

# Control Solutions and Humidification Systems for HVAC/R



# high efficiency solutions

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

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

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

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

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



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

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

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

## power solutions

Since its founding, CAREL has been offering its customers service in designing and manufacturing electrical panels for HVACR. We are talking about 40 years of history.

During that time a lot has changed but CAREL has always stuck by its customers, seeking to offer them better service every day; service that is complete and full of innovation.

power solutions is the renewed, integrated offering that is strongly focused on energy savings, thanks to the technology of CAREL products.

Power Solutions is the attire that each CAREL product should have. It is the conjunction between control, mainly consisting of electronics and software, and the final application.

CAREL will be closer to its customers and will also ensure them greater benefits in terms of logistics flows. It will no longer be necessary to outsource work to external panel technicians. CAREL offers you a complete solution, ready to be installed in production or on site. You no longer need to worry about delivery times being delayed due to complicated logistics flows. Moreover, the level of quality, professionalism and lifetime will be the same as the Carel standard for all its other products.

But we're not only talking about products.

We operate an extensive sales organisation, through branches, affiliates and distributors. This means you can find standard products in the warehouse, no matter where you are in the world, that are expressly designed for every HVACR application.

The support and consulting you need will always be close by. We will speak your language and always be able to point you to the final solution in the shortest possible time and with professionalism.



Our innovative solutions, the result of years of experience, will help you save time. You will always have high level support and consulting, adding value to your service.

## power solutions

The know-how acquired during our thirty years of experience enables us to respond to the technical requirements of all HVACR applications.

The potential of CAREL technology, together with our skills in the electromechanical sector, allow us to offer to the market a complete solution for unit management and control.

power solutions is the strongest response to the needs of all end users.

That's why every day we analyse your specifications and we take care of

your needs, in order to design the best solution for your application, leaving you to concentrate on your customers and market.

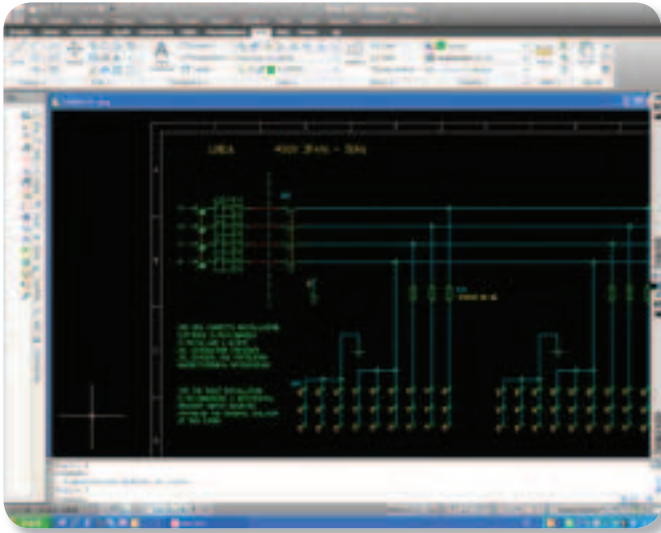
We offer our expertise to analyze applications, size and choose the best components, design and draw up the technical documentation, we test all our finished products and deliver them to their final destination.

power solutions will be the final touch to make your application environmentally friendly: efficiency and sustainability, the

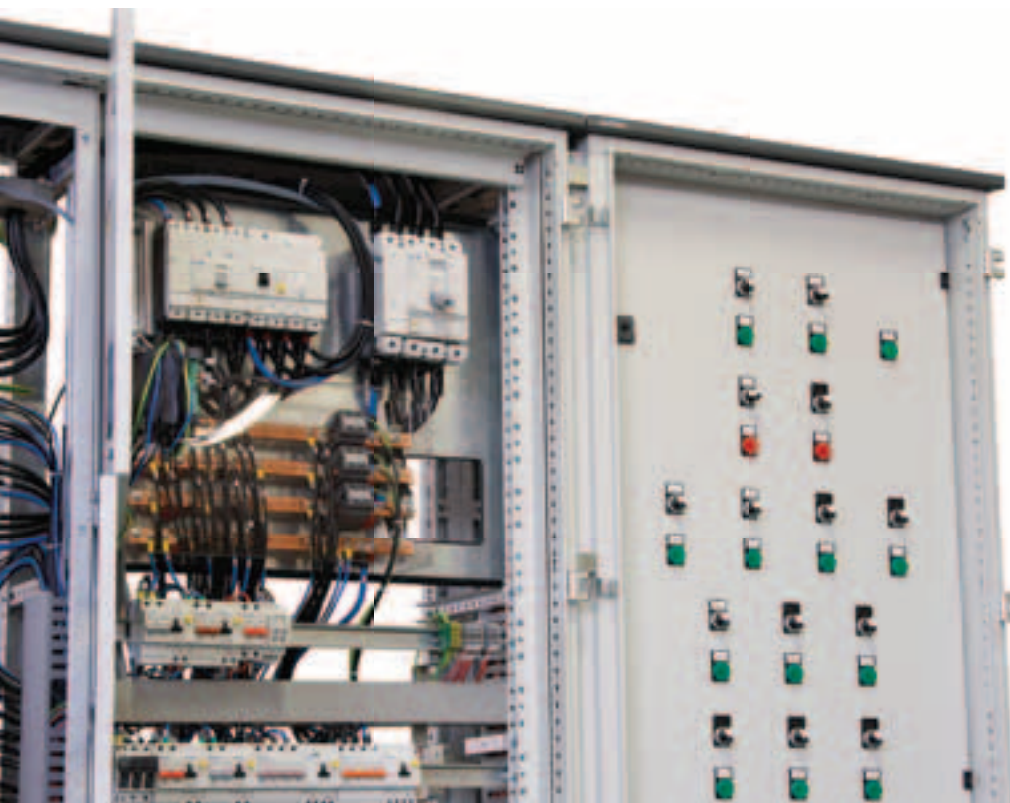
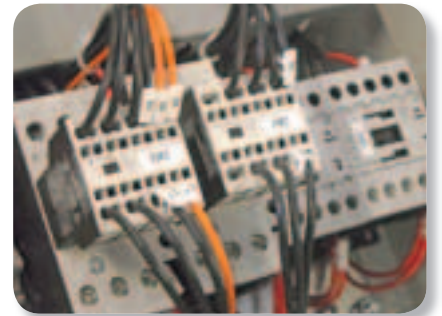
result of Carel integrated control systems. We use the best brands for all raw materials, we use high-tech software for design, we bring to life your ideas with our resources and energy.

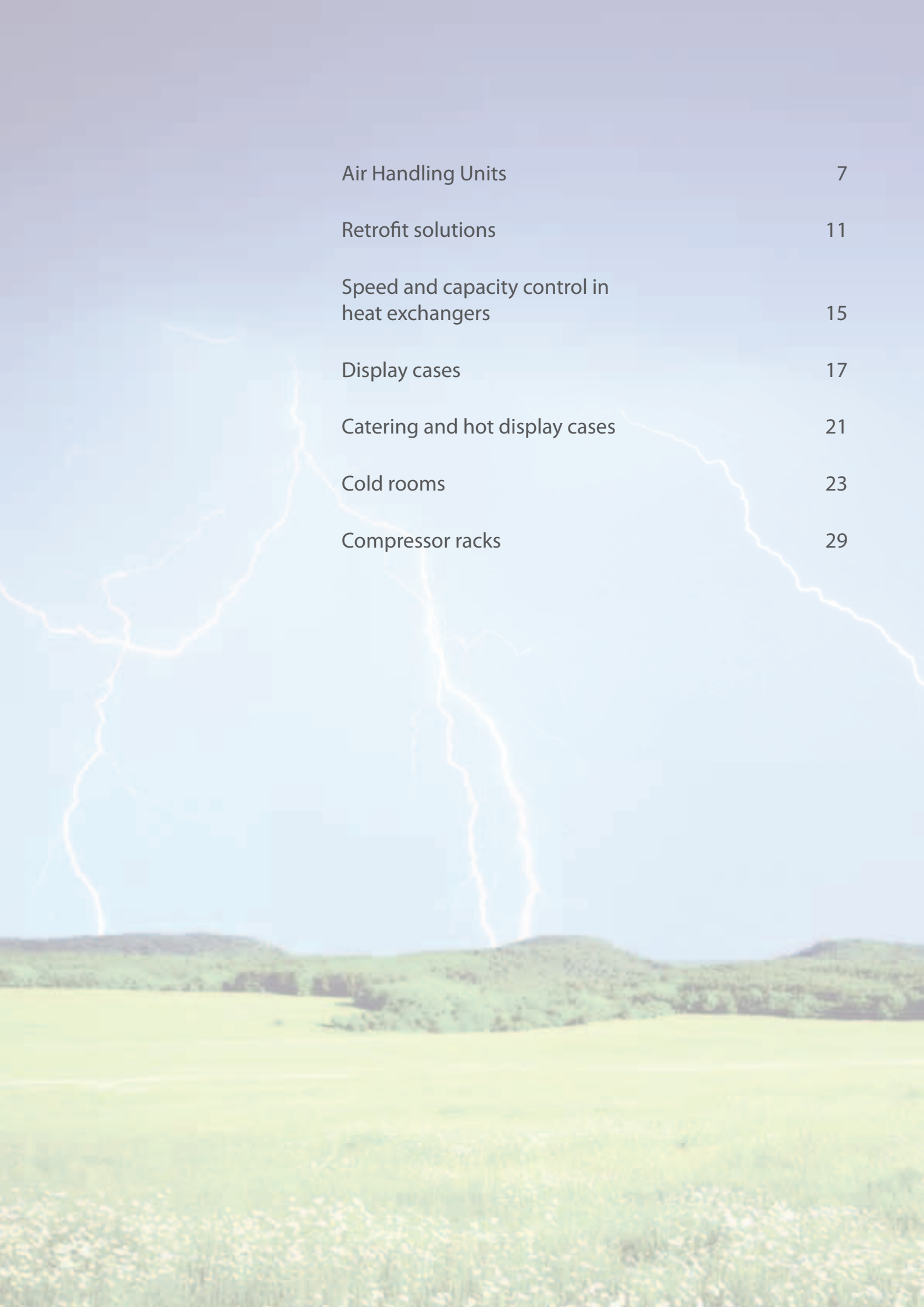
Our standard products are the result of many years of experience and feedback from customers and the market, but each new request for us is a goal to achieve together with CAREL technology.

## Dedicated design software



## Technical details





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## Air Handling Units

In this complex modern society, personal welfare and comfort are of crucial importance. Correct humidification, besides reducing suspended dust, allows people in closed environments to breathe well, without problems resulting from dryness of primary airways. The reduction in skin evaporation due to correct humidification also reduces the sensation of cold and, consequently, the temperature can be reduced, thus saving on heating and limiting the dispersion of heat between indoor and outdoor areas. Air handling units are made up of different components, each one responsible for a specific process.

Modularity is the most obvious characteristic of handling units, as these appliances are designed and sized based on specific requirements.

Over the course of the year, these units can perform various functions:

- mixing, filtering and movement between recirculated air and outdoor air;
- air pre- and re-heating
- air cooling
- air humidification and dehumidification

During the winter season, dry air increases the level of dust present in the air.

With correct humidification, the quality of

indoor air can be improved by reducing the concentration of dust due to less fragmentation of fibres as well as a greater tendency for the particles to collect together and thus be more easily filtered.

Office buildings often also include areas used for other activities. This makes designing systems and energy distribution more complex and creates a need for integration in order to optimise running costs. The well-being of people in the workplace is fundamental for improved productivity.

However personal comfort is not the only application.

A stable environment with the correct conditions is essential in order to preserve costly art works and objects over time. If the canvas constantly changes size, the painting, whose dimensions remain the same, will be irreversibly damaged. Wood and parchment objects would also be destroyed in a short amount of time if dryness in the environment starts to make them crack.



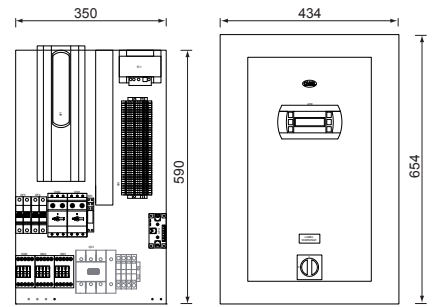
## MasterAria

### AHUMSTA\*

The panels in the Masteraria series are perfect for controlling standard AHUs which require the management and supply of two fans, a heat recovery unit, an optional external electrical load and actuators, valves, probes, alarms and safety devices, limited to the number of inputs and outputs on the electronic controller. The Masteraria solution is created inside a fibreglass case with two doors (one of which is transparent) suitable for installations from -25 to 60 °C, very sturdy and impact resistant (IK10), glow wire 650 °C, IP65 protection rating and grey RAL 7035, IMQ CEI 23-48/23-49 and IMQ EN 62208 certifications. Each case is equipped with its own wall installation kit with threaded holes already in place on the bottom. The main panel disconnect switch is located on the inside door, with front control using a rotating handle. In the same way, the user interface is located on the inside door, easily removable with the knife switch closed, to allow easy cabling and start-up. Besides the detailed wiring diagram, provided as standard in paper format, a quick diagram is also made available on glossy adhesive paper and

attached to the back of the inside door. The heart of Masteraria are the thermal protectors for the motors, made up of a fixed, wired base and plug & play thermal modules chosen based on the size of the fan. Thus, Masteraria is an off-the-shelf product, as for each project, the only variable to be chosen is which thermal module to install, in just a few seconds, based on the already wired motor protectors inside the panel. The wiring plate also has four power terminals to supply an external electrical load (multistage coil, modulating coil, condensing unit, humidifier, ...): the hard-copy wiring diagrams, with two tables, show the maximum external electrical load that can be supplied through the support terminals according to the size of the fans installed. Also, all of the inputs and outputs are linked to the support terminal board in order to be able to take full advantage of all of the potential of the pCO sistema.

### Dimensions (mm)



### Technical specifications

**Power supply:** mains, 400V 3~ + N + E  
**Operating conditions:** -10T35 °C, 90% RH non condensing

**Protection rating:** IP65

**Assembly:** on the wall using bracket kit (supplied)

#### I/Os:

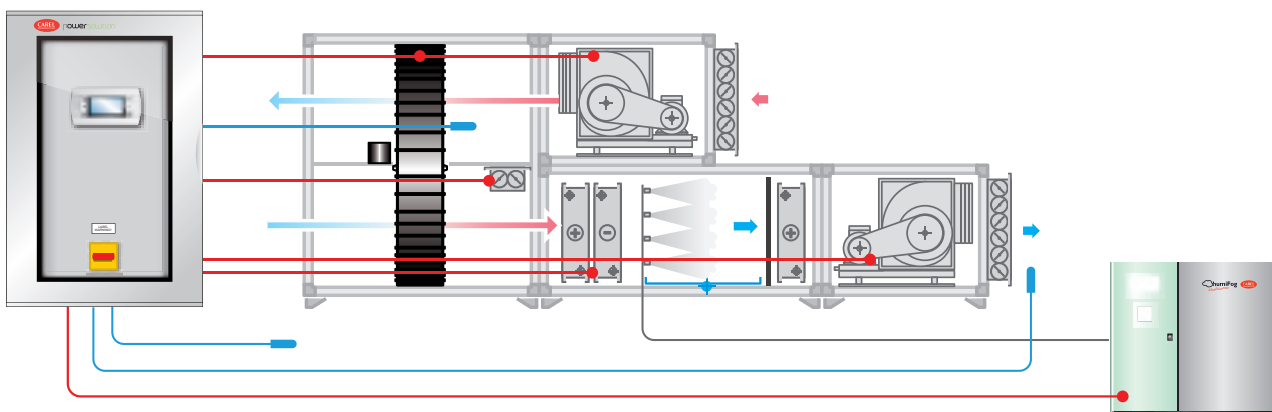
- analogue inputs: 8
- digital inputs: 14
- digital outputs: 13
- analogue outputs: 4

#### Dimensions:

- light: 650X430X210 mm
- backplate: 650X370x10 mm
- large: 805X615X315 mm

**Connections:** directly on internal panel terminal board

### Theoretical diagram



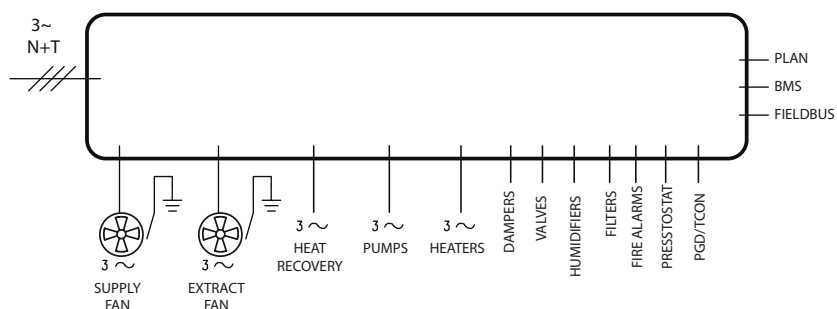


## Technical specifications table

Specifications	AHUMSTA001	AHUMSTA002	AHUMSTA003	AHUMSTA004	AHUMSTA005	AHUMSTA006	AHUMSTA007
<b>Versions</b>	light 5.5	light 15	backplate 5.5	backplate 15	Large 5.5	Large 15	Large 30
<b>Power supply</b>							
400V 3~ +N +T (max)	●	●	●	●	●	●	●
<b>User interface</b>							
user interface type	PGD1000FW0						
Ready for remote terminal	●						
<b>Outputs (up to)</b>							
fan 1	5.5 kW	15 kW	5.5 kW	15 kW	5.5 kW	15 kW	30 kW
fan 2	5.5 kW	15 kW	5.5 kW	15 kW	5.5 kW	15 kW	30 kW
rotary heat exchanger	0.55 kW						
auxiliary terminals	up to 95 A						
<b>Inputs/outputs</b>							
Digital inputs	14						
Digital outputs	13						
Analogue inputs	8						
Analogue outputs	4						
<b>Programming/ports</b>							
keys	●						
Modbus Master	optional card required				●	●	●
Modbus Master/MP-BUS optional	optional card required						
Modbus Slave	optional card required				●	●	●
BMS	optional card required						
pLAN	●						
<b>Other specifications</b>							
Fibreglass case dimensions	650X430X210	650X430X210	-	-	805X615X315	805X615X315	805X615X315
Rear metal plate dimensions	-	-	650X370x10	650X370x10	-	-	-
Controller	PCO3000AM0				PCO50000U0CM0		
Protection rating	IP65						
Packaging	single						

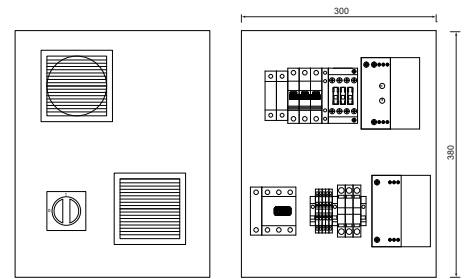
● standard

## Operating diagram





Dimensions (mm)



## Modulating units for electric heaters

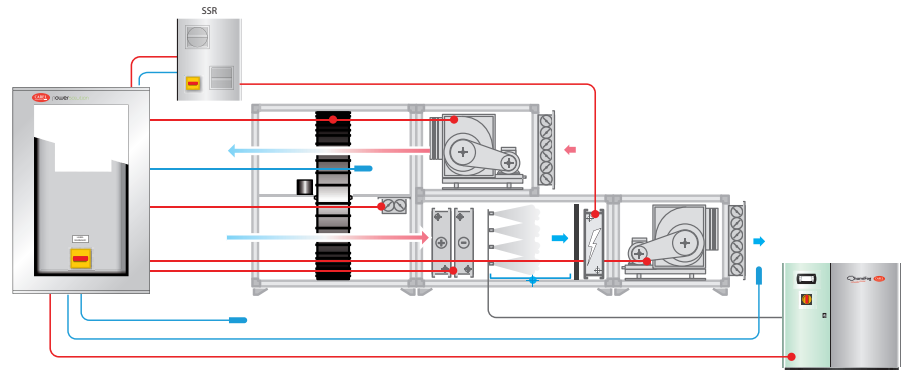
### AHUSSR\*

Panels in the SSR series start out as add-on accessories for the MasterAria panels but can be also used as stand alone units. They allow the management of a three phase electrical load controlled by a 0 to 10 V modulating input signal. In combination with the MasterAria panels, they manage the electric heating coils that are part of the air handling unit. The MasterAria auxiliary power terminals directly supply the SSR panels (obviously taking into account the maximum output power from the MasterAria terminals in relation to the sizes of the supply and extraction fans). The MasterAria takes the role of the Master while the SSR is the Slave. The terminal boards on both panels also have terminals labelled with letters to allow unequivocal, simple and rapid connection between the two electrical devices. The container is made from fibreglass with a single door, perfect for installations from -25 to 60 °C, very sturdy and impact resistant (IK10), glow wire 650 °C, IMQ CEI 23-48/23-49 and IMQ EN 62208 certifications. Each case is equipped with fans and grills for heat dissipation and its own wall installation kit with threaded holes already in place on the back. The main panel disconnect switch is located on the door, with front control using a yellow/red rotating handle.

### Technical specifications

- Power supply:** mains, 400V 3~+N+E (connection on the terminal board)
- Operating conditions:** -20T40 °C, 90% RH non condensing
- Protection rating:** IP54
- Assembly:** wall/surface (bracket kit included)
- I/Os:**
  - analogue inputs: 1
- Dimensions:** according to the model, 650x540x260 mm max.
- Connections:** spring terminals on wiring plate for signal and load, on knife switch for power supply

### Theoretical diagram

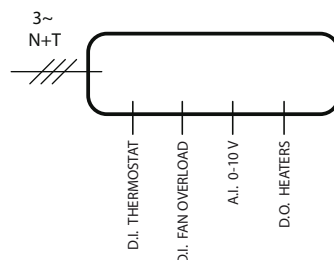


### Technical specifications table

	AHUSSR*1	AHUSSR*2	AHUSSR*3	AHUSSR*4	AHUSSR*5
<b>Power supply</b>					
400V 3~ +N +T (max)	●	●	●	●	●
Operating conditions	-20T40 °C, <90% RH non condensing				
<b>Loads</b>					
kW (up to) AC1	16.5	25	34	42	72
<b>Other specifications</b>					
SSR control signal	0 to 10 V				
Plastic case dimensions	425x325x180		500x430x210		650x540x260
Protection rating	IP54				
Packaging	single				

● standard

### Operating diagram





## Retrofit solutions

Just how many refrigeration and air conditioning installations are there throughout the world?

Whatever the actual number, it is certainly huge.

Retrofitting old systems, required to comply with new environmental directives but also seen as a business opportunity, is definitely an interesting prospect.

Performing a retrofit on an existing system with the objective of implementing continuous and detailed monitoring in compliance with HACCP regulations allows users to:

- control the temperature of existing chillers with low impact systems, avoiding having to replace of the electronics installed on the units themselves;
- limit the amount of wiring by taking advantage of wireless technology and thus significantly reducing installation costs;
- simplify data recording procedures;
- record and monitor the data relating to the system;

- prevent and/or identify possible critical events and automatically advise the system supervisor via email, SMS or fax in order to implement corrective actions;
- process reports, tables and automatic graphs for system logs to be stored and archived according to HACCP regulations, reducing the time needed to complete the required forms;
- monitor the system, even remotely;
- receive all the parts needed for the installation from a single supplier.

CAREL offers the complete package for the electrical panel equipped with valve driver and electronic valve. It is a plug & play solution that allows quick replacement in the field.

In fact, the driver accepts a simple on/off signal that also comes from a mechanical thermostat and then takes care of the rest. No special settings are needed because it is already preconfigured in the factory. The old mechanical thermostat can therefore be easily replaced without any special modifications to the system and, especially, without the need to change the

specific control parameters, which is not always easy for installers and more suited to a technical design office.

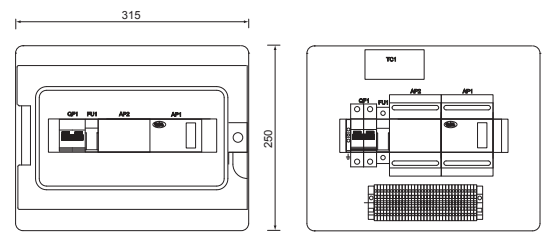


## EDV panel

### EDVPN\*

evdEVO panel is housed inside a highly sturdy fibreglass container (impact resistance rating IK 09) that ensures an IP65 protection rating and is equipped with a removable transparent tinted door that is lock-ready. Also, an innovative hinge system allows the door to be opened flush with the wall, thus preventing detachment and breakage in the event of accidental impact. The final aesthetic finish is perfect, the colour is RAL7035, case certifications are IMQ CEI 23-48/-23/49, IMQ EN 62208 compliant with IECCE CB SCHEME IEC 60670-24 The outside door opening also allows front access and control of main panel disconnection through two-pole circuit breakers and access to the fuse holder base with transformer protection for inspection and maintenance. Along with the electrical panel, one of each of the following accessories is provided: NTC060HF01, SPKC005310, SPKT0043R0. Various technical combinations are available for each application therefore besides the finished products offered in the catalogue, a different set of features can be requested: solution with support terminal board for all I/Os or with direct connection to the driver, with original box or with holes and/or cable glands to make installation easier, with or without Ultracap module, with or without language display for the driver or with the driver model or preferred accessories. The wiring diagram provided, in the user's language, offers two connection methods for the driver digital output: to signal alarms or control the valve in the event of power failures. All this makes the evdEVO panel the best solution for retrofits and new electronic valve installations.

### Dimensions (mm)



### Technical specifications

**Power supply:** mains, 230V 1P+N+E (connection on the terminal board)

**Operating conditions:** -25T50 °C for Ultracap version, -10T60 °C for non Ultracap version, 90% RH non condensing

**Protection rating:** IP65

**Assembly:** wall/surface mounted with screws

#### I/Os:

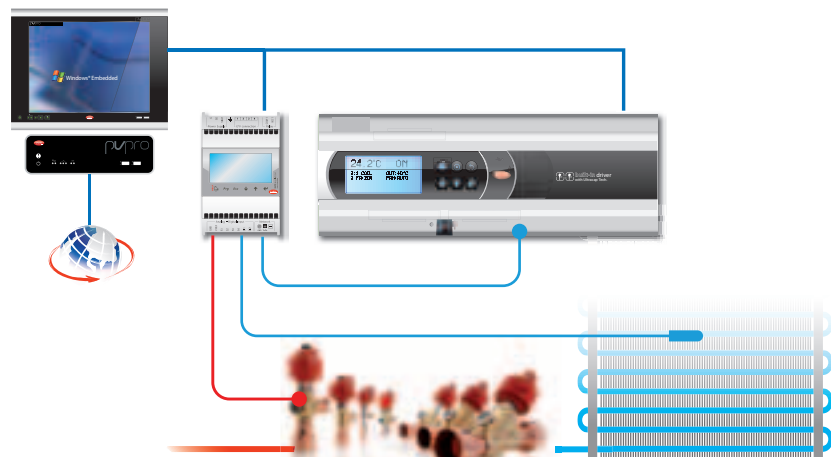
- **analogue inputs:** 2
- **digital outputs:** 2 voltage free

**Serial ports:** 1 for CAREL network

**Dimensions:** 263x314x143 mm

**Connections:** spring terminals on wiring plate

### Theoretical diagram

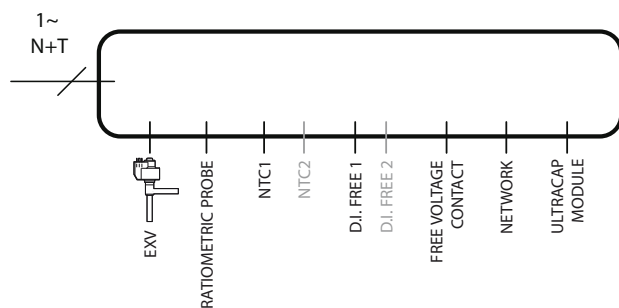


## Technical specifications table

	EDVPN01001	EDVPN01002	EDVPN01003	EDVPN01004	EDVPN12005	EDVPN12006	EDVPN11007	EDVPN11008
<b>Power supply</b>								
230Vac (-15/10%) 50-60 Hz	●							
<b>User interface</b>								
EVDIS*	□							
EVDENV00E0	□							
<b>Precision</b>								
Std. CAREL NTC: -50T50 °C -50T90 °C	●							
0...5 Vdc	●							
4...20 mA	●							
0...10 Vdc	●							
1 CAREL EXV valve	●				-	-	●	●
2 CAREL EXV valves	-				●	●	-	-
<b>Inputs/outputs</b>								
Digital inputs	2							
relay: voltage free, relay output up to 230 Vac	1							
<b>Network</b>								
tLAN	●	●	-	-	-	-	-	-
Modbus	-	-	-	-	●	●	-	-
RS485	-	-	●	●	●	●	●	●
<b>Other specifications</b>								
Casing dimensions (mm)	263x314x143							
Controller	EVD0000E30	EVD0000E50	EVD0000T50	EVD0000E50				
Protection rating	IP65							
Packaging	single relay rating: 5 A, 250 Vac resistive; 2 A, 250 Vac inductive							
Ultracap	-	●	-	●	-	●	-	●
Terminals block support	-	-	-	-	-	-	●	●

- standard
- optional

## Operating diagram







## Speed and capacity control in heat exchangers

Heat exchangers in general, whether for air/air applications or air/water applications (i.e., condensers), have considerable weight in terms of efficiency and energy yield. This device is essential for correct design of the chiller cycle, and must be properly managed, therefore requiring electronic control.

The advent of electronically controlled brushless motors allows finer control and noise reduction.

Carel offers a series of programmable controllers (pCO) that can manage these loads via a serial connection, thus reducing space, wiring and installation complexity in general, allowing the management of a large amount of information in real time and rapid intervention in the event of anomalies or failures.

This is not the only option to satisfy the market: Carel completes the offering with a range of inverters, and is thus able to meet all customer needs. Integrated either into the panel or part of an overall solution, this represents a complete, unique, high value package that allows standardisation, cost reduction and new items to complete our customers' catalogues. They will thus

be able to supply their excellent products with new, high-tech solutions.

There are different types of heat exchangers used, and CAREL is able to offer dedicated solutions for each application and need based on available space, loads, types of motors used and, therefore, the control required.

CAREL is certified by the main international names in the ventilation industry.

The pCO controller, the heart of the control system, has software modules for managing brushless fans, capable of taking advantage of the performance offered by fan manufacturers.

Modbus serial communication allows easy and complete interfacing with actuators, simplifies their wiring and reduces the space used.

The control panel is smaller thanks to the lower number of electromechanical components, as electromagnetic switches are no longer necessary for power control.

### Custom solutions

CAREL supplies the largest operators in this industry worldwide. The high level of integrated controls, inverters and remote management solutions are the best that CAREL can offer in this industry. CAREL is always striving for innovation and benefits that it can offer to meet the demanding challenges required by the market every day.



## Unit for fan cooled condensers and liquid coolers

### CONDROF\*

The electrical panel is built with 15/10 painted steel plate structure, lockable door and continuous gasket.

The application controls the operation of fans, condensers and coolers.

Various combinations are possible that are suitable for each application controlled, both by temperature and pressure, such as:

- electronic fan speed control with inverter, either inside the panel (IP22) or external (IP54);
- electronic fan speed control through phase cutting;
- EC (electronic) fan speed control;
- staged electronic fan speed control;
- external fan control.

Upon request, power supply and control can be provided for one or more chillboosters for liquid cooler application. Each CAREL controller is installed inside the already configured electrical panel and is ready for use.

The measurement probes are not included. These can be requested when the order is placed.

For applications in extreme environments, electrical panels are built inside stainless steel cases.

### Technical specifications

**Power supply:** mains, 400 V 3~+N+E

**Operating conditions:** -15T60 °C 90% RH non condensing

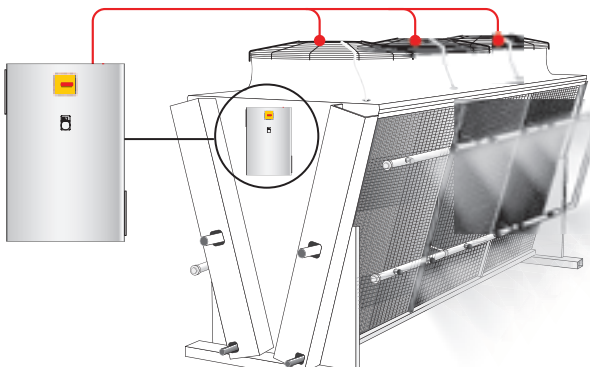
**Protection rating:** IP54

**Assembly:** on the wall, bracket kit included

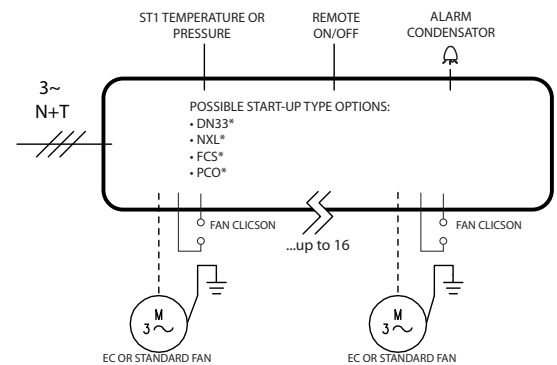
**Dimensions:** depending on the number of fans and the application

**Connections:** terminals for auxiliary circuit, directly on the electromagnetic switches or on the power terminals.

### Theoretical diagram



### Operating diagram



### Technical specifications table

	CONDROF001	CONDROF002	CONDROF003	CONDROF004	CONDROF005	CONDROF006
<b>Power supply</b>						
400/3+N Vac (-15/10%) 50-60 Hz	●	●	●	●	●	●
<b>Other</b>						
No. of fans	1...16	1...16	1...16	1...16	1...16	1...16
Controller	NXL000****5*	NXL000****2*	DN33*+FCS*	DN33*	DN33*	-
Protection rating	IP54					
Control probes	not included					

● standard





## Display cases

Chillers are an essential part of a refrigeration system and as such must be operated with the best solutions available to ensure state of the art performance and flexibility.

Each display case controller must ensure correct storage temperature and monitor operating conditions.

However, in addition to ensuring the basic necessities, the CAREL retail system pays special attention to energy savings and reliability.

There are solutions available that allow high performance operation, with a subsequent reduction in energy consumption, and greater control with back-up procedures in case of anomalies, and thus greater safety.

In the food industry, refrigeration is one of the most delicate and complex applications, as food needs to be kept at different temperatures depending on the processing phase.

Refrigeration slows the growth of bacteria in foods. The technique is based on the extremely quick and intense action of cold temperatures, ensuring the organoleptic properties of the food remain intact and

extending storage time.

Both systems designed and installed on an industrial scale and for consumers are based on standard procedures and techniques. The chiller is just one part of a more complex system that allows the evaporator to define the ideal heat exchange and thus preserve the food.

The use of E2V proportional electronic expansion valves in chillers allows the energy savings possible with chiller control to be fully exploited.

The possibility of operating at fully floating condensing and evaporation pressures is perhaps the primary distinctive element of energy savings as a result of using E2V expansion valves.

This optimisation is possible through continuous strategies applied in real time aimed at achieving the best possible operating conditions for the entire system, ensured by using an integrated solution such as the CAREL retail system.

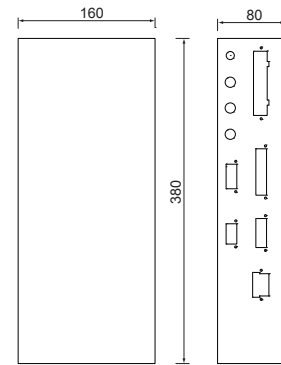


## powerbox

PBOX\*

powerBox is housed inside an unpainted 15/10 galvanised steel case, while the cover, also 15/10 sheet metal, is attached using threaded screws. Rotary main switch with yellow/red handle and control from the side. All of the wiring with the internal circuitry is performed using panel feed-through connections sized specifically for supplying the power circuit and auxiliary circuit. The external connection kit can be supplied on its own or included with powerBox. The relay outputs are protected with bayonet fuses and single phase push button circuit breakers, both panel feed-through connections on the same side as the connectors, which can easily be inspected and replaced. The adhesive wiring diagram is located on the inside wall of the cover and offers immediate help. On the outside surface of the cover is a sticker showing details of the connectors and individual pins in order to make installation easy, quick and error-free, also avoiding the need for installers to work inside the panel. This product offers a great deal of customisation possibilities in terms of dimensions and shape of the cases, type and power of the units to be managed, CAREL electronic controller model and sticker customisation.

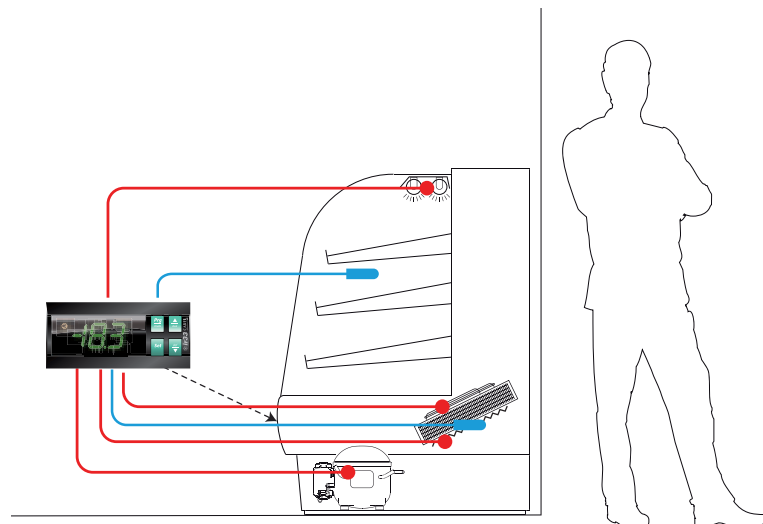
### Dimensions (mm)



### Technical specifications

- Power supply:** mains, 230 V 1~+N+E (panel pass-through or strip connector)
- Operating conditions:** -10T60 °C, 90% RH non condensing
- Protection rating:** IP21
- Assembly:** in a drawer or on a shelf, not attached using screws/bolts
- I/Os:**
  - **analogue inputs:** up to 4 NTC/PTC
  - **digital inputs:** 2 voltage-free contacts
  - **digital outputs:** up to 4 relays
- Serial ports:** 1 for CAREL network
- Dimensions:** 160x70-80x380 mm
- Connections:** removable screw panel-pass through terminals

### Theoretical diagram

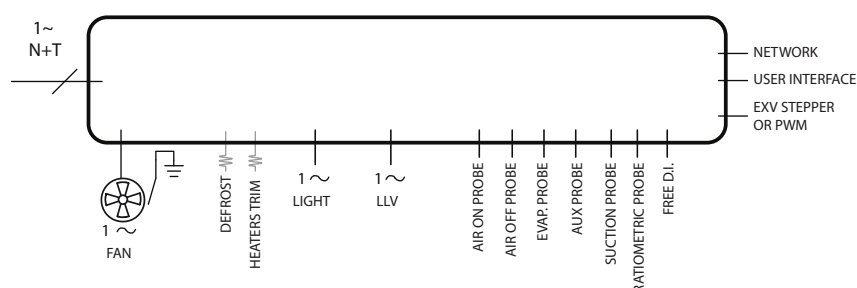


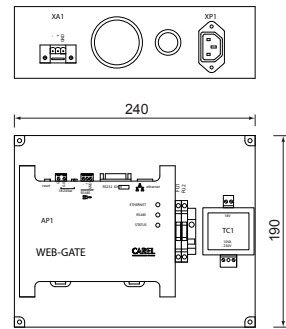
## Technical specifications table

	PBOX3C33HT	PBOX3C33LT	PBX3TMP2HT
<b>Power supply</b>			
230Vac -15/10% 50-60 Hz	●	●	-
115/230Vac	-	-	●
<b>Controller/defrosting/probes</b>			
Std. CAREL NTC: -50T50 °C -50T90 °C	●	●	7
High temperature NTC: -20T115 °C	●	●	
PTC: -50T50 °C -50T150 °C	●	●	7
PTC/PT1000	-	-	7
0.5...4.25 Vdc	-	-	2
4...20 mA	-	-	1
PWM 12 Vdc	-	-	2
0...10 Vdc	-	-	1
CAREL EXV valve	-	-	1
<b>User interface</b>			
display	LED 3 digits plus icon		connector for connection with IR00UGC300 installed
keypad	ergonomic with 4 buttons		
<b>Outputs</b>			
relays	4	4	5 (3 in exchange)
compressor	2 HP	2 HP	6 A
electric defrosting	16 A	-	8 A
end cycle defrosting	-	●	-
evaporation fan	8 A	8 A	6 A
light auxiliary output	8 A	8 A	10 A
Auxiliary output 2	-	-	6 A
<b>Programming</b>			
keypad and key	●	●	●
HACCP / Real Time Clock	with Real Time Clock		●
Master/Slave network	-	-	●
Defrost optimisation	-	-	●
Remote control	-	-	●
EXV sistema	-	-	●
Anti-sweat heaters	-	-	●
Fan speed modulation	-	-	●
<b>Other specifications</b>			
Case dimensions	380x160x70	380x160x70	380x160x80
Controller type	IR33C7HB20	IR33C7HB20	MX30M25HR0
Protection rating	IP21	IP21	IP21
Packaging	single	single	single
Relay rating to EN60703-1:	8 A, 8(4) A; 16 A, 12(2) A; 2 HP, 10(10) A	8 A, 8(4) A; 16 A, 12(2) A; 2 HP, 10(10) A	8 A, 8(4) A; 16 A, 12(2) A; 2 HP, 10(10) A

- standard
- optional

## Operating diagram





## GateBox

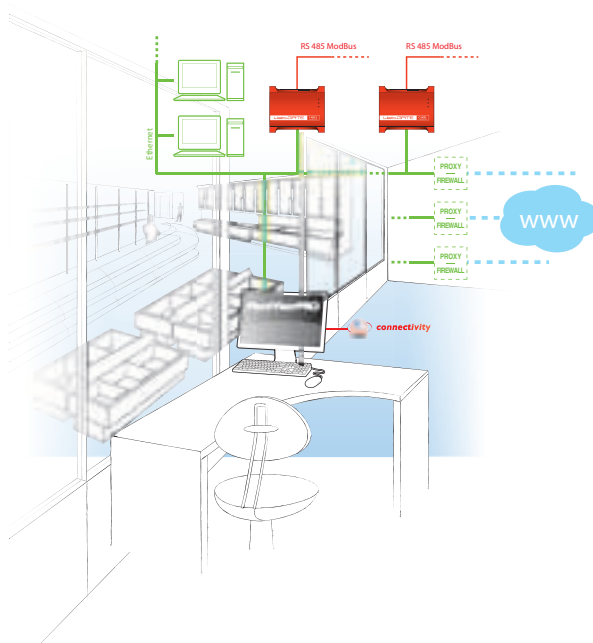
### GATEBOXC\*

GateBox is the easiest and most complete solution for simple and quick use of the CAREL WebGate. Everything needed to supply, program, connect and position the device easily and get it up on the network in just a few minutes is housed inside a small plastic container with IP protection. The 2m long, BS 1363 power supply cable is provided inside the package. A connector on the GateBox side allows easy RS485 connection, two grommets are provided for possible RS232 connection and directly on the body of the WebGate for Ethernet connection. Inside the box, a transformer and two fuses are already installed. WebGate allows connection of all CAREL controllers to any™-TCP/IP Ethernet network, the most widespread communication standard. These are the technologies that the Internet is based on and thanks to these, WebGate allows the use of browsers for diagnostic functions and local and remote system monitoring. The TCP/IP protocol then supports other protocols that can be used to transfer all the data coming from controllers connected to the Ethernet™ network to a local or remote supervisor. WebGate is also easily configured via RS232.

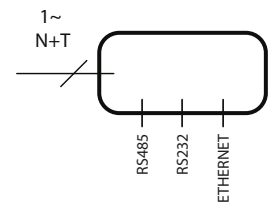
### Technical specifications

- Power supply:** mains, 230 V 1~+N+E (with BS 1363 connector)
- Operating conditions:** 0T50 °C, <90% RH non condensing
- Protection rating:** IP44
- Assembly:** on vertical surfaces with mounting screws or simply resting on horizontal surfaces
- Serial ports:** RS485, Ethernet
- Dimensions:** 240x190x90 mm
- Connections:** RS485 with 3 way panel pass-through terminal

### Theoretical diagram



### Operating diagram



### Technical specifications table

	GATEBOXC00
<b>Power supply</b>	
230Vac (-15/10%) 50-60 Hz	●
Operating conditions	0T50 °C, <90% RH non condensing
<b>Rete</b>	
RJ-45 for Ethernet™ 10BaseT	●
RS232	●
RS485	max. 16
<b>Protocols</b>	
SNMPv1, HTTP, FTP	●
<b>Other specifications</b>	
Memory	128 kB RAM, 1 MB FLASH (400 kB available for WEB pages and user data)
Plastic case dimensions (mm)	240x190x90
Protection rating	IP44
Packaging	single

● standard



## Catering and hot display cases

CAREL offers a series of solutions for hot display cases (bain marie), retarders and blast chillers featuring a complete line of user terminals. The complete version including graphic display is capable of meeting the needs of the most demanding users who are always looking for innovative solutions.

The wide range of products available satisfies all requirements, ensuring the end user a properly stored and high quality product.

HACCP management is included on the latest generation instruments. This ensures temperature control of the food products stored, in compliance with HACCP guidelines. Parameters are set directly from the instrument.

It is possible to set time and temperature limits required by food storage regulations. The controller automatically monitors the unit, highlighting any critical situations. The standard program allows complete management of the retarder or blast chiller, setting operating cycles, times and variable temperature and humidity set points.

The retarder cabinet controller also includes an air humidity controller thanks to the wide range of CAREL humiSteam-type immersed electrode humidifiers. The blast chiller controller can manage the control temperature and "hot point" temperature separately, deciding which value to display and which to use to control the unit in the various conditions. Once the blast chiller cycle has begun, the controller implements the best strategy to bring the food product to the desired temperature within the set time limit. This solution ensures temperature control of the food product stored in compliance with HACCP guidelines, highlighting any critical situations regarding temperature and time limits.

Parameters can be programmed directly on the instrument or via the supervisor system, if available.

### Solutions for controlling hot display cases and for refrigeration

Temperature controls for "bain marie" applications are typically used in catering and display case applications.

It allows the level of water inside the tank to be controlled via digital input. The logic manages activation of a solenoid valve for refilling. Natural evaporation due to near-boiling temperatures leads to a reduction in level over time.

The controller inside the electrical panel also controls the electric heater used to heat the tray.

The electrical panel includes the following:

- plastic case;
- circuit board;
- level relay;
- user terminal;
- electromagnetic power switch;
- support terminal board.



## Temperature control system for bain marie applications

RETBNMR\*

This solution allows extremely easy management of temperature and water level in catering and cafeteria display case trays where food must be kept hot. The electrical panel is inside a plastic case with IP45 protection rating. A grommet system allows the power supply to be directly connected to the support terminal board. It comes with the temperature probe and terminal to be positioned on the front of the display case. Each electrical panel is inspected, configured and ready to be installed. The possible use of IROPZKEY programming key allows customisation of the parameters. The quick-mount terminal has a flat keypad that, due to its flat surfaces, allows easy cleaning and ensures a higher level of hygiene in complete compliance with HACCP requirements. The terminal is ideal for applications where available space is particularly limited. The internal depth is only 31mm and the faceplate can be customised for integration with the design of the display case.

### Technical specifications

**Power supply:** mains, 400/3/50-60Hz or 230/1/50-60Hz Vac

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

**Protection rating:** IP45

**Terminal protection rating:** IP65

**Assembly:** on the wall or on a shelf  
**I/Os:**

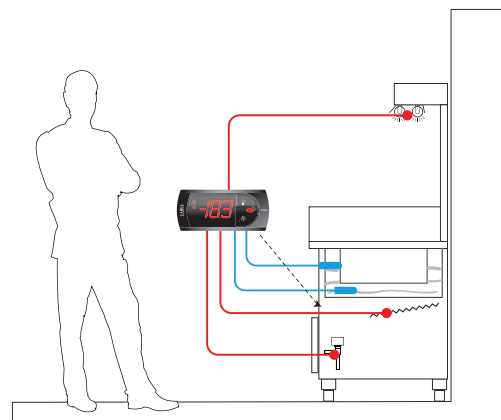
- **controller analogue inputs:** up to 1 NTC-HT
- **level sensor analogue inputs:** 1 resistive (max. 7 V~ 1 mA)
- **controller digital outputs:** 3

**Dimensions:**

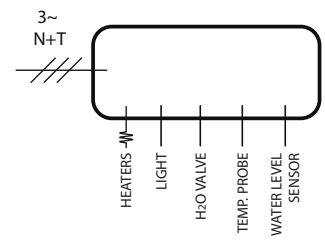
- **controller:** 36x81x39 mm
- **plastic case:** 240x190x90 mm

**Connections:** directly on internal panel terminal board

Theoretical diagram



Operating diagram



### Technical specifications table

	RETBNMR001
<b>Power supply</b>	
230 Vac (-15/10%) 50-60 Hz	●
400 Vac (-15/10%) 50-60 Hz	□
<b>Loads/Outputs</b>	
3 heaters, max 1500W cdu 230/1/50-60 Hz	contactor
1 solenoid valve for water outlet	board relay: EN60730-1: 12(2) A, 250 Vac, 100000 cycles (N.O. contact only)
1 light	board relay: EN60730-1: 12(2) A 250 Vac, 100000 cycles (N.O. contact only)
<b>User interface</b>	
display	LED 3 digit plus icon
<b>Programming</b>	
optional key	IROPZKEY*
<b>Other specifications</b>	
Case dimensions (mm)	240x190x90
Controller	PZEFX8I041
Protection rating	IP45
Packaging	single

- standard
- optional



## Cold rooms

Food storage uses various procedures that vary based on duration:

- refrigeration, if the food must be stored for a short period of time (0...7 °C).
- freezing, deep freezing and freeze-drying if it must be stored for long periods.

When deep freezing a product, it must reach a temperature of -18 °C in less than 4 hours, while for regular freezing the product can take more than 4 hours to reach -18 °C. During freeze-drying the product is dried following forced evaporation of the moisture contained in the product.

In the food industry, refrigeration is one of the most delicate and complex applications, as food needs to be kept at different temperatures depending on the processing phase.

Refrigeration slows the growth of bacteria in foods. The technique is based on the extremely quick and intense action of cold temperatures, ensuring the organoleptic properties of the food remain intact and extending storage time.

Systems designed and installed on an industrial scale as well as those for consumers are based on standard

procedures and techniques. The chiller is just one part of a more complex system that allows the evaporator to define the ideal heat exchange and thus preserve the food.

Cold rooms are a key point in the cold chain.

Proper management has positive impact on both the quality of the stored product and on the environment in terms of energy savings.

Often the contents of a cold room are quite valuable and therefore require serious and reliable technological solutions.

Depending upon the type of food or system, cold rooms can be classified as:

- normal temperature (>0 °C, for storing fruit and vegetables for example)
- low temperature (<0 °C, for storing meat for example)
- stand-alone (with onboard compressor/condenser)
- with remote condenser or packaged units
- centralised (without onboard compressor, with remote compressor rack).

Typically, cold rooms with onboard

condensers or packaged units are used in small stores, while cold rooms served by compressor racks are used in supermarkets and distribution centers.

The main devices that normally need to be managed by an electronic controller are:

- Probes for measuring room and defrost temperature (if featured)
- Compressor
- Defrost heaters
- Evaporator fans
- Lights
- Door switch
- Alarms
- Condenser fans

CAREL offers its customers various types of electrical panels based on advanced controllers that are easy to use and extremely flexible.



## powercold

### CLDRMS\*

This is a wide range of solutions for three-phase cold rooms. High power electric heaters can be managed for defrosting. Cold room management is performed using the extremely new ir33+ line or the well-known MPXPRO. The application is suitable for both stand-alone rooms as well as for those with compressor racks (retail).

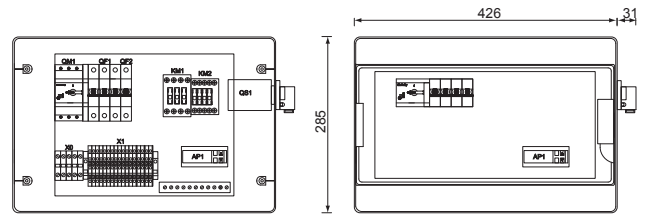
The CLDRMS\* panels for cold room applications are housed inside a highly sturdy fibreglass container (impact resistance rating IK 09) that ensures an IP65 protection rating and are equipped with a removable transparent tinted door that is lock-ready. Also, an innovative hinge system allows the door to be opened flush with the wall, thus preventing detachment and breakage in the event of accidental impact. The final aesthetic finish is perfect, the colour is RAL7035, case certifications are IMQ CEI 23-48/-23/49, IMQ EN 62208 compliant with IECEE CB SCHEME IEC 60670-24

The outside door opening also allows front access to the compressor protectors, defrosting heaters and auxiliary circuit via overload switches and circuit breakers. The general switch on the electrical panel is the rotating type with yellow/red handle and lateral control.

Various technical combinations are available for each application, therefore, a combination of characteristics that is different from those offered in the catalogue can be requested:

- with original case or with holes and/or cable glands to make installation easier;
- With electromechanical devices that allow the management of other types and sizes of units
- with model ir33+ or preferred accessories.

### Dimensions

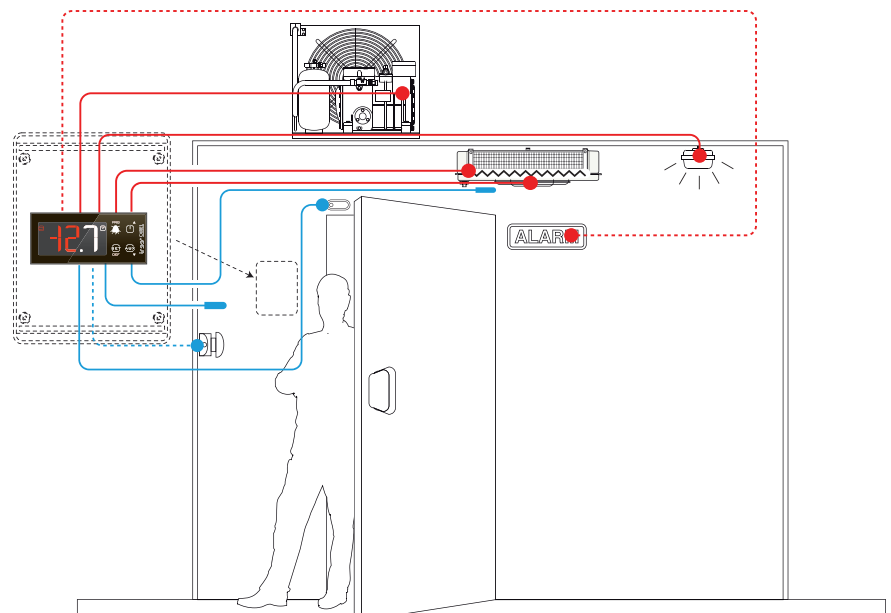


The wiring diagram provided, in the user's language, also suggests the wiring method if the application requires pump-down. The CLDRMS\* panels are, therefore, a high efficiency and highly versatile solution in managing three-phase cold rooms.

### Technical specifications

- Power supply:** mains, 115/230 Vac
- Operating conditions:** -10T60 °C, 90% RH non condensing
- Protection rating:** IP65
- Assembly:** wall-mounted using screws
- I/Os:**
  - **analogue inputs:** up to 2 NTC/PTC
  - **digital inputs:** 2 voltage-free contacts
  - **digital outputs:** up to 4 relays
- Serial ports:** 1 for RS485, 1 for tLAN interface
- Dimensions:** 426x288x148 mm
- Connections:** directly on internal panel terminal board

### Theoretical diagram



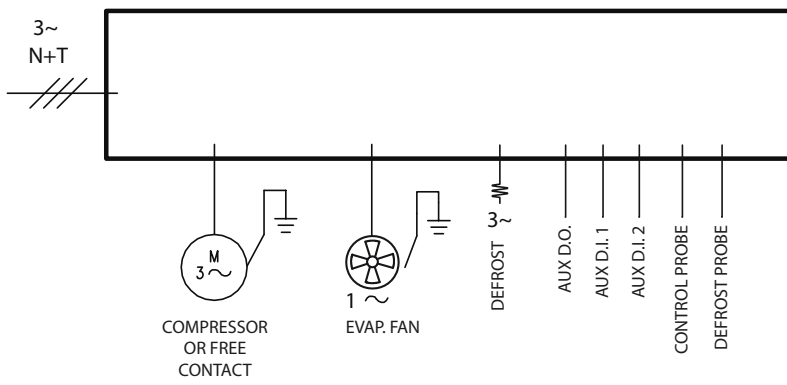


## Technical specifications table

	CLDRMS3001	CLDRMS3002	CLDRMS3003	CLDRMS3004	CLDRMS3005	CLDRMS3006	CLDRMS3007	CLDRMS3008	CLDRMS3009	CLDRMS3010	CLDRMS3011	CLDRMS3012	CLDRMS3013	CLDRMS3014	CLDRMS3015	CLDRMS3016	CLDRMS3017	CLDRMS3018		
<b>Power supply</b>																				
115/230Vac	●																			
<b>Precision</b>																				
Std. CAREL NTC	-50T50 °C	●																		
	-50T90 °C																			
PTC	-50T50 °C	●																		
	-50T90 °C	●																		
	-50T150 °C	●																		
<b>User interface</b>																				
display	LED 3 digits plus icon																			
keypad	ergonomic with 4 buttons																			
<b>Outputs</b>																				
compressor	4 A/1~	5 A/1~	8 A/1~	10 A/1~	4 A/3~	5 A/3~	8 A/3~	20 A/1~	10 A/3~	16 A/3~	4 A/1~	5 A/3~	8 A/3~	12 A/3~	16 A/1~	voltage-free contact	voltage-free contact	voltage-free contact		
electric defrosting	10 A/1~										10 A/3~					10 A/1~	10 A/3~	20 A/3~		
evaporator fans	4 A/1~																			
auxiliary outputs	8(4) A																			
<b>Inputs/outputs</b>																				
Digital input 1	●																			
Digital input 2	●																			
<b>Programming/ports</b>																				
keypad	●																			
key	●																			
Infrared port for remote control	●																			
HACCP/Real Time Clock	●																			
Optional connection with IROPZ48500	●																			
Optional connection with IROPZDSP00	●																			
<b>Other specifications</b>																				
Case dimensions (mm)	288x426x148																			
Controller	IREV*																			
Protection rating	IP65																			
Packaging	single; Relay rating to EN60703-1: 8(4) A, ..., 12(2)A																			
<b>ir33+ Configuration</b>																				
bn1	Ventilated unit at normal temperature with electric defrost (timed)																			
bn2	Ventilated unit at normal temperature with electric defrost (by temperature) and light control																			
bn3	Ventilated unit at normal or low temperature with electric defrost (by temperature) and light control																			
bn4	Ventilated unit at normal temperature with electric defrost (double evaporator, by temperature)																			
bn5	Ventilated unit at normal or low temperature with electric defrost (double evaporator, by temperature) and light control																			
bn6	CAREL standard (predefined configuration)																			

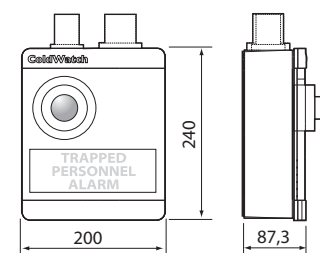
● standard

Operational diagram

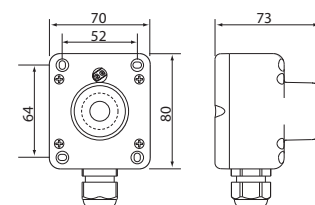




## Dimensions



control unit



emergency button

## Coldwatch

### CLDRMS\*

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

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

The kit includes:

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

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

### Theoretical diagram



## Technical specifications

**Power supply:** 230 Vac

**Operating conditions:**

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

**Protection rating:**

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

**Certification:** CE

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

**I/Os:**

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

**Serial ports:** 1 for CAREL network

**Dimensions:**

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

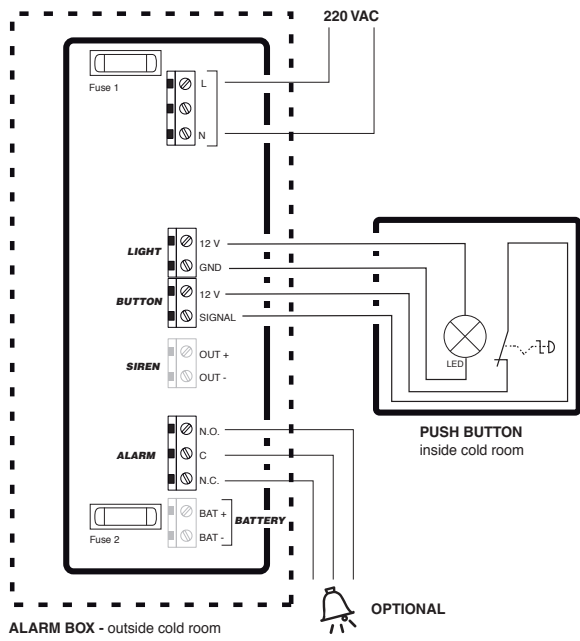
**Connections:** screw terminals

## Technical specifications table

	CLDRMS*
<b>Power supply</b>	
230 Vac - 50/60 Hz	●
Operation autonomy	with 230 Vac power supply: unlimited with fully charged battery: 10 h
Battery	12 Vdc
Battery autonomy	10 h
<b>Other specifications</b>	
Visible signal	Red flashing LED
Audible signal characteristics	90 dB at 1 m
Emergency button inside the cold room	red LED 12 Vdc -25...40 °C IP67
Module outside the cold room	-10...40 °C IP43
Auxiliary relay	250 Vac 8 A AC1 (contact closed with alarm)

● standard

Operating diagram





## Compressor racks

The compressor rack is the most important and complex electromechanical device in the refrigeration system: this delivers cooling for the foodstuffs to all the refrigeration units and related processing rooms.

The CAREL retail sistema has been designed to be meet the needs of manufacturers, providing OEMs and installers a complete line that matches the results of their design efforts, maximising results.

From limited numbers of simple hermetic compressors or large racks, to inverter driven or capacity-controlled semi-hermetic and hermetic compressors. In terms of energy saving, the compressor rack has a wide range of operation, as the installed power is very significant: all our solutions have been designed with the focus on this aspect.

The use of E2V proportional electronic expansion valves, along with the power of the electronic controllers, allow energy balance to be maximised.

Carel offers two platforms for managing compressor racks:  $\mu$ Rack and pRack.

The  $\mu$ Rack series includes a series of compact parametric controllers, at a low cost and particularly easy to use and

install on small systems with the following features:

- high efficiency display for viewing monitored variables;
- mounting on DIN rail or panel and in kits complete with accessories;
- clear and highly visible icons for operating conditions and any anomalies;
- a PWM output for modulating condenser fan operation using a speed controller.
- operation with floating condensing pressure for increasing compressor efficiency and performance.
- three levels of access for viewing and programming the parameters: (user, installer, manufacturer), with the possibility of reassigning the parameters among various levels.

pRack is the ideal solution to meet the many needs of the market for control and management of more complex and advanced centralised compressor racks (i.e. CO2 refrigerant):

- high number of inputs and outputs for control requirements;
- innovative management algorithms for energy savings;
- unique control software in six languages,

compatible with various hardware sizes and with a wide range of integration/supervision possibilities;

- possibility of separating the compressor controller from the fan controller with a unique user interface and local network connection between controllers.
- drastic reduction in electrical connection costs for remote fans.
- control of modulating capacity through dedicated outputs for compressor inverter and/or inverter/cut-off controls for condenser fans.
- operation with floating condensing pressure for increasing compressor efficiency and performance.



## Unit for compressor rack management

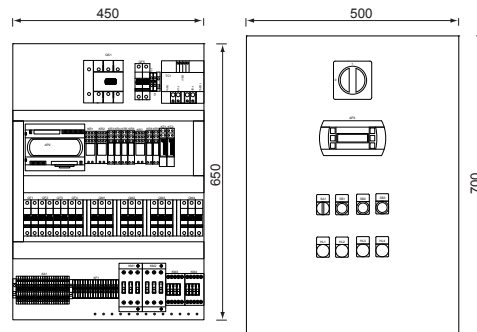
CMPRCK\*

The compressor rack series controllers can manage racks with a maximum of two compressors. One of the compressors is fixed speed and the other chosen between fixed speed or variable speed with inverter. Based on the model, 2 to 5 three phase fans for the condensing unit can be managed. The entire series also allows the supply and management of the fans for extracting heat from the compressor head and the heaters on the compressor oil sumps in order to offer an overall solution for managing small compressor racks. The cases, available in different sizes based on compressor power and the number of condensing fans managed, use 15/10 thick RAL painted steel plate, with 20/10 thick galvanised steel wiring plates, a door with reversible opening and two safety closures and continuous gasket and a specially sized cable entry plate located on the bottom of the case. Upon request, the electrical panel can be supplied with cable glands large enough for cable entry. Each case is equipped with its own wall installation kit with holes already in place on the back. The main panel disconnect switch is located on the inside door with control from the front using a rotating handle. In the same manner, the user interface is located on the inside door along with the switches and signal lights for operating conditions and alarms. The wiring diagrams are prepared in order to manage the standard safety chain linked to compressors and pressure switches. Upon request the panel can be supplied sized for the management of different compressor and condenser fan power ratings.

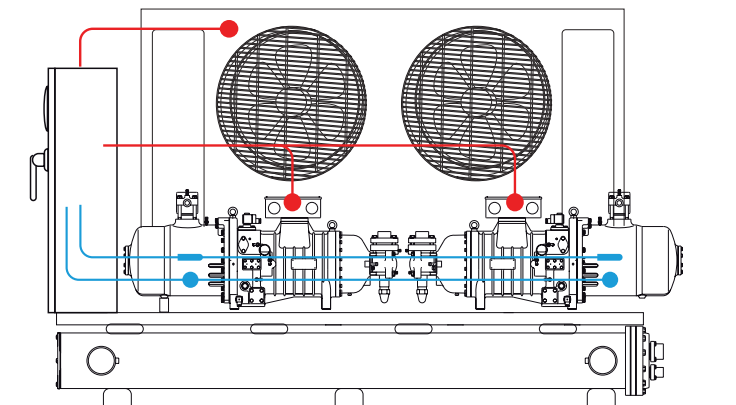
### Technical specifications

- Power supply:** mains, 400V 3ph + N + E
- Operating conditions:** -25T60 °C 90% RH non condensing
- Protection rating:** IP54
- Assembly:** on the wall using bracket kit (supplied)
- I/Os:** according to model
- Connections:** directly on the inside panel terminal board for auxiliary, directly on the electromagnetic switches for units/power.

### Dimensions



### Theoretical diagram



## Technical specifications table

	CMPRC0001	CMPRC0002	CMPRC0003	CMPRC0004	CMPRC0005	CMPRC0006	CMPRC0007	CMPRC0008	CMPRC0009	CMPRC0010	CMPRC0011
<b>Power supply</b>											
400V 3~ +N +T (max)	●										
<b>User interface</b>											
display	PGD0000F00										
Ready for remote terminal	●										
<b>Outputs (max)</b>											
Compressor 1 (with or without inverter)	400V 10-16 A	400V 16-25 A	400V 25-40 A			400V 40-50 A			400V 50-58 A	400V 40-50 A	400V 50-58 A
Compressor 2 (without inverter)	400V 10-16 A	400V 16-25 A	400V 25-40 A	400V 16-25 A	400V 20-25 A	400V 25-32 A	400V 32-40 A	400V 25-32 A	400V 32-40 A	400V 32-40 A	
Compr. head heat extractors	230V 0.53 A										
Compr. sump heaters	230V 0.53 A										
Condenser fan 1 400V 4A	●										
Condenser fan 2 400V 4A	●										
Condenser fan 3 400V 4A			●	●	●	●	●	●	●	●	●
Condenser fan 4 400V 4A				●	●	●	●	●	●	●	●
Condenser fan 5 400V 4A										●	●
Condenser fan 6 400V 4A										●	●
<b>Inputs/outputs</b>											
Digital inputs	6	6	8	8	8	8	8	8	8	14	14
Digital outputs	5	5	8	8	8	8	8	8	8	13	13
Analogue inputs	4	4	5	5	5	5	5	5	5	8	8
Analogue outputs	2	2	4	4	4	4	4	4	4	4	4
<b>Programming/ports</b>											
user terminal	●										
key	●										
Real Time Clock	optional card required	●	●	●	●	●	●	●	●	●	●
pLAN	●										
tLAN	●	●	optional card required								
CAREL protocol	●										
Modbus RTU protocol	●										
LonWorks protocol	optional card required										
<b>Other specifications</b>											
Fibreglass case dimensions	700x500x250	800x600x250	800x800x300	1000x800x300							
Controller	PCO1000AX0	PCO3000AS0								PCO3000AM0	
Protection rating	IP54										
Packaging	single										

● standard

Operating diagram

