segments	LCD icons
Backlighting	fluorescent light	blue LEDs	green LEDs/ white LEDs	green LEDs	green LEDs	green LEDs
Buzzer	●	●	■	■	●	●
Colour	256 colori	monocromatico	-	-	-	-
Number of rows	depending on font size	depending on font size	8	4	-	-
Number of columns	depending on font size	depending on font size	22	20	-	-
Touchscreen	●	●	-	-	-	-
Index of protection	IP40	IP40	IP65	IP65	IP65	IP30
Panel installation	●	●	●	●	●	-
Wall mounting	●	●	●	●	-	●
Operating conditions	0T45 °C	0T50 °C	-20T60 °C	-20T60 °C	-20T60 °C	0T50 °C
Oriental language capacity	●	●	●	●	-	-
Bold, italic, underline	●	●	-	-	-	-
Scalable fonts	●	●	-	-	-	-
Programmable icons	●	●	●	●	-	-
Animated icons	●	●	-	-	-	-
Graphs	●	●	-	-	-	-
pLAN	●	●	●	●	-	●
RS485 (CAREL/Modbus)	-	-	-	-	-	●
tLAN	-	-	-	-	●	-
Built-in temperature /humidity sensors	-	-	-	-	-	●
External membrane keypad	●	●	●	●	-	-
Available in pCO plastic case	-	-	●	●	-	-
Used with pCO <sup>3</sup>	●	●	●	●	□	● on pLAN ⊙ on Field Bus
Used with pCO <sup>1</sup>	●	●	●	●	□	● on pLAN ⊙ on Field Bus
Used with pCO <sup>C</sup>	-	-	●	●	-	● on pLAN ⊙ on Field Bus
Used with pCO <sup>XS</sup>	○	○	●	●	●	● on pLAN ⊙ on Field Bus

● default

■ as standard with version in pGDI plastic case, or models PGD0000\*Z0 & PGD1000\*Z0

○ 1+1 MB version

□ with PCO100TLN0 optional board on FieldBus serial port

⊙ with PCO100FD10 optional board on FieldBus serial port





## pCO sistema: room terminals, wireless version and serial version

easy way is the first completely wireless CAREL solution for the management of ambient comfort (temperature and humidity) in buildings.

It guarantees energy saving and optimisation of the entire system.

Ideal for air-source systems (roof-top units, air handling units), they can be adapted to any type of application (underfloor heating, industrial monitoring,...).

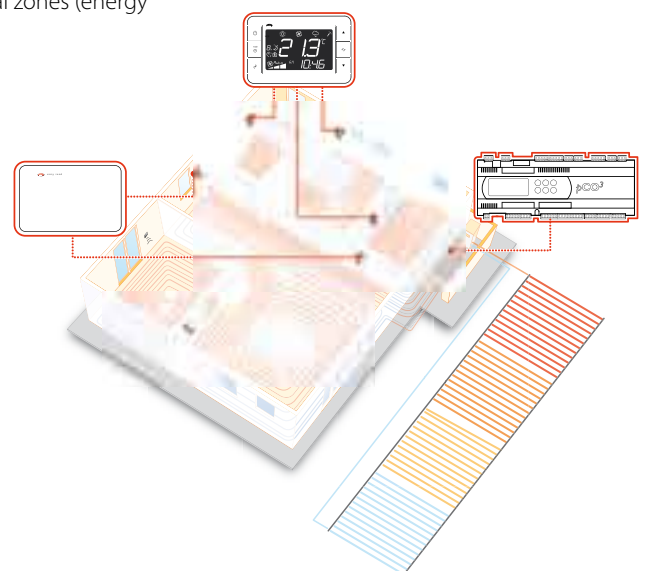
The system is made up of:

- **easy set:** an innovative wireless terminal with built in temperature and humidity sensors.
- **easy read:** wireless temperature and humidity sensors.
- **access point:** RS485 to ZigBee™ gateway, used to gather the information from the terminals and sensors and send it to a master supervisor (pCO controller, PlantVisorPRO or PlantWatchPRO).
- **repeater:** ZigBee™ to ZigBee™ device that repeats the radio signals so as to allow greater distance between the access point and the terminals/sensors.

easy way is an advantageous solution in terms of:

- flexibility: possibility to manage flexible spaces very simply, i.e. the reorganisation of a supermarket or office, without having an impact on the communication network;
- simple retrofit installation in historic or prestige buildings that do not have raised floors or false ceilings;
- lower installation and running costs;
- simple commissioning/service;
- integration with the more commonly-used Building Management Systems (BMS);
- specific control of individual zones (energy saving);

- the now mature ZigBee™ standard technology used for wireless communication ensures a high degree of security in the exchange of data;
- Mesh layout between access point and repeater







## easy set

EW00T\*\*\*00

The easy set terminal with built-in temperature and humidity sensors allows the user to change a number of settings so as to improve ambient comfort, such as ON/OFF, set point, operating mode, time bands, ... The terminal, white or black depending on requirements, can be rested on a shelf or table or fastened to the wall using the plastic support supplied.

### Technical specifications

**Power supply:** SAFT LS 14500 lithium battery

**Power input:** max. 130 mW

**Operating conditions:**

0T50°C, <80% rH non-condensing

**Storage conditions:**

-20T70°C, <80% rH non-condensing

**Index of protection:** IP20

## easy read

EW00S\*\*000

The easy read sensor measures the ambient temperature and humidity. The sensor, white or black depending on ram, can be rested on a shelf or table or fastened to the wall using the plastic support supplied.

### Technical specifications

**Power supply:** SAFT LS 14500 lithium battery;

**Power input:** max. 100 mW

**Operating conditions:**

0T50°C, <80% rH non-condensing

**Storage conditions:**

-20T70°C, <80% rH non-condensing

**Index of protection:** IP20

## access point

EW00AB2020

The access point is a fundamental component of the easy way ARIA system. It acquires the data from the terminals and sensors (up to 60) and relays it to a supervisory system (PlantWatchPRO, PlantVisorPRO) or a pCO device, which then uses such data to control the air-conditioning unit.

### Technical specifications

**Power supply:**

- 24 V~ ±10% (class 2 from power line)

- 24 V~ ±10% -15% 2VA (class 2 safety transf.);

**Power input:** 1 VA

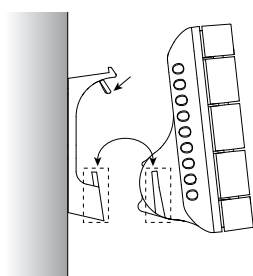
**Operating conditions:** 0T50°C, <80% UR non-condensing

**Storage conditions:**

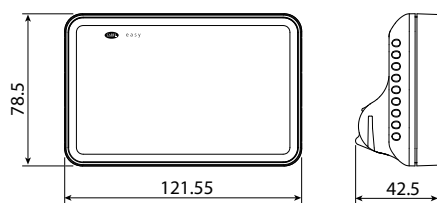
-20T70°C, <80% UR non-condensing

**Index of protection:** IP55 The index of protection is only ensured if a single cable is used with an outside diameter less than 8 mm

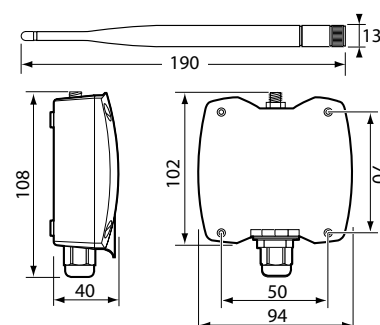
Wall mounted



Dimensions (mm)



Dimensions (mm)





## repeater

EW00RB\*02\*

The repeater relays the ZigBee signals so as to achieve greater distances between the terminals/sensors and the access points.

### Technical specifications

**Power supply:**

- 24 V~ ±10% (class 2 from power line)
- 24 V~ ±10% -15% 2VA (class 2 safety transf);

**Power input:** 1 VA

**Operating conditions:** 0T50°C, <80% rH non-condensing

**Storage conditions:**

-20T70°C, <80% rH non-condensing

**Index of protection:** IP55 The index of protection is only ensured if a single cable is used with an outside diameter less than 8 mm

## Room terminal, serial version

ADP\*

pAD (pCO Ambient Display) is the latest member of the pCO sistema family of displays. pAD is an icon-based LCD terminal for wall-mounting in the room. Available in two models (with temperature sensor or temperature and humidity sensors). pAD can be connected to the pLAN or FieldBus RS485 port, depending on the model. The clock as standard for the management of time bands, and the appealing design make this display ideal for residential or commercial applications.

### Technical specifications

**Power supply (as per EN60730-1):**

24 Vac ±15 %, 50/60 Hz 70 mA 1.5 VA or 31 Vdc ± 29 % 70 mA

**Power input:** max 1 watt

**Operating conditions:**

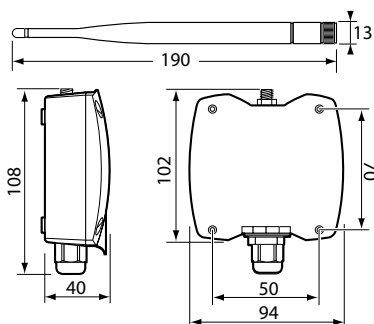
0T50 °C; 10 to 85% rH non-condensing.

**Storage conditions:**

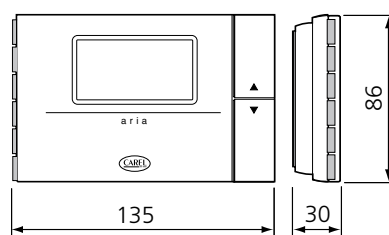
-20T70 °C; 0 to 85 % rH non-condensing.

**Index of protection:** IP30;

Dimensions (mm)



Dimensions (mm)





Models					
Specifications	EW00T* easy set	EW00S* easy read	EW00AB2020 access point	EW00RB2020 ripetitore	ADP* pAD
Built-in temperature sensor	●	●	-	-	●
Built-in humidity sensor	■	■	-	-	■
Type of LCD	LCD with icons	-	-	-	LCD with icons
Backlighting	-	-	-	-	Green LED
Case / display colour	black/negative or white/positive	black or white	black	black	white
Index of protection	IP20	IP20	IP55	IP55	IP30
Desktop installation	●	●	-	-	-
Wall mounting	●	●	●	●	●
Buzzer	-	-	-	-	●
Operating conditions	0T50 °C	0T50 °C	0T50 °C	0T50 °C	0T50 °C
CAREL protocol over ZigBee™	●	●	● to terminals/ sensors/repeaters	●	-
CAREL slave protocol over RS485	-	-	●	-	●
Modbus slave protocol over RS485	-	-	-	-	●
pLAN	-	-	-	-	●
ZigBee distance	100m outdoors 50m indoors with visibility on access point/repeater	100m outdoors 50m indoors with on access point/ repeater	100m outdoors 50m indoors with on terminals/ sensors/repeaters	100m outdoors 50m indoors with visibility on access point/terminals- sensors	-
RS485 distance	-	-	100m outdoors 50m indoors with visibility on terminals/sensors/ repeaters	-	1 km FieldBus RS485 500m pLAN
Maximum number of devices	60 for each access point	60 for each access point	15 on RS485 serial	8 for each access point	30 pLAN 200 RS485
Used with pCO <sup>3</sup> /pCO <sup>1</sup>	●	●	●	●	●
Used with pCO <sup>C</sup> /pCO <sup>XS</sup>	-	-	-	-	pLAN only

● as standard  
■ optional



# 1tool

1tool is the new development tool for the CAREL programmable controller platform. It features five different environments available to the designer for managing all phases of the application program: from design to testing and debugging and right up to commissioning in the field.

The fundamental aspect of this tool is integration: all the environments are linked together to best support development of the application program.

Indeed, each environment is dedicated to the development of a specific function and interacts with the other environments so as to ensure the designer:

- greater reliability, thanks to the real time error notification in the design phase;
- a reduction in development times using the new functions available, above all the new libraries of functional modules;
- flexibility in terms of software customisation.

All these features, new graphics and userfriendliness make 1tool an excellent product that responds to a variety of needs for HVAC/R applications.

## Connectivity

CAREL, as well as offering its customers high quality and reliable products, has always paid special attention to the requirement of OEMs operating in the HVAC/R sector to interface the pCO sistema controllers with the most commonly-used BMS (Building Management Systems). For the designer, in fact, it has become standard to offer software applications that can interface with the most common protocols. Using 1tool, interfacing with the main BMS, such as Modbus®, LonWorks® and BACnet™ can be implemented simply in the design phase.

## Backward compatibility

During the development of 1tool, CAREL focused special attention on ensuring that customers who have developed applications using EasyTools can exploit the work done in terms of the software developed until now. Using the Migration Wizard, a plug-in available in the 1tool package, applications developed in EasyTools can be converted safely and completely, thus protecting their prior work.

## Documents

The tool creates all the main documents relating to the application, such as the list of I/Os, list of parameters, supervisor and alarm tables. In this way, the developer can simply and quickly source the essential information required to create the instruction manual for the application.

## Information in real time

Using the "Really Simple Syndication" system, currently one of the most popular formats for distributing information on the Web, the 1tool developer can be kept constantly informed of the latest news and updates published on the CAREL site.



### Libraries of modules

The libraries of functional modules represent one of the main new features of 1 tool. The modules are functional blocks made up of control algorithms and user interfaces. The designer can thus, with a simple “click”, import the desired algorithm and all the corresponding user interfaces into the application, saving a significant amount of development time.

To best support its customers, CAREL provides libraries of functional modules designed for the various different HVAC/R applications. Users can also convert their own specific algorithms into reusable modules, making the development of subsequent projects faster and more secure, being based on consolidated logic.



### Simulation of the application

Using the Simulation Editor, one of the five 1 tool environments, the applications developed can be tested quickly and reliably. The new environment simulates the control algorithm and the corresponding user interface in detail, using new and more powerful functions when compared to the previous EasyTools. Firstly, the designer can apply different types of simulation, from continuous execution of the application to step-by-step execution of the various functional blocks making up the algorithm. During simulation, furthermore, the input and output values of the various functional blocks can be displayed in real time. Finally, the use of break-points allows faster debugging of the application being developed.



### pCO Manager

pCO Manager is the new 1 tool environment that assists the user in the configuration and setup of the HVAC/R unit.

Available in two versions, integrated in 1 tool and stand-alone, it allows the user to configure the unit parameters quickly and safely, and then test the actual application using the serial connection between the controller on the unit and the PC.

Security in controlling the parameters is ensured by different access profiles, each with different restrictions based on the type of user.

Finally, remote monitoring is guaranteed by the connection via modem (PSTN or GSM).



### User interface

Mask Editor is the 1 tool environment designed for the simplified management of the user interface. With a language that is part graphic-based and part text-driven, the user interface of the application can be completely customised.

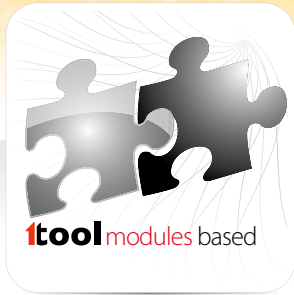
The environment is orientated around the multi-language management of the project, so as to respond to the increasing need in HVAC/R to simply manage all the various languages of the application.

The functions available in the environment (implementation of texts, images, animated icons,...), are managed using simple graphic objects, making the tool easy and straightforward to use.



### Distributed intelligence

Net Editor is the environment that links together the various elements in the pCO sistema (programmable controllers, terminals and electronic valve drivers) in the pLAN network. This environment can be used to define the structure of the network in graphic mode, establishing how many and which units are present and what information each of these will exchange with the others. In this way, each pCO controller will both control the connected devices and at the same time exchange information with the other controllers in the network, so as to ensure optimum coordination of the climate control system or manage specific situations, such as alarms.



## pCO sistema software applications

Air-conditioning applications play a primary role in the range of the CAREL solutions.

These programs, developed with the EasyTools System, allow the pCO family programmable controllers to operate using different logic according to the unit being controlled (air-conditioning units, roof-top units, chillers, shelters).

Thanks to the pLAN connection, some programs feature the possibility of using more than one board for the same unit, if the number of I/O is not sufficient, or for the rotation of a series of units.

The pCO sistema control boards feature the multi-language function and a direct connection, or connection using an optional board to BMS.

Flexibility is further guaranteed by the different sizes of the boards

### Advantages

#### Modularity

With the pCO sistema boards the user can choose between different sizes: Extra Small, Small, Medium, Large and Extra Large, with a different number of inputs and outputs.

#### Hardware key

The application software can be loaded onto the boards using a hardware key, which is also suitable for saving the alarms and logs easily and quickly.

#### BMS

The pCO sistema controllers can be interfaced to BMS using Modbus®, BACnet™, LonWorks®, TREND and other protocols, by adding plug-in communication boards.

#### Flexibility

CAREL standards have been designed and developed with the aim of covering the greatest possible number of requirements.



### Ground source heat pumps

The first complete integrated electronic solution for managing ground source heat pumps, for residential applications and swimming pools, ensuring energy saving and optimising the management of the entire system. Various solutions are available so as to adapt to the possible levels of integration between the heat generator and the system.

#### Main functions:

- control of the water and ambient set point;
- home heating or domestic hot water;
- outside temperature compensation;
- high efficiency ensured by the use of the electronic expansion valve;
- dedicated room terminal;
- management of tandem compressors.



### Control solutions for chillers

Standard application programs for managing air/water or water/water chillers, with tandem scroll compressors, semi-hermetic compressors or screw compressors featuring continuous or stepped capacity control.

The maximum configuration includes 8 hermetic or semi-hermetic compressors or 2 screw compressors for each unit, with a limit of 4 units.

Based on the type of compressors, various pCO sistema controllers can be used to create the best configuration in terms of I/Os.

The condenser fans can also be managed, with stepped or modulating control, using the CAREL FCS.

As well as connection to the most commonly used BMS, SMS messages can also be sent and received via a GSM modem to and from mobile phones



### Control solutions for precision air-conditioners

Standard application programs for either direct expansion or water-cooled air-conditioning units, with control of the condenser, a built-in or external humidifier, and electronic expansion valves.

The maximum configuration features 2 valves or 2 compressors.

A local network can be used to connect up to 8 units, for centralised alarms or to balance the operating hours.

Connection is available to the leading BMS, and SMS messages can be sent and received to and from mobile phones using a GSM modem.

The alarm and event log is saved to the memory expansion and can be viewed on the LCD display or from a PC with an RS485 connection.



### Control solutions for roof-top units

Standard application programs for managing the temperature and humidity in roof-top units with two circuits and four compressors.

The free cooling and free heating functions allow energy savings by exploiting the temperature of the outside air.

The maximum configuration features 2 capacity-controlled or 4 hermetic compressors, 2 heaters, and a built-in or external humidifier.

Connection is available to the leading BMS, and SMS messages can be sent and received to and from mobile phones using a GSM modem.

The alarm and event log is saved to the memory expansion and can be viewed on the LCD display or from a PC with an RS485 connection.



### Control solutions for shelter air-conditioners

Standard application programs for managing individual and multiple shelter units (max. 4), for mobile telephone applications and use in prefabricated buildings. As well as managing compressors, fans and heaters, the outside air damper can also be controlled for freecooling. In addition, the speed of the condenser fans can also be controlled.

Complete alarm functions are managed, to ensure maximum safety and security in the event of break-ins, fires and power failures. Connection is available to the main BMS, and SMS messages can be sent and received to and from mobile phones using a GSM modem. The alarm and event log is saved to the memory expansion and can be viewed on the LCD display or from a PC with an RS485 connection. All the parameters can be modified and are protected by three levels of password: user, installer and manufacturer.



### Control solutions for hydronic systems: area controller

Standard application programs for the control of hydronic systems, such as fan coils, cassette units, AHUs, chillers and heat pumps. These applications envisage different architecture for communication between the different devices, increasing performance and optimising running costs. By analysing the climatic conditions in the different environments (heating/cooling), the chillers, heat pumps or boilers for the production of cold or hot water can be activated, the temperature in the loops controlled using modulating valves and circulating pumps, the set point of the water adapted to actual needs or based on time bands. The pGD user interface, now available in the 256-colour version with touchscreen, interactively displays the layout of the different environments and control points, offering a powerful and flexible system with maximum simplicity for the user. The pCO, finally, centralises the data from the terminal units and communicates using the main communication standards available on the market.



### Control solutions for AHUs in supermarkets

Standard application programs for the control of air handling units.

These manage all the cooling, heating, humidification, dehumidification and post-heating functions, as well as freecooling, enthalpy control, set point compensation, heat recovery and air change. The fans, air filters and external devices (refrigeration units) are protected by a complete alarm management system. In addition, the fan speed can be controlled by inverter, so as to maintain a constant outlet and return pressure in systems with variable flow-rate, optimising the consumption of energy. Different versions of display are used to read the data both on the unit and from a distance. All the parameters can be modified and are protected by three levels of password: user, installer and manufacturer. The application can be integrated into the PlantVisor or PlantWatch supervisory system by RS485 serial connection, and can also interface to the Modbus\* protocol.





# Parametric controllers

CAREL continues to focus its efforts on searching for increasingly advanced control solutions for HVAC/R applications. Specific commitment is dedicated to parametric controllers, which provide the user a powerful and flexible instrument. Indeed, starting from extremely simple control strategies the user can, by modifying just a few parameters, adopt control algorithms that are much more sophisticated and innovative, based on the state-of-the-art in the air-conditioning sector.

The flexibility of the controllers has become increasingly accessible due to the introduction of new software tools for programming the controllers directly from a personal computer.

Simple installation is also an important factor, both as regards assembly and wiring, using standard templates and quick connectors.

Finally, all parametric controllers can interface with both CAREL supervisory systems and open supervisory systems.



Integrated Control Solutions & Energy Savings



## μC sistema

μC sistema is the result of CAREL's decades' long experience in the design and production of parametric controllers for HVAC units. μC sistema is made up of parametric controllers, in both the panel mounted and DIN rail versions, user interfaces, both local and remote, communication interfaces, input/output expansions and electronic expansion valve drivers.

Everything the OEM needs to operate in the HVAC/R sector with a flexible, economical and high performance control system. A wide range of applications can be customised by setting specific parameters, for chiller/HP appliances: air/water, water/water, air/air and roof-top units, up to two circuits, with a maximum of 3 compressors per circuit.

### Advantages

- extremely compact dimensions;
- possibility to connect to a remote terminal;
- high reliability;
- management of electronic expansion valves;
- ergonomic and high efficiency display with icons;
- simple wiring (new tLAN serial network);
- modular architecture.

### Main functions

- proportional water/air return and outlet control with timed logic;
- P+I control;
- stepped control in each circuit;
- condenser/evaporator control;
- part-winding management;
- solenoid valve control and pump down management;
- sliding defrost in HP mode;
- electric heating step as independent antifreeze support on the evaporator;
- control and warnings on component operating hours;
- part load operation for high pressure in chiller mode;
- fan on when starting with high outside temperatures;
- stop compressors for low outside temperature values;
- part load operation for low pressure (HP);
- low noise in chiller and HP mode;
- set point variation and ON/OFF from time band;
- electronic expansion valve driver management;
- event logging: alarms with FIFO logic;
- data logging of evaporation and condensing temperature and pressure (last 100 alarms);
- smart key - download data logs to PC

- send alarms by SMS;
- autotuning;
- self-diagnostics;
- automatic changeover;
- smart defrost;
- programming key.

### Devices controlled

- compressors;
- condenser fans;
- reversing valve;
- water circulating pump or outlet fan (air-air);
- antifreeze heater;
- alarm signal device;
- electronic expansion valve;
- air damper (roof-top units).

### Options

- RS485, LON, RS232 serial board for modem;
- programming key;
- fan speed controllers, both single-phase and three-phase;
- driver for electronic expansion valves;
- I/O expansion;
- ratiometric pressure probes.



## μC³: control of single and two-circuit units with up to 6 compressors

MCH3\*

The μC³ series is the top of the μC range. It has been designed to satisfy the most demanding and important manufacturers in the sector who require increasingly high performance and competitive products. μC³ can be installed with or without the DIN rail case, the wiring system is plug-in with Molex® connectors. The case guarantees a high index of protection, reduces the risk of electrostatic discharges and reduces the assembly times for the entire system.

μC³ can manage up to six hermetic compressors or two semi-hermetic compressors in a maximum of 2 circuits, with the possibility to control the electronic expansion valve. With the large number of inputs and outputs, it can completely control air/water units, chillers and heat pumps, water/water units with reversal on the gas and water circuit, air- and water-cooled condensing units with and without reverse cycle, and air/air heat pumps. It can also

manage roof-top units with and without freecooling based on the temperature or the enthalpy. Using an optional RS485 communication board, μC³ can be interfaced with the CAREL PlantVisor supervisory system, or alternatively, using the embedded Modbus® RTU or LonWorks™ protocol, ensures open connectivity to third-party BMS systems.

Furthermore, to ensure greater safety and simpler maintenance and monitoring of the air-conditioning systems, μC³, using the optional RS232 board, can receive and send SMS messages via a GSM modem. μC³ has a built-in tLAN port for the connection of the local LED terminal and an RS485 port for the electronic expansion valve driver. The pGD<sup>o</sup> remote terminal can be connected as an option.

The optional real time clock and large backup memory mean that the last 100 active alarms

can be saved, along with the main values controlled.

### Technical specifications

**Power supply:** 24 Vac (±15%) 50/60 Hz & 22 to 38 Vdc

**Power input:** 35 VA or 14 W

**Operating conditions:**

-10T55 °C <90% rH non-condensing

**Storage conditions:**

-20T70 °C <90% rH non-condensing

**Analogue inputs:** 10 (2 - 0 to 5 Vdc or NTC, 2 - 0 to 5 Vdc or NTC, 5 NTC, 1 - 4 to 20 mA)

**Digital inputs:** 18 with voltage-free contacts

**Analogue outputs:** 6 (4 - 0 to 10 Vdc, 2 PWM)

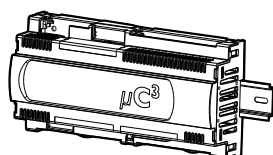
**Digital outputs:** 14

**Installation:** DIN rail or panel

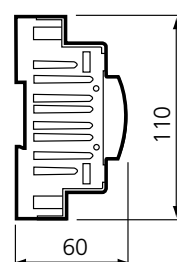
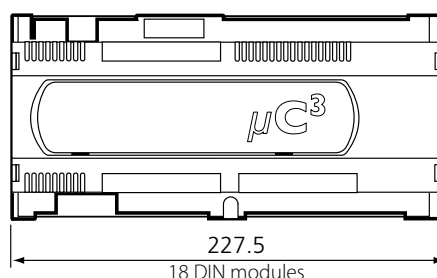
**Index of protection:**

- IP20 (with case);
- IP00 (without).

### DIN rail mount



### Dimensions (mm)





## μGEO: controller for ground source heat pumps with one circuit and 1/2 compressors

MCH2\*\*\*\*4\* + MCH2\*\*\*\*6\*

μGEO is the parametric solution for the complete control of single circuit heat pumps with one or two compressors, managing the production of domestic hot water and hot or cold water for the heating or cooling system, based on the priority defined by the user.

μGEO is especially suitable for geothermal applications, based on the control of the efficiency of the underground probe.

Wiring is performed using Molex® plug-in connectors, thus reducing space, and speeding up and simplifying assembly.

### Technical specifications

**Power supply:** 24 Vac, -15 to 10 %; 50/60 Hz

**Power input:** 3W

**Operating conditions:**

-10T55 °C - humidity <90% rH non-condensing

**Storage conditions:**

-10T70 °C - humidity 80% rH non-condensing

**Digital inputs ID1 to ID10:**

- electrical standard: voltage-free contact;
- closing current referred to earth: 5 mA;
- maximum closing resistance: 50 W

**Analogue inputs:**

- B1, B2, B3, B5, B6, B7: CAREL NTC temperature probes (10 kW at 25 °C);
- the response time depends on the component used, typical value 90 s;
- B4, B8: CAREL 0 to 5 Vdc ratiometric pressure probes or voltage-free contact

**Index of protection:** front panel IP55

## μC² SE: control of single and two-circuit units with up to 4 compressors

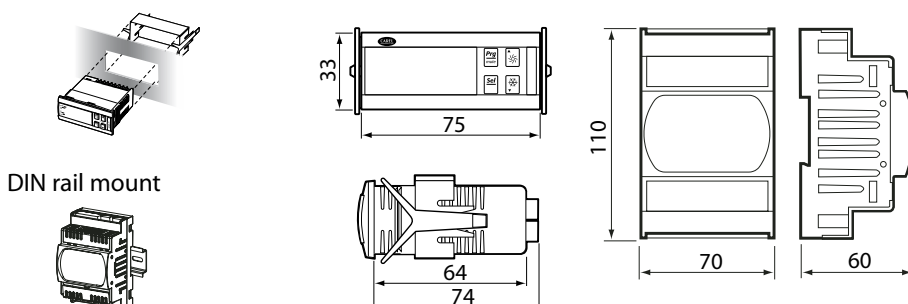
MCH200003\*

μC² SE represents the technological evolution of the μC² series. All the μC² SE series controllers in fact feature microprocessors with RISC technology and optional real time clock, ensuring top-of-the-range performance and user friendliness. The μC² SE series is available in the panel mounting version, and the wiring is plug-in with Molex®, connectors, reducing dimensions, simplifying and speeding up installation.

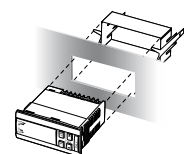
μC² SE can manage up to four hermetic or two semi-hermetic compressors in a maximum of two circuits, as well as one electronic valve driver per circuit. Optimum management of air/water and water/water chillers/HPs, air- and water-cooled condensers, direct air/air units and heat pumps, roof-top units with freecooling by temperature.

Flush mount

Dimensions (mm)



Flush mount





## μC<sup>2</sup>: control of single and two-circuit units with up to 4 compressors

### Technical specifications

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

**Power input:** 3 W

**Operating conditions:**

-10T55 °C, <90% rH non-condensing

**Storage conditions:**

-20T70 °C, <90% rH non-condensing

**Analogue inputs:** 4 (3 NTC inputs & one input configurable as NTC/ratiometric pressure probe/digital input)

**Digital inputs:** 5 from voltage-free contact

**Analogue outputs:** 1 PWM modulating output

**Digital outputs:** 5 relays with NO contacts 250 Vac 3 A res. 2 A

**Installation:** flush mount

**Index of protection:** front panel IP55

MCH200000\*, MCH200001\*, MCH200002\*

μC<sup>2</sup> is the new CAREL controller with compact dimensions for the management of chillers and heat pumps with up to two compressors or one semi-hermetic compressor. μC<sup>2</sup> also includes a model featuring DIN rail mounting. Air/air, air/water, water/water or condensing units with reversal on the refrigerant or water circuit can all be controlled. With 4 inputs for the probes, the μC<sup>2</sup> can perform advanced functions such as defrost control, energy saving and compensation. In addition, it can be connected to an expansion board via the innovative tLAN network, allowing the management of up to 4 hermetic or 2 semi-hermetic compressors in two circuits, as well as one electronic valve driver per circuit.

The expansion board has the same number of inputs and outputs as the μC<sup>2</sup> and as a result can completely control a second circuit. This can have up to two hermetic compressors or one semi-hermetic compressor, an electronic

valve and independent management of the condenser and defrost functions.

### Technical specifications

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

**Power input:** 3 W

**Operating conditions:**

-10T55 °C, <90% rH non-condensing

**Storage conditions:**

-20T70 °C, <90% rH non-condensing

**Analogue inputs:** 4 (3 NTC inputs & one input configurable as NTC/ratiometric pressure probe/digital input)

**Digital inputs:** 5 from voltage-free contact

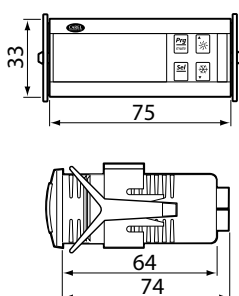
**Analogue outputs:** 1 PWM modulating output

**Digital outputs:** 5 relays with NO contacts 250 Vac 3 A res. 2 A

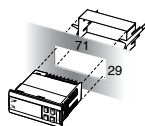
**Installation:** flush mount or DIN rail

**Index of protection:** front panel IP55

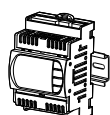
### Dimensions (mm)



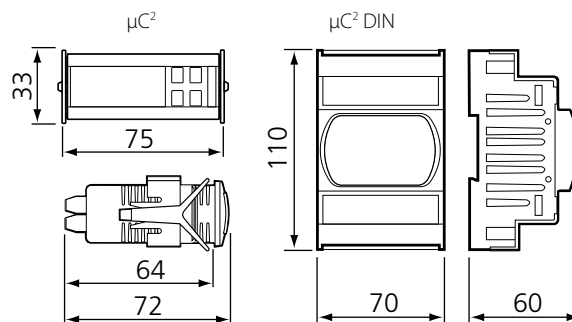
### Flush mount



### DIN rail mount



### Dimensions (mm)



## Accessories and options



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### Semi-graphic interface (PGD0\*)

Advanced user interface that can display symbols, icons and the main international alphabets. The 120x32 pixel graphic display ensures optimum management of the unit, displaying the status of all the components: compressors, valves, pumps, etc. In addition, it also displays the various operating modes (chiller, heat pump). The keypad can be used to simply access and modify all the unit parameters, making it an excellent service tool.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### µAM terminal (ADE\*)

µAM is an area controller for the simple and intuitive management of the µ-dronic system. µAM can manage a chiller plus 10 master fan coils, each connected to up to 5 slaves. Automatic changeover of system operating mode based on requirements, energy saving according to the load, coordination of set points and centralised time bands are just some of the advantages provided by this product.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### Supernode (SNM0000ES0)

Used to integrate the µC2SE and the µAD into a supervisor network (BACnet™, LON, Konnex, SNMP, HTTP, TREND,...).



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### RS485 serial board for µC<sup>2</sup> (MCH2004850)

Used to interface the µC<sup>2</sup> flush-mount version to an RS485 supervisory network or the remote terminal.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### pLD large terminal (PLD\*)

CAREL offers a competitive solution for all applications where costs need to be reduced and limited space is available for installing the terminal. The pLD large terminal has 4 digits, 8 buttons and 8 LEDs for indicating alarms and unit status. This terminal displays the main variables and can be used to access the essential unit configuration parameters.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### Fan ON/OFF control module (CONVONOFF0)

This manages the condenser fans in ON/OFF mode. The control relay has contacts rated to 10 A at 250Vac in AC1 (1/3 HP inductive).



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### RS485 serial board for supervisor (MCH200TSV0)

Used to connect, via a remote terminal, to an RS485 supervisory system.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### Remote terminal

(MCH200TP00 - MCH200TW00)

MCH2\*\*T is a sophisticated graphic LCD for panel mounting, installation on the unit, or remote wall-mounting, for the complete control of the unit. Access divided by level and complexity via password, the management of the units by graphic icons and access to the complete list of parameters make the pGD0 an excellent hand-held instrument for servicing and setting up the unit.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### Fan 0 to 10 V control module (CONV0/10A0)

This module converts the PWM signal sent by the corresponding relay on the controller to a standard 0 to 10 V (or 4 to 20 mA) signal.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### Fan speed controllers (MCHRTF\*)

These devices modulate the power delivered to a generic load according to the principle of phase cutting.

These have been especially developed to receive the control signal from CAREL controllers (Pulse Width Modulation signal) in order to vary the speed of the condenser fans based on the pressure or temperature measured at the condenser coil; the models available can manage single-phase fans with currents of 2, 4, 6, 8 and 12 A at 230 Vac.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### Driver for electronic expansion valves (EVD\*4\*)

Controls the refrigerant superheat by managing most of the electronic expansion valves with stepper motors available on the market and ratiometric pressure sensors, resident bypass algorithms and alternative control to superheat, and features considerable configuration possibilities.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

### µAD room terminal (ADM\*)

µAD, an LCD with icons for remote wall-mounting in the room as a simple user interface, with built-in temperature or temperature plus humidity sensor and time band management, for use in residential or smaller commercial / services applications.



- $\mu\text{C}^3$      $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$      $\mu\text{GEO}$

Expansion board for second circuit (MCH2\*2\*)  
I/O expansion board for managing the second circuit.



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**I/O board (MCH2\*6\*)**  
Dedicated I/O expansion board for  $\mu\text{GEO}$ .



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**Smart Key (PCOS00AKY0)**  
Used to download the logs saved on the  $\mu\text{C}^3$ .



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**Konnex board on BMS (PCOS00KXB0)**  
The KNX technological standard is now widely used in building automation and control for commercial and residential use. CAREL is member of the KNX Association ([www.knx.org](http://www.knx.org)). The CAREL Konnex board is compatible with all KNX/EIB devices and can be installed on the BMS port on the pCO sistema or e-drofan controllers. The K-Set tool (available for download from [ksa.CAREL.com](http://ksa.CAREL.com)) is used to create an XML file for the custom profiles.  
info: [konnex@carel.com](mailto:konnex@carel.com)



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**RS485 serial board for  $\mu\text{C}^2$  DIN (FCSER00000)**  
Used to interface the  $\mu\text{C}^2$  DIN rail version to an RS485 supervisory network or the remote terminal.



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**Programming key (MCH300KYA0 & PSOPZKEY\*)**  
The programming key allows the  $\mu\text{C}^3$  to be programmed quickly, even when not powered, reducing the risk of making errors. Versions are available with battery or external power supply.



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**RS485 serial board (PCOS004850)**  
Used to interface directly to an RS485 network with optical isolation. The maximum baud rate available is 19200 baud (settable via software).



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**TREND serial board (PCO100CLP0)**  
Provides communication with the TREND interface, a commonly-used building management system in English-speaking countries. For orders and information contact [trend@carel.com](mailto:trend@carel.com).



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**Clock board (PCO100CLK0)**  
Option used to manage the time and date and provide RAM with battery backup for the application program.



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**BACnet™ MSTP RS485 interface board (PCO1000BA0)**  
Used to interface the pCO controllers with the BACnet™ MSTP, protocol, an emerging standard in the HVAC industry.  
info: [pcoweb@carel.com](mailto:pcoweb@carel.com)



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**LonWorks® serial board (PCO1000\*F0)**  
Used to interface the controllers to a LonWorks® network. The type of interface on the LonWorks® network side is FTT-10A 78 kbs (TP/FT-10). The baud rate must be set to 4800.



- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

**Ethernet™ interface board (PCO1000WB0)**  
Used to interface the pCO controllers with the BACnet™ Ethernet™, IP, SNMP V1, 2, 3, FTP & HTTP.  
info: [pcoweb@carel.com](mailto:pcoweb@carel.com)

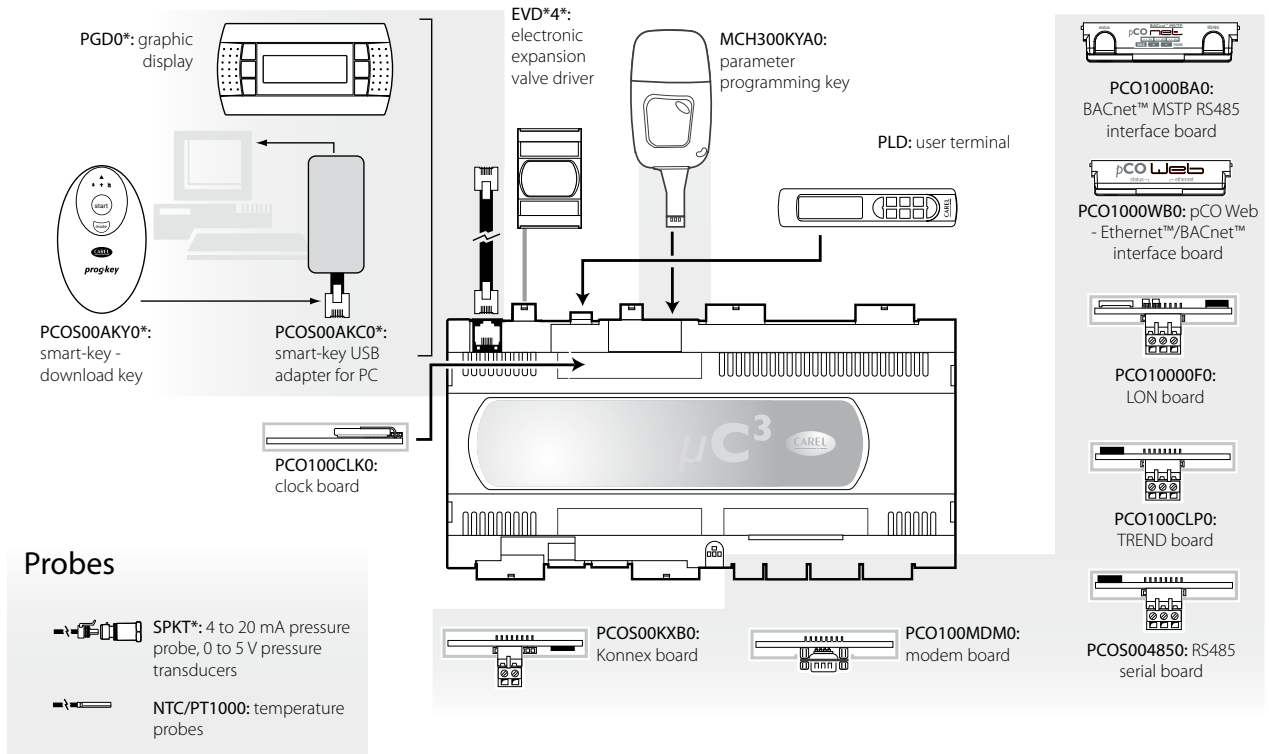


- $\mu\text{C}^3$       $\mu\text{C}^2\text{SE}$   
  $\mu\text{C}^2$       $\mu\text{GEO}$

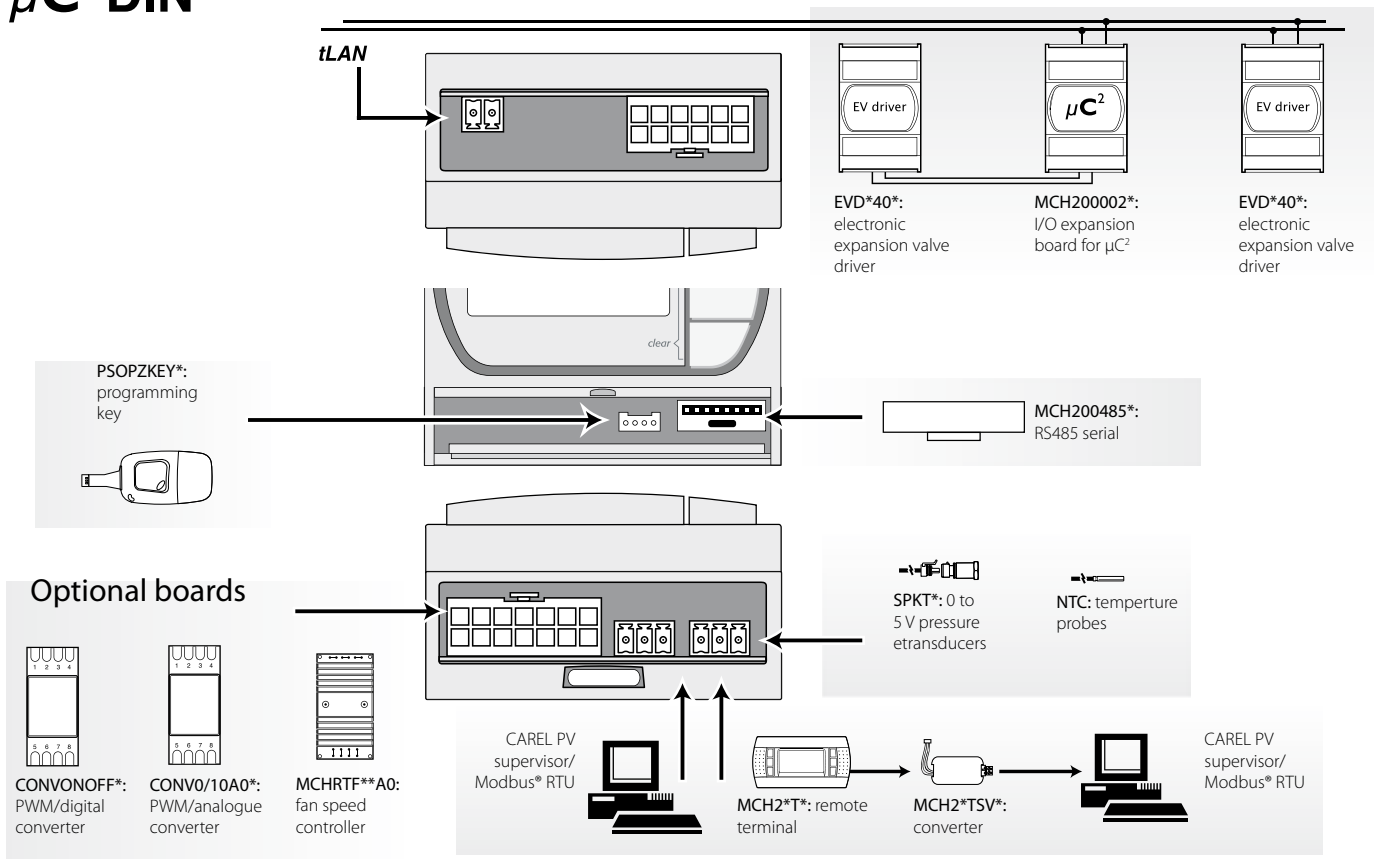
**RS232 serial board (PCO100MDM0)**  
Used to interface the  $\mu\text{C}^3$  with a GSM modem for sending and receiving SMS messages relating to alarms and warnings.

# OVERVIEW DRAWING

## $\mu C^3$



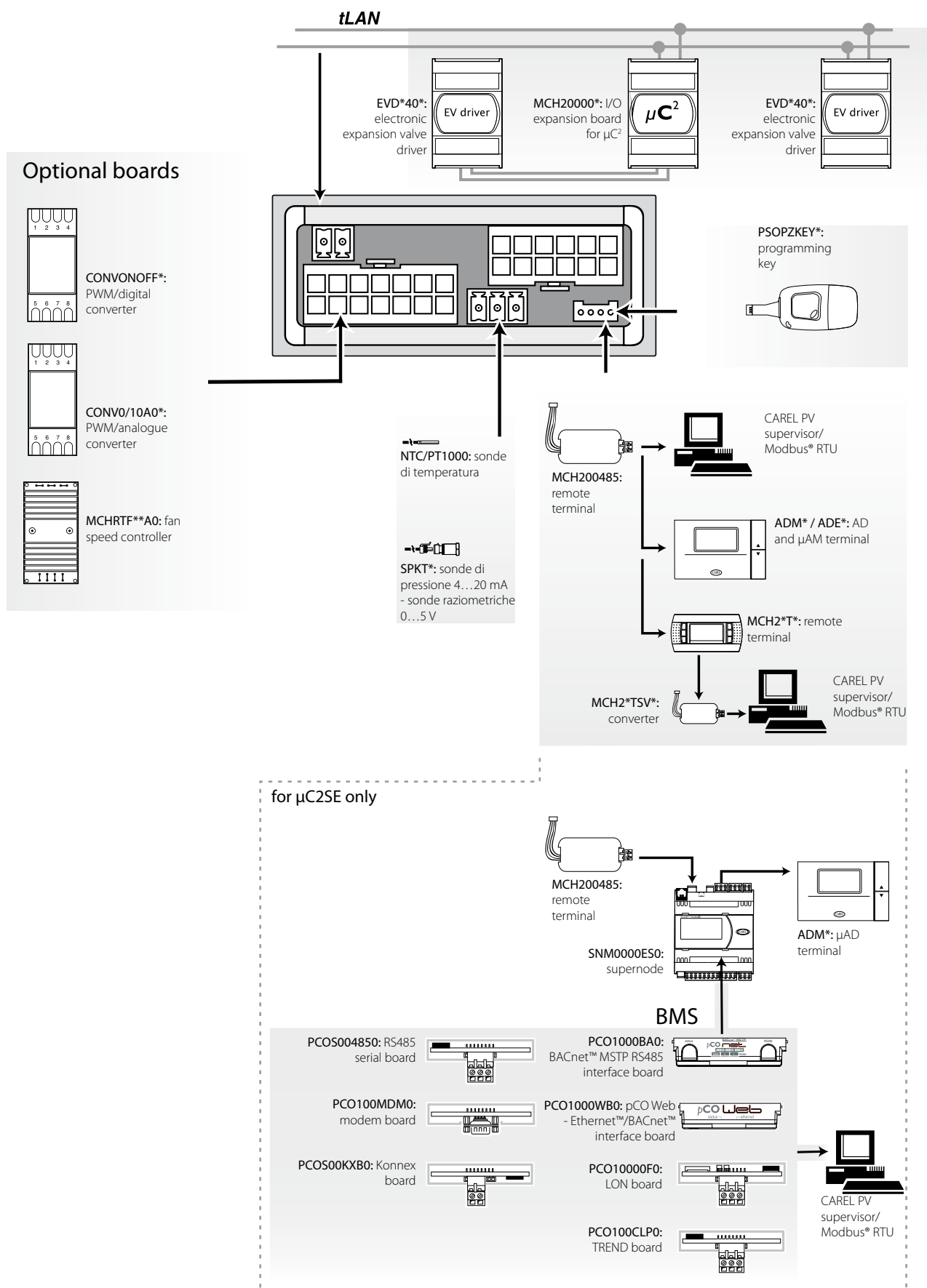
## $\mu C^2$ DIN





# OVERVIEW DRAWING

## $\mu C^2 / \mu C^2 SE / \mu GEO$



### Models

Hardware specifications	$\mu C^3$	$\mu C^2 SE$	$\mu C^2$	$\mu C^2 exp.$	$\mu GEO$
Real Time Clock	●	■	-	-	■
EVD4* driver connection for E <sup>2</sup> V	●	●	●	●	●
Programming key	●	●	●	-	●
Built-in display	-	●	■	-	●
Remote display	●	●	●	-	●
I/O expansion	-	●	●	-	●
Alarm log	●	●	-	-	●
Logging of variable values	●	-	-	-	-
CAREL - Modbus® RTU protocol	●	●	●	-	●
RS485 connection	■	■	■	-	■
RS232/SMS connection	■	-	-	-	-
LON FTT10 connection	■	-	-	-	-
Number of analogue inputs	10	4	4	4	4+4
Ratiometric inputs	2	1	1	1	1+1
4 to 20 mA inputs	1	-	-	-	-
NTC inputs	7	3	3	3	3+3
Number of dig. inputs w/ voltage-free contacts	18	5	5	5	5+5
Number of analogue outputs	6	1	1	1	1+1
0 to 10 V outputs	4	-	-	-	-
PWM outputs	2	1	1	1	1+1
Number of digital outputs	14	5	5	5	5+5
SPST relay outputs	12	5	5	5	5+5
SPDT relay outputs	2	-	-	-	-
Index of protection	IP40 / IP00	IP65	IP65 / IP40	IP40	IP65
Power supply	24 Vac/Vdc	24 Vac	24 Vac	-	24 Vac
Operating conditions	-10T60 °C	-10T55 °C	-10T55 °C	-10T55 °C	-10T55 °C
Installation	DIN rail or open board	panel	panel or DIN rail	DIN rail	panel + DIN rail

● standard - ■ opzionale



Software specifications	Models			
	$\mu C^3$	$\mu C^2 SE$	$\mu C^2$	$\mu GEO$
Proportional control with timed logic water/air on return & outlet	●	●	●	●
P+I control	●	-	-	-
Step control for circuit	3	2	2	2
Condensing/evaporation pressure control	2 step or mod.	1 step or mod.	1 step or mod.	1 step or mod.
Part-winding	●	-	-	-
Solenoid valve control & pump down management	●	● (E <sup>2</sup> V only)	-	● (E <sup>2</sup> V only)
Sliding defrost in HP mode	●	●	-	●
Electric heater step as independent antifreeze support for evaporator	● (2)	● (2)	● (1)	●
Monitoring & signalling of component operating hours	●	●	●	●
Capacity control for high pressure in chiller mode	●	●	●	●
Fan on with high outside temperature when starting	●	●	●	●
Stop compressors with low outside temperatures	●	●	-	●
Capacity control for low pressure (HP)	●	●	-	●
Low noise in chiller & HP mode	●	●	-	●
Set point variation & ON/OFF from time bands	●	●	-	●
Management of drivers for electronic expansion valves	●	●	●	●
Event logging: alarms with FIFO logic	● (200 alarms)	● (25 alarms)	-	● (25 alarms)
Condensing/evaporation temperature & pressure data logging (last 7 days)	●	-	-	-
Smart key - download logs to PC	●	-	-	-
Send alarms via SMS	●	-	-	-
Autotuning	●	●	-	●
Self-diagnostics	●	●	-	●
Automatic changeover	●	●	-	●
Smart defrost	●	●	-	●
Programming key	●	●	●	●

● standard - ■ opzionale



POCC IT.AM50.B09036

## e-dronic

Integrated communication between chillers and fan coils is an increasingly important requirement for the manufacturers of these air-conditioning units; nonetheless, the market still does not offer suitable solutions. CAREL has taken up the challenge of joining and combining these two different elements, offering its customers a solution that is easy to manage, ensures increased ambient comfort and considerable energy saving. CAREL thus presents e-dronic, a system of user interfaces, I/O boards and accessories for the management and control of chiller/fan coil systems.

e-dronic is compatible with the already established pCO platform, and exploits its advantages in terms of flexibility.

### Hardware architecture

#### Zone, standard and extended broadcast

Zone broadcast is the typical solution for single offices and small shops that require a limited number of fan coils per zone, and where the zones do not necessarily need to communicate with one another or with a centralised supervisory system. The tLAN network standard is used, on a serial connection via TTL signals, enhanced with the CAREL proprietary communication protocol. To ensure simple installation, the protocol is used in mono-directional mode, that is, the master fan coil controls and the others operate accordingly: the addresses of the slaves do not need to be set. Adding the optional CANbus board on the fan coil

allows the network to reach a maximum of 99 fan coils, over a maximum distance of 1 km.

#### integrated hybrid e-drobus

The integrated hybrid e-drobus is a master/slave system that is ideal for installations that require a master in every zone, connected to a number of slaves to support the temperature control action of the master.

Typical applications are in homes in which the different zones (living room, bedroom, kitchen) are managed by different master/slave systems.

The integrated hybrid e-drobus system uses the CANbus protocol for the connection between the master fan coils and the tLAN for the master/slave connection.

This means that the optional CANbus board only needs to be installed where needed.

The pCO controller manages both the chiller/HP and the fan coils, optimising comfort and running costs. In this way, the chiller user terminal also acts as an interface for the hydronic system.

#### extended hybrid e-drobus

The hybrid e-drobus system can be enhanced and extended by adding a further pCO controller dedicated exclusively to the management of the fan coils. The chiller controller and the area controller exchange data via the pLAN, while the fan coils are connected via the CANbus network. As in the previous versions, master/slave communication takes place via the tLAN. The extended hybrid e-drobus can manage 64 masters with 5 slaves each, meaning a maximum of 384 fan coils. Each master fan coil can manage a user terminal, via tLAN.

#### multimaster e-drobus

One special application of the e-drobus system uses the CANbus network to connect the master fan coils and the slaves on the same communication line. The fan coils must be configured as master or slave via software. This type of configuration is used to effectively and competitively manage flexible spaces, allowing the layout of the network and the relationships between master and slaves to be configured simply via software.

#### µe-dronic

µe-dronic is the typical solution for small installations (homes, shops, small offices) where the chiller/HP can be controlled by a µC<sup>2</sup>SE controller. Up to 10 master fan coils can be connected, each with a maximum of 5 slaves, in an RS485 network managed by a simple zone controller. The new µAM controller coordinates the small hydronic installation using a common reference set point, defining the operating time bands and coordinating the heating/cooling requests.

### System design

CAREL presents e-droCAD, the software used to design, check and cost an air-conditioning system communication network based on the e-dronic product line, allowing the user to fully exploit CAREL's wealth of experience and technological innovation. The e-droCAD software is essentially designed for technical personnel (designers, electricians, plumbers, installers, etc.), and purchasing and/or sales personnel.



## e-drofan

HYFC\*

The main board in the e-dronic system (e-drofan) can manage and control the fan speed and the local zone network. One board must be installed on each fan coil; the board is already fitted for serial communication.

Using the optional valve boards, e-drofan can also control the hot and cold water valves, and manage other important functions such as the signals from the boiler, chiller/heat pumps and electric heaters.

The devices can be controlled in ON/OFF or proportional mode.

In addition, using the integrated Modbus® RTU protocol and an optional RS485 board, the e-dronic system can interface directly to open BMS systems.

### Technical specifications

**Power supply:** 230 Vac, -15 to 10%; 50/60 Hz

**Power input:** 4 VA (excluding relay loads)

**Operating conditions:**

0T60 °C, <90% rH non-condensing

**Storage conditions:**

-20T80 °C, <90% rH non-condensing

**Inputs:**

- 5 digital inputs with voltage-free contact;
- 3 analogue inputs for CAREL NTC probe

**Outputs:** 3 relay 6 (2) A, 250 Vac

**Index of protection:** IP00



### acqua (HYPA\*1\*)

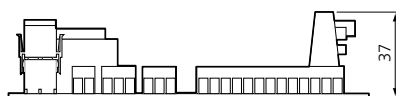
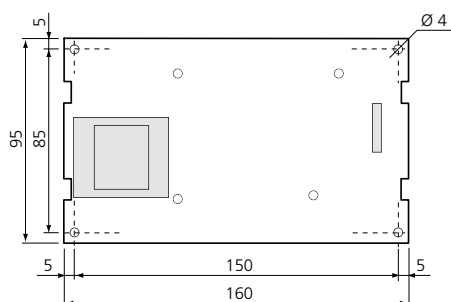
The terminal has a liquid crystal display that makes operation simple and user-friendly, enhanced by a series of icons that simplify the reading of the data displayed. The acqua terminal, moreover, has 8 buttons for quick access to most of the configuration functions. Its simple and functional appearance makes it readily suited to any environment. CAREL has focused great attention on the aesthetics of the product, given its probable use in the home and shops. The terminal can be installed up to 30 m away using a 3 wire serial connection (serial plus power supply).



### e-droset (HYPA\*3\*)

e-droset, an alternative to the acqua terminal, is the flush-mounted user interface for the e-dronic system. It can be installed up to 30 m away from the controller, and is compatible with the most commonly used wallplates on the market, such as B-Ticino and Vimar. Alternatively, it can be flush mounted on the side of the fan coil. The compact dimensions and the attractive design make e-droset the ideal solution for offices and residential installations.

### Dimensions (mm)



## Accessories and options



### Relay expansion board (HYVC000R\*)

The expansion board features 4 relays, 2 of which with voltage-free contacts for enabling and relaying control signals, and 2 directly powered by the main board at 230 V.



### RS485 board (HYSC00F0P0)

Microprocessor serial board for CAREL or Modbus® RS485 network.



### Adapter for programming key (HYKA)

Used together with the programming key code PSOPZKEY\*.



### Expansion board with 2 triacs, 2 relays (HYVC000M\*)

The expansion board features two triacs for a 230 V three-point servomotor.

One 2 kW relay for the management of an electric heater plus 1 control relay with voltage-free contacts.



### CANbus board (HYSC00F0C0)

Microprocessor serial board for hydronic network and advanced functions.



### Konnex board on BMS (PCOS00KXB0)

The KNX technological standard is now widely used in building automation and control for commercial and residential use.

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

The CAREL Konnex board is compatible with all KNX/EIB devices and can be installed on the BMS port on the pCO sistema or e-drofan controllers. The K-Set tool (available for download from [ksa.carel.com](http://ksa.carel.com)) is used to create an XML file for the custom profiles.

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



### Expansion board with 2 x 0 to 10 V, 2 relays (HYVC000V\*)

The expansion board features 2 modulating outputs for 0 to 10 Vdc servomotors, and 2 relays with voltage-free contacts.



### IR receiver board (HYIR\*)

This allows the e-drofan to receive the settings from the remote control and displays, using 3 LEDs, the status of the unit and any alarms.

Fitted with a button for setting operation if the batteries are discharged.



### Ethernet™ interface board (PCO1000WB0)

Used to interface the pCO controllers with the BACnet™ Ethernet™, IP, SNMP V1, 2, 3, FTP & HTTP. info: [pcoweb@carel.com](mailto:pcoweb@carel.com)



### Expansion board with 4 triacs (HYVC000T\*)

The expansion board features 4 triacs for the control of 230 V 3-point servomotors.



### CANbus USB converter (CVSTDUCAN0)

Used to access a CANbus network from a personal computer.



### Remote control (HYHS\*)

IR remote control fitted with LCD and 13 buttons for local or zone programming.

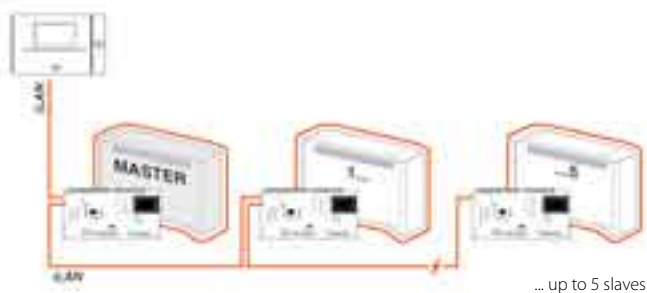


### Programming key (PSOPZKEY)

Used to simply export the configuration of the parameters from one e-drofan to another. Useful in systems with a large number of fan coils. Version with power supply.

# Network architecture

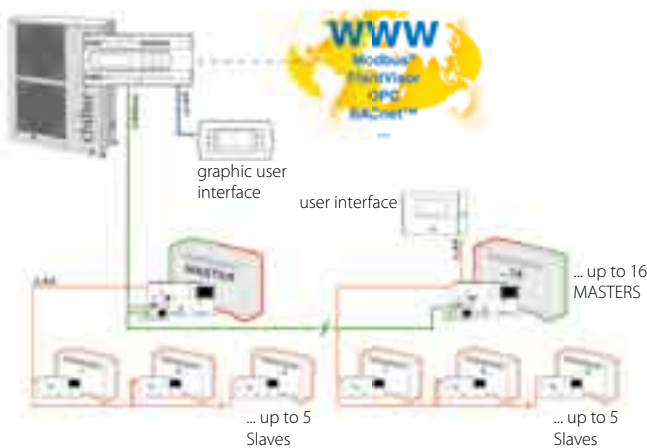
Standard zone broadcast



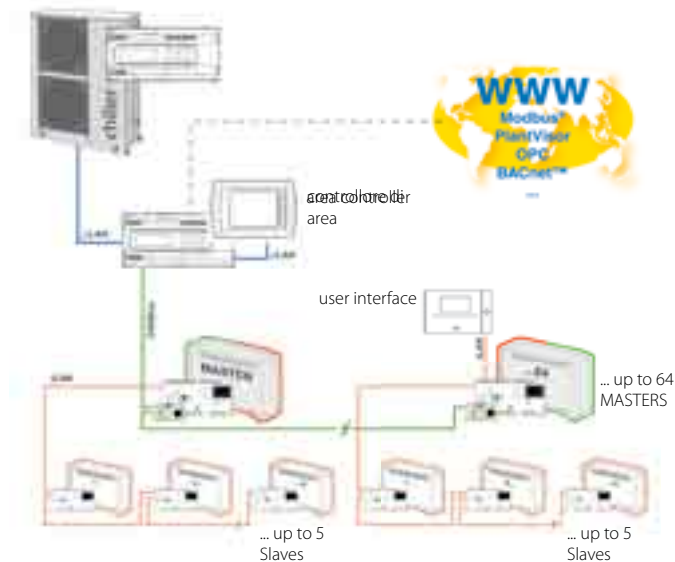
Extended zone broadcast



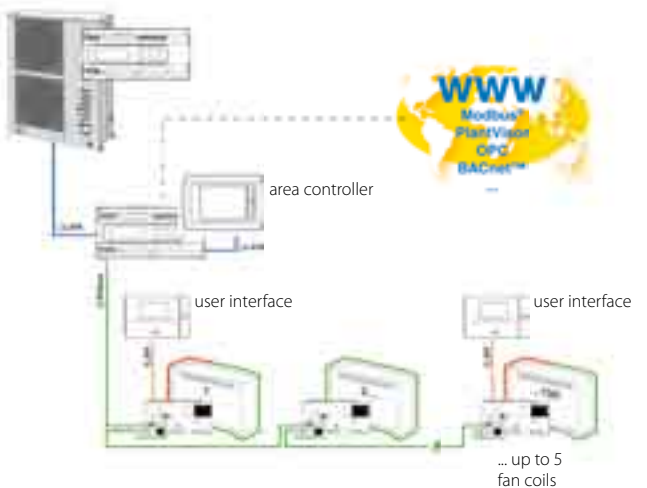
integrated hybrid e-drobus



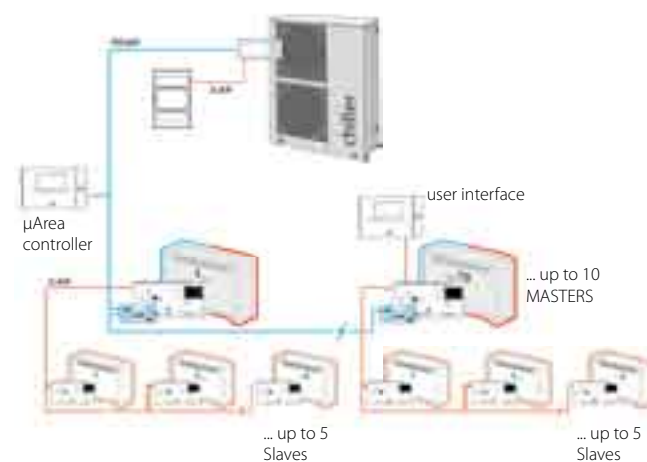
extended hybrid e-drobus



multimaster e-drobus



µ-dronic





POCC IT.AI150.B09036

## MasterAria

MasterAria is the first CAREL parametric solution for the control of small air handling units and large fan coils.

A compact IP65 plastic case houses: a controller, a contactor (single phase 1.1 kW and three phase 4 kW) and an MCB with adjustable overload protector (0.1 to 10 A).

Many different accessories and sensors are available.

Using a special RS485 serial board (optional), MasterAria can be connected to a CAREL supervisory system or third party BMS with the Modbus® protocol.

The programming key can be used to save the parameter configuration and download it to other devices.

The large and intuitive LCD, with integrated real time clock and room temperature sensor, makes the programming and control of the units user-friendly and immediate.

The product can be supplied complete with electrical panel, with the electronic board already installed inside, featuring simplified connection thanks to the holes already made in the plastic case and the cable glands supplied in the packaging, or alternatively by purchasing the control boards separately, that is, main board + valve board + terminal (acqua).





## MasterAria

CTE\*

MasterAria manages all the main functions of an AHU, including:

- control of hot and cold water valves;
- control of the outlet fan;
- management of the electric heater;
- management of the outside damper;
- management of the bypass damper.

MasterAria is configured above all using the acqua user interface. The rest of the configuration is performed using the dipswitches located on the main board inside the panel: HYCT000000.

### Technical specifications

#### Power supply:

- single-phase: 230 V 1~, 50/60 Hz;
- three-phase: 400 V 3~, 50/60 Hz

**Operating conditions:** -10T50°C, <90% rH non-condensing (with plastic case)

#### Storage conditions:

-20T80 °C, humidity 80% rH non-condensing

**Index of protection:** IP54 with disconnect switch (with plastic case)



#### Main board (HYCT\*)

Manages the fan and performs temperature control. Allows the connection of digital inputs for the remote control of functions such as ON/OFF, heating/cooling, economy.

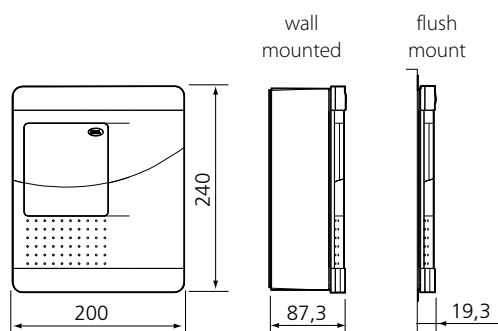
It must be used with one of the valve boards shown here. The optional RS485 serial port allows connection to a supervisory system.



#### acqua (HYPA\*1\*)

The terminal has a liquid crystal display that makes operation simple and user-friendly, enhanced by a series of icons that simplify the reading of the data displayed. The acqua terminal, moreover, has 8 buttons for quick access to most of the configuration functions. Its simple and functional appearance makes it readily suited to any environment. CAREL has focused great attention on the aesthetics of the product, given its probable use in the home and shops. The terminal can be installed up to 30 m away using a 3 wire serial connection (serial plus power supply).e).

### Dimensions (mm)



## Accessories and options



#### Relay expansion board (HYVC000R\*)

The expansion board features 4 relays, 2 of which with voltage-free contacts for enabling and relaying control signals, and 2 directly powered by the main board at 230 V.



#### Expansion board with 2 triacs, 2 relays (HYVC000M\*)

The expansion board features two triacs for a 230 V three-point servomotor or two modulating outputs for two solenoid valves.

One 2 kW relay for the management of an electric heater plus 1 control relay with voltage-free contacts.



#### Expansion board with 2 x 0 to 10 V, 2 relays (HYVC000V\*)

The expansion board features 2 modulating outputs for 0 to 10 Vdc servomotors, and 2 relays with voltage-free contacts.



#### Expansion board with 4 triacs (HYVC000T\*)

The expansion board features 4 triacs for the control of 230 V 3-point servomotors.



#### RS485 board (HYSC00F0P0)

Microprocessor serial board for CAREL or Modbus® RS485 network..



**CAREL**  
E198839

## μAC

μAC is the CAREL solution for medium-sized air-conditioning units. It is reliable and ready for the most common types of air-conditioners.

The ideal controller for those with sophisticated requirements but who don't need the custom settings provided by the pCO sistema family, while still having all the advantages of the latter in terms of serial connection and interface modules.

Special attention has been paid to user-friendliness; using a simple 5-button keypad and an easy-to-understand LCD display, the user can easily choose the unit configuration and control its operation.

### Advantages

- excellent performance/price ratio
- compactness
- same dimensions as the flush-mounted pCO terminal
- easy to use
- customised appearance upon request
- possibility of the connection of a series of units in master/slave operation

### Main functions

- control of the air intake temperature and humidity;
- energy saving by freecooling (shelters) or compensation;
- dehumidification management;
- outlet fan speed control;
- complete alarm management with log;
- automatic rotation of a series of units;
- serial connection for supervision/telemaintenance.

### Devices controlled

- 1 or 2 compressors or cooling coil valves;
- 1 or 2 heaters or heating coil valves;
- outlet fan in ON/OFF or proportional mode;
- humidifier with proportional output;
- dehumidifier with ON/OFF output;
- alarm device.

### Options

- RS485 serial board;
- clock board with memory for alarm log and time bands;
- programming key

### Programming

All the unit parameters can be configured not only from the keypad on the front panel, but also using a hardware key and/or via serial line..



## μAC: controller for precision air-conditioners

MAC2\*

μAC is an electronic controller for the complete management of the precision air-conditioners, both direct expansion versions (with 1 or 2 compressors), with 1 or 2 heaters or with coils (valve on the heating coil and/or valve on the cooling coil). It can also manage a humidifier (with CP/CPY or Humicontrol controller) and dehumidifier with various pre-set configurations. In addition, it can also be used in units for telecom shelters, including management of the condenser fan (ON/OFF and continuous control).

### Technical specifications

**Power supply:** 24 Vac (±15%), 50/60 Hz

**Potenza elettrica:** 10 VA minimum

**Operating conditions:**

-10T54 °C, <90% rH non-condensing

**Storage conditions:**

-10T70 °C, <90% rH non-condensing

**Analogue inputs:** 3 for NTC probes;

1 x 0 to 1 Vdc or 4 to 20 mA input

**Digital inputs:** 10 not optically isolated with reference to G0 powered at 24 Vac

**Analogue outputs:** 1 x 0 to 1 Vdc output, not optically isolated; 1 PWM output

**Digital outputs:** 5 24 Vac triacs, optically isolated, 1 A;

2 relays, 250 Vac 2 A

**Precision:** temperature ±0.5 °C; humidity ±0.5% rH

**Resolution:** 0.1 °C; 0.1% rH

**Installation:** flush mounting

**Index of protection:** front panel IP55

## Accessories and options



### Clock board (MAC2CLK\*)

MAC2CLK000 enables the clock, time bands and alarm log functions



### RS485 serial board (MAC2SER\*)

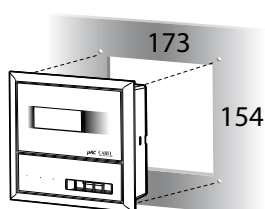
MAC2SER000 is used to interface the μAC to a supervisor network via the RS485 standard (asynchronous) with the CAREL protocol.



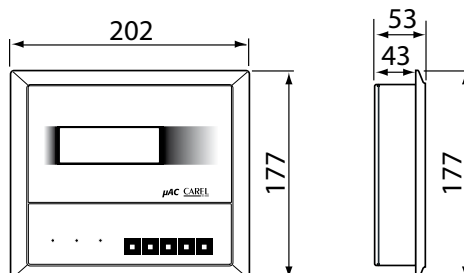
### Programming key (MAC2KEY\*)

The programming key allows the list of set parameters to be saved and/or copied to other instruments quickly and reliably.

## Flush mount



## Dimensions (mm)





# Temperature, humidity and pressure control solutions

CAREL offers increasingly advanced control solutions in the field of parametric controllers for HVAC/R applications. Specific commitment is dedicated to universal controllers, which provide the user a powerful and flexible instrument that easily can be configured. Starting from extremely simple control strategies the user can, by modifying just a few parameters, adopt control algorithms that are much more sophisticated and innovative, for example PID with AutoTuning.

The Comtool software can be used to configure the parameters on the controllers directly from a personal computer.

Simple installation is also an important factor, both as regards assembly and wiring, using standard templates and quick connectors.

Finally, all universal controllers can interface with CAREL supervisory systems and open supervisory systems.



Integrated Control Solutions & Energy Savings



E198839



40016243



EN13485



POCC IT.AI50.B09036

## Universal controllers

The Infrared Universale series (IR32/IRDR, IR33/DN33) is a range of instruments for controlling the temperature, pressure and humidity values in air-conditioning, refrigeration and heating units. The range includes models for satisfying all requirements.

The instruments can work with the most common temperature, humidity and pressure probes (NTC, PT100, type J or K thermocouples, 0 to 20 mA, 4 to 20 mA, 0 to 1 Vdc).

The controllers are available with one, two or four outputs, both in the version with changeover relay (8 A resistive), or with 0 to 10 Vdc outputs for managing external solid state relays (SSR).

The case can be chosen to best suit each application.

The instruments in the Infrared Universale series are in fact available in two different formats: the version for flush mounting with IP65 front panel, and the version for DIN rail mounting.

### Advantages

The features of the Infrared Universale series controllers include:

- nine different programs, already configured to best manage each control situation;
- most of the controllers can be powered at between 12 and 24 V, alternating or direct current. In addition, there are also versions with 110 or 230 Vac power supply;
- all models are fitted with 1 or 2 digital inputs to simplify alarm management (including delays), changing the set point (from external clock or switch), remote ON/OFF, heating/cooling selection, etc.;
- the thermostats with NTC probes (thermistor) allow the use of a second probe with special functions;
- the IR33/DN33 series can be fitted with internal RTC and feature PID algorithms with AutoTuning;
- low consumption switching power supply.
- the controllers can be programmed in three ways: on the keypad of the instrument, from a PC and using a convenient and exclusive remote control.



## IR33 & DN33: universal thermostats with 1, 2 & 4 outputs (relays, SSR, 0 to 10 Vdc)

IR33V\*, IR33W\*, IR33Z\*  
& DN33V\*, DN33W\*, DN33Z\*

This series of “universal” controllers can be used with different types of temperature probes (NTC, PT100, thermocouples), while a second probe enables compensation operation (cooling or heating) differential operation (difference between the two temperatures), or freecooling operation (logic enabled based on set point for the second probe). They feature two digital inputs that can be configured to manage functions such as an immediate or delayed external alarm, and remote ON/OFF. Programming is made extremely simple by the 9 selectable operating modes (e.g.: direct, reverse, dead zone, PWM, etc.). All controllers feature a PID algorithm with AutoTuning and can be purchased complete with RTC (clock). A low consumption switching power supply is used on both the 12/24 Vac and 115/230 Vac versions

IR33D\*, IR33A\*, DN33A\*, IR33B\*, IR33E\*,  
DN33B\*, DN33E\*

As for the other thermostats in the “Universale” series, these too can be used with different types of temperature probes (NTC, PTC, PT1000). The fundamental characteristic of this series is the possibility to control the most commonly available solid state relays, or alternatively the optional CAREL modules (CONVONOFF0 and CONV0/10A0), or alternatively with mixed configurations (relay + 0 to 10 Vdc output).

These instruments are effective in a range of different applications, such as the control of ovens, modulating valves, or on/off and modulating actuators.

### Power supply:

IR33\*H\*, DN33\*H\*: 115/230 Vac ( $\pm 10\%$ ), 50/60 Hz;  
IR33\*LR\*, DN33\*LR\*: 12/24 Vac/Vdc ( $\pm 10\%$ ), 50/60 Hz;

### Power input:

IR33\*H\*, DN33\*H\*: 6 VA; IR33\*LR\*, DN33\*LR\*: 4 VA

### Operating conditions:

-10T60 °C, <90% rH non-cond.

### Storage conditions:

-20T70 °C, <90% rH non-cond.

### Inputs:

2 NTC/PTC/PT1000

NTC (-50T90 °C);

High temperature NTC (-40T150 °C);

PTC (-50T150 °C)

PT1000 (-50T150 °C);

2 digital from voltage-free contact, programmable

### Outputs:

IR33V\* & DN33V\*: 1 relay, 250 Vac 8 A res.;

IR33W\* & DN33W\*: 2 relays, 250 Vac 8 A res.;

IR33Z\* & DN33Z\*: 4 relays, 250 Vac 8 A res.;

IR33D\*: 1 SSR; max. current 15 mA; resistance 660  $\Omega$ ;

IR33A\*, DN33A\*: 1 SSR; max. current 15 mA;

resistance 660  $\Omega$ ;

IR33B\* & DN33B\*: 1 relay + 1 x 0 to 10 Vdc analogue;

IR33E\* & DN33E\*: 2 relays + 2 x 0 to 10 Vdc

analogue;

**Display:** 3 digit with decimal point & sign

### Installation:

IR33\*: flush mount;

DN33\*: DIN rail

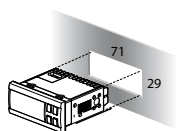
### Index of protection on front panel:

IR33\*: IP65;

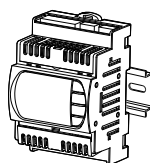
DN33\*: IP40

### Installation

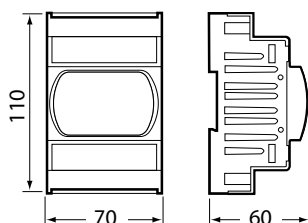
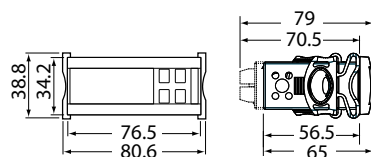
flush mount



DIN rail



### Dimensions (mm)





## IR32 & IRDR: universal humidistats and pressure switches with 1, 2, 4 outputs

IR32V\*, IR32W\*, IR32Z\*  
& IRDRV\*, IRDRW\*, IRDRZ\*

These IR Universale models can also be connected to any transducer able to supply a current (0 to 20 mA or 4 to 20 mA) or voltage signal (0 to 1 Vdc) for the measurement and control of physical values such as the pressure and humidity.

The models with voltage inputs, using the additional CONV0/L000 module, can also accept transducers with a 0 to 10 Vdc output signal.

They feature one digital input (two in the DIN rail version) that can be configured to manage functions such as an immediate or delayed external alarm, and remote ON/OFF. The models with 4 outputs (IR32Z\*, IRDRZ\*) allow the rotation of the actuators, an especially useful function for compressor management.

IR32D\*, IR32A\*, IRDRA\*

These IR Universale models can also be connected to any transducer able to supply a current (0 to 20 mA or 4 to 20 mA) or voltage signal (0 to 1 Vdc) for the measurement and control of physical values.

The models with voltage inputs, using the additional CONV0/L000 module, can also accept transducers with a 0 to 10 Vdc output signal.

The fundamental characteristic of this series is the possibility to control the most commonly available solid state relays, or alternatively the optional CAREL modules (CONVONOFF0 and CONV0/10A0). Each output can be connected to a different CONV\* module for the management of mixed configurations (relay, 0 to 10Vdc, 4 to 20mA, solid state relay).

### Technical specifications

#### Power supply:

IR32V\*E, IR32V\*L, IR\*A & IR32D\*: 12/24 Vac/Vdc ( $\pm 10\%$ ), 50/60 Hz;  
IR32W\*H: 110/230 Vac ( $\pm 10\%$ ), 50/60 Hz;  
IR32W\*, IR\*Z\*: 12/24 Vac/Vdc ( $\pm 10\%$ ), 50/60 Hz;  
IRDRV\* & IRDRW\*: 24 Vac ( $\pm 10\%$ ), 230 Vac ( $\pm 15\%$ ), 50/60 Hz

#### Power input:

IR32D\*: 2 VA; IR32A\*: 3 VA; IRDRA\*: 4 VA

#### Operating conditions:

0T50 °C, <90% rH non-cond.

#### Storage conditions:

-10T70 °C, <90% rH non-cond.

#### Inputs:

IR\*0\*: NTC probe (-50T90 °C);  
IR\*1\*: PT100 probe (-99T600 °C);  
IR\*2\*: TcK (-99T999 °C) & TcJ (-99T800 °C);  
IR\*3\*: 0 to 20 or 4 to 20 mA;  
IR\*4\*: -0.5 to 1 Vdc

IR32\*: 1 digital from voltage-free contact, programmable; IRDRA\*: 2 digital from voltage-free contact, programmable

#### Outputs:

IR\*V\*: 1 relay, 250 Vac 8 A res.;  
IR\*W\*: 2 relays, 250 Vac 8 A res.;  
IR\*Z\*: 4 relays, 250 Vac 8 A res.  
IR32D\*: 1 SSR relay; maximum current 15 mA; resistance 660  $\Omega$ ;  
IR\*A\*: 4 SSR relays; maximum current 15 mA; resistance 660  $\Omega$

**Display:** 3 digit with decimal point & sign

**Precision:** IR\*A\* & IR32D:  $\pm 1\%$  of full scale

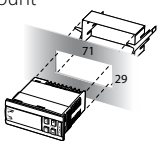
IR\*V\*, IR\*W\* & IR\*Z\*:  $\pm 1\%$  on set limits

**Installation:** IR32\*: flush mount; IRDR\*: DIN rail

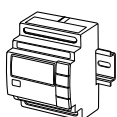
**Index of protection:** IR32\*: IP65; IRDR\*: IP40

### Installation

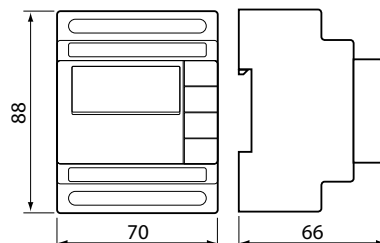
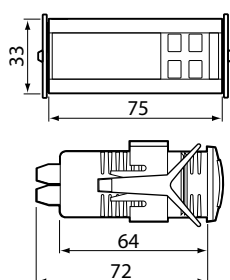
flush mount



DIN rail



### Dimensions (mm)







## PJ heating/cooling

PJ32V\*, PJ32W\*, PJ32Z\*, PJNZ\*

PJ32 heating/cooling is a complete range of thermostats, with models featuring 1 to 3 relays, NTC or PTC probes. The version with 1 output performs the function of a thermostat, while the model with 2 outputs also allows the management of a second probe. The model with 3 outputs always features the alarm output, as well as the control outputs. Models are also available developed for the control of wine coolers (PJNZ\*), featuring a heating output and a coiling output with defrost management.

### Technical specifications

#### Power supply:

- PJ32\*V\*: 12 Vac (-15 to 10%) or 12 Vdc, 50/60Hz;
- PJ32\*W\*: 230 Vac (-15 to 10%), 50/60Hz;
- PJ32\*Z\*: 115 Vac (-15 to 10%), 50/60Hz

**Op. conditions:** -10T50 °C, <90% rH non-cond.

**Storage cond.:** -20T70 °C, <90% rH non-cond.

**Range of measurement:** -50T90 °C, resolution 1 °C/°F

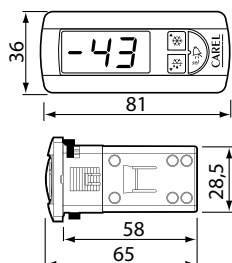
**Inputs:** 1 or 2 for NTC or PTC probe; 1 digital input as alternative to second probe

**Outputs:** up to 2 control relays & 1 alarm relay depending on the model

**Installation:** flush mount

**Index of protection:** IP65 flush mounted & with gasket inserted

### Dimensions (mm)



## Clima

ADC\*

Electronic instrument for controlling ambient temperature and humidity. It can be used in various operating modes. Special attention has been focused on the advanced algorithms in heating, cooling or automatic operation. Special functions for the control of underfloor heating, radiant floors in cooling mode and temperature compensation functions. Timer and RTC clock for day and night operation. 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 +10 to -15% 50/60Hz 1 VA, 22-35 Vdc 0.5W

#### Operating conditions:

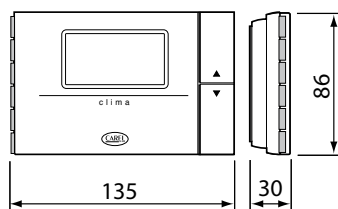
0T60°C, 10 to 90% rH non-cond.

#### Storage conditions:

-20T70°C, 10-90% rH non-cond.

**Index of protection:** IP20

### Dimensions (mm)



## Special modules

CONV\*

These have been developed to be connected directly to the Infrared Universale series instruments (version D and A). They can in any case be used with other controllers, for example with the µchiller series. There are three models:

- 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;
- CONV0/1L00: powers other transducers and converts a 0 to 10 Vdc signal into a 0 to 1V signal as per the CAREL standard.

### Technical specifications

**Power supply:** 24 Vac (±10%), 50/60 Hz

CONV0/10A0: 50 mA; CONVONOFF0: 30 mA;

CONV0/1L00: 180 mA

#### Operating conditions:

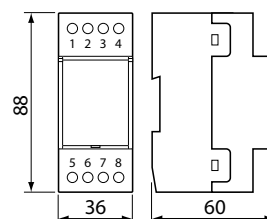
0T50 °C, <90% rH non-cond.

#### Storage conditions:

-10T70 °C, <90% rH non-cond.

**Index of protection:** IP20

### Dimensions (mm)



## Table of IR33 Universale & DIN version models

Specifications	Models						
	IR33V* DN33V*	IR33W* DN33W*	IR33Z* DN33Z*	IR33A* DN33A*	IR33D* -	IR33B* DN33B*	IR33E* DN33E*
<b>Power supply</b>							
12/24 Vac ±10%, 50/60 Hz, 12/30 Vdc	●	●	●	●	●	●	●
115/230 Vac ±10%, 50/60 Hz	●	●	●	●	●	●	●
<b>Power input</b>	4 VA	4 VA	4 VA	4 VA	4 VA	4 VA	4 VA
<b>Inputs</b>							
control probe - NTC/PTC/PT1000	2	2	2	2	2	2	2
digital inputs	2	2	2	2	2	2	2
<b>Outputs</b>							
relays	1	2	4	-	-	1	2
SSR	-	-	-	4	1	-	-
0/10 Vdc	-	-	-	-	-	1	2
<b>User interface</b>							
3-digit LED display	●	●	●	●	●	●	●
<b>Resolution</b>							
0.1 from -9.9 to 99.9	●	●	●	●	●	●	●
<b>Precision</b>							
±0.5% of full scale	●	●	●	●	●	●	●
<b>Index of protection on front panel</b>							
IP65 (flush)	●	●	●	●	●	●	●
IP40 (DIN rail)	●	●	●	●	-	●	●
<b>Programming</b>							
keypad	●	●	●	●	●	●	●
remote control	●	●	●	●	●	●	●
serial	●	●	●	●	●	●	●
programming key	●	●	●	●	●	●	●
<b>Special functions</b>							
signal buzzer	●	●	●	●	●	●	●
multifunction digital inputs	●	●	●	●	●	●	●
serial connection	●	●	●	●	●	●	●
PID with AutoTuning	●	●	●	●	●	●	●
alarm log (models with clock)	●	●	●	●	●	●	●
clock	●	●	●	●	●	●	●
decimal point	●	●	●	●	●	●	●
● as standard							



## Table of IR32 Universale models

Specifications	Models								
	IR32A*	IRDRA*	IR32D*	IRE32V*	IRDRV*	IR32W*	IRDRW*	IR32Z*	IRDRZ*
<b>Power supply</b>									
12 Vac/Vdc ±10%, 50/60 Hz	●	●	●	●	-	●	-	●	●
24 & 230 Vac ±10%, 50/60 Hz	-	-	-	-	●	-	●	-	-
110/230 Vac ±10%, 50/60 Hz	-	-	-	●	-	-	-	-	-
<b>Power input</b>	3 VA	3 VA	2 VA	2 VA	3 VA	3 VA	3 VA	3 VA	4 VA
<b>Inputs</b>									
NTC control probe	2	2	2	2	2	2	2	2	2
PT100 control probe	1	1	1	1	1	1	1	1	1
J-K thermocouple control probe	1	1	1	1	1	1	1	1	1
4 to 20 mA control probe	1	1	1	1	1	1	1	1	1
-0.5 to 1 Vdc control probe	1	1	1	1	1	1	1	1	1
digital inputs	1	2	1	1	2	1	2	1	2
<b>Outputs</b>									
relays (NTC model)	-	-	-	1	1	2	2	4	4
relays (other models)	-	-	-	1	1	2	2	4	4
SSR	4	4	1	-	-	-	-	-	-
<b>User interface</b>									
3-digit LED display	●	●	●	●	●	●	●	●	●
<b>Resolution</b>									
0.1 from -9.9 to 99.9	●	●	●	●	●	●	●	●	●
<b>Precision</b>									
±0.5% of full scale	●	●	●	●	●	●	●	●	●
<b>Index of protection on front panel</b>									
IP65 (flush)	●	-	●	●	-	●	-	●	-
IP40 (DIN rail)	-	●	-	-	●	-	●	-	●
<b>Programming</b>									
keypad	●	●	●	●	●	●	●	●	●
remote control	●	●	●	●	●	●	●	●	●
serial	●	●	●	●	●	●(*)	●	●	●
<b>Special functions</b>									
signal buzzer	●	●	●	●	●	●	●	●	●
multifunction inputs	●	●	●	●	●	●	●	●	●
serial connection	●	●	●	●	●	●(*)	●	●	●
decimal point	●	●	●	●	●	●	●	●	●
(*) not on IR32V*H*									
● as standard									



# Sensors and protection devices

Sensors and protection devices are components used in refrigeration units

They measure a physical value (temperature, humidity, pressure, etc.) and convert the reading into an electrical signal to be sent to the electronic controller, allowing the unit to work within the required operating limits.

These components carry out a key role in the improvement of control and the optimised management of the installation.

They can interface with and be adapted to controllers supplied by third parties with standard output signals.





POCC IT.AM50.B09036

## 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 its own line of humidifiers.

The range includes temperature and humidity sensors for various applications, with installation in sockets or ducts, in residential or industrial environments, guaranteeing high performance and compatibility with all CAREL controllers.

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

### Advantages

CAREL probes, as well as featuring the recognised performance that sets them apart, are very versatile and can satisfy various market requirements.

Indeed, all the probes have been especially designed to be compatible not only with all CAREL controllers, but also with the most commonly used standards around the world.

- The temperature and humidity probes are available with different operating ranges and in special versions for corrosive or polluting environments.
- The new pressure transducers, as well as being available in a ratiometric version, now offer improved performance in terms of precision, better supporting of overpressure, extended operating temperature range and resistance to acceleration.
- The new air quality sensors offer installers and manufacturers of AHUs an important new accessory, with the certainty of CAREL quality.
- Furthermore, CAREL provides a series of protection modules: thermal protectors for the compressors (THP), especially for

scroll units, and phase sequence controllers (RSF), ideal for systems in which the correct sequence of the phases is fundamental for the correct operation of the installation.

- The new smoke/fire and flood detectors are compact devices with automatic calibration, meaning they can adapt to all environments without a reduction in the precision of activation.



## Active temperature, humidity and temperature/humidity probes

DPW\*: for room installation  
DPD\*: for duct installations

Particularly suitable for civil and commercial environments with precise design requirements. Used in ducted heating and air-conditioning systems. The range also includes models with RS485 connection using the CAREL or Modbus® protocol.

### Technical specifications

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

#### Operating conditions:

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

#### Storage conditions:

-20T70 °C, <90% rH non-cond.

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

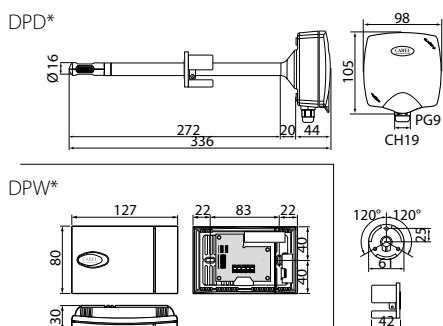
#### Installation:

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

#### Index of protection:

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

### Dimensions (mm)



## Active temperature/humidity probes

DPP\*: for industrial environments

Specifically designed to measure high humidity levels with great precision. The range also includes models with RS485 connection using the CAREL or Modbus® protocol.

### Technical specifications

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

#### Operating conditions:

-10T70 °C, -20T70, <100% rH non-cond.

#### Storage conditions:

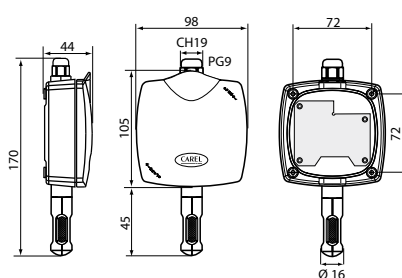
-20T70 °C, <100% rH non-cond.

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

#### Installation:

**Index of protection:** IP55 (case); IP54 (sensor)

### Dimensions (mm)



## Active immersion temperature probes

ASIT\*: immersion

The ASIT\* immersion probes are used to measure the temperature inside cooling or heating circuits.

These are especially suitable when the sensor is in direct contact with the fluid being measured.

### Technical specifications

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

#### Operating conditions:

-10T70 °C, <100% rH non-cond.

#### Storage conditions:

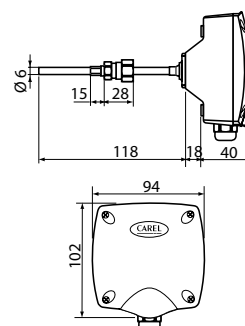
-20T70 °C, <100% rH non-cond.

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

#### Installation:

**Index of protection:** IP55 (case); IP67 (sensor)

### Dimensions (mm)





## Universal active temperature probes

ASET\*: universal

The universal temperature probes can be used in a multitude of applications; in particular, version ASET03\* features an electronic amplifier, protected by an IP55 plastic case, which allows remote installation up to 200 m with a 4 to 20 mA output signal.

### Technical specifications

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

#### Operating conditions:

-30T90 °C or 30T150 °C, <100% rH non-cond.

#### Storage conditions:

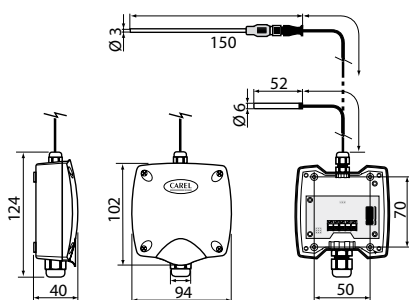
-20T70 °C, <100% rH non-cond.

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

**Installation:** direct or with socket

**Index of protection:** IP55 (case); IP67 (sensor)

### Dimensions (mm)



## Air quality sensors: VOC, CO<sub>2</sub>, CO<sub>2</sub>+VOC

DPWQ\*: for room installations

DPPQ\*: for duct installations

These analyse air quality and are ideal for ventilation systems and air handling units in domestic and commercial environments.

Main functions:

- measuring air quality;
- quantitative analysis of contamination by polluting gases;
- setting a sensitivity threshold according to the maximum level;
- ventilating rooms only when necessary, so as to guarantee energy saving.

### Technical specifications

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

#### Operating conditions:

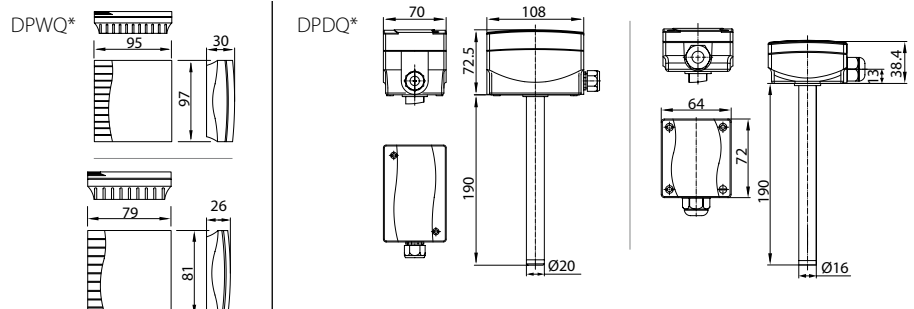
0T50 °C, 10 to 90% rH non-cond.

#### Storage conditions:

-20T70 °C, 10 to 90% rH non-cond.

**Outputs:** 10 Vdc or 4 to 20 mA based on the model

### Dimensions (mm)







## Temperature probes with NTC thermistor

NTC\*HP\*, NTC\*WP\*, NTC\*WF\*,  
NTC\*HF & NTC\*HT, NTCINF\*

CAREL propone per i diversi controlli, una gamma di sensori con diverse caratteristiche adatti per differenti applicazioni principalmente nel settore del mercato HVAC/R.

La precisione ottenuta grazie alle soluzioni tecniche adottate nella realizzazione del sensore, l'affidabilità come risultato dei test cui sono sottoposte, fanno delle sonde NTC CAREL degli affidabili trasduttori per la rilevazione della temperatura, da un costo contenuto.

Sono inoltre disponibili sonde per infilzaggio con o senza resistenza di preriscaldamento, per rilevare la temperatura del cuore prodotto.



## Immersion probes

TSN\* and TSC\* = NTC version  
TST\* and TSM\* = PT1000 version  
TSOPZ= accessories (connectors, fittings, sockets...)

CAREL proposes the new TS\* range of immersion probes, in models with NTC and PT1000 sensors, suitable exclusively for hydronic applications. Fast installation, rapid sensor response and an excellent price/performance ratio are the main features of this product range. The probes are available complete with connectors, cables, fittings and sockets.



## Temperature probes with PTC, Pt100, Pt1000 sensor, J and K thermocouples

PTC\*

The PTC temperature probes represent a solution for both refrigeration and heating applications, measuring temperatures in the range from -50T100 °C and 0T150.

PT100\*

The PT100 sensors represent the ideal solution for all applications in which the temperature must be measured over an extended range, from -50°C to 400°C (depending on the model).

TSQ\* & TSH\*

The PT1000 sensor (TSQ\* and TSH\*) is ideal for all applications in which the temperature must be measured over an extended range, from -50 to 250 °C (TSQ\*) and from -50 to 90 °C (TSH), while maintaining precision even over long distances for remote installation.

TCJ\* & TCK\*

Type J and K thermocouples allow temperatures of up to 800°C to be measured.



## 4 to 20 mA pressure transducers

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

These pressure transducers provide a standard analogue current signal (4 to 20 mA).

They are used above all in refrigeration and air-conditioning applications to measure the pressure in the refrigerant circuits, however their high performance also makes them ideal for many other applications. They can also be used in refrigerant circuits containing ammonia.

Available with male and female fittings.

### Technical specifications

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

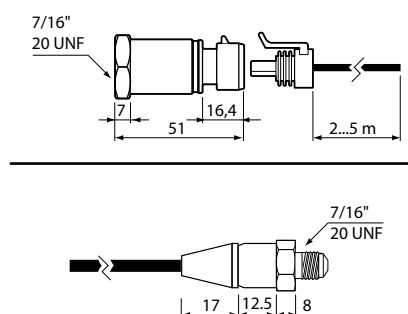
**Operating conditions:** -25T80 °C (male), -40T135 °C (female)

**Connector thread:** 7/16" 20 UNF

**Precision:**  $\pm 2.5\%$  BR (male),  $\pm 4\%$  FS (female)

**Index of protection:** IP65

### Dimensions (mm)



## 0 to 5 V ratiometric pressure transducers

SPKT\*R\* & SPKC00\*

These pressure transducers provide a 0 to 5 V ratiometric signal (automotive standard).

Like the 4 to 20 mA pressure transducers, these can be used in air-conditioning and refrigeration systems, excluding those containing ammonia.

Available with female fitting only.

### Technical specifications

**Power supply:** 4.5 to 5.5 Vdc

**Operating conditions:** -40T135 °C

**Outputs:** 0.5 to 4.5 Vdc

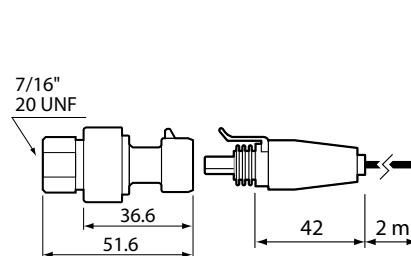
**Precision:**  $\pm 1.2\%$  of interval

**Temperature error:**  $\pm 0.013\%$  /°C

**Connector thread:** 7/16" 20 UNF

**Index of protection:** IP65

### Dimensions (mm)



## Differential pressure transducers

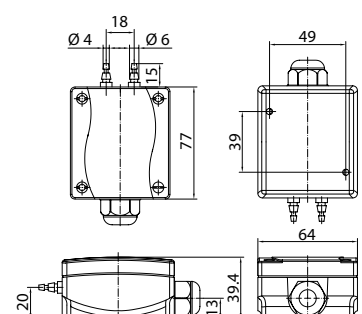
SPKT00\*5N0

The differential pressure transducers use a new ceramic sensor that provides a voltage or current signal calibrated and compensated according to the temperature. Ideal for measuring low pressure values in air-conditioning systems, rooms, laboratories and clean rooms (air and non-corrosive gases).

The main features are:

- compact construction;
- easy installation thanks to the built-in mounting bracket;
- clip-on cover with fastening screw.

### Dimensions (mm)





### Differential pressure switch

DCPD0\*0\*00

CAREL supplies differential air pressure control units for filters, fans, air ducts, air-conditioning and ventilation systems. The pressure switch is ideal for control and safety functions in air-conditioning systems to signal that the fans have stopped or the filters are blocked. It can be installed in environments with non-aggressive and non-flammable atmospheres, and comes in the version with assembly kit.



### Air flow switch

DCFL000100

CAREL supplies flow switches for controlling the flow of air or non-aggressive gases inside the distribution ducts of air-conditioning or air handling systems. These devices feature a galvanised plate base and a sealed ABS cover, IP65 (on the side towards the outside of the duct), according to the EN60529 standard, class of protection 1 - EN 60335-1 standard.



### Thermal protector

THP\*

The THP motor protection module has been especially designed for scroll compressors. According to the DIN 44081/082 standards, up to nine PTC temperature sensors, with different rated response temperatures, can be connected in series to the input of the measurement circuit. As soon as the temperature in one of the monitored areas exceeds the rated response temperature of the corresponding PTC sensor, the THP motor protector module is activated, and consequently de-energises the relay. When the protector is activated a timer is started; the protection mechanism cannot be reset until 30 seconds have passed, and when the PTC signals (the resistance of the sensors) have fallen below the reset threshold.



### Flood detector

FLOE\*

The new flood detecting device is able to sense the presence of water in an environment. It is generally used to protect against flooding in computer rooms, offices, laboratories, special environments. It is made up of a detector (normally fitted on the electrical panel) and a sensor (installed in the position being controlled). When the sensor is wet by the water, the alarm is automatically activated on the detector, switching the status of the relay.



### Antifreeze thermostat

DCTF000320

Designed to protect heat exchangers (evaporator coils) and electric heaters in air-conditioning and refrigeration systems.

It can be used in all applications where the temperature needs to be checked at a specific point in the system, to prevent it falling below of a set safety value.

The thermostat also provides automatic protection in the event of a sensor fault.



### Smoke and fire detector

SFF\*

The smoke and fire detectors are electronic devices that promptly measure dangerous and sudden rises in temperature or increases in the presence of smoke. Their unique feature is the auto-calibration function, which guarantees the activation of the device over time, while perfectly adapting to different environmental conditions without losing sensitivity.



### Phase sequence controller

RSF\*

The RSF modules control the correct sequence of the input phases L1, L2 and L3 and measure the voltage for the three phases. They are fitted with a relay that is energised when the phase sequence is correct and the measurement of each individual phase is within  $\pm 10\%$  of the rated voltage (depending on the model). The dimensions are compact and modular (DIN standard). These modules are therefore ideal for equipment, systems or units where the correct sequence of the phases is fundamental for correct operation.

## Active temperature and humidity probes

Specifications			
Models	temperature range	range of measurement	output
<b>Active room probes, power supply 9 to 30 Vdc/12 to 24 Vac</b>			
DPWT010000	-10T60 °C		select. 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 to 90% rH	• NTC 10 K at 25 °C (temperature) • select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA (humidity)
DPWC110000	-10T60 °C	10 to 90% rH	select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPWC115000	-10T60 °C	10 to 90% rH	• NTC 10 K at 25 °C (temperature) • 0 to 10 Vdc (humidity)
DPWC112000	-10T60 °C	10 to 90% rH	0 to 10 Vdc
DPWC114000	-10T60 °C	10 to 90% rH	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		select. 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 to 90% rH	• NTC 10 K at 25 °C (temperature) • select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA (humidity)
DPPC110000	-10T60 °C	10 to 90% rH	select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPPC210000	-20T70 °C	0 to 100% rH	select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPPC112000	-10T60 °C	10 to 90% rH	0 to 10 Vdc
DPPC212000	-20T70 °C	0 to 100% rH	0 to 10 Vdc
DPPT014000	-10T60 °C	10 to 90% rH	opto-isolated RS485 serial
DPPC114000	-10T60 °C	10 to 90% rH	opto-isolated RS485 serial
DPPC214000	-20T70 °C	0 to 100% rH	opto-isolated RS485 serial
<b>Active duct probes, power supply 9 to 30 vdc/12 to 24 vac</b>			
DPDT010000	-20T70 °C		select. 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 to 90% rH	• NTC 10 K at 25 °C (temperature) • select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA (humidity)
DPDC110000	-10T60 °C	10 to 90% rH	select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPDC210000	-20T70 °C	0 to 100% rH	select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA
DPDC112000	-10T60 °C	10 to 90% rH	0 to 10 Vdc
DPDC212000	-20T70 °C	0 to 100% rH	0 to 10 Vdc
DPDT014000	-20T70 °C		opto-isolated RS485 serial
DPDC114000	-10T60 °C	10 to 90% rH	opto-isolated RS485 serial
DPDC214000	-20T70 °C	0 to 100% rH	opto-isolated RS485 serial
<b>Case index of protection</b>	IP55 for DPD, DPP IP30 for DPW		(for duct and ind. env.) (wall-mounted)
<b>Sensor index of protection</b>	IP30 IP40 IP54		for DPW for DPD for DPP
<b>Temperature time constant</b>	in still air in moving air (3 m/s)		300 s 60 s
<b>Humidity time constant</b>	in still air in moving air (3 m/s)		60 s 20 s



### Specifications

Models	range of measurement	output
<b>Active immersion probes, power supply 9 to 30 Vdc/12 to 24 Vac</b>		
ASIT030000	-30T90 °C	select. -0.5 to 1 Vdc/4 to 20 mA
ASIT030001	-30T90 °C	select. -0.5 to 1 Vdc/4 to 20 mA
<b>Universal active probes, power supply 9 to 30 vdc/12 to 24 vac</b>		
ASET030000	-30T90 °C	select. -0.5 to 1 Vdc/4 to 20 mA
ASET030001	-30T90 °C	select. -0.5 to 1 Vdc/4 to 20 mA
ASET030002	-30T150 °C	select. -0.5 to 1 Vdc/4 to 20 mA

### Passive temperature probes

#### Specifications

Models	range	precision	constants (time)	IP
<b>NTC*</b>				
NTC0*HP00	-50T105 °C -50T50 °C (in fluid)	25 °C: ±1%	75 s (in air)	IP67
NTC0*WF00	-50T105 °C	25 °C: ±1%	4.5 s (in fluid)	IP68
NTC0*WP00	-50T105 °C	25 °C: ±1%	10 s (in fluid)	IP68
NTC0*WG00	-50T105 °C	25 °C: ±1%	4.5 s (in fluid)	●
NTC0*HT00	0T120 °C (air) 150 °C X 3000 hours	±0.5 °C, -10T50 °C - 25 °C: ±1.0 °C; -50T85 °C ±1.6 °C; +85T120 °C - ±2.1 °C; +120T150 °C	60 s (in air)	IP55
NTC0*HF00	-50T90 °C	±0.5 to 25 °C; ±1.0 °C from -50T90 °C	75 s (in air)	IP55
NTCINF	-50T110 °C	25 °C: ±1%	10 s (in air) 60 s (in air)	IP67
TSN*	-40T120 °C	25 °C: ±1%	5 s (in fluid)	○
TSC*	-40T90 °C	25 °C: ±1%	5 s (in fluid)	○
<b>PT100*</b>				
PT100000A1	-50T250 °C	IEC 751 class B	75 s (in air)	IP65
PT100000A2	-50T400 °C	IEC 751 class B	75 s (in air)	IP65
PT100000A3	-50T200 °C	IEC 751 class B	75 s (in air)	IP67
<b>PT1000</b>				
TSH*HF*	-50T90 °C	±0,8 °C, -50T90 °C	75 s (in air)	IP67
TSQ15MAB00	-50T250 °C	IEC 751 class B	2.5 s (in fluid)	IP65
TST*	-40T120 °C	IEC 751 class B	5 s (in fluid)	○
TSM*	-40T90 °C	IEC 751 class B	5 s (in fluid)	○
<b>PTC</b>				
PTC0*0000	0T150 °C	±2 °C; 0T50 °C - ±3 °C; -50T90 °C - ±4 °C; 90T120 °C	60 s (in air)	IP65
PTC0*W*	-50T100 °C	±2 °C; 0T50 °C - ±3 °C; -50T90 °C - ±4 °C; 90T120 °C	60 s (in air)	IP67
PTC03000*1	-50T120 °C	±2 °C; 0T50 °C - ±3 °C; -50T90 °C - ±4 °C; 90T120 °C	60 s (in air)	IP67

- glass temperature sensor
- immersion probe

## Pressure transducers

Specifications							
Models	power supply	operating temperature	range	precision	output signal	constants (time)	IP
<b>SPKT00-R0: 0 to 5 V ratiometric - female</b>							
*53*	4.5 to 5.5 Vdc	-40T120 °C	4.2 bars absolute	±1.2%	0.5 to 4.5 V	10 ms	IP65
*13*	4.5 to 5.5 Vdc	-40T120 °C	9.3 bars absolute	±1.2%	0.5 to 4.5 V	10 ms	IP65
*33*	4.5 to 5.5 Vdc	-40T120 °C	34.5 bars absolute	±1.2%	0.5 to 4.5 V	10 ms	IP65
*43*	4.5 to 5.5 Vdc	-40T120 °C	17.3 bars absolute	±1.2%	0.5 to 4.5 V	10 ms	IP65
*B6*	4.5 to 5.5 Vdc	-40T120 °C	45.0 bars absolute	±1.2%	0.5 to 4.5 V	10 ms	IP65
<b>SPK*: 4 to 20 mA - male</b>							
*1000000	8 to 28 Vdc	-25T80 °C	-0.5 to 7 bars	±2.5% fs	4 to 20 mA	-	IP67
*2500000	8 to 28 Vdc	-25T80 °C	0 to 25 bars	±2.5% fs	4 to 20 mA	-	IP67
*3000000	8 to 28 Vdc	-25T80 °C	0 to 30 bars	±2.5% fs	4 to 20 mA	-	IP67
<b>SPK*C*: 4 to 20 mA - female</b>							
*T0021C0	8 to 28 Vdc	-40T135 °C	-0.5 to 7 bars	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65
*T0011C0	8 to 28 Vdc	-40T135 °C	0 to 10 bars	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65
*T0031C0	8 to 28 Vdc	-40T135 °C	0 to 30 bars	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65
*T0041C0	8 to 28 Vdc	-40T135 °C	0 to 18.2 bars	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65
*T00B1C0	8 to 28 Vdc	-40T135 °C	0 to 44.8 bars	±1% fs; 0T50 °C	4 to 20 mA	<10 ms	IP65

## Air quality sensors

Specifications		
Models	type	output
<b>Room 24 Vac/15-36 Vdc</b>		
DPWQ306000	V.O.C.	0 to 10 Vdc or 4 to 20 mA
DPWQ402000	CO <sub>2</sub>	0 to 10 Vdc
DPWQ502000	V.O.C. e CO <sub>2</sub>	0 to 10 Vdc
<b>Duct 24 Vac/15-36 Vdc</b>		
DPDQ306000	V.O.C.	0 to 10 Vdc or 4 to 20 mA
DPDQ402000	CO <sub>2</sub>	0 to 10 Vdc
DPDQ502000	V.O.C. e CO <sub>2</sub>	0 to 10 Vdc

## Differential air pressure transducers

Specifications							
Models	power supply	power input	differential pressure range	differential pressure full scale precision	output signal	differential pressure constants (time)	IP
SPKT00C5N0	15 to 30 Vdc	≥20 mA	0 to 0.5 mbars	±3%	4 to 20 mA	0.055 s	IP65
SPKT0065N0	15 to 30 Vdc	≥20 mA	0 to 10 mbars	±3%	4 to 20 mA	0.055 s	IP65
SPKT0075N0	15 to 30 Vdc	≥20 mA	0 to 25 mbars	±3%	4 to 20 mA	0.055 s	IP65



## Pressure switches and flow switches

Specifications							
operating conditions	sensor	range	precision	maximum current	output signal	type of contacts	IP
<b>DCPD0*0100: duct pressure switches</b>							
-25T85 °C max 50 mbar	silicone membrane	0.5 to 5 mbar	0.2 ± 15% mbars	1.5 (A) 25 Vac 0.1 A 24 Vac	NO / NC voltage-free contact	sealed switch, AgCdO contacts	IP54
<b>DCPD0*1100: duct pressure switches</b>							
-20T85 °C max 50 mbar	silicone membrane	0.2 to 2 mbar	0.2 ± 15% mbars	1.5 (A) 25 Vac 0.1 A 24 Vac	NO / NC voltage-free contact	sealed switch, AgCdO contacts	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	sealed switch	IP65
*: "1" with assembly kit							





# Remote management and communication solutions

systems of monitoring and supervision carry out a role key in the management incorporated of the systems HVAC/R.

These are essential instruments for continuously and effectively controlling the status of field devices and recording temperature and events in compliance with HACCP regulations.

They can perform scheduled actions (e.g. lights on/off, etc. ) and optimise the organisation of maintenance operations through effective alarm management.

The immediate signalling of alarms by SMS, e-mail and/or fax means the installation is always under control, while the remote system can be used to resolve several problems quickly, without need to go on-site, ensuring economic savings and faster response times.

The system offers various reporting options, including standards-compliant print-outs at programmable times.

In addition, critical situations can be highlighted relating to the trend in values such as temperature, pressure and power consumption, comparing values between different utilities.





# Connectivity

Connectivity is the result of CAREL's years of experience in the design and manufacture of programmable controllers for HVACR units. CAREL constantly follows the technological advances in communications, focusing on several fundamental concepts.

## Connectivity

Interfacing and compatibility with the more commonly-used BMS (Building Management Systems): BACnet™, LonWorks®, Modbus®, SNMP. This ensures:

- remote management of the unit via modem and the Internet, including using a simple browser.
- authorised personnel, wherever they may, are notified of any alarm situations, including by SMS and e-mail.
- simple creation of alarms and graphs for prompt unit diagnostics.

## Interoperability

Ability to work and cooperate in a distributed intelligence system and with integrated solutions, acquiring from and sharing information with third party devices for:

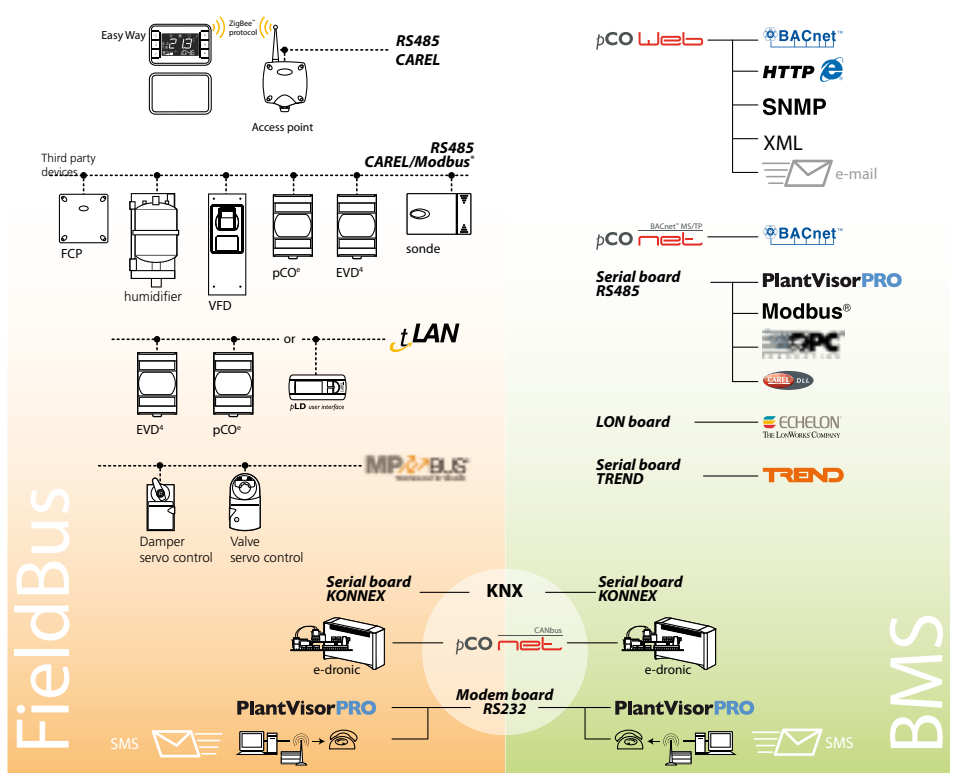
- optimised management of the unit.
- high efficiency of the installation (energy saving)

## Security

Risk-free transmission of information and data exchange, an important factor above all when using networks that are universally accessible.

The CAREL devices can be configured for:

- differentiated access to the unit for maintenance personnel or supervision.
- secure access via internet or VPN (virtual private network).





## Supernode

SNS\*

The new Supernode series is the result of the need for a controller than can manage considerable information flows.

This feature adds to the numerous advantages of a programmable controller. Supernode is the first CAREL controller with 32-bit microprocessor and embedded 4MB flash memory.

The unit is compact (6 DIN modules) with built-in negative blue 132x64 pixel display. La tastiera, posta orizzontalmente sotto il display e senza serigrafia, permette la personalizzazione delle funzioni associabili a ciascun tasto (visualizzate nell'ultima riga del display) differenziandole da maschera a maschera.

Supernode is a product:

- flexible: ideal for more demanding applications, using the numerous I/Os available and a modern and functional semi-graphic display;
- powerful: the power of the new platform

makes the management of information fast and reliable;

- connectable: 6 serial ports:
  - 2 built-in RS485 ports, one of which optically isolated;
  - 2 slots for BMS plug-in cards;
  - 2 USB ports (Master and Slave).

The fast digital input, standard on all versions, can be used to directly read energy counters. Ideal as a system coordinator, simultaneous access by two supervisory systems and the master function for multiple serial connections make it adaptable to all kinds of applications and needs.

### Technical specifications

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

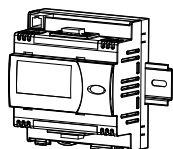
**Power input:** 11W (13VA)

**Operating conditions:**  
-10T60°, 90% rH non-cond.

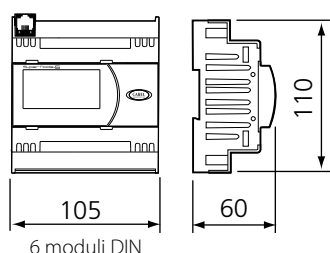
**Storage conditions:**  
-20T70°C, 90U.R. non cond.

**Index of protection:** IP20 – front panel IP40

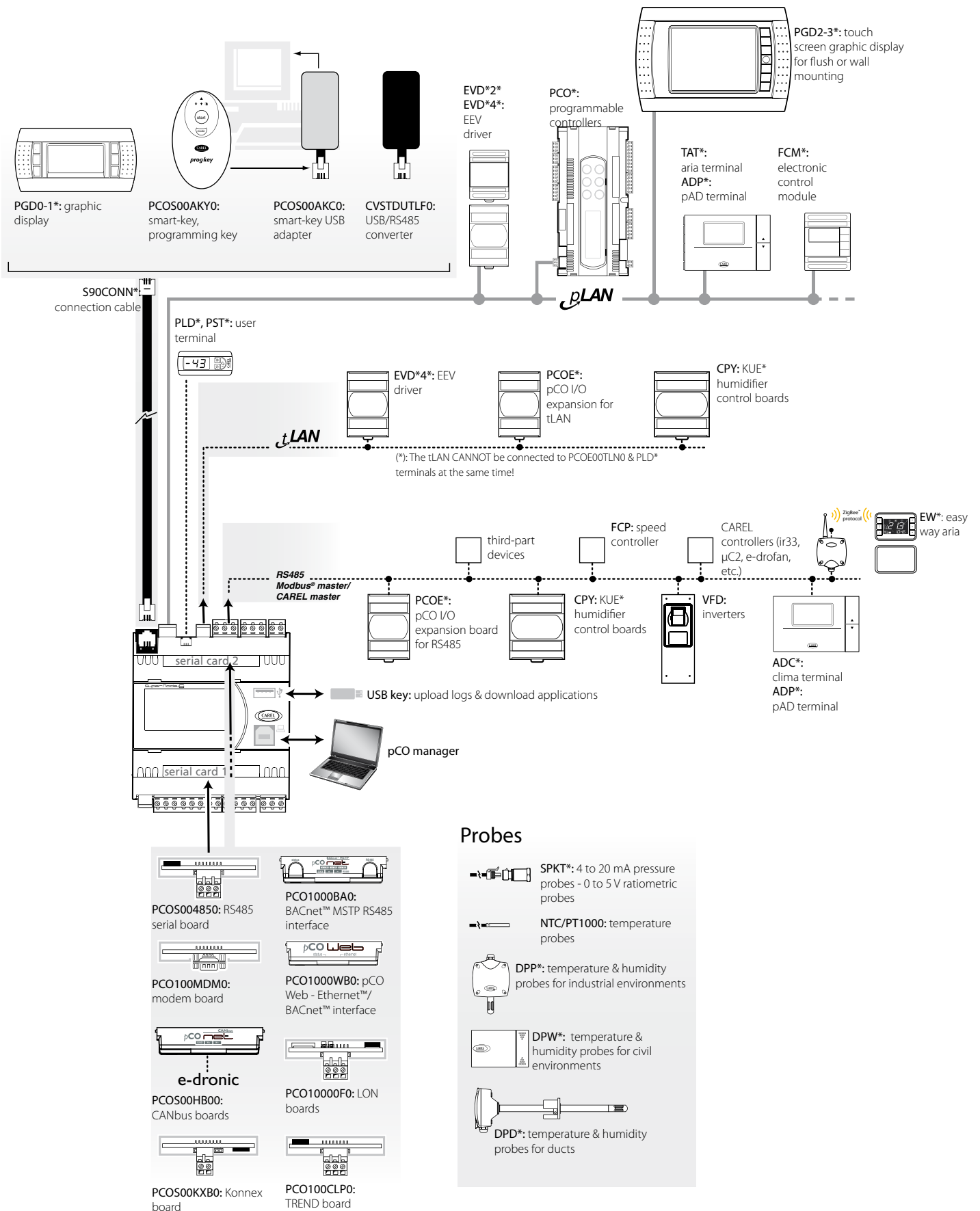
### Montaggio su guida DIN



### Dimensioni (mm)



# OVERVIEW DRAWING

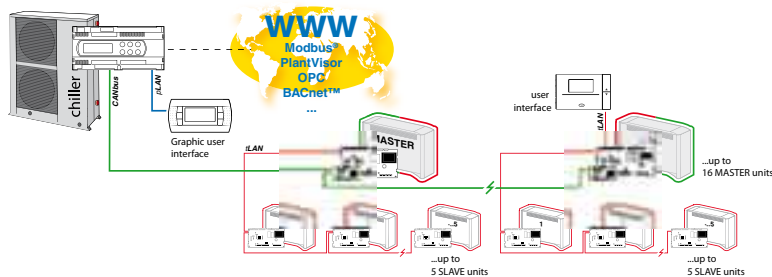


<b>Models</b>		
<b>Specifications</b>	<b>SNS*M</b>	<b>SNS*L</b>
4Mb flash memory	●	●
8Mb flash memory	■	■
512kb RAM	●	●
2Mb RAM	■	■
32Mb NAND flash	■	■
Real Time Clock	■	■
Max. no. of serial ports	6	5
pLAN	●	●
Opto-isolated RS485/tLAN/PST-PLD	●	●
Serial board 1 connector	●	●
Serial board 2 connector	●	●
Master USB port	■	■
Slave USB port	■	■
Ready for programming key	●	●
Negative blue built-in display 132x64 pixels	■	■
User interface with 6 LEDs + 1 button built-in	■	■
Black Box	●	●
Max. no. of inputs	7	10
PT1000 inputs	2	2
0 to 10 V inputs	6	6
0 to 1 V inputs	6	6
4 to 20 mA or 0 to 20 mA inputs	2	2
NTC inputs	6	8
0 to 5 Vdc ratiometric inputs	6	6
Fast digital inputs with voltage-free contacts	3	6
Select inputs by software	1	1
Max. no. of analogue outputs	●	●
0 to 10Vdc outputs	2	2
PWM outputs (phase control)	1	1
Max. no. of digital outputs	1	1
SPST relay outputs	2	7
SPDT relay outputs	1	6
Max. no. of SSR outputs	1	1
48 Vdc power supply	2	3
24 Vac power supply	●	●
Alimentazione 24 Vac	●	●

● standard - ■ optional

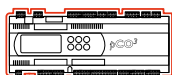
## FieldBus connectivity

From the viewpoint of communication between controllers made by different companies, CAREL also offers a wide variety of solutions for interfacing the pCO family controllers with field devices such as valves, VFDs, serial sensors, Belimo actuators etc. In this way, the pCO sistema series controllers not only manage the individual units, but the entire air-conditioning/refrigeration installation.



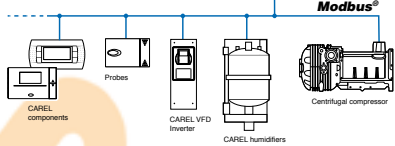
**CANbus** (BMS: PCOS00HBB0, FieldBus: PCOS00HBF0)

The CANbus option allows the pCO controllers to be connected to the CAREL fan coil management system (e-drofan), thus ensuring simpler management of the installation and optimising, through synergy between the controllers, comfort and running costs Available for both FieldBus and BMS serial port.



**RS485** (PCO100FD10)

The RS485 serial option on the FieldBus serial interface can be used with the Modbus® Master or CAREL Master protocol.



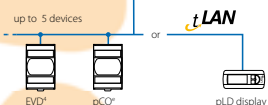
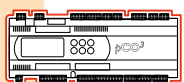
FieldBus: (A)  
BMS: (B) (C)



FieldBus: (A)

**tLAN** (PCO100TLN0)

The tLAN option is used to connect to CAREL devices, such as I/O expansions (pCOe) or electronic valve drivers (EVD4), up to a maximum of 5. Alternatively, this option can be used to connect to the PLD/PST display.



FieldBus: (A)

**MP-BUS®** (PCO100MPB0)

The MP-BUS® protocol can be used to manage up to 8 Belimo servo controls via a simple two-wire connection cable.

**Modem** (BMS: PCO100MDM0, FieldBus: PCOS00FD20)

Direct connection to a traditional or GSM modem, allowing:

- remote supervision by PlantVisor;
- remote connection via Winload.

The use of a GSM modem also offers the possibility to communicate via SMS (short message service), so as to:

- send alarms and information;
- receive commands to reset alarms or perform any actions without having to physically go to the installation.

Available for both FieldBus and BMS serial port.

FieldBus: (A)  
BMS: (B) (C) (D) (E)

FieldBus: pCO<sup>3</sup>  
BMS: (B) (C) (D) (E) (F)

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

The KNX technological standard is now widely used in building automation and control for commercial and residential use.

CAREL is member of the KNX Association ([www.knx.org](http://www.knx.org)). The CAREL Konnex board is compatible with all KNX/EIB devices and can be installed on the following ports:

- BMS, for the pCO sistema or e-drofan controllers;
- FieldBus, for the pCO<sup>3</sup> controllers.

The K-Set tool (can be downloaded from [ksa.carel.com](http://ksa.carel.com)) is used to create an XML file for the custom profiles.

### Can be used in Fieldbus and/or BMS

- (A) = pCO<sup>3</sup> e pCO<sup>1</sup>
- (B) = pCO<sup>3</sup> / pCO<sup>1</sup> / pCO<sup>XS</sup> / pCO<sup>C</sup>
- (C) = Supernode
- (D) = Mastercase3 / pCO<sup>rack</sup> \*
- (E) = humiSteam X-plus / gaSteam / MC \*
- (F) = e-drofan
- (G) = altri

\* check compatibility with the application program



# BMS connectivity

CAREL controllers can be connected to the BMS in the following ways:

- directly, thanks to the ability of the pCO sistema series controllers to select the protocol used (CAREL, Modbus®);
- using a serial board that communicates with the protocol used by the BMS (BACnet™, SNMP, LON...);
- integrating the driver for the management of the CAREL proprietary protocol into the (OPC®, CAREL DLL).

## RS485 (PCOS004850)

The RS485 option for BMS serial port can be used for interfacing to supervisory systems, such as PlantVisorPRO, OPC, Modbus or proprietary (CAREL DLL), using the CAREL slave or Modbus RTU slave protocols.



BMS: (B)(C)(D)(E)

## Modbus®

Introduced in the 1970s and now one of the most widely-used BMS protocols. The pCO sistema series controllers are Modbus® native.



This is an industrial standard created by a consortium of companies, in collaboration with Microsoft® to standardise the drivers for proprietary devices. Using the CAREL OPC server, any Windows® OPC client application (SCADA, supervisors, management software, etc.) can communicate with all CAREL devices in user-friendly OPC mode, without requiring a gateway.



CAREL provides a DLL that manages communication with CAREL controllers. In particular, using the services supplied by the routines contained in the CAREL DLL (available for download from ksa.carel.com), supervision software can be developed for receiving and sending data from/to all CAREL peripherals without needing to know the protocol that these adopt.

## LONWORKS® LON (PCO1000F0)

The LonWorks® system, developed by Echelon® is one of the dominant solutions in the market of automation and control in industry, offices, homes and transport. Electrical standard supported: FTT10. CAREL is a LonMark® Partner. The LONset tool (available for download from ksa.carel.com) can be used to create the LON files (NXE and XIF) for the custom profiles. Info: lon@carel.com



BMS: (B)(C)(D)(E)



BMS: (B)(C)(D)(E)

TREND is a building automation system that is very widely used in English-speaking countries and in Europe in general. For further information on the supply and configuration of the interface board, contact trend@carel.com.



BMS: (B)(C)(D)(E)(F)



e-mail

HTTP

SNMP  
XML

## pCOWeb (PCO1000WB0)

Interface with the emerging protocols in the HVAC sector and based on the Ethernet™ standard.

Connection to the following networks:

- SNMP v1,v2,v3 networks with TRAP;
- BACnet™ Ethernet, BACnet™/IP networks;
- LAN or Internet.

Using the Web-Server function embedded in the pCOWeb, the user can download the HTML pages relating to their own application via FTP and then use a browser for the remote management of the installation. The embedded LINUX™ operating system allows the addition of plug-ins developed by the user for their own requirements. The pCO application can therefore now be downloaded from a remote station across the Ethernet network, in maximum security. It also features a logger for creating log files (.CSV) and graphs (.BMP) of limited numbers of variables. These files can be received daily via e-mail. info: pcoweb@carel.com

BMS: (B)(C)(D)(E)(F)(G)

## Web-GATE: TCP/IP interface (WEBG0000B0)

Connection to a local Ethernet™-TCP/IP network at 10 Mbps. Connection to the following networks:

- SNMP v1 networks;
- LAN or Internet.

Using the Web-Server function of the Web-GATE, the user can download the HTML pages relating to the application via FTP and then open a browser for the remote management of the installation.



BMS: (B)(C)(D)(E)



## pCOnet (PCO1000BA0)

Interface with the BACnet™ MS/TP protocol based on the EIA-485 standard. Info: pcoweb@carel.com



This is the protocol designated in 1995 by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) as the organisation's official protocol.

Type of protocol supported:

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

The BACset tool (available for download from ksa.carel.com) can be used to configure and test the boards. pCOWeb and pCOnet are certified by the BTL (BACnet Test Laboratory). www.bacnetinternational.org.



## Remote management and monitoring systems

The need for the use of a remote management system is often dictated by standards, as well as to ensure rapid alarm management and optimise routine and special maintenance operations.

CAREL meets these needs by fitting many of its instruments with an RS485 serial connection.

In this way, the user can access the control parameters and the device status from a remote supervisor.

CAREL proposes solutions for different types of installation:

- PlantWatch and PlantWatchPRO, PC-free solutions for small refrigeration and air-conditioning systems of up to 32 (PlantWatch) and 100 devices (PlantWatchPRO);
- PlantVisorPRO, a PC-based solution, for refrigeration and air-conditioning systems with a maximum of 200 utilities.

### Advantages

PlantVisorPRO is the innovative CAREL supervisory system that exploits the latest web technology. The data are saved in a database, ensuring reliability and portability. This ensures the user a powerful, easy-to-use and highly customisable tool for all different needs/applications.

PlantVisorPRO is surprisingly easy to use, both regarding configuration and access to the parameters of the instruments.

It can connect to all CAREL instruments, both for refrigeration and air-conditioning. This means that complex installations featuring commercial or industrial refrigeration and air-conditioning systems can be grouped into one single application.

The powerful alarm management scheduler ensures that any service requests are sent to the appropriate recipient.

PlantVisorPRO local, available in the embedded version, represents a perfect solution plug&play, simplifying the installation operations on-site.

The Pc-GATE converter and cables are included in the packaging.

PlantVisorPRO simplifies HACCP management, being able to produce temperature and alarm printouts for all the supervised instruments.

The temperature data are saved in a powerful database.

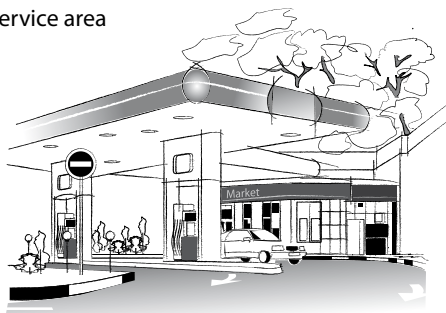
### Quality certification

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 chilled, frozen, deep-frozen/quick-frozen food and ice cream.

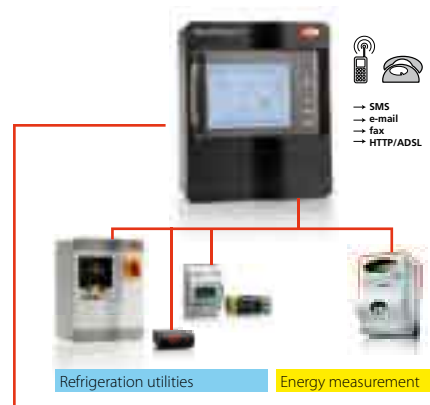
PlantVisorPRO is also compliant with EN13485.



service area

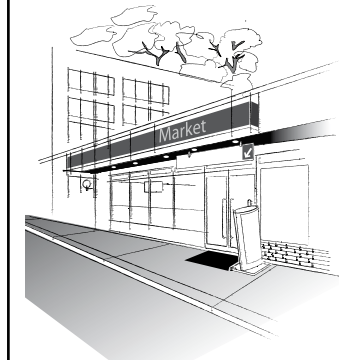


PlantWatchPRO is the ideal solution for monitoring the temperature and managing the alarms on the refrigeration utilities in small installations, such as service stations or small stores in general (discount stores, local shops). The GSM modem can be used to send alarm signals via SMS to the service network.



small supermarket

- SMS
- e-mail
- fax
- HTTP/ADSL



PlantWatchPRO is also an excellent solution for medium-sized supermarkets where the control and supervision requirements are the same as for larger installations. PlantWatchPRO can integrate the monitoring not only of refrigeration utilities, but also the air-conditioning and power consumption measuring systems. PlantWatchPRO allows temperature monitoring in compliance with the HACCP standards, and indeed alarm management and the possibility to connect to the remote service centre are standard functions available in the product.



PlantVisorPRO Remoto

control centre

PlantVisorPRO Remote can be used to access one or more local sites running PlantWatchPRO or PlantVisorPRO to check alarm situations, view graphs, set parameters and print reports. The alarms are immediately managed by the PlantVisorPRO Remote system, and each local service centre is immediately notified via fax or SMS so as to ensure optimised management of the service operations.



large supermarket

PlantVisorPRO is the ideal solution for large installations with a considerable number of utilities in the field and extensive control requirements.





## PlantVisorPRO local embedded

PPSTD\*

PlantVisorPRO is the innovative CAREL supervisory and monitoring system for both small and large installations.

PlantVisorPRO offers:

- monitoring and energy saving management functions;
- HACCP reports and graphs;
- simple and intuitive alarm management for effective maintenance;
- local and remote connectivity;
- activity scheduling and controls for instruments or groups of instruments.

PlantVisorPRO ensures the installation is always under control.

All alarm situations are detected by PlantVisorPRO and signalled in both the local system and the remote system. E-mails, faxes and SMS messages can be sent immediately to inform the service centre of any problems, so as to be able to optimise service operations.

A different level of importance can be defined for each alarm, with the information sent to multiple recipients, based on time bands.

PlantVisorPRO proposes an intuitive, effective and pleasant navigation interface, with cutting edge features: relational database, user profiling and access control, XML protocol for exchanging data between applications, Modbus®, connectivity, web interface.

PlantVisorPRO local is available in the PC-embedded version in the basic, small and

advanced models, so as to respond to the needs of different types of installation. This plug & play solution simplifies installation in the field; avoids hardware compatibility problems with the peripherals, such as modems, and reduces overall cost (maintenance, selection of components, installation of the software).

Version	No. instruments	Functions
Small	20	low
Basic	400	"
Advanced	400	complete

### Technical specifications

**Power supply:** 230 Vac;

**Connection cables & pc-Gate:** included; RS232 serial port for PC-Gate (to CAREL instruments);

Parallel port (printer);

Telephone jack for analogue modem/fax;

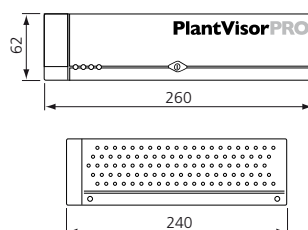
USB ports (printers, modem, pendrive, etc.);

Ethernet™ 10/100 network connector (LAN, WAN, Internet);

VGA connector (1024 x 768 monitor);

PS2 port for mouse and keypad

### Dimensions (mm)



## PlantVisorPRO remote

PPSTD\*

PlantVisorPRO remote is used to manage a series of installations located in different geographical areas from one single station. Available in two versions: for the supervision of 20 sites and 50 sites. Solutions for more than 50 sites can be developed to order by CAREL or its VAR network so as to offer the maximum in terms of system management and integration of customer requirements. The remote system can be used to resolve many problems without need to go on site.

## PlantVisorPRO IDE

PPIDE\*

PlantVisorPRO IDE is the integrated development environment for the construction of custom versions of PlantVisorPRO. This software package can be used to enter system layouts, add new custom programmable controllers, introduce a new language and other additional modules to enhance the performance of the supervisory system.

\* IDE products are released following completion of training at CAREL headquarters. Contact your local CAREL agent.



## PlantWatchPRO

PWPRO\*

PlantWatchPRO is the new solution from CAREL for the supervision of small-medium installations.

Complete network and alarm configuration, simple navigation and an attractive design are some of the features that make PlantWatchPRO the cutting edge product in its category.

A colour LCD touchscreen, and the use of practical menus, guide the user simply and intuitively, without the use of a PC (however a PC can be connected if necessary), thus providing a practical solution for all those environments that do not have room for a computer.

Other innovative features of PlantWatchPRO include:

- possibility to connect and control up to 100 devices;
- use of the CAREL or Modbus® protocols for connection;
- recording of around 100 variables, sampled every 15 minutes, for more than one year;
- IP65 index of protection;
- ready for connection to the PlantVisorPRO Remote supervisor system;
- three output relays, for alarm signals or activating lights and defrosts;
- possibility to export data (alarms, events, system and model configurations and variable reports) using a USB memory key (the data are downloaded in a format that is compatible with Microsoft® Excel and Microsoft® Word);
- import new standard or custom devices;
- display graphs;
- proximity sensor that activates the display without the user needing to open the cover;
- external buzzer management;
- complete alarm configuration;
- phone book for SMS contacts, fax numbers, e-mail addresses;

- active defrost management;
- possibility for multiple users to access the system, with different privileges (administrator, normal user, user with privileges);
- instrument suitable for technical environments, no moving parts.

PlantWatchPRO is also available in the version with built-in modem.

### Technical specifications

**Power supply:** 90-240 V, 50-60 Hz

**Power input:** 6.7 W (typ), 9 W (max)

**Operating conditions:**

5T50 °C, 20 to 80 % rH

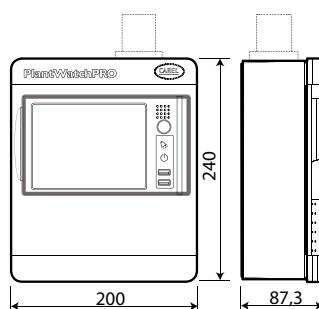
**Storage conditions:**

-20T60 °C, 20 to 80 % rH

**Installation:** wall-mounted

**Index of protection:** IP65 (with cover closed)

### Dimensions (mm)

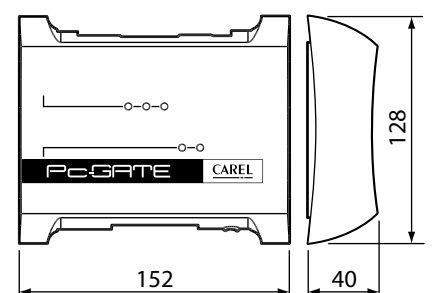


## Pc-GATE

The new RS232/RS485 converter is a device with a number of functions: serial conversion from RS232 to RS485, PC-network communication watchdog, junction for star connections, amplifier to increase the length of the line over one kilometre.

- CVSTD00000 converter/amplifier only, with RS232 or RS485 input and two RS485 outputs to the network, one digital input and one alarm output.

### Dimensions (mm)





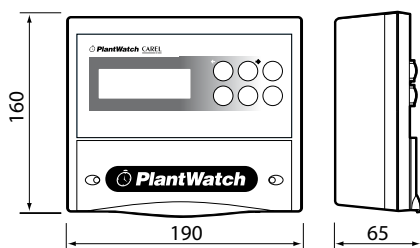
## PlantWatch

PLW00\*: integrated monitoring and remote management solution.

Ideale per impianti di dimensione contenuta, PlantWatch è un registratore dati versatile, un sistema di vigilanza degli impianti ed uno strumento per il controllo a distanza. Ideal for compact systems, PlantWatch is a versatile data recorder, a formidable surveillance system and an exceptional instrument for remote control. PlantWatch allows installers, managers, technicians and maintenance personnel complete control of refrigeration, air-conditioning, heating and other systems. PlantWatch can manage up to 32 instruments and displays the data in five languages. It is also available with built-in modem (PSTN). For each possible critical situation, the user can decide whether PlantWatch should signal the event by buzzer, send a fax or SMS message to a GSM mobile phone, simply save the event, print it or call the service centre running PlantVisor Enhanced.\* PlantVisor Enhanced remote\* is the default program for downloading the values and the alarms saved.

\*product available until June 2008.

### Dimensions (mm)



#### PlantWatch printer module (PLW0PPR\*)

The module allows a parallel printer (with resident fonts) to be connected to the CAREL RS485 supervisory network.

The module receives the information on the print operations and modes from PlantWatch.

It can also be used to signal any lack of activity on the network (network "watchdog") for more than 20 minutes.



#### Kit for direct RS232 serial connection to a PC (PLW0PPC\*)

The kit includes the "PlantWatch manager" configuration software, an RJ45-DB9 female adapter with DCE connections (meaning it can be fitted directly to the PC's serial port) and a 5-metre long 8-wire flat cable.



#### Kit for connection to an external modem (PLW0PMD\*)

The kit contains a 5-metre long 8-wire flat telephone cable, an RJ45-DB25 male adapter and an RJ45-DB9 male adapter, both with DTE connections for direct insertion into the female connector on the modem.



## Synchro wireless

SYN\*

The Synchro wireless version represents the most advanced technology used to simply and quickly setup supervision for large systems such as supermarkets. Wireless technology is used for communication between the controllers and the supervisory system, thus avoiding the problems and costs related to laying the cables. The technology used for wireless transmission is based on the Mesh networks, which are highly efficient and can overcome/get around any obstacles in the area.

### Specifications

**Power supply:** 12 Vac/Vdc (-10% to +10%), 50/60 Hz;

**Current input:** 50 mA

**Connections:** plug-in terminal for communication with peripherals: max cable size 1.5 mm<sup>2</sup>, (use shielded cable with shield connected to GND)

**Plug-in power supply terminal:** max cable size 1.5 mm<sup>2</sup>

**Assembly:** wall-mounted by screws

**Status display:** three LEDs for status and operation:

- LED indicating the type of device (master or slave);
- on the master LED indicating wireless transmission, on the slave device validated;
- on the master LED indicating wireless reception, on the slave wireless activity.

**Operating conditions:**

0T50 °C; 20 to 80% rH non-condensing

**Storage conditions:**

-20T70 °C; 20 to 80% rH non-condensing

**Index of protection:** IP55.



## Energy<sup>2</sup>

ENERGY\*

Energy optimisation is fundamental in achieving significant improvements in the energy balance and consequent reductions in the running costs of systems. CAREL offers a panel-mounted microprocessor-based electronic controller especially designed to acquire data on electricity usage, so as to analyse and manage electrical loads. Energy<sup>2</sup> analyses the electricity consumption and intervenes when the mean value envisaged exceeds the maximum set. The control functions momentarily deactivate any loads that are not strictly necessary, so as to bring the power consumption back within the set limits. The devices that are switched off are restarted as soon as the conditions of the installation allow. The priority and disconnection mode can be set for each electrical load monitored.

### Advantages:

- centralised management using just one controller of all the data corresponding to energy consumption, ensuring precise monitoring;
- limit where possible the exceeding of the contracted power supply rating through the intelligent management of the loads, avoiding penalties;
- improve the use of electricity by activating the loads at preset times, applying programmable time bands to highlight and eliminate any energy wastage;
- optimise certain loads, such as the air-conditioning or heating system, with functions such as Optimum start-stop and Duty cycling.

### Features of the Large version (ENERGY2120)

- management of up to 15 loads that can be intelligently deactivated;
- one alarm output;
- up to three 4 to 20mA inputs for monitoring power consumption;
- one analogue output for managing a 3-way valve
- up to 3 NTC probes for optimising the air-conditioning or heating system.



### Current transducer (0907554AXX)

Electronic current transducer for low voltages, with 500 A end scale and 4 to 20 mA output.

### Features of the XS version (ENERGY7060)

- management of up to 4 loads that can be intelligently deactivated;
- one alarm output;
- up to two 4 to 20mA inputs for monitoring power consumption;
- up to 3 NTC probes for optimising the air-conditioning or heating system.

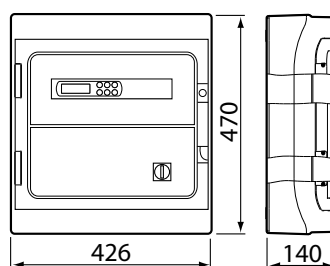


### Mains analyser (6714505AXX)

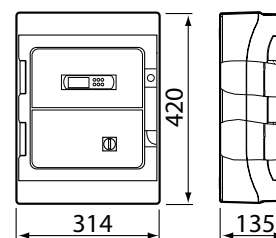
Three-phase mains analyser for measuring the electrical values in low voltage applications.

### Dimensions (mm)

ENERGY2120\*



ENERGY7060





# E<sup>x</sup>V system

CAREL presents its solution for electronic expansion valves (EXV) with proportional modulation and excellent technical and functional characteristics.

The ExV series can be used in many applications in the fields of air-conditioning and refrigeration at low and normal temperatures, and ensures compatibility with the most commonly used refrigerants.

The use of ExV technology ensures energy saving compared to a mechanical expansion valve, paying for itself in a very short time.

In addition, it has been proven and validated in the field that in commercial refrigeration and computer room air-conditioning applications the reduction in consumption achievable using ExV is on average 15 to 20% annually, based on the application, with seasonal peaks of up to 30%.



Integrated Control Solutions & Energy Savings



**CALUS**  
E304579

## ExV electronic expansion valve

The flow of refrigerant is modulated through a calibrated hole fitted with a conical movable element, driven by a stepper motor, and the internal mechanism is suspended on calibrated springs with ball bearings: control is consequently very precise, stable and reliable over time, eliminating the risk of locking.

The ExV is entirely manufactured using laser welding and quality materials (AISI 316L and high performance plastics), and each piece is functionally tested.

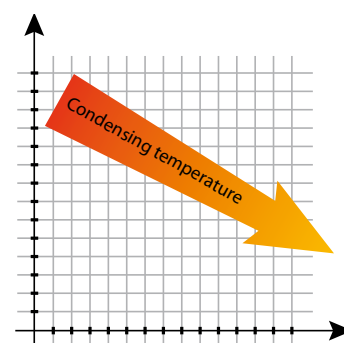
Given the current increase in installations using high pressure refrigerants, the ExV series has been designed to ensure operation up to 35 bars differential and 42 bars suction pressure, thanks to the high thrust force. In addition, the expansion capacity in both directions allows the layout of the refrigerating circuit to be simplified in reverse-cycle heat pumps and reduces installation costs: only one expansion valve is required, and non-return valves are not needed.

### Energy saving and precision

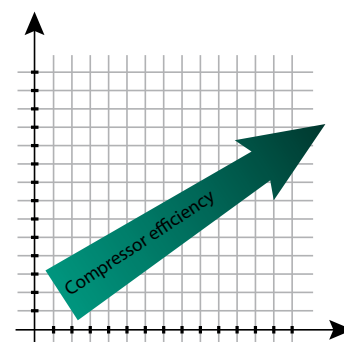
The extended range of operation and the precision in terms of control (from 10 to 100% of rated capacity) allow significant energy savings.

As well as this characteristic, ExV stands out for its significant control quality and the capacity to quickly reach and then maintain stable conditions when starting and upon changes in demand.

The latter aspect is ideal for precision air-conditioning and industrial refrigeration applications, where as well as ensuring energy savings, ExV also increases performance and provides very stable operation.



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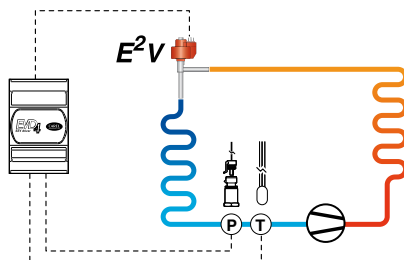


## Control systems

CAREL offers a number of solutions for the management of the E<sup>2</sup>V electronic expansion valves.

The operation of the E<sup>2</sup>V is based on controlling the superheat of the refrigerant, with some additional functions (MOP, LOP, LOW SUPERHEAT): in order to calculate these parameters, a pressure probe and a temperature probe need to be installed at the evaporator outlet.

The expansion of the refrigerant is controlled using the CAREL control algorithm, which in real time calculates the optimum position of the valve stopper and, using a driver, moves it with the built-in stepper motor (see the diagram on the side).



The reading of the probes, the control algorithm and the movement driver can be managed either using built-in devices or separate modules.

In the former case, the devices are integrated into the main controller (for example MPXPRO with built-in driver).

In the latter case, the separate EVD400 module can be integrated with:

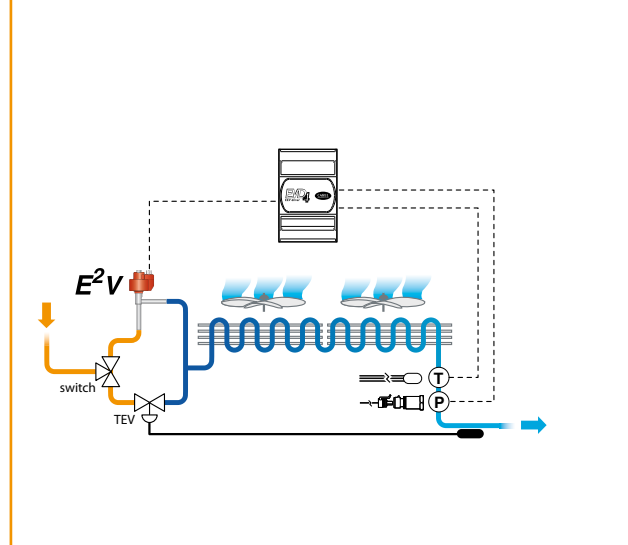
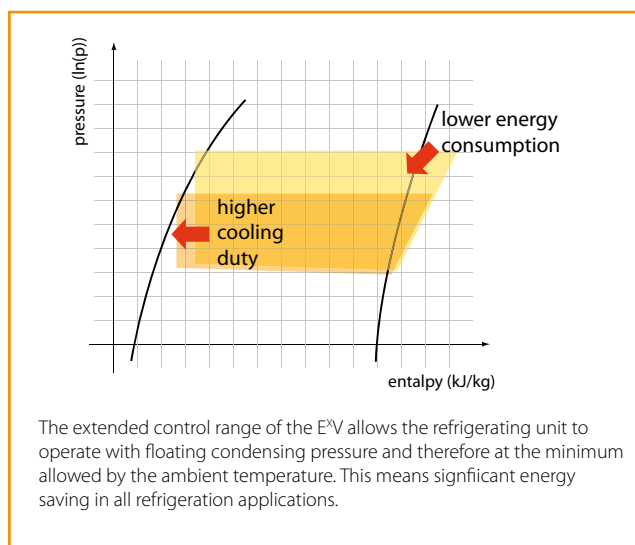
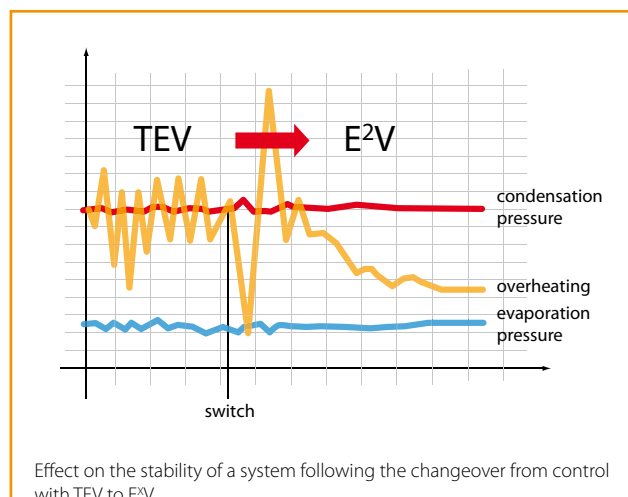
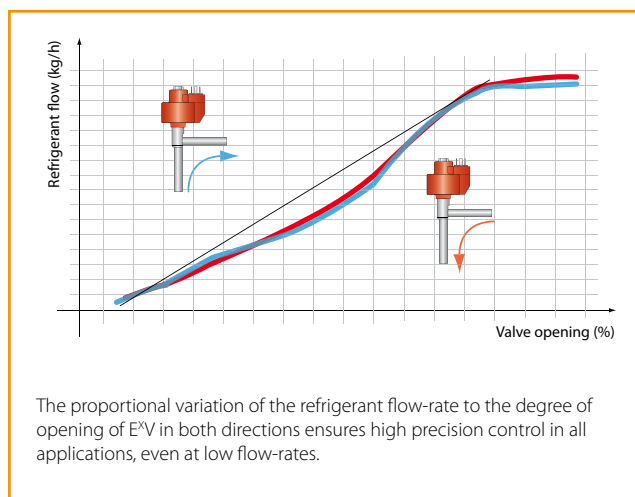
- a  $\mu$ C<sup>2</sup> series parametric controller;
- a pCO series programmable controller;
- an instrument made by CAREL or other

manufacturers that sends a digital signal to the EVD400 module to start stand-alone control.

If programmable controllers are used, the 1Tool system makes it possible to customise the control algorithm so as to adapt management to specific requirements of the installation (pump down, dehumidification upon request).

For parametric controllers, on the other hand, the functions provided represent a complete offering for the needs of standard systems.

In addition, preventive maintenance and efficient alarm management are available by monitoring, using the supervisory system, the refrigerant superheat value and consequently the degree that the E<sup>2</sup>V is open, as well as other parameters from the various inputs on the controller.





## E<sup>2</sup>V: electronic expansion valve

E<sup>2</sup>V\*; E<sup>3</sup>V\*; E<sup>4</sup>V\*

E<sup>2</sup>V, E<sup>3</sup>V and E<sup>4</sup>V are proportional electronic expansion valves activated by a two-pole stepper motor. Control is performed using a calibrated stem that slides through an opening, with 14 mm travel. The stem is positioned by a stepper motor with a range of around 500 steps. The correct mechanical balance guarantees significant stability of superheat control according to the set point and a rapid response to transient situations. The proportional control also ensures no pulsation in pressure on the refrigerant lines and greater control over the return of liquid to the compressor. E<sup>2</sup>V is available in different sizes, with cooling capacities of up to 250 kW, with different types of fittings (copper, brass, stainless steel). The most suitable size valve can be selected easily using the E<sup>2</sup>V SELECTION software available from ksa.carel.com, or alternatively by referring to the shortcut tables, as shown in the brochure and on the company website www.carel.com.

## EVD4\*: E<sup>2</sup>V universal driver

EVD\*4\*

The EVD400 driver is the most advanced and versatile solution in the CAREL range for the control and positioning of electronic expansion valves. Versions EVD\*400, \*410 and \*420 respectively come with the communication protocols pre-set for connection to the µC and pCO controllers (tLAN), pCO (pLAN) and supervisor or PlantVisor (RS485), and can manage a vast range of EEVs made by different manufacturers. Versions EVD\*430, \*440 and \*450 come with same protocols pre-set as above, however for managing CAREL valves only. By the end of 2008 a new version will be available, the EVD\*460 for Modbus® communication.

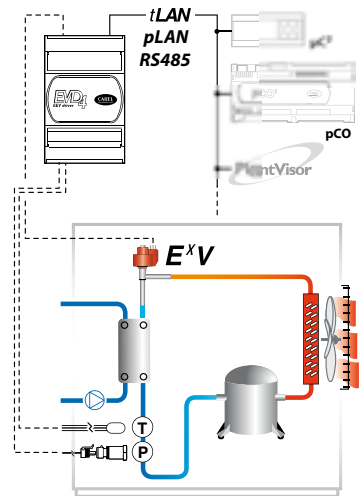
EVD400 can operate in stand-alone mode, with a digital input for starting/stopping the device and connections to the temperature and pressure probes and the electronic expansion valve. EVD4\* can also act as a simple positioner, based on a 4 to 20 mA or 0 to 10 V analogue input signal. The use of ratiometric pressure sensors, the resident bypass and control algorithms with alternatives to superheating control, and considerable configuration options make the EVD400 the most advanced solution currently available.

## MPXPRO series and MasterCase3: controllers with built-in driver

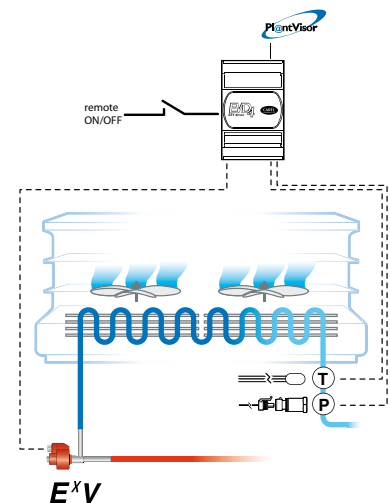
MX2\* & MC3\*

Complete controllers for display cabinets with built-in EEV driver. Optimised for OEMs and installers, reducing installation costs and space by integrating the unit electrical panel. The use of ratiometric pressure sensors further reduces the costs of the solution.

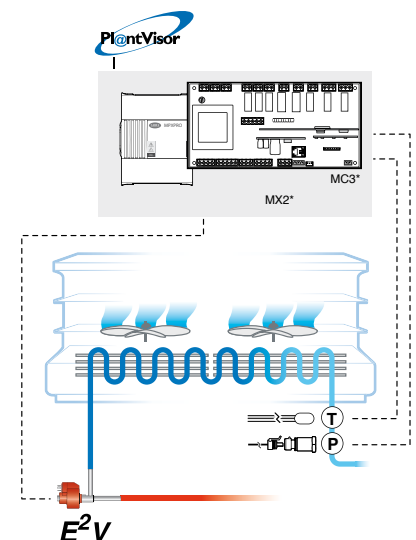
## Example of application on a chiller



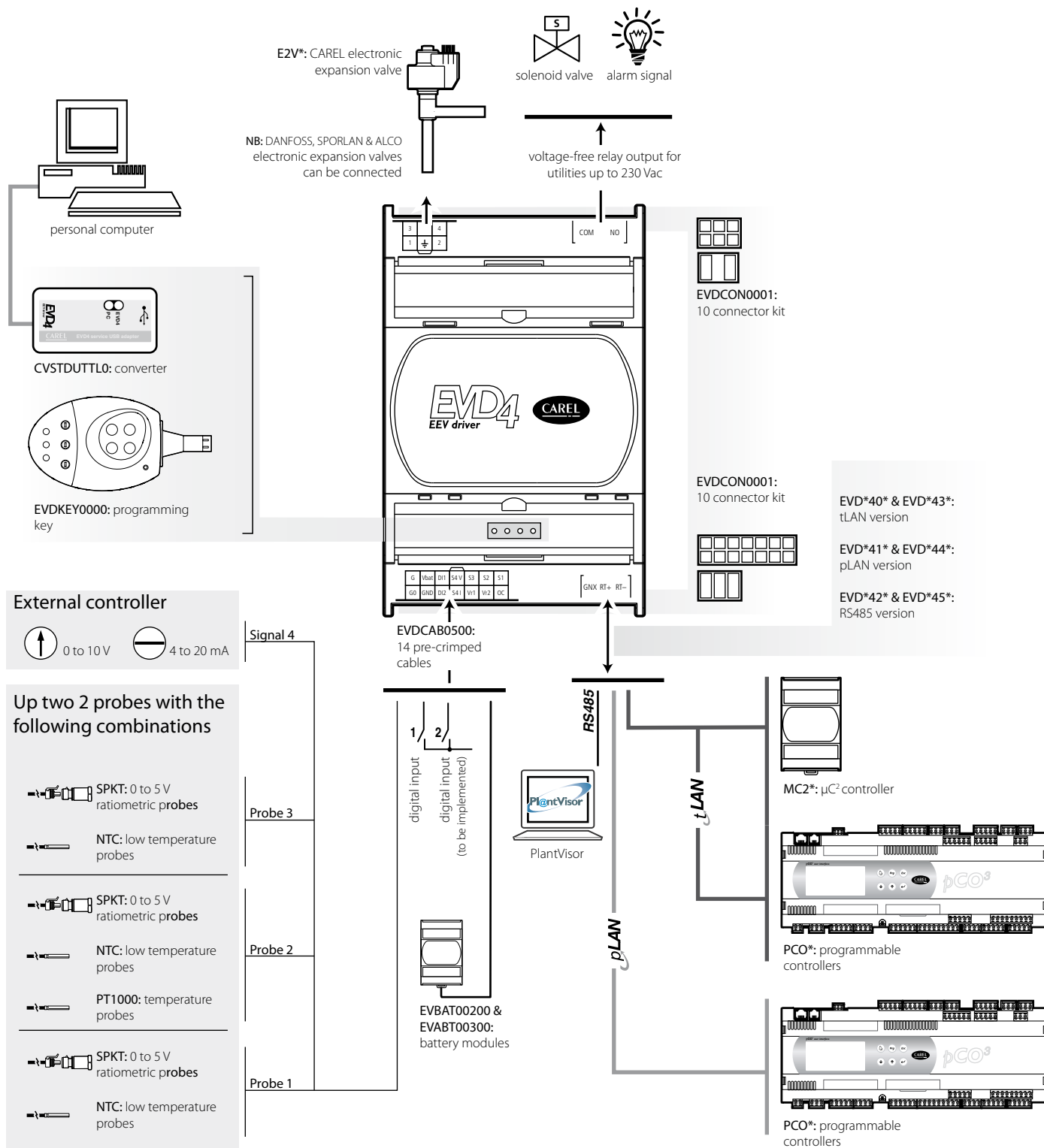
## Example of application on a display cabinet with stand-alone driver



## Example of application on a display cabinet with stand-alone driver



# OVERVIEW DRAWING





# Condenser controllers and inverters

Speed controllers represent a solution for controlling electric motors.

They are typically used on condensing units, in compressors or pumps, to modulate the speed and optimise the efficiency of the unit, achieving considerable energy saving.

Devices are available in the single-phase and three-phase versions, and with varying index of protection (IP).



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POCC IT.A150.B09036

## Condenser controllers and inverters

Completing its range of products, CAREL offers a series of modules designed for special applications on HVAC/R units.

In fact, optional modules are available that have been specifically designed, and therefore optimised, for increasingly important functions in current air-conditioning and refrigeration units

Air-conditioning and refrigeration processes feature a number of very delicate stages that determine the correct operation of the installation, the correct maintenance of the desired temperature and humidity and the protection of the expensive equipment used for these applications.

Knowing the critical points of the installation allows preventive action to be taken so as to prevent problems from arising that may even cause the entire system to shutdown.

CAREL offers a complete series of devices for controlling the condenser and providing protection, to be used in combination with its controllers.

As regards the control of the condenser, the solution offered involves the FCS series controllers, which feature the possibility of

operating in the stand-alone configuration with the FCM control module, or connected to a pCO sistema series controller.

This series features devices available for all needs: three-phase and single-phase versions, with different index of protection (IP 00, 20, 55).

As regards the parametric controllers, such as the  $\mu$ chiller series, CAREL offers the MCHRTF range, ideal for this type of controller.

These speed controllers are also compatible with the pCO sistema programmable controllers. They can manage single-phase fans with current ratings of 2, 4, 6 and 8 A, 203 Vac.

The new range of variable frequency drives (VFD), the NXL series, is designed specifically for applications such as:

- variable speed of fans in air handling systems;
- modulation of compressor operation;
- variable flow-rate of system supply pumps and evaporator pumps on chillers;
- control of condensing pressure in fan assemblies.

Inverters are used on the electric motors that drive water pumps or fans to modulate the load and achieve precise and energy-efficient process control. The variation in compressor speed by inverter guarantees a correct flow of refrigerant inside the circuit, allowing the continuous operation of the compressor, bringing benefits in terms of cooling efficiency and considerable overall energy saving.



## 4, 8, 10 and 12 A single-phase speed controllers

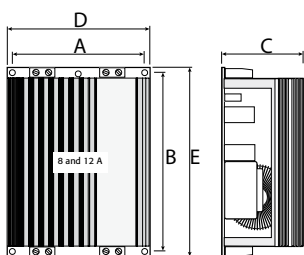
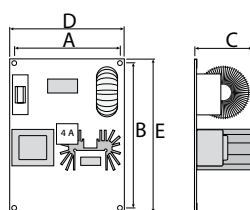
FCS1\* & MCHRTF\*

The FCS and MCHRTF series single-phase controllers have been designed to control the fan speed on condensing units according to the signal from the controller. Specifically, the FCS series receives a 0 to 10 V signal, while the MCHRTF series controllers receive a PWM signal.

### Technical specifications

**Models available:** 4, 8, 10 & 12 A/230 Vac  
**Index of protection:** IP10

### Dimensions (mm)



Model	A	B	C	D	E	F
FCSM042300	75	100	40	82	82	-
FCSM082300	75	100	58	82	107	-
FCSM122300	75	100	58	82	107	-
MCHRTF04C0	43	100	40	50	107	-
MCHRTF08C0	75	100	58	82	107	-
MCHRTF12C0	75	100	58	82	107	-



## FCS: IP20 three-phase speed controllers

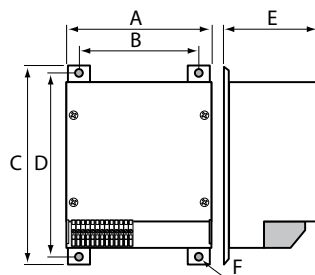
FCS3\*10

The IP20 range, suitable for panel installation, can be controlled by a 0 to 10 Vdc analogue signal from evolved controllers such as the FCM or pCO sistema, or a PWM signal (pulse width modulation) from the  $\mu$ Chiller series. These controllers can manage motors with ratings from 9 to 40 A, and feature a control board that distributes the power to the load, in linear or quadratic mode, with the cut off, threshold, and minimum and maximum speed functions set using the trimmers on the board.

### Technical specifications

**Power supply:** 400 Vac (-15 to 10%), 50/60 Hz  
**Operating conditions:** -10T50 °C  
**Storage conditions:** -20T70 °C  
**Control signal:** 0 to 10 Vdc/PWM  
**Input signal impedance:** 10 k $\Omega$   
**Index of protection:** IP20

### Dimensions (mm)



Model	A	B	C	D	E	F
FCS3094010	170	144	265	250	155	7
FCS3124010	170	144	265	250	115	7
FCS3204010	198	174	265	250	140	7
FCS3404010	198	174	265	250	175	7



## FCS: IP55 three-phase speed controllers

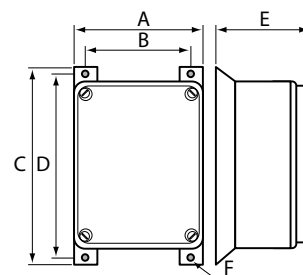
FCS3\*00

The three-phase series with IP55 index of protection are ideal for outside installation, and can be controlled by a 0 to 10 Vdc analogue signal from evolved controllers such as the FCM or pCO sistema, or by a PWM signal (pulse width modulation) from the  $\mu$ Chiller series. The range, which includes the control of motors with ratings from 6 to 40 A, features a control board that distributes the power to the load, in linear or quadratic mode, with the cut off, threshold, and minimum and maximum speed functions set using the trimmers on the board.

### Technical specifications

**Power supply:** 400 Vac (-15 to 10%), 50/60 Hz  
**Operating conditions:** -10T50 °C  
**Storage conditions:** -20T70 °C  
**Control signal:** 0 to 10 Vdc/PWM  
**Input signal impedance:** 10 k $\Omega$   
**Index of protection:** IP55

### Dimensions (mm)



Model	A	B	C	D	E	F
FCS3064000	158	133	225	200	115	7
FCS3124000	205	180	280	255	130	7
FCS3204000	198	174	280	255	158	7
FCS3404000	245	219	340	315	200	7



## FCM: electronic control module

FCM\*

The FCM series controllers are used to manage the main physical values (temperature, pressure, humidity) in air-conditioning, refrigeration and heating units. Despite being designed for generic use, special attention has been focused on their use as condensing temperature/pressure controllers, through the control of the fan speed on condensing units. The output of the controller is a 0 to 10 V analogue signal. In addition, they feature one control relay and two digital inputs with programmable functions. Three models are available, which differ according to the type of analogue inputs (probes):

- with inputs for CAREL NTC temperature probes;
- with 0 to 10 V inputs;
- with 0 to 20 mA or 4 to 20 mA inputs.

### Technical specifications

**Power supply:** 24 Vac/Vdc (-20 to 10%), 50/60 Hz

**Operating conditions:**

0T50° C, <90% rH non-cond.

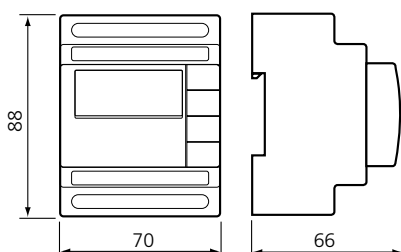
**Storage conditions:**

-10T70 °C, <90% rH non-cond.

**Installation:** DIN rail

**Index of protection:** IP20, (IP40 flush mount)

### Dimensions (mm)



## Speed controllers for stand-alone condensing units

FCP\*

FCP is a speed controller for single-phase fans on stand-alone units with up to two circuits. It controls the fan speed according to the variation in pressure in the condenser circuit, so as to maintain the set point, via a 0 to 5 V signal from the ratiometric pressure transducer (SPKT\*R0) positioned in the water circuit. This device is used for air-conditioning and refrigeration applications, and is installed directly on the condensing unit, thanks to the case with IP54 index of protection. It can control asynchronous electric motors (specific for phase control), with a load of up to 8 A / 230 Vac. Available in the Master/Slave or power version (as for the current MCHRTF80A0, IP54 version).

### Technical specifications

**Power supply:** 230 Vac (-15 to 10%), 50/60 Hz with autosensing

**Maximum current:** 8 A at (-20T50 °C)

**Operating conditions:**

-20T50 °C, <85% rH non-condensing

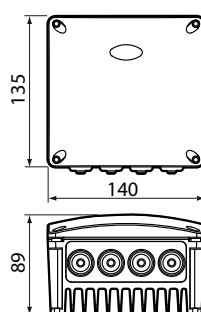
**Storage conditions:**

-20T70 °C, <85% rH non-condensing

**Analogue inputs:** 0 to 5 Vdc ratiometric, 8 mA or NTC

**Index of protection:** IP54

### Dimensions (mm)



## Inverters

NXL\*

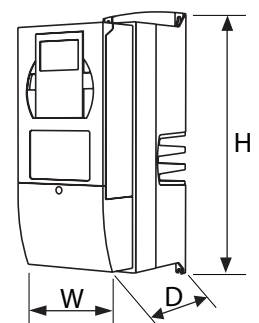
The NXL series is available in power ratings from 0.37 to 30 kW, with single/three-phase power supply and three-phase output, index of protection up to IP54, for all variable flow-rate applications.

Control can be performed using a 0 to 10 V or 4 to 20 mA analogue signal or alternatively Modbus® standard via serial communication, thus integrating the functions of the device with the software for managing the pCO series controllers or the PlantVisor supervisor.

The range can also be used with a removable control panel with remote RS232 serial connection. A PC can be used as an alternative to the control panel for managing the inverter.

Other advantages include: wide operating range, easy installation and use, low noise levels, high index of protection against electromagnetic disturbance, compact and thin 'book-style' design.

### Dimensions (mm)







The NXL series is the ideal solution for all environments, completing and enhancing the range of CAREL products for maximum efficiency and energy saving in HVAC/R systems.

#### Technical specifications

##### Single-phase power supply:

208 to 240 V, 0.37 kW to 1.5 kW;

##### Three-phase power supply:

380 to 500 V, 0.55 kW to 30 kW;

**Control panel:** optional, 4 buttons & multilanguage LCD;

**Control signal:** settable 0 to 10 V or 4 to 20 mA

## μVFD

NXM

μVFD is the new CAREL range of compact inverters for HVAC/R applications with power ratings up to 2.2 kW for single-phase power supply and 5.5 kW for three-phase.

μVFD is a inverter that is small in size, easy to program and start, and low cost.

The many advantages of the μVFD include a new modular conception, meaning only the part of the hardware required to integrate the pCO sistema series programmable controller needs to be used: thus the μVFD Power Module, with no display, I/Os or control electronics; the software and user interface are in fact part of the pCO controller, thus making the CAREL solution economical and simple to install and manage.

The μVFD is fully integrated into the pCO is total: the 1 tool module manages the inverter via Modbus® serial connection, the user interface and application reside on the pCO, while the μVFD simply handles the power part.

The version of the μVFD complete with user interface and control board for the management software is suitable for general purpose applications integrated into the pCO

sistema, responding to the requirements of compactness and competitiveness in terms of purchase cost.

#### Technical specifications

**Single-phase power supply:** 208 to 240 V, 0.25 to 2.2 kW

**Three-phase power supply:** 380 to 480 V, 0.55 to 5.5 kW

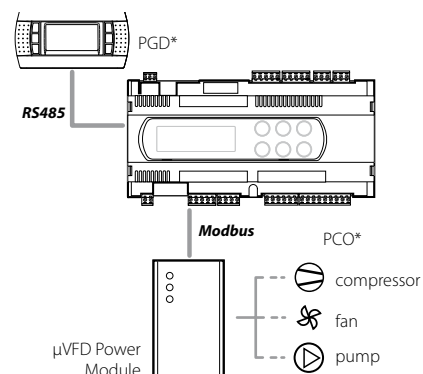
**Index of protection:** IP20

**Control signal:** settable 0 to 10 V or 4 to 20 mA

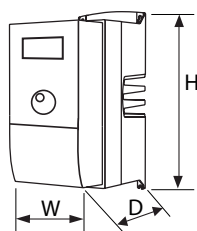
#### Models available:

- stand alone;
- power module

#### Example of Power Module integration



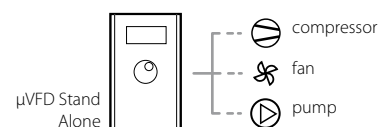
#### Dimensions (mm)



taglia	WxHxD
MI1	65,5x156,5x98,5
MI2	90x195x101,5
MI3	100x262,5x108,5

size	WxHxD
MF2	60x130x150
MF3	84x220x172
MF4	128x292x190
MF5	144x391x214
MF6	195x519x237

#### Example of stand alone application







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