I/O module: CAREL retrofit controller

User Manual

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

CAREL

Technology & Evolution

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

We wish to save you time and money!
We can assure you that the thorough reading of this manual will guarantee correct installation and safe use of the product described.

IMPORTANT WARNINGS

BEFORE INSTALLING OR OPERATING ON THE APPLIANCE, CAREFULLY READ THE INSTRUCTIONS IN THIS MANUAL

This equipment has been designed to operate without risks for the specificied purpose, as long as:
- the installation, operation and maintenance are performed according to the instructions in this manual and;
- the environmental conditions and supply voltage fall within the values indicated here below.
Any other use or changes which have not been previously authorised by the manufacturer, are considered improper.
Liability for injures or damage caused by improper use lies exclusively with the user.
Note some electrical components of this instrument are live, thus all the service or maintenance operations must be performed by expert and skilled personnel only, aware of the necessary precautions to be taken.
Before accessing the internal parts, disconnect the power supply.

Disposal of the parts of the controller:

The controller is made up of metal and plastic parts. All these components must be disposed of according to the local legislation in force on waste disposal.

General warnings - operating environments and connections

The following conditions represent correct installation:

- *avoid installing the instrument in environments featuring: wide and rapid fluctuations in room temperature, temperature and relative humidity values near the limits, exposure to any jets of pressurised water (TECHNCIAL QUESTION FOR MARKETING– this is not IP65 therefore should refer to any water), high levels of electromagnetic and/or radio-frequency interference (e.g. transmitting antennae);*
- *use cable terminals that are suitable for the terminals being used. Loosen each screw and insert the cable ends, then tighten the screws. Once this operation has been completed, lightly tug the cables to check that they are sufficiently tight;*
- *to avoid electromagnetic disturbance separate as much as possible the probe signal and digital input cables from cables carrying inductive loads and power cables, to avoid any electromagnetic disturbance. Never lay power cables and probe cables in the same conduits (including those for the electrical cables). Do not install the probe cables in the immediate vicinity of power devices (contactors, circuit breakers or the like); reduce the distancepath of the sensor cables as much as possible and avoid laying spiral paths around power devices. To extend the probe cables, use cables with a minimum cross-section of at least 0.5 mm^2;*
- *the cables to be connected to the contacts of the controller must be resistant to the maximum operating temperature, determined by summing the maximum room temperature envisaged to the heat produced by the controller, equal to 20°C;*
- *protect the power supply to the loads connected to the controller (compressor, defrost, fan, etc.) using suitable devices (thermal-magnetic overload switches, circuit breakers), rated according to the corresponding loads connected.*

Safety for operators and precautions when handling the controller.

To protect the safety of operators and safeguard the controller, before performing any operations on the board, disconnect the power supply. Electrical damage to the electronic components is almost always due to electrostatic discharges caused by the operator. Adequate measures must be adopted for these types of components, in particular:

- *before handling the controller, touch an earthed part (simply not touching a component is not sufficient, as a 10,000V discharge, a voltage that can easily be reached by static electricity, causes an arc of around 1 cm.);*
- *the parts must remain, where possible, inside their original packaging. If the controller needs to be removed from the packaging, transfer the product to antistatic packaging without touching the rest of the controller;*
- *avoid in all circumstances the use of non-antistatic plastic, polystyrene or sponge bags;*
- *avoid in all circumstances handing the material from one operator to another (to avoid electrostatic induction and consequent discharges).*

IMPORTANT!

Never connect the digital outputs on the controller to loads of primary importance!
No liability is accepted for any damage caused to the utilities due to incorrect installation.

WARNINGS FOR INSTALLATION

To install the controller, proceed as follows, with reference to the connection diagrams shown **in this manual.**

1) **Programming the instrument**: for a more detailed description, see the chapter on "Programming".

2) **Connecting the probes and digital inputs:** the probes and digital inputs can be installed at a maximum distance of 10 metres from the controller, as long as wires with a minimum cross-section of 1mm are used. To improve immunity to disturbance, shielded cables should be used (connect only one end of the shield to the earth on the electrical panel).).

3) **Connecting the actuator:** carefully calculate the maximum capacity of the relay, as indicated in the "technical specifications".

4) **Serial network connection:** if the connection is provided to the CAREL supervisory network via the RS485 line, make sure that the polarity of the cables is correct.

5) **Power supply:** make sure that the instrument is not connected to a power supply other than the one described in the technical specifications.

Avoid installing the I/O module in environments with the following characteristics:

- relative humidity higher than the value specified in the technical specifications;
- heavy vibrations or knocks;
- exposure to continuous jets of water;
- exposure to aggressive and polluting elements (e.g.: sulphur and ammonia gases, saline mist, smoke) which may cause corrosion and/or oxidation;
- high magnetic and/or radio-frequency interference (thus avoid installation near transmitting antennae);
- exposure of the I/O module to direct sunlight and atmospheric elements in general;
- large and rapid fluctuations in ambient temperature;
- environments where explosives or mixes of flammable gases are present;
- exposure to dust (formation of corrosive patina with possible oxidation and reduction of insulation).

Connecting the controllers:

- use cable terminals that are suitable for the terminals being used;
- each screw and insert the cable ends, then tighten the screws;
- once this operation has been completed, lightly tug the cables to check that they are sufficiently tight;
- separate as much as possible the probe, digital input and supervisory network cables from cables carrying inductive loads and power cables, to avoid any electromagnetic disturbance;
- never lay power cables and probe, digital input or supervisory network cables in the same conduits (including those in the electrical panels).
- do not install the probe digital input or supervisory network cables in the immediate vicinity of power devices (contactors, circuit breakers or the like);
- avoid powering the controller directly from the main power supply in the panel, if this source of power also supplies other devices, such as contactors, solenoid valves, etc.

Caution: the incorrect connection of the power supply may seriously damage the system.
Fit all the electromechanical safety devices on the unit that are necessary to ensure the safety of the system.

CONTENTS:

1. Introduction

The CAREL IOM* is a compact, versatile and easy-to-install instrument, featuring panel (din rail mounting (- 4 DIN modules), used to acquire the operating parameters from an installation, and make them available to a supervisory/monitoring system.
Especially suitable for the supervision of systems with electromechanical controllers or non-CAREL electronic controllers, the I/O module completes the range of CAREL Retrofit Solutions, designed to satisfy the needs of the leading manufacturers in the sector, with the purpose of reducing the installation costs.

1.1 Main characteristics

Power supply
Models are available with 230Vac / 115Vac / 24Vac power supply, respectively: IOM0023000; IOM0011500; IOM0002400.

Installation
All models feature DIN rail installation.

Applications
The programmability of the CAREL I/O module ensures maximum flexibility in its application. The same standard hardware can be used to measure data from:

- chiller and heat pumps;
- roof-top units;
- small / medium air handling units;
- refrigerated cabinets;
- cold rooms;
- maturing rooms;
- compressor packs.

Inputs
The I/O module can manage:

- NTC probes
- 4 to 20mA transducers (pressure, temperature, relative humidity...);
- 0 to 5 V ratiometric transducers (pressure, temperature, relative humidity...);
- Voltage-free digital contacts;
- Optically-isolated digital contacts with voltage signals.

Output
Digital relay output (signal or remote alarm...).

Serial connection
The I/O module can manage RS485 serial communication using the CAREL standard protocol and baudrate, for the development of supervisory and telemaintenance systems.
The ideal application is together with PlantWatch and PlantVisor.

Accessories
The controller can be configured via a serial connection or using the programming key (code PSOPZKEY00). Specific software must be provided obtained from by CAREL).

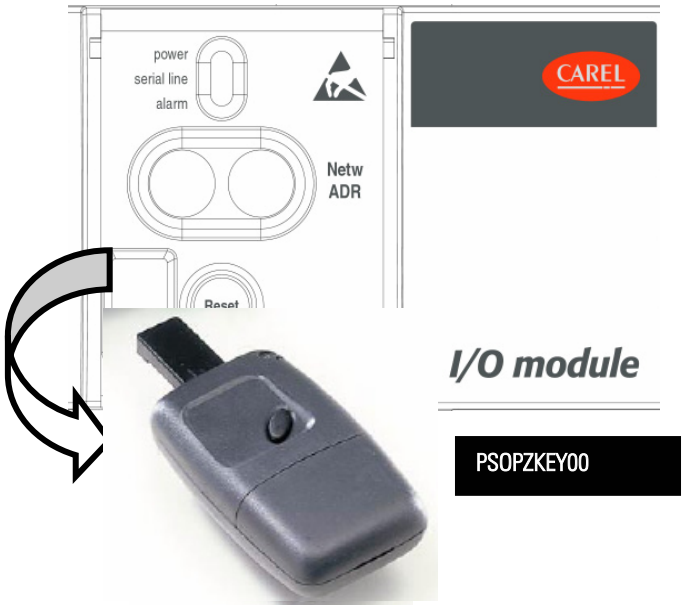
- RS485 serial data converter + power supply + connection cable.
- Reading/programming key for CAREL controllers PSOPZKEY00.
- Programming key kit with serial connection PSOPZPGR00.
- Software for programming the key.

Approval
The quality and the safety of the I/O module are guaranteed by the ISO 9001-certified design and production system.
The modules conform to the EN 60730-1, EN 60730-2-9 and EN61010-1 safety standards.

CE The CE mark confirms the quality and the safety of the plug-in series, guaranteed by the CAREL ISO 9001 certified design and production system.

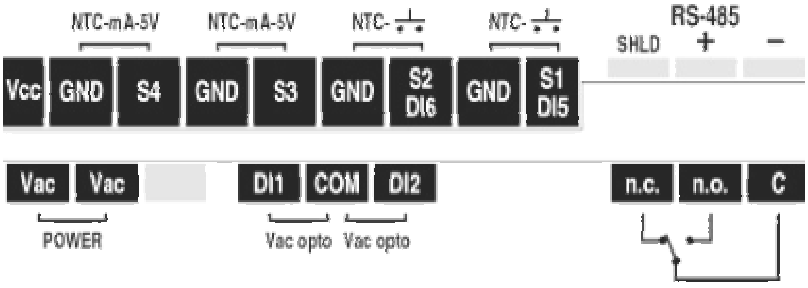
1.2 User interface

- **POWER LED** (Green)
  ON when the I/O module is powerd correctly.
- **SERIAL LINE LED** (Yellow)
  When on, signals indicates connection to the supervisory system.
- **ALARM LED** (Red)
  If OFF, normal operation.
  If ON, signals that the alarmi are disabled
  If flashing, indicates a current alarm.
- **Key**
  The connector is used to connect the programming key for reading/writing the controller's operating parameters.
- **2 Rotary switch** (BCD 0-9)
  Adjustable from 0 to 99, used to set the serial address of the controller (Network ADdRess) in the monitoring system.
- **RESET button**
  The button on the instrument is used to mute the built-in buzzer (see the paragraph on "Alarms").



2. Installation

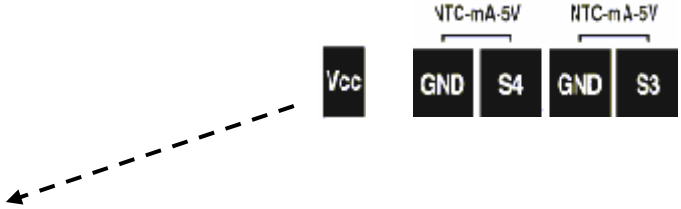
The I/O module can manage analogue inputs, optically-isolated digital inputs with a voltage signal, and voltage-free contacts. Specifically:



- DI1, DI2: optically-isolated digital input with voltage signal.

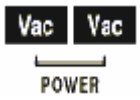
- S1, S2: inputs that can be configured as NTC probe inputs or digital inputs with voltage free contacts (DI5, DI6)..

- S3, S4: inputs that can be configured as NTC probe inputs, 4 to 20 mA inputs or 0 to 5 V ratiometric inputs

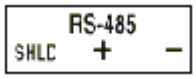


- Vcc: power supply to the 4 to 20mA probes (around approx 13 Vdc) or the 0 to 5 ratiometric probes (around approx 5 Vdc)

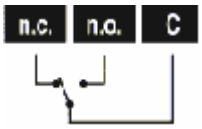
- Vac: power is supplied to the instrument via the corresponding POWER terminals (Vac)



- RS485: serial communication to the CAREL supervisory network via the terminals SHLD, +, -

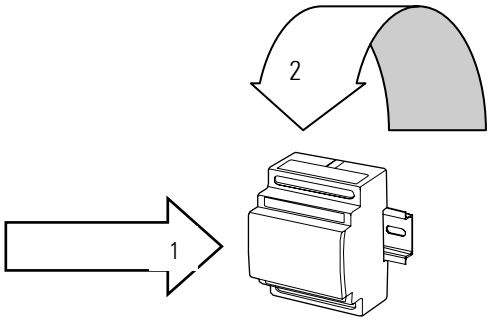


- Relay: the relay output on the I/O module is available at terminals C, n.c., n.o



2.1 Assembling and securing the instrument

The I/O module is installed on a DIN rail inside the electrical panel.
To secure the module to the DIN rail, simply press the device lightly, after having rested it on the rail. When the rear tabs click into place, the device is secured to the rail. To remove the controller, simply use a screwdriver to release and raise the tabs.
The tabs are kept in the locked position by a return spring.



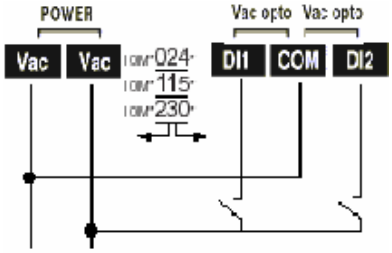
2.2 Power supply to the instrument

The power supply to the instrument depends on the model, according to the table below:

MODEL	POWER SUPPLY
IOM00**230**00	**230 Vac**
IOM00**115**00	**115 Vac**
IOM000**24**00	**24 Vac**

2.3 Connecting the digital inputs

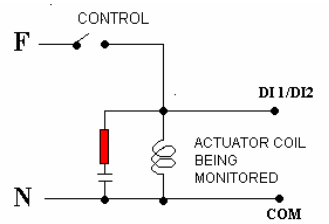
Digital 1-2 (optically-isolated):
Terminals DI1, DI2 and COM can be used to connect two digital inputs with voltage signals.



The power supply to the inputs depends on the model of the instrument, as per the table below:

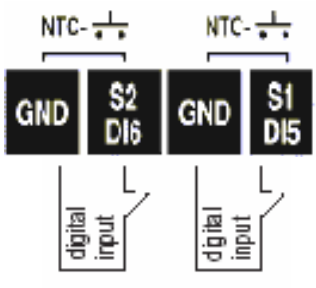
MODEL	POWER SUPPLY
IOM0023000	230 Vac
IOM0011500	115 Vac
IOM0002400	24 Vac

Warning: other devices should not be connected to inputs ID1 and ID2 (for example, relay coils).
In the specific case of the 230 Vac inputs, if necessary, install the dedicated RC filter in parallel with the coil.



RC filter	Characteristics	Voltage supported
1	0.5 μF 100R 250 Vac	24-115 V
2	0.5 μF 100R 400 Vac	230 V

Digital 5-6 (free contacts):
If configured as digital inputs using the instrument operating parameters, digital inputs with voltage free contacts can be connected to terminals DI5, GND, DI6, GND, according to the diagram below:

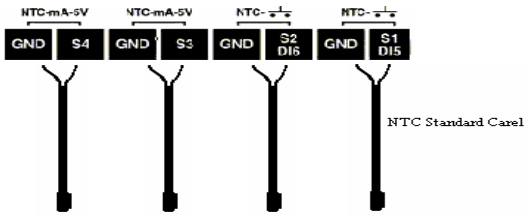


Warning: Check that the configuration of the inputs on the instrument corresponds to the number and the type of the probes and digital inputs that will be connected

2.4 Connecting the analogue inputs

2.4.1 NTC probes

If the inputs are configured using the instrument operating parameters for NTC probes using the instrument operating parameters, standard CAREL NTC probes can be connected to terminals S1-GND, S2-GND, S3-GND and S4-GND, according to the diagram below:

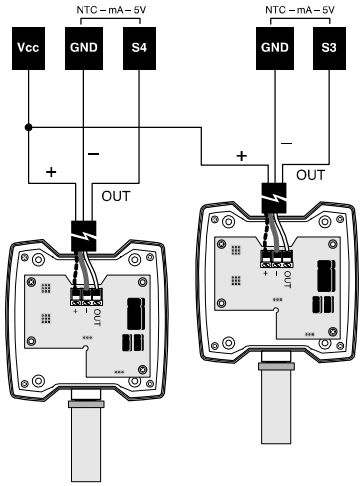


The two NTC probe wires are identical: no special order polarity is required when connecting these to the terminal block.

2.4.2 4 to 20 mA probes:

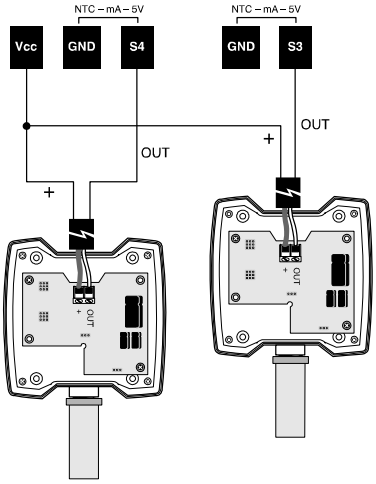
If configured using the instrument operating parametersas current inputs using the instrument operating parameters, 4-20mA probes can be connected to terminals S4-GND, S3-GND and Vcc, according to the diagram below:

Active probes with 3 wires:



Note: for the power to the active probes, the three wires each have a different polarity:
OUT probe, corresponds to Sy on I/O module terminal block
+ (probe), corresponds to VCC on I/O module terminal block
- (probe), corresponds to GND on I/O module terminal block

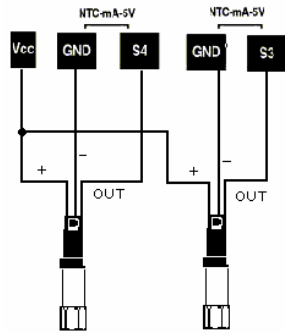
Active probes with 2 wires:



Note: the + indicates the probe power supply wire, OUT the probe output wire (4 to 20 mA signal)

2.4.3 0 to 5 V ratiometric probes

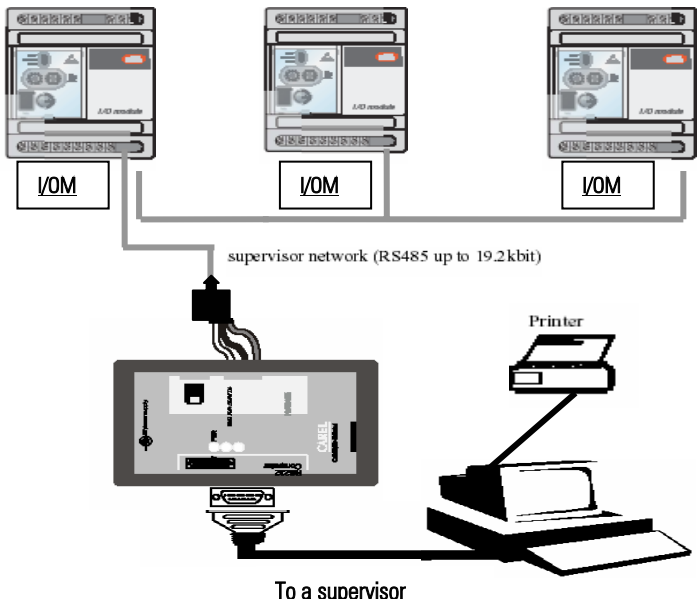
If configured using the instrument operating parameters as ratiometric inputs using the instrument operating parameters, 0 to 5 V ratiometric probes can be connected to terminals: S4-GND; S3-GND and Vcc, according to the diagram below:



NOTE: indicates the probe power wire, "OUT" the probe output (5 V rat. signal) and "-" the reference wire.

2.5 Local serial network

As previouslyalready mentioned, the I/O modules are designed to be connected to the CAREL RS485 local network, thus allowing the communication and supervision of data and information by the supervisor.
The supervisory system can monitor the operation of the refrigerationnt circuits controlled by the instruments: eg temperature, pressure, alarms, faults, defrosts etc..
The CAREL supervisory system can be used to modify the instrument I/O module's operating parameters according to the needs of the operator.



The figure shows a diagram of a series of I/O modules connected in an RS485 network + printer for the alarm log.

All the versions of the I/O module can be connected in a local network.
All the devices connected to the network are identified by a unique serial address.
The address is set on the devices using the rotary switches on the user interface.
The supervisory system must be used to configure all the instruments connected in parallel and the Ident according to corresponding the value that set on each instrument. If the same address is assigned to more than one unit, the network will not work; consequently, more than one I/O module cannot have the same serial address.
The serial connection between the I/O module and the RS485 converter must be made using a AWG20/22 twisted pair + shielded cable; the shield must be connected to GND. The wiring of the RS485 network uses removable three-way connectors. The serial address of the instrument may be between 1 and 99. The value 0 assigns the instrument address 200 (not supported in the basic version).
If more than one device detects an alarm and there is no serial communication for more than 5 minutes, a built-in buzzer will sound.

Warnings:
1. carefully observe the polarity of the TX+ and TX- wires;
2. the maximum length of the network must not exceed 1000 m; branches must not exceed 5 m;
3. do not use star-type connections in the line;
4. all the instruments in the network must be powered by their own insulated power supply. The secondary must not be earthed;
5. the terminal furthest away from the RS232 / RS485 serial converterd must be fitted with the 120 Ω, ¼ W resistor supplied, between the TX+ and TX- contacts;
6. never lay the network cables near, or worse, in the same conduit as the power cables.

3. Programming

There are two parameters that determine the operating modes of the instrument: MOD and OUT

3.1 Analogue and digital input configuration (MOD parameter)

The first operation to be performed if the default configuration is not suitable for the specific application is to set the operating mode.
The setting of the MOD parameter results is fundamental for establishing the configuration required by the operator.
In fact, the MOD parameter is used to establish the type of analogue and digital inputs read by the instrument, according to the table below:

Value	Configuration
0	**1** NTC, **2** NTC, **3** NTC, **4** NTC
1	**1** DI5, **2** DI6, **3** NTC, **4** NTC
2	**1** NTC, **2** NTC, **3** (4 to 20 mA), **4** (4 to 20 mA)
3	**1** DI 5, **2** DI 6, **3** (4 to 20 mA), **4** (4 to 20 mA)
4	**1** NTC, **2** NTC, **3** 5 V raz (con range 0.5 to 4.5), **4** 5 V raz (con range 0.5 to 4.5)
5	**1** DI 5, **2** DI 6, **3** 5 V raz (con range 0.5 to 4.5), **4** 5 V raz (con range 0.5 to 4.5)
6*	**1** NTC, **2** NTC, **3** 5 V raz (con range 0.5 to 4.5), **4** 5 V raz (con range 0.5 to 4.5)
7*	**1** DI 5, **2** DI 6, **3** 5 V raz (con range 0.5 to 4.5), **4** 5 V raz (con range 0.5 to 4.5)

*= in these two configurations, the probe fault alarms AS3 and AS4 referring to the 5 V rat. probes are not active!

Example: If MOD=0, the configuration of the instrument will correspond to this value, that is, 4 NTC.

The recommended configuration for the control monitoring of a multiplexed supermarket cabinet corresponds to is 4 NTC temperature probes relating to the respective sections of the multiplexed unit, and two digital inputs used to detect the defrost status of the evaporator and the operating status of the compressor or solenoid.
The recommended configuration for the control of a cold room corresponds is to 2 NTC probes, one that measures the inside temperature and one that measures the evaporator temperature for the defrost function, plus 4 digital inputs for detecting: the status of the compressor; the defrost status; the activation of the fans and, as an auxiliary function, detecting when the door is open.
The recommended configuration for a compressor pack is able to manage two 4-20mA pressure probes, one suction and one condensing pressure, and 4 digital inputs for the status of the compressors (up to 3) and the fourth input for an auxiliary application, such as a remote alarm (condensers).

NOTE: The #PROBES parameter can be used to establish the analogue probes that are effectively present.

3.2 Relay operating mode (OUT)

The **OUT** parameter defines whether the relay on the instrument is activated in the event of internal alarms, or alternatively whether it can be controlled by the remote supervisory system.
There are three operating modes:

Value of OUT	Configuration
0	Relay set via serial connection, not linked to an internal alarm, can be used as an auxiliary
1	Relay linked to the high/low alarms ATy*****H/ ATyL, probe faults ASy /digital input errors AFx***** and end defrost by timeout TDx
2	Relay linked to the alarms ATyH, ATyL, ASy, AFy, TDx with Ny=x (for future models)

(*) =x index of the digital input, y = index of the analogue input

3.2.1 Configuring the relay as an auxiliary

Set the parameter **OUT=0** (relay not linked to the internal alarms).
The relay can now be used as an auxiliary, activated and deactivated by the supervisory system.
In this mode, the instrument works as a remote I/O module.
With this setting a certain status can be assigned to the relay, according to the alarms detected.
This status will have priority over the setting made by the supervisory system.
In this way, the I/O module can be made to promptly react to a number of alarms that are considered important, independently from the speed and the traffic on the supervisory network.

One such example is a compressor thermal overload switch that must immediately stop the compressor.
The parameters LINK 1 and LINK 2 can be used to "link" the relay output to the sources of the alarm.
The status of the relay, according to the alarms assigned by LINK 1 and LINK 2, is determined by the parameters OUTL 1 and OUTL 2.
If more than one alarm is activated, linked to the same relay, with a different output status, the PRIORITY parameter can be used to define the priority of the output status.

For example, a condenser fan may be linked to a high condensing pressure alarm and a fan thermal overload alarm. The high pressure alarm starts the fan, and the thermal overload alarm stops it. PRIORITY can be used to establish that the stopping of the fan is the preferential status when both alarms occur.
The ALCOMM parameter, on the other hand, can be used to establish the status of the relay if OFF-LINE is detected for more than 5 minutes.

The status of the relay can also be decided when starting the instrument, depending on the remote device that will be connected:
RELÈ PWUP=0 (Open) ; RELÈ PWUP=1 (Closed)

3.2.2 Configuring the relay as being linked to the internal alarms:

Set the parameter **OUT=1** (relay linked to the internal alarms). The relay is now is able to be automatically activated/deactivated when the controller detects an alarm:eg high/low temperature, probe fault, digital input error etc.
This function is linked to the **MODE** parameter (status of the relay at rest): **= 0 normally open; = 1 normally closed**
If the relay is activated during an alarm, the status of the digital variable in the supervisory system varies according to the setting of the MODE parameter: 0 (contact closed), 1 (contact open).

For further details, refer to the paragraph "*Description of the parameters*".

3.3 List of parameters

	Parameter	Value	Min.	Max.	Def.	U.M
A1	Type of dig. input 1	0= normal input (read-only) 1= alarm with input open 2= alarm with input closed 3= detect defrost 4= disable general alarms 5= detect cleaning cycle	0	5	0	----
D1	Alarm delay, seconds (dig. input 1): alarm delay defrost timeout alarm disable time maximum cleaning cycle time	If: A1= 1, 2 0= immediate alarm A1= 3 0= infinite A1= 4 0= infinite A1= 5 0= immediate timeout	0	30000	20	seconds
DK1	Alarm maintenance time, seconds, dig. input 1	If A1= 1, 2	0	30000	20	seconds
MTD1	Signal in the event of defrost timeout from input 1	0= signal to supervisor only 1= alarm + signal to supervisor	0	1	0	----
	DIG. INPUT 2					
A2	Type of dig. input 2	0=normal input (read-only) 1= alarm with input open 2= alarm with input closed 3=detect defrost 4=disable general alarms 5=detect cleaning cycle	0	5	0	----
D2	Alarm delay, seconds (dig. input 2): alarm delay defrost timeout alarm disable time maximum cleaning cycle time	If: A1= 1, 2 0= immediate alarm A1= 3 0= infinite A1= 4 0= infinite A1= 5 0= immediate timeout	0	30000	20	seconds
DK2	Alarm maintenance time, seconds, dig. input 2	If A2= 1, 2	0	30000	20	seconds
MTD2	Signal if defrost timeout from input 2	0= signal to supervisor only 1= alarm + signal to supervisor	0	1	0	----
	DIG. INPUT 5 (valid for MOD=1,3,5)					
A5	Type of dig. input 5	0= normal input (read-only) 1= alarm with input open 2= alarm with input closed 3= detect defrost 4= disable general alarms 5= detect cleaning cycle	0	5	0	----
D5	Alarm delay, seconds (dig. input 5): alarm delay defrost timeout alarm disable time maximum cleaning cycle time	If: A1= 1, 2 0= immediate alarm A1= 3 0= infinite A1= 4 0= infinite A1= 5 0= immediate timeout	0	30000	20	seconds
DK5	Alarm maintenance time, seconds, dig. input 5	If A5= 1, 2	0	30000	20	seconds
MTD5	Signal if defrost timeout from input 5	0= signal to supervisor only 1= alarm + signal to supervisor	0	1	0	----
	DIG. INPUT 6 (valid for MOD=1,3,5)					
A6	Type of dig. input 6	0= normal input (read-only) 1= alarm with input open 2= alarm with input closed 3= detect defrost 4= disable general alarms 5= detect cleaning cycle	0	5	0	----
D6	Alarm delay, seconds (dig. input 6): alarm delay defrost timeout alarm disable time maximum cleaning cycle time	If: A1= 1, 2 0= immediate alarm A1= 3 0= infinite A1= 4 0= infinite A1= 5 0= immediate timeout	0	30000	20	seconds
DK6	Alarm maintenance time, seconds, dig. input 6	If A6= 1, 2	0	30000	20	seconds
M TD6	Signal if defrost timeout from input 6	0= signal to supervisor only 1= alarm + signal to supervisor	0	1	0	----
	ANALOGUE INPUT FUNCTIONS					
MOD	Type of instrument (configuration of digital and analogue inputs)	0= 1 NTC, 2 NTC, 3 NTC, 4 NTC 1= DI 5, DI 6, 3NTC, 4NTC 2= 1 NTC, 2 NTC, 3 (4 to 20mA), 4 (4 to 20 mA) 3= DI 5, DI 6, 3 (4 to 20 mA), 4 (4 to 20 mA) 4= 1 NTC, 2 NTC, 3 5 V rat, 4 5 V rat. with range (0.5 to 4.5) 5= DI 5, DI 6, 3 5 V rat., 4 5 V rat. with range (0.5 to 4.5) 6* =1 NTC, 2 NTC, 3 5 V rat., 4 5 V rat. with range (0.5 to 4.5 V) 7* = DI 5, DI 6, 3 5 V rat.,4 5 V rat. with range (0.5 to 4.5 V) * = The probe fault alarms AS3, AS4 are not active for the 5 V ratiometric. probes	0	7	0	----

#PROBES	Number of probes present	0= No probe 1= probe - - - 1 2= probe - - 2 - 3= probe - - 2 1 4= probe - 3 - - 5= probe - 3 - 1 6= probe - 3 2 - 7= probe - 3 2 1 8= probe 4 - - - 9= probe 4 - - 1 10= probe 4 - 2 - 11= probe 4 - 2 1 12= probe 4 3 - - 13= probe 4 3 - 1 14= probe 4 3 2 - 15= probe 4 3 2 1	0	15	15	----
CF	Temperature in degrees centigrade or Fahrenheit (NTC only)	0=centigrade 1=Fahrenheit	0	1	0	----
	ANALOGUE INPUT 1 (valid for MOD 0,2,4)					
N1	Probe 1 associated with digital input 1, 2, 3, 4	1=dig. input 1 2=dig. input 2 3=not associated 4=not associated	1	4	1	----
H1	High alarm threshold for probe 1 (Max. end scale alarm disabled)		L1	1000.0	100.0	°C/°F
L1	Low alarm threshold for probe 1 (FS min alarm disabled)		-200.0	H1	-100.0	°C/°F
R1	Alarm delay, minutes (high and low thresholds) probe 1		0	255	20	minutes
F1	Filter for probe 1	0= fast response …… 15= slow response	0	15	8	----
O1	Offset probe 1 (calibration)		-10.0	10.0	0.0	°C/°F
DS1	Variation in readings, probe 1, for transmission to the supervisor		0.1	5.0	0.5	°C/°F
	ANALOGUE INPUT 2 (valid for MOD 0,2,4)					
N2	Probe 2 associated with digital input 1, 2, 3, 4	1=dig. input 1 2=dig. input 2 3=not associated 4=not associated	1	4	2	----
H2	High alarm threshold for probe 2 (Max. end scale alarm disabled)		L2	1000.0	100.0	°C/°F
L2	Low alarm threshold for probe 2 (Min. end scale alarm disabled)		-200.0	H2	-100.0	°C/°F
R2	Alarm delay, minutes (high and low thresholds) probe 2		0	255	20	minutes
F2	Filter for probe 2	0= fast response …… 15= slow response	0	15	8	----
O2	Offset probe 2 (CALIBRATION)		-10.0	10.0	0.0	°C/°F
DS2	Variation in readings, probe 2, for transmission to the supervisor		0.1	5.0	0.5	°C/°F
	ANALOGUE INPUT 3					
N3	Probe 3 associated with digital input 1, 2, 3, 4, 5, 6	1=dig. input 1 2=dig. input 2 3=not associated 4=not associated 5=dig. input 5 (if MOD 1, 3, 5, 7) 6=dig. input 6 (if MOD 1, 3, 5, 7)	1	6	3	----
H3	High alarm threshold for probe 3 (Max. end scale alarm disabled)		L3	1000.0	100.0	°C/°F/bar/…
L3	Low alarm threshold for probe 3 (Min. end scale alarm disabled)		-200.0	H3	-100.0	°C/°F/bar/…
R3	Alarm delay, minutes (high and low thresholds) probe 3		0	255	20	minutes
F3	Filter for probe 3	0= fast response …… 15= slow response	0	15	8	----
O3	Offset probe 3 (calibration)		-10.0	10.0	0.0	°C/°F/bar/…
DS3	Variation in readings, probe 3, for transmission to the supervisor		0.1	5.0	0.5	°C/°F/bar/…
V3L (MOD 2,3,4,5,6,7)	Minimum value for probe 3 as 4…20 mA or 10 % of 5 V ratiometric signal		-200.0	V3H	0.0	bar/…
V3H (MOD 2,3,4,5,6,7)	Maximum value for probe 3 as 4…20 mA or 90 % of 5 V ratiometric signal.		V3L	819.0*	30.0	bar/…
(*)NOTE: values less than or equal to 819 must be set for parameter V3H						
	ANALOGUE INPUT 4					
N4	Probe 4 associated with digital input 1, 2, 3, 4, 5, 6	1=dig. input 1 2=dig. input 2 3=not associated 4=not associated 5=dig. input 5 (if MOD 1, 3, 5, 7) 6=dig. input 6 (if MOD 1, 3, 5, 7)	1	6	4	----
H4	High alarm threshold for probe 4 (Max. end scale alarm disabled)		L4	1000.0	100.0	°C/°F/bar/…
L4	Low alarm threshold for probe 4 (Min. end scale alarm disabled)		-200.0	H4	-100.0	°C/°F/bar/…

R4	Alarm delay, minutes (high and low thresholds) probe 4		0	255	20	minutes
F4	Filter for probe 4	0= response slow …… 15= response fast	0	15	8	----
O4	Offset probe 4		-10.0	10.0	0.0	°C/°F/bar/…
DS4	Variation in readings, probe 4, for transmission to the supervisor		0.1	5.0	0.5	°C/°F/bar/…
V4L (MOD 2,3,4,5,6,7)	Minimum value for probe 4 as 4…20 mA or 10 % of 5 V ratiometric signal		-200.0	V4H	0.0	bar/…
V4H (MOD 2,3,4,5,6,7)	Maximum value for probe 4 as 4…20 mA or 90 % of 5 V ratiometric signal.		V4L	819.0*	30.0	bar/…
(*)NOTE: values less than or equal to 819 must be set for parameter V4H						
	RELAY OPERATING MODES					
OUT	Select relay operating mode	0=Relay set via serial 1=Relay linked to alarms ATy*H, ATyL, ASy, AFx*, TDx (if alarm selected) 2=Relay 'y' linked to alarms ATyH, ATyL, ASy, AFx, TDx (with Ny=x). Envisaged on future models. *= *x (index of digital input 1-2-5-6)* *y (index of probe input 1-2-3-4*	0	2	1	----
MODE (OUT ≠ 0)	Relay status at normal condition	0=Relay 1 N.O. 1=Relay 1 N.C. 2-15=not managed	0	15	0	----
LINK1 (OUT=0) (*)	Matrix for assigning alarms to outputs (1/2)	RELAY 1 AF1=4096; AF2=256	0	65536	0	----
LINK2 (OUT=0) (*)	Matrix for assigning alarms to outputs (2/2)	RELAY 1 AF5/AS1/AT1L/AT1H=4096; AF6/AS2/AT2L/AT2H=256; AS3/AT3L/AT3H=16; AS4/AT4L/AT4H=1;	0	65536	0	----
OUTL1 (OUT=0) (*)	matrix of output status according to the alarm (1/2)	RELAY 1 AF1=4096; AF2=256	0	65536	0	----
OUTL2 (OUT=0) (*)	matrix of output status according to the alarm (2/2)	RELAY 1 AF5/AS1/AT1L/AT1H=4096; AF6/AS2/AT2L/AT2H=256; AS3/AT3L/AT3H=16; AS4/AT4L/AT4H=1;	0	65536	0	----
PRIORITY (OUT=0)	Priority of output status in the event of multiple alarms	RELAY 1=1 (energised) RELAY 1=0 (de-energised)	0	15	0	----
ALCOMM (OUT=0) (*)	Status of the outputs in the event of communication alarms	RELAY 1= from 0 to 15 (save last status) ENABLE=16 (relay de-energised) ENABLE=16+1=17 (relay energised)	0	31	0	----
(*)the value to be set is obtained by adding the numbers corresponding to the individual alarms						
	BUZZER					
BUZ	Select buzzer operating mode:	0= buzzer set by serial 1= buzzer linked to the alarms ATy*H, ATyL, ASy, AFx*, TDx (if alarm selected) and if communication is interrupted for more than 5 min *= *x (index of digital input 1-2-5-6)* *y (index of probe input 1-2-3-4)*	0	1	0	----
BUZZ-PWUP	Status of the buzzer output at power-up	0=off 1=active	0	1	0	----
	STATUS OF RELAY OUTPUTS AT POWER-UP					
RELÈ 1-PWUP	Stato uscita 1 al power-up	0=eccitato 1=diseccitato	0	1	0	----
	COMMANDS FROM THE SUPERVISOR					
BUZZER [ON/OFF]	Variable that activates/deactivates the buzzer from the supervisor	0= buzzer deactivated 1= buzzer activated				
RELE 1 [ON/OFF]	Variable that opens/closes the relay contact from supervisor if OUT=0	0= relay contact de-energised 1= relay contact energised				

3.4 Description of the parameters

Table of alarms:

ATyH	High temperature alarm probe y
ATyL	Low temperature alarm probe y
AFx	Alarm, digital input x
ASy	Fault alarm, probe y
TDx	Defrost timeout, digital input x

A (1/2/5*/6*)
This parameter is used to select the function of the digital inputs.
Functions available: normal input (=0), alarm with input open (=1)/closed (=2), detect defrost (=3), disable general alarms (=4) and cleaning cycle (=5).

D (1/2/5*/6*)
The meaning of this parameter depends on the value of the corresponding parameter A (1,2,5*,6*).
If Ax=1/2, that is, digital input x is configured as an alarm (normally closed or open), the parameter Dx establishes the alarm delay time (in seconds), between the physical activation of the alarm and the activation of AFx *(see the description in the table of alarms above).*
If Ax= 3, that is, digital input x has the function of detecting the defrost status, the parameter Dx establishes the defrost timeout (in seconds), that is, the time after which the timeout TDx is signalled and the monitoring of the temperature is reset, even if the defrost is still active.
If Ax=4, that is, digital input x has the function of disabling the alarms [ATyH], [ATyL], [AFx], [TDx], the parameter Dx establishes the disabling time (in seconds):

Dx=0	Undetermined time, while the input is closed
Dx <>0	Disable for the time Dx

If Ax=5, that is, digital input x has the cleaning cycle function, the parameter Dx establishes the cleaning cycle time (in seconds) over which the controller sends the signal [CT]. In any case, the alarms [ATyH], [ATyL], [AFx], [TDx] are ignored while digital input x remains closed.

DK (1/2/5*/6*)
If an alarm from digital input is detected (Ax=1.2), this is maintained, after deactivation, for a time (in seconds) equal to DKx.
The function is not active if applied to the defrost, the disable alarm function and the cleaning cycle.

MTD (1/2/5*/6*)
This is a digital variable whose setting defines whether to enable the alarm signal after the defrost timeout.
1= defrost timeout alarm enabled on supervisor
0= defrost timeout alarm not enabled on supervisor

MOD
Configures the analogue and digital inputs.

0=	1 NTC, 2 NTC, 3 NTC, 4 NTC
1=	DI 5, DI 6, 3 NTC, 4 NTC
2=	1 NTC, 2 NTC, 3 (4 to 20 mA), 4 (4 to 20 mA)
3=	DI 5, DI 6, 3 (4 to 20 mA), 4 (4 to 20 mA)
4=	1 NTC, 2 NTC, 3 5 V rat., 4 5 V rat. with range (0.5 V to 4.5 V)
5=	DI 5, DI 6, 3 5 V rat., 4 5 V rat. with range (0.5 V to 4.5 V)
[6]=	1 NTC, 2 NTC, 3 5 V rat., 4 5 V rat. with range (0.5 V to 4.5 V)
[7]=	DI 5, DI 6, 3 5 V rat., 4 5 V rat. with range (0.5 V to 4.5 V)

[6], [7]= For these two types of configuration, the probe alarms AS3, AS4 corresponding to the 5 V rat. probes are not active (see table T3 corresponding to the probes with voltage signals).
* = inputs configured as digital

 # PROBES
Used to configure set the probes connectedfitted to the instrument.

0 =	No probe
1 =	Probe - - - 1
2 =	Probe - - 2 -
3 =	Probe - - 2 1
4 =	Probe - 3 - -
5 =	Probe - 3 - 1
6 =	Probe - 3 2 -
7 =	Probe - 3 2 1
8 =	Probe 4 - - -
9 =	Probe 4 - - 1
10=	Probe 4 - 2 -
11=	Probe 4 - 2 1
12=	Probe 4 3 - -
13=	Probe 4 3 - 1
14=	Probe 4 3 2 -
15=	Probe 4 3 2 1

NOTE: In the event of a probe error or if the probe is not present, the value sent to the supervisor will be –250.0 °C or –418.0 °F.

CF
Used to set the reading in degrees centigrade or Fahrenheit (digital variable).

N (1/2/3/4)
Parameter that associates the instrument probes y (1/2/3/4) with the digital inputs x (1/2/5/6).
This parameter is important in the disable alarms during defrost function.
If the probe y is associated with digital input x, (Ny=x) and digital input x has the function of detecting the defrost status (Ax=3), during the defrost (digital input x closed), the high and low temperature alarms are ignored on input y.
At the end of the defrost, the high and low temperature alarms are enabled again, with the high and low temperature alarm delay time.

Warning: probes 1 and 2 and digital inputs 5 and 6 share the same terminals and are mutually exclusive.
Therefore, associating digital inputs 5 and 6 with probes 1 and 2 has no meaning.

H (1/2/3/4)
This sets the high alarm threshold, relating to probes 1, 2, 3, 4.
When the high alarm threshold is exceeded, the signal ATyH is activated, with y = 1, 2, 3, 4
Max. end scale: alarm disabled.

L (1/2/3/4)
Sets the low alarm threshold, relating to probes 1, 2, 3, 4.
When the low alarm threshold is exceeded, the signal ATyL is activated, with y = 1, 2, 3, 4
Min. end scale: alarm disabled.

R (1/2/3/4)
This sets the high and low alarm delay time (in minutes).
The alarm is signalled after the time Ry from when the high or low threshold is exceeded.

F (1/2/3/4)
This sets the digital filtering on the values measured.
The value 0 corresponds to low filtering, and therefore high sensitivity, the value 15 means more filtering and greater stability.
An intermediate value is recommended (default=8) so as to achieve suitable stability.

O (1/2/3/4)
This sets the offset value for the probes, used for the calibration performed by the user. The value assigned to this parameter is added to (positive value) or subtracted from (negative value) the value measured by the probes (e.g.: to lower the reading by 2.3°C, set Oy =-2.3 °C).

DS (1/2/3/4)
This sets the minimum difference between two successive readings of the analogue probes required to send the reading to the CAREL Supervisory System.
If, for example, DS1=0.3, the value read by probe 1 will be sent to the CAREL Supervisor System when the new reading has varied by at least ± 0.3 units.
This parameter establishes the hysteresis for the detection of the high and low alarms, equal to 3xDSy.

V (3/4)L
This represents the value corresponding to 4 mA or to 10% of the 5 V ratiometric signal, for analogue inputs 3 and 4.

MOD	V(3,4)L
MOD=2,3	Value corresponding to 4 mA
MOD=4,5,6,7	Value corresponding to 10% of the 5 V ratiometric signal

V (3/4)H
This represents the value corresponding to 20 mA or to 90% of the 5 V ratiometric signal, for analogue inputs 3 and 4.

MOD	V(3,4)H
MOD=2,3	Value corresponding to 20 mA
MOD=4,5,6,7	Value corresponding to 90% of the 5 V ratiometric signal

4 to 20 mA probes: MOD=2,3

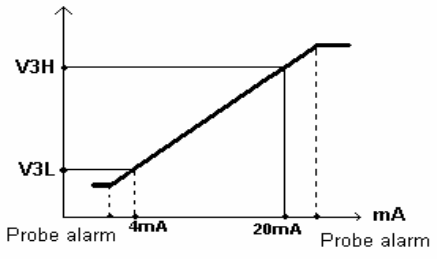


Table of alarms for 4 to 20 mA probes (T 1):

Set Alarm	Lower threshold	Reset Alarm	Reset Alarm	Upper threshold	Set Alarm
3.25 mA	3.5 mA	3.75 mA	20.25 mA	20.5 mA	20.75 mA

5 V ratiometric probes: MOD=4,5,6,7

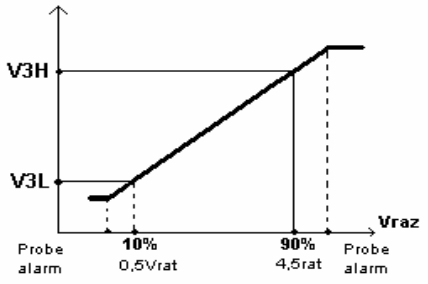


Table of alarms for 5 V scale 0.5 V to 4.5 V (T2/T3):

(T2) MOD = 4, 5

Set Alarm	Lower threshold	Reset Alarm	Reset Alarm	Upper threshold	Set Alarm
0.25 V	0.375 V	0.5 V	4.5 V	4.625 V	4.75 V

(T3) MOD = 6*, 7*

Set Alarm	Lower threshold	Reset Alarm	Reset Alarm	Upper threshold	Set Alarm
none	none	none	none	none	none

*= For these two values of MOD, the probe alarms AS3 and AS4 corresponding to the 5 V rat. probes are not active.

Table of alarms for NTC probes(T4):

NTC: MOD=0,1,2,4

Set Alarm	Lower threshold	Reset Alarm	Reset Alarm	Upper threshold	Set Alarm
-52.5 °C	-50 °C	-47.5 °C	87.5 °C	90 °C	92.5 °C

Probe errors: These are signalled if the probe is present according to [MOD] and [#PROBES]. The activation and the deactivation of the probe error considers the hysteresis, according to the value measured (see tables T1, T2, T3, T4).
In the event of a probe error or if the probe is not present, the value sent to the supervisor will be –250.0°C or –418.0 F.

OUT

The OUT parameter defines whether the RELAY on the instrument is activated by the alarms detected internally, or alternatively whether it can be controlled by the remote supervisory system.There are three operating modes:

Value of OUT	Configuration
0	Relay set via serial connection, not linked to any internal alarm, can be used as an auxiliary
1	Relay linked to the high/low alarms ATy*H/ ATyL, probe faults ASy / digital input errors AFx* and end defrost by timeout TDx
2	Relay y linked to the alarms ATyH, ATyL, ASy, AFy, TDx with Ny=x (envisaged for future models)

(*)=x digital input index, y = analogue input index

Configuring the relay as an auxiliary:

Set the parameter OUT=0 (relay not linked to the internal alarms).
The relay can now be used as an auxiliary, activated and deactivated by the supervisory system.
In this mode, the instrument works as a remote I/O module.
With this setting a certain status can be assigned to the relay, according to the alarms detected.
This status will have priority over the setting made by the supervisory system.
In this way, the I/O module can be made to promptly react to a number of alarms that are considered important, independently from the speed and the traffic on the supervisory network.
One such example is a compressor thermal overload switch that must immediately stop the compressor.
The parameters LINK 1 and LINK 2 can be used to "link" the relay output to the sources of the alarm.
The status of the relay, according to the alarms assigned by LINK 1 and LINK 2, is determined by the parameters OUTL 1 and OUTL 2.
If more than one alarm is activated linked to the same relay, with a different output status, the PRIORITY parameter can be used to define the priority of the output status. For example, a condenser fan may be linked to a high condensing pressure alarm and a fan thermal overload alarm. The high pressure alarm starts the fan, and the thermal overload alarm stops it. PRIORITY can be used to establish that the stopping of the fan is the preferential status when both alarms occur.
The ALCOMM parameter, on the other hand, can be used to establish the status of the relay if OFF-LINE is detected for more than 5 minutes.
The status of the relay can also be decided when starting the instrument, depending on the remote that will be connected:
RELÈ PWUP=0 (Open) ; RELÈ PWUP=1 (Closed)

Configuring the relay as linked to the internal alarms:

Set the parameter OUT=1 (relay linked to the internal alarms). The relay is now is able to be automatically activated/deactivated when the controller detects an alarm: high/low temperature, probe fault, digital input error etc.
This function is linked to the MODE parameter (status of the relay at rest): = 0 normally open; = 1 normally closed
If the relay is activated during an alarm, the status of the digital variable in the supervisory system varies according to the setting of the MODE parameter: 0 (contact closed), 1 (contact open).

MODE
Establishes the relay status a rest, normally energised or de-energised, if OUT=1 or 2

Mode	Relay status at reset
= 0	Normally de-energised
= 1	Normally energised

LINK1/LINK2
If OUT=0, the matrices are active, that is, the values used to establish which alarms the relay changes status for.
This function therefore allows the relay to be activated/deactivates only for the alarm/alarms desired by the user.
As regards any other alarms detected by the instrument, the relay will remain in the status set via the serial connection and can be displayed only by the supervisory system.
The alarms are selected using the matrices, that is, the series of values set for the parameters LINK1 and LINK2:

	RELAY 1	RELAY 2	RELAY 3	RELAY 4	Variable
AF1	**4096**				LINK1
AF2	**256**				
AF3					
AF4					
AF5 o AS1, AT1L, AT1H	**4096**				LINK2
AF6 o AS2, AT2L, AT2H	**256**				
AS3 o AT3L, AT3H	**16**				
AS4 o AT4L, AT4H	**1**				

LINK1
This parameter refers to the matrices for alarms AF1 and AF2, that is, the alarms relating to the digital inputs with voltage signal 1 and 2.
To activate the relay for the alarm AF1 only, set the value **4096** (value defined for this type of alarm).
To switch the status of the relay only when the alarm AF2 is activated, set the value **256**.
To activate the relay if both alarms are activated, simply sum the two values: **4096+ 256= 4352.**

LINK2
The same configuration procedure used for LINK 1 is also used for this parameter.
For AF5, the value to be set is **4096,** for AF6 **256** and for both the sum of the two values.
If S1 and S2 are configured in the place of DI 5 and DI 6, setting the value **4096** enables the probe 1 "threshold exceeded" (AT1H and AT1L) and probe 1 fault alarms (AS1).
On the other hand, setting the value **256** enables the probe 2 "threshold exceeded" (AT2H and AT2L) and probe 2 fault alarms (AS2).
As regards probe S3, to activate the relay for the alarms AS3 and AT3L or AT3H, set the value **16**, and set the value **1** for AS4 and AT4L or AT4H, relating to probe S4.
As in the case of the previous parameter, the sum of the values set will enable the relay with the corresponding alarms.

Example 1:
To activate the internal relay only when an alarm from digital input DI1 and DI2 (AF1 and AF2) is activated and when a probe 3 "threshold exceeded" error occurs (AT3L or AT3H): for the parameter LINK1, set the value **4096+256=4352** to activate AF1 and AF2, while for the parameter LINK2, set the value **16**.

OUTL1/OUTL2
If OUT=0, and after having correctly set the parameters LINK1/ LINK2, the parameters OUTL1 and OUTL2 can be used to establish the status of the relay for each type of alarm, at the moment of activation.

	RELAY 1	RELAY 2	RELAY 3	RELAY 4	Variable
AF1	**4096**				OUTL1
AF2	**256**				
AF3					
AF4					
AF5 o AS1, AT1L, AT1H	**4096**				OUTL2
AF6 o AS2, AT2L, AT2H	**256**				
AS3 o AT3L, AT3H	**16**				
AS4 o AT4L, AT4H	**1**				

OUTL1
This parameter refers to the alarms configured by LINK 1 (those corresponding to the digital inputs with voltage signal).
What is the status of the relay when one or more than one alarm is activated?
By assigning a value to this parameter (see the table above), the status of the relay can be defined (energised/de-energised) when an alarm AF1 or AF2 is activated.
To set the open or de-energised status of the relay corresponding to the alarm AF1, do not enter any value (that is, 0) for the parameter OUTL1; on the other hand, to set the closed or energised status, enter the value (listed in the table above) **4096** for the parameter OUTL1.
The same procedure is used for the alarm AF2: the value 0 for the parameter OUTL1 this means that relay will be de-energised when this alarm is activated; if, as per the table, the value **256** is set, the relay will be energised when the alarm AF2 is activated.
In the event where the alarms AF1 and AF2 are activated at the same time, in order to energise the relay for both the alarms, simply sum the values: **4096+256=4352** and enter this value for the parameter OUTL1.

OUTL2

This parameter refers to the alarms configured by LINK 2 (those corresponding to the digital inputs with voltage free contacts and/or the probes on the analogue inputs). The same configuration procedure used for OULT1 is also used for this parameter.
For AF5, the value to be set in order to energise the relay is **4096,** for AF6 **256,** and for both the sum of the two values.
If S1 and S2 are configured in the place of DI 5 and DI 6, when setting the value **4096** the relay will be energised for the probe 1 "threshold exceeded" (AT1H and AT1L) and probe 1 fault alarms (AS1). On the other hand, when setting the value **256** the relay will be energised for the probe 2 "threshold exceeded" (AT2H and AT2L) and probe 2 fault alarms (AS2). As regards probe S3, to energise the relay for the alarms AS3 and AT3L or AT3H, set the value **16**, and set the value **1** for AS4 and AT4L or AT4H, relating to probe S4. As in the case of the previous parameter, the sum of the values set will energise the relay with the corresponding alarms.

Example 2:

Looking back at example 1, when the alarm AF1 is activated the relay is in the open or de-energised status, and when the alarm AF2 is activated the relay is in the closed or energised status. According to the values shown in the table and the explanation of the parameter OUTL 1, the following will be true:

0 = (AF1 relay de-energised) + 256 (AF2 relay energised) = 256 [the value to be set for the parameter OUTL1 to achieve the desired result]

As regards the "threshold exceeded" alarm AT3x, the relay is set to switch to the open status:

1 (AT3x relay open) X 16 =16 [the value to be set for the parameter OUTL2 to achieve the desired result]

PRIORITY

In the event where more than one?alarm occurs simultaneously, as previously set with LINK1/2, and there is a conflict between the settings of OUTL1/2, the priority of the relay status can be defined by setting the PRIORITY parameter. The [PRIORITY] variable used to establish the priority of the output in the event of alarms with different settings.

Value	RELAY 1	RELAY 2	RELAY 3	RELAY 4	Variable
0	Contact de-energised				PRIORITY
1	Contact energised				

Example 3:

Continuing with example 2, we now need to set the priority in the event where AF1, AF2 and AT3L or AT3H occur simultaneously. To set the status of the relay as closed: **enter the value 1 for the Priority parameter.** On the other hand, to set the open status: **assign Priority the value 0.**

ALCOMM

The parameter ALCOMM can be used to establish the relay status if OFF-LINE is detected for more than 5 minutes
The [ALCOMM] variable established the status of the outputs in the event of communication errors.

Value	RELAY 1	RELAY 2	RELAY 3	RELAY 4	Variable
Up to 15	Status maintained at the last setting				ALCOMM
16	Relay de-energised when OFF-LINE				
17	Relay energised when OFF-LINE				

For values less than 16, the I/O module maintains the last status before going off-line from the supervisor.
To use the ENABLE function, enter the value **16** (relay de-energised when OFF-LINE), while **16+1=17** (relay energised when OFF-LINE).

BUZ

Used to modify the operating modes of the buzzer.
0=the buzzer can be activated via the serial connection;
1=the buzzer is activateds if there is no communication for more than 5 minutes and the alarms ATyH, ATyL, ASy, AFx, TDx (set as an alarm) are active.

BUZ-PWUP (output)

This parameter is used to establish the status of the buzzer at power up.
0=off
1=activated

RELÈ-PWUP (output)

This parameter is used to establish the status of the relay at power up if OUT= 0
0=relay de-energised at power up
1=relay energised at power up

COMMANDS FROM THE SUPERVISOR:

BUZZER [ON/OFF]

This variable is used to activate/deactivate the buzzer from the supervisory system (in the event of no communication, to mute the buzzer use the RESET button directly on the instrument).
0=buzzer deactivated
1=buzzer activated

RELAY 1 [ON/OFF]

This variable is used to energise or de-energise the relay from the supervisory system.
0=relay de-energised
1=relay energised.

3.5 Alarms

[AG] General alarm: this indicates that one? of the following alarms is active: high ATyH, low ATyL, probe ASy, delayed or immediate AFx, and defrost timeout TDx (if selected as an alarm).
The general alarm AG is reset automatically.
0 =no alarms active
1 =one or more alarms active

[ATyH/ATyL]
The high and low alarms are activated after the alarm delay Ry.
The hysteresis for the variation in the high and low alarms is 3xDSy.
The high and low alarms feature automatic and manual reset. In the case of manual reset (alarms reset from the supervisor), the delay times corresponding to the alarms are also reset, and the monitoring cycle starts again.

AT1H high alarm, probe 1: this means that probe 1 has exceeded the alarm threshold H1. This is monitored by the supervisory system inside the alarm window.
AT1L low alarm, probe 1: this means that probe 1 has exceeded the alarm threshold L1.This is monitored by the supervisory system inside the alarm window.
AT2H high alarm, probe 2: this means that probe 2 has exceeded the alarm threshold H2. This is monitored by the supervisory system inside the alarm window.
AT2L low alarm, probe 2: this means that probe 2 has exceeded the alarm threshold L2. This is monitored by the supervisory system inside the alarm window.
AT3H high alarm, probe 3: this means that probe 3 has exceeded the alarm threshold H3. This is monitored by the supervisory system inside the alarm window.
AT3L low alarm, probe 3: this means that probe 3 has exceeded the alarm threshold L3. This is monitored by the supervisory system inside the alarm window.
AT4H high alarm, probe 4: this means that probe 4 has exceeded the alarm threshold H4. This is monitored by the supervisory system inside the alarm window.
AT4L low alarm, probe 4: this means that probe 4 has exceeded the alarm threshold L4. This is monitored by the supervisory system inside the alarm window.

[AFx]
The digital alarms are delayed by the time Dx from when detected, and maintained for the time DKx when the conditions are no longer present.
The digital alarms feature automatic and manual reset. In the case of manual reset (alarms reset from the supervisor), the delay times corresponding to the alarms are also reset, and the monitoring cycle starts again.

AF1 input 1 alarm: indicates that an alarm from digital input 1 is present
AF2 input 2 alarm: indicates that an alarm from digital input 2 is present
AF3 input 3 alarm: not managed
AF4 input 4 alarm: not managed
AF5 input 5 alarm: indicates that an alarm from digital input 5 is present
AF6 input 6 alarm: indicates that an alarm from digital input 6 is present

[ASy]

AS1 probe 1 fault alarm: this occurs when probe 1, as configured, is disconnected or faulty, and can therefore not measure the temperature correctly.
0=alarm not present
1=probe 1 alarm active
AS2 probe 2 fault alarm: this occurs when probe 2, as configured, is disconnected or faulty and can therefore not measure the temperature correctly.
0=alarm not present
1=probe 2 alarm active
AS3 probe 3 fault alarm: this occurs when probe 3, as configured, is disconnected or faulty and can therefore not measure the temperature correctly.
0=alarm not present
1=probe 3 alarm active
AS4 probe 4 fault alarm: this occurs when probe 4, as configured, is disconnected or faulty and can therefore not measure the temperature correctly.
0=alarm not present
1=probe 4 alarm active

[TDx]
This is a digital variable that signals the defrost timeout status on the configured input configured.
0 = no defrost timeout
1= defrost timeout
If the variable **MTD (digital) is selected as "**signal + alarm" at end defrost by timeout, that is MTD=1, after the time Dx (defrost duration), as well as the signal sent to the supervisor, the general alarm will also be activated.

[AHW] Hardware alarm (signal): this occurs when the fault detected is an EPROM error or A/D conversion error.
0= hardware alarm inactive
1= hardware alarm active

RESET button
This button on the instrument is used to mute the internal buzzer: the buzzer is sounded when the serial communication lacks instrument, after for more than 5 minutes.
Irrespective of the setting of BUZ, which establishes whether the buzzer is controlled via the serial connection or linked to the alarms on the instrument (after 5 minutes of no serial communication), pressing the button mutes the buzzer. The buzzer muting function stops if the buzzer has been switched off via the serial control or because communication has returned. After that, if the conditions require the buzzer to sound again, it will be activated and the button can be used to mute it again

3.6 Signals

[Sy]
This is a read-only parameter used to constantly monitor the values measured by the probes (1/2/3/4/)

[TDx]
This is a digital variable that signals the status of defrost timeout on the input configured.
0 = no defrost timeout
1= defrost timeout
If the variable MTD (digital) is selected as "signal only" for end defrost by timeout, that is MTD=0, after the time Dx (defrost duration), a signal will be sent to the supervisor.

[DIx]
This is a read-only digital variable that indicates the status of the digital inputs configured on the instrument.
0 =digital input open
1 =digital input closed

[CT] cleaning cycle timeout (signal):
This is a signal that refers to the end of the cleaning cycle.
0 = no cleaning cycle timeout
1 = cleaning cycle timeout
This can be set via the serial connection.
This function is linked to the parameter A for the association of the function with the digital input, and to the parameter D for the duration of the cycle.

[BUZZ] status
This is a digital variable used to identify the status of the buzzer.
0=buzzer inactive
1=buzzer active
This is a read-only parameter.

[RELAY 1] status
This is a digital variable used to identify the status of the relay.
0=relay contact open
1=relay contact closed
This is a read-only parameter..

3.7 Setting the parameters (via the serial connection or hardware key)

3.7.1 Access from the supervisory system (PlantVisor)

To program the parameters directly on the instrument, the CAREL PlantVisor supervisory system must be installed correctly on a PC with the necessary system requirements.
After having setting the serial address identifier in the software to the same value as set on the instrument (using the two rotary switchesd on the user interface), click the mouse on the "PARAMS"parameters icon button in on the top right to access the window with the complete list of the parameters inon the instrument;.
After having entereingd the parameter programming access password (if required),???? the configurations can be modified by placing the cursor directly on the desired parameter.
Each item features an explanation of the possible values that can be set.
When modifying the values, it is recommended to refer to the list of parameters and their description in the user manual supplied with the product, or the section "Description of the parameters" in this manual.
Once the most suitable configuration has been selected, click the mouse on the grey "SEND" button at the bottom of the PlantVisor start page.
The parameters have now been successfully modified.
For further details refer to the PlantVisor technical manual.

3.7.2 Hardware key

The hardware key is used to program the instruments simply and quickly, without needing to connect it to the power supply.

Programming the instrument with the CAREL hardware key[PSOPZKEY00]

1. open the rear cover on the key and place dipswitch no. 2 in the ON position. Close the cover again (this needs to be should only be performed once, to configure the programming mode of the instrument on the key);
2. connect the key to the Key port on the instrument;
3. press and hold the button on the key, checking the sequence of the LEDs: red, and after a few seconds green;
4. if the signalling sequence is as described above, the write operation to the I/O module has been completed correctly (green LED on), the button can be released and the key disconnected from the instrument;
5. in the event of different signals (the green LED does not come on or the LED flashes), a problem has occurred (see the key instruction sheet PSOPZKEY00).

Copying the parameters from the instrument to the CAREL hardware key [PSOPZKEY00]

Reading the parameters on the instrument with the key:

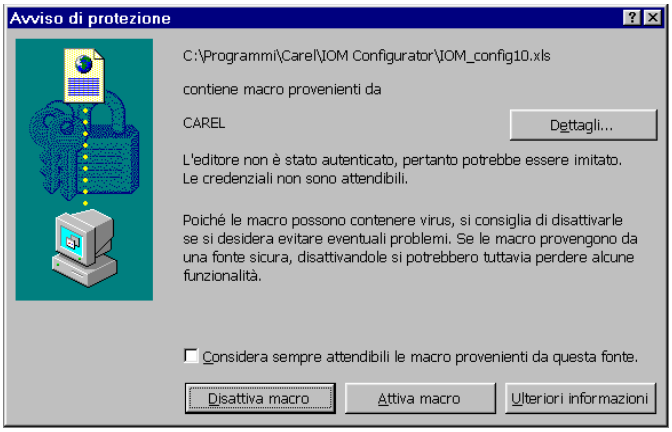
1. open the rear cover on the key and place the two dipswitches in the OFF position. Close the cover;
2. connect the key to the port on the instrument;
3. press and hold the button on the key, checking the sequence of the LEDs: red, and after a few seconds green;
4. if the signalling sequence is as described above, the reading and copy operation to the key has been completed correctly (green LED on), the button can be released and the key disconnected from the instrument;
5. in the event of different signals (the green LED does not come on or the LED flashes), a problem has occurred (see the key instruction sheet PSOPZKEY00).

Optional software for programming the key

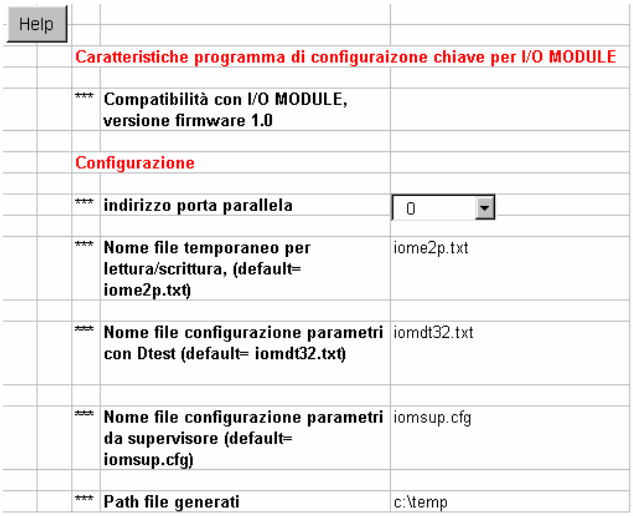
The key programming software (OPTIONAL) and programming interface can be used to write the instrument operating parameters to the key. The specific software for programming the key needs to be installed on a PC.

Installation of the additional software for programming the key:

- Connect the programming interface to the parallel port LPT on the PC (using the flat cable supplied).
- Insert the connector on the key into the connector on the interface.
- Install the program by running the file setup.exe on the installation CD.
- Open Excel 2000 and set "medium" level of protection for macros (TOOLS-MACRO-PROTECTION), in this way, the macros (if present) can be activated as desired by the user, in response to the message shown when the worksheet is opened.
- Now open the Excel sheet from the START menu, as follows: START- ALL PROGRAMS- CAREL- I/OM configurator (click the left mouse button), or alternatively double clicking the icon on the desktop.
- Once the sheet for programming the system has been opened, the system will prompt the user whether to activate or deactivate the "macro": to use all the functions, choose ACTIVATE MACRO.



- Select the address of the parallel port used (see "config" sheet): the numbers are expressed in hexadecimal format, and the default value is 378. The path for saving the files generated can also be defined; if the directory is not already present it is created automatically.

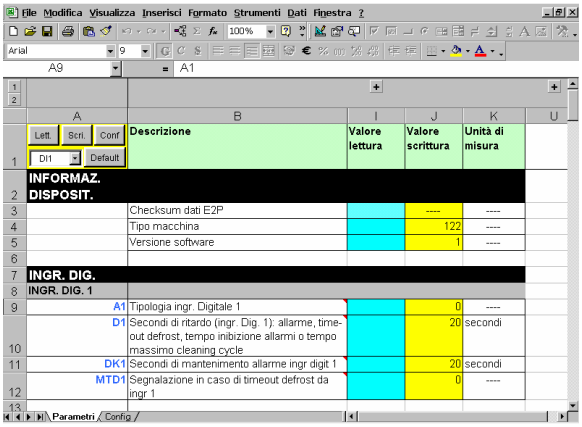


Writing the parameters to the key using the programming software:

1. Insert the key in the special connector (4 pin AMP) on the programming card connected to the PC.
2. Run the programming software supplied by CAREL; when prompted to activate the macro, click OK to proceed.
3. Modify the parameters according to the desired configuration, making sure not to exceed the pre-set range of values.
4. Select the WRITE button; the system will automatically copy the selected parameters to the key. When the LED on the key is red, the data transfer is in progress. Once the key has been programmed, the LED will be green. The key can now be removed from the connector and used to program the instruments.

Reading the parameters on the key using the programming software:

1. Insert the key in the special connector (4 pin AMP) on the programming card connected to the PC.
2. Run the programming software supplied by CAREL; when prompted to activate the macro, click OK to proceed.
3. Select the READ button; the program will automatically read the parameters on the key. When the LED on the key is red, the data transfer is in progress. Once the parameters have been read from the key, the LED will be green. The key can now be removed from the connector.



- Read the parameters saved on the key (previously read from the I/O module); these are displayed in the blue column.
- SCRI: Write the parameters to the key (values previously set in the yellow column).
- DEFAULT: Load the default values of the parameters into the write column.
- CONF: Create the file used to configure the I/O module via Dtest, PlantVisor or Modi (check the name and the path in the "CONFIG" sheet).

The drop-down toolbar allows access directly to the various groups of parameters, without needing to use the PG-UP or PG-DOWN keys.

3.8 Default configuration

The I/O module's electronic controllers are supplied already preprogrammed with the default parameters, providing for operation in applications that require four NTC probes and two digital inputs with voltage signals: for example, the control of a refrigerated cabinet with multiple evaporators.

PARAMETER	DEFAULT	NOTE
MOD	0	(1 NTC; 2NTC; 3 NTC; 4NTC) + DI1 and DI2 optically-isolated
PROBES	15	1,2,3,4
CF	0	Centigrade
OUT	1	Relay linked to internal alarms
MODE	0	Relay N.O. at rest
RELÈ PWUP	0	Open at power up
BUZ	0	Set via serial
BUZZ-PWUP	0	Muted at power up
A1	0	Read-only function
D1	20	Alarm delay, seconds
DK1	20	Alarm maintenance time, seconds
MTD1	0	End defrost signal only
A2	0	Read-only function
D2	20	Alarm delay, seconds
DK2	20	Alarm maintenance time, seconds
MTD2	0	End defrost signal only
N 1	1	Probe 1 associated with input DI 1
N 2	2	Probe 2 associated with input DI 2
N 3/4	3/4	Not associated to any DI
H(1/2/3/4)	100	High alarm threshold
L(1/2/3/4)	-100	Low alarm threshold
R(1/2/3/4)	20	Alarm activation delay, minutes
F(1/2/3/4)	8	Filter for probes
O(1/2/3/4)	0.0	Offset probes
DS(1/2/3/4)	0.5	Variation in probe reading for transmission to master

4. Operation

The CAREL I/O module is a device used to monitor the operating parameters of an installation (with electromechanical or non- CAREL electronic controller) and make them available to the CAREL PlantWatch or PlantVisor supervisory systems.

4.1 Analogue inputs

The device can acquire up to 4 analogue inputs of various kinds: NTC temperature probes, 4-20mA probes (pressure, relative humidity…) and 5 V ratiometric probes (pressure…).
The physical value depends on the type of probe connected: pressure, temperature, relative humidity…
Each analogue input is associated with a high threshold (Hy) and low threshold (Ly). The high and low alarms are signalled by the variables **ATyH** and **ATyL**.
The high and low alarm signals can be delayed to avoid "false" signals, using the parameter **Ry**.
The instrument can also signal probe errors, using the variables **ASy**.
The reading of the probes can be filtered to allow a more stable measurement in noisier environments, using the parameter **Fy**. The reading of the probes can also be compensated using an offset **Oy**.

4.2 Digital inputs

The instrument can read acquire, according to the parameter MOD, 2 digital inputs with voltage free contacts and 2 optically-isolated digital inputs. The status of the inputs digital (variable DIx) is sent, via the serial line, to the supervisory system for monitoring.

4.2.1 Configuration of a digital input as read-only:

DI1 and DI2 are always active. In the case of DI5 and DI6, set MOD=1, 3, 5 or 7 to enable the reading of the digital input.
Set the parameter corresponding to digital input Ax=0.
No probe needs to be associated with the digital input.
The delay time Dx and maintenance time DKx are not enabled.

4.2.2 Digital input as normally open or normally closed alarm

The status of the digital input is monitored as a normally open or normally closed alarm.
The physical status of the digital input is monitored using the variable DIx.
If the alarm status is present for a time greater than Dx, the alarm signal AFx is activated.
If the alarm conditions are not longer present, the alarm signal AFx remains for the time DKx.

Configuring a digital input as an alarm:

1. DI1 and DI2 are always active. To enable the reading of DI5 and DI6, set MOD=1, 3.5 or 7.
2. Set the parameter Ax=1 or 2.
3. Set the alarm delay time Dx.
4. Set the alarm maintenance time DKx.
5. No probe needs to be associated with the digital input.

4.2.3 Digital input for detecting the defrost status

The digital input used to monitor the defrost status of the evaporator and disable, during the defrost, the high and low temperature alarms,
The alarms are disabled for all the probes where Ny=x.
The defrost status is determined when the digital input is closed.
When the defrost ends, the high and low temperature alarms are enabled again, using the set alarm delay Ry. If the defrost status lasts longer the time set for Dx, the instrument generates the signal TDx (defrost ended by timeout); in addition, if selected using the parameter MTD, a local alarm is generated and the high and low temperature alarms are enabled again.
The signal is automatically reset at the start of the following defrost.
If Dx=0, the defrost timeout is infinite; in this case digital input represents the means for disabling the alarms corresponding to the associated probe inputs.
The physical status of the input is monitored using the variable DIx.
The high and low alarms, corresponding to the probes where Ny=x, are monitored using the variables ATyH and ATyL.

Configuring a digital input for detecting the defrost status:

1) Install a temperature control probe on the cabinet or in the cold room.
   Set the high and low temperature thresholds, above and below which the alarm signals are to be activated:
   H(y) =…; L(y) = -…
   To set a delay time if the probe exceeds the high/low thresholds, modify the parameter R(y).
   (Modify the probe offset by setting parameter O(y) and the probe reading variation by setting parameter DS(y), as required).
2) Set the parameter Ax=3.
3) Associate the digital input with the probe y, by setting Ny=x; in this way, during the defrost the high and low temperature alarms will not be signalled..
4) Set the maximum defrost time using parameter D(x).
5) Set the defrost timeout signal mode using parameter MTD(x):
   0=signal only
   1=alarm + signal
6) The time DKx is not active in this function.

Diagram of normal defrost operation:

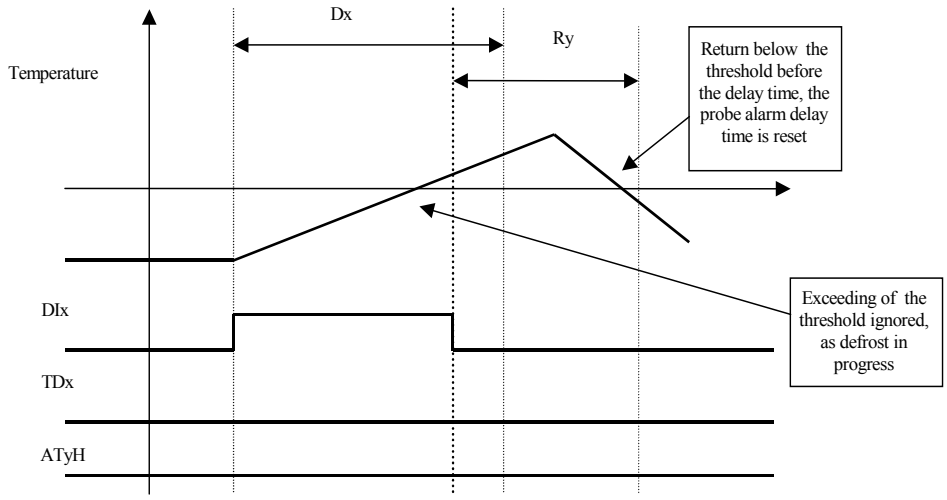
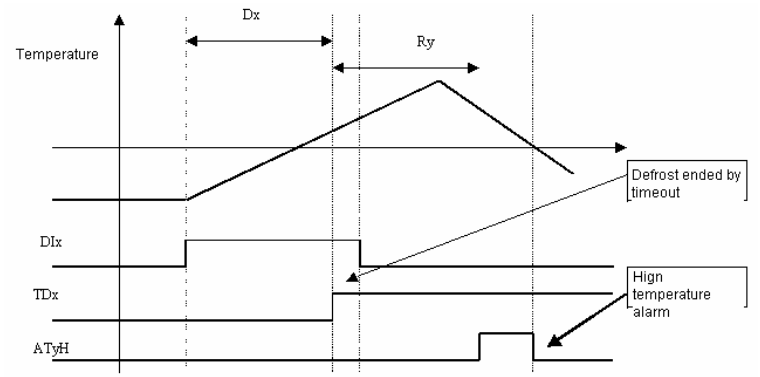


Diagram with defrost timeout and alarm:



If a probe alarm delay has also been set (R 1/2/3/4), the high/low temperature alarm will be disabled for the time D(x)+R(y).

4.2.4 Digital input for disabling the general alarms

When the input is closed, the alarms ATyH, ATyL, AFx, TDx are disabled.
If the parameter Dx=0, the alarms are disabled for an undetermined time, while the input is closed.
If Dx<>0, the alarms are disabled for the time Dx from when the contact is closed. The opening of the contact does not stop the disabling function, while the closing of the contact again resets the disable time.
The status of the digital input for disabling the alarms is monitored using the variable DIx.

Configuring a digital input to disable the general alarms:

1. Configure the presence of the digital inputs: digital inputs 1 and 2, always present; 5 and 6 present if MOD=1/3/5/7.
2. Set the parameter Ax=4.
3. Set the disable alarm time Dx.
4. No probe needs to be associated to the digital input.
5. The time DKx is not enabled.

4.2.5 Digital input for activating the cleaning cycle

When the digital input is closed, the alarms ATyH, ATyL, AFx, and TDx are disabled.
When the time Dx has elapsed, the controller sends the warning signal CT, and alarms remain disabled while the digital input not is closed. If the parameter Dx=0, the cleaning cycle timeout signal is sent immediately.
The physical status of the input is monitored using the variable DI(x).

Configuring a digital input to activate the cleaning cycle:

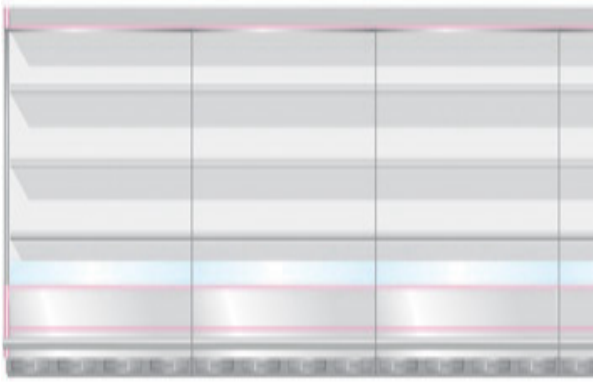
1. Configure the presence of the digital inputs: digital inputs 1 and 2, always present; 5 and 6 present if MOD=1/3/5/7.
2. Set the parameter Ax=5.
3. Set the cleaning cycle time Dx.
4. When the cleaning cycle is active, the status of the digital input associated with this function can be displayed on the supervisory system. The cleaning cycle status parameter is CT: 0= cleaning cycle active; 1= cleaning cycle timeout.
5. This differs from the defrost function in the following ways:
   - the timeout is accompanied by a signal only to the supervisory system;
   - the alarms are disabled during the cycle without having to associate any probe, and consequently on all those previously configured on the instrument;
   - the alarms are disabled until the contact is switched, and not only after D(x).

5. Practical examples

The following paragraphs describe some types oftypical applications and configurations solely as examples for the user,. as, dDue to the variety ofmany applications and the various different requirements, these cannot be copied entirely but rather used as a starting point.

5.1 Multiplexed cabinets

The instrument is used to monitor control a refrigerated cabinet on one line only, with four different evaporators featuring simultaneous defrosts .

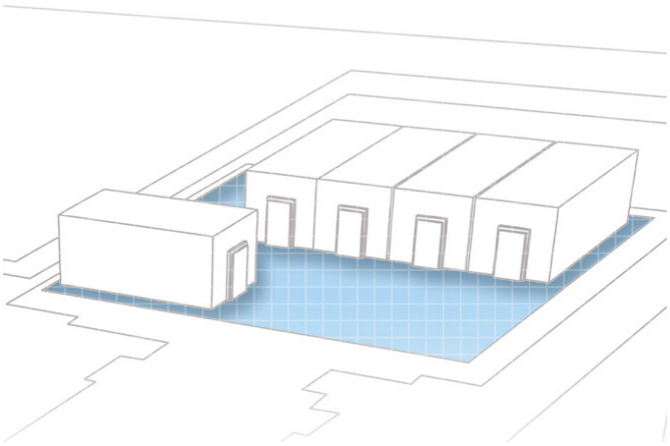


Configuration for the cabinet

Setting the I/O module to the control a multiplexed island:

1) Configure the type of the inputs using the parameter MOD, as required. As regards the cabinet, the appropriate configuration is 4 NTC and 2 optically-isolated DI **(MOD=0).** Declare which probes are present: #PROBES **(1/2/3/4)=15** and the desired temperature scale : **(CF = Centigrade/Fahrenheit).**
2) Apply probe 1 to the first unit to measure control the temperature of the cabinet.
   Set the high and low temperature thresholds above and below which the alarm signals are activated : **H(1) =…; L(1) = -…**
   To set a delay time if the probe exceeds the high/low thresholds, modify parameter R(1). Modify the probe offset by setting parameter O(1) and the probe reading variation by setting parameter DS(1), as required.
3) Apply probe 2 to the evaporator on the second unit to measure control the temperature of the cabinet.
   Set the high and low temperature thresholds above and below which the alarm signals are activated : **H(2) =…; L(2) =…**
   To set a delay time if the probe exceeds the high/low thresholds, modify parameter R(2).
   Modify the probe offset by setting parameter O(2) and the probe reading variation by setting parameter DS(2), as required
4) Apply probe 3 to the evaporator on the third unit to measure control the temperature of cabinet 3. Set the high and low temperature thresholds above and below which the alarm signals are activated : **H(3) =…; L(3) =…**
   To set a delay time if the probe exceeds the high/low thresholds, modify parameter R(3).
   Modify the probe offset by setting parameter O(3) and the probe reading variation by setting parameter DS(3), as required.
5) Apply probe 4 to the evaporator on the fourth unit to measure control the temperature of cabinet 4. Set the high and low temperature thresholds above and below which the alarm signals are activated : **H(4) =…; L(4) =…**
   To set a delay time if the probe exceeds the high/low thresholds, modify parameter R(4).
   Modify the probe offset by setting parameter O(4) and the probe reading variation by setting parameter DS(4), as required.
   It is very important to associate each probe with the same digital input (parameter N1/2/3/4) so as to correctly monitor the simultaneous defrost on all the evaporators. In this way, the high and low temperature alarms will be disabled during the defrost time [D(1)], for all the probes.
6) Connect digital input 1 to the evaporator defrost status signal.
   In general, when the defrost is in progress on the cabinet, the digital input of the I/O module is closed.
   Using the parameter **A1, (type of input 1),** configure the input for the function "**DEFROST=3".**
   Associate all the temperature probes with input(1), using the parameter **N(1/2/3/4)=1** to ensure that the probe alarms are disabled.
   Set the defrost duration time using the parameter **D(1)**, relating to this input.
   During this period, the high and low temperature alarms detected by the probes associated with this digital input, will be automatically disabled.
   If a probe alarm delay has also been set (R 1/2/3/4), the high/low temperature alarm will be disabled for the time D(1) + R(1/2/3/4).
   The mode for signalling the end of the defrost can be selected: for the signal to the supervisor only, set the parameter **MTD(1)= 0 (signal only)**; to activate an alarm at the end of the defrost, select the parameter **MTD(1)= 1 (signal + alarm)**.
   The alarm maintenance time, in seconds, for digital input 1: **DK(1),** is not considered even if set, as for this function the signal/alarm is automatically reset at the start of the following defrost.
7) Connect digital input 2 to the compressor or solenoid status signal. In general, when the chiller is in operation, the digital input is closed.
   Using the parameter **A2 (type of input 2),** configure the input for the function "**READ ONLY=0".**
   This function is used to display the status of this input on the supervisory system **(ON/OFF).**
   This function disables the delay times **D(2),** the maintenance time **DK(2),** and the alarms: **(general alarm AG and input 2 alarm AF2).** It is in fact a read-only function!
8) **Configure the relay for use as an auxiliary (from the supervisor):**
   Set the parameter **OUT=0** (relay not linked to the internal alarms). The relay can now be used to activate/deactivate a remote alarm, the fans, a siren, a light, or only for the alarms enabled by the matrices LINK1 and LINK2.
   This function is linked to the parameter **RELÈ ON/OFF** (relay energised/de-energised at rest): = **0 normally open**; =**1 normally closed.**
   The status of the relay can also be decided when starting the instrument, depending on the remote that will be connected:
   RELÈ PWUP=0 (Open) ; RELÈ PWUP=1 (Closed).

5.2 Cold rooms



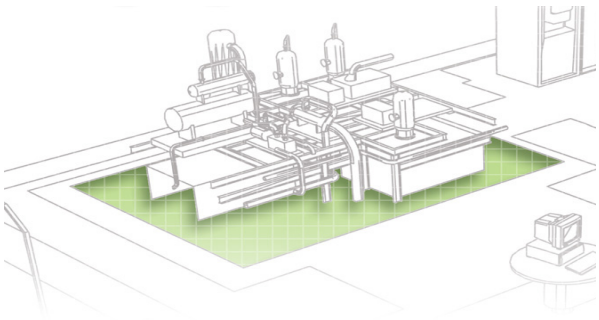
The instrument can be used to monitorcontrol a cold room, and in particular the temperature inside the cold room, the correct operation during the defrost of the circuit, the status of the fans and the status of an auxiliary function, such as the opening of the door.

Configuration for cold rooms

To set the I/O module to monitor control the operation of a cold room, carefully observe the following instructions:

1) Configure the type of the inputs using the parameter MOD, as required. As regards the cold room, the most suitable configuration is 2 NTC, 2 DI and 2 optically-isolated DI (**MOD=1**). Declare which probes are present: **#PROBES (3/4)=12** and the desired temperature scale: **(CF = Centigrade/Fahrenheit)**
2) Apply probe 3 to the thermostat sensor to monitor control the inside temperature. Set the high and low temperature thresholds above and below which the alarm signals are activated : **H(3) =…; L(3) = -…**
   To set a delay time if the probe exceeds the high/low thresholds, modify parameter R(3).
   Modify the probe offset by setting parameter O(3) and the probe reading variation by setting parameter DS(3), as required.
3) Apply probe 4 to the evaporator on the cold room to measure the temperature before, during and after defrosting.
   Set the high and low temperature thresholds above and below which the alarm signals are activated : **H(4) =…; L(4) = -…**
   To set a delay time if the probe exceeds the high/low thresholds, modify parameter R(4).
   Modify the probe offset by setting parameter O(4) and the probe reading variation by setting parameter DS(4), as required.
   It is very important to associate this probe with a digital input (parameter N1/2/3/4) so as to monitor the progress of this function. In this way, the high and low temperature alarms will be disabled during the defrost for this probe.
4) Connect digital input 1 to the evaporator defrost status signal. In general, when the defrost is in progress in the cold room, the digital input of the I/O module is closed. Using the parameter **A1 (type of input 1),** configure the input for the function "**DEFROST=3".**
   Associate a temperature probe **(probe 4)** with input (1) using the parameter **N(4)=1** to disable the alarms for that probe. Set the defrost duration time using the parameter **D(1)** relating to this input. During this period, the high and low temperature alarms detected by probe 4 associated with this digital input, will be automatically disabled. **If a probe 4 alarm delay has also been set (R4), the high/low temperature alarm will be disabled for the time D(1)+R(4).**
   The mode for signalling the end of the defrost can be selected: for the signal to the supervisor only, set the parameter **MTD(1)= 0 (signal only)**; to activate an alarm at the end of the defrost, select the parameter **MTD(1)= 1 (signal + alarm)**.
   The alarm maintenance time, in seconds, for digital input 1: DK(1), is not considered even if set, as for this function the signal/alarm is automatically reset at the start of the following defrost.
5) Connect digital input 2 to the compressor or of the solenoid status signal. In general, when the chiller is in operation the digital input is closed.
   Using the parameter **A2 (type of input 2),** configure the input for the function "**READ ONLY=0".** This function is used to display the status of this input on the supervisory system **(ON/OFF).**
   This function disables the delay times **D(2),** the maintenance time **DK(2),** and the alarms: **(general alarm AG and input 2 alarm AF2).** It is in fact a read-only function!
6) Connect digital input 5 to the fan start and stop contact. In general, when the fans are on, the digital input on the I/O module is closed.
   Using the parameter **A5 (type of input 5),** configure the input for the function "**READ ONLY=0".**
   This function is used to display the status of this input on the supervisory system **(ON/OFF).**
   This function disables the delay times **D(5),** the maintenance time **DK(5),** and the alarms: **(general alarm AG and alarm input 5 AF5).** It is in fact a read-only function!
7) Connect digital input 6 to the auxiliary contact (switch), for example the door to the cold room .
   Using the parameter **A6 (type of input 6),** configure the input for the function "**READ ONLY=0".**
   This function is used to display the status of this input on the supervisory system **(ON/OFF).** This function disables the delay times **D(6),** the maintenance time **DK(6),** and the alarms: **(general and input 6).** It is in fact a read-only function!
   ALTERNATIVELY
   connect digital input 6 to the auxiliary contact of the cold room or the door, configuring it as an **"ALARM WITH INPUT OPEN" (A6=1) or "ALARM WITH INPUT CLOSED" (A6=2).**
   This function is used to display the status of this input on the supervisory system **(ON/OFF)**, and can activate an alarm.
   An alarm delay time can be set, **D(6),** which starts after the opening (if A6=1) or the closing (if A6=2) of the digital input.
   The parameter **DK(6)**, on the other hand, is the alarm maintenance time, that is, the period that the alarm remains on for when the input returns to the initial status (closed A6=1; open A6=2).
8) **Configuring the relay for use as an auxiliary (from the supervisor):**
   Set the parameter OUT=0 (relay not linked to the internal alarms). The relay can now be used to activate/deactivate a remote alarm, the fans, a siren, a light or alternatively only for the alarms enabled by the matrices LINK1 and LINK2.
   This function is linked to the parameter **RELÈ ON/OFF** (relay energised/de-energised at rest): **= 0 normally open**; **=1 normally closed**
   The status of the relay can also be decided when starting the instrument, depending on the remote that will be connected:
   RELÈ PWUP=0 (Open) ; RELÈ PWUP=1 (Closed).

5.3 Compressor Racks



Configuration for compressor packs.

To set the I/O module as an instrument for monitoring controlling the operation of a compressor pRack:

1) Configure the type of the inputs using the parameter MOD, as required. As regards the compressor prack, the most suitable configuration is 2 probes (4…20 mA), 2 DI with voltage free contacts and 2 optically-isolated DI **(MOD=3).** Defineclare which probes are present: #PROBES **(3/4)=12** and the desired temperature scale : **(CF = Centigrade/Fahrenheit).**

2) Apply the pressure probe 3 to the intake of the compressors connected in parallel, so as to control the suction pressure.
Set the maximum **(V3H)** and minimum end scale values **(V3L)**, in reference to the technical specifications of the current or pressure probes connected to the instrument. To set a delay time if the probe exceeds the high/low thresholds, modify parameter **R(3).**
Modify the probe offset by setting parameter **O (3)** and the probe reading variation by setting parameter **DS(3)**, as required.

3) Apply probe 4 to the outlet of the compressors connected in parallel, so as to control the delivery pressure.
Set the maximum **(V4H)** and minimum end scale values **(V4L)**, in reference to the technical specifications of the current or pressure probes connected to the instrument. To set a delay time if the probe exceeds the high/low thresholds, modify parameter R(4).
Modify the probe offset by setting parameter O(4) and the probe reading variation by setting parameter DS(4), as required.
For this type of application, the association of the probes with the digital inputs has no meaning.

4) Connect digital input 1 to the compressor 1 or solenoid 1 status signal. In general, when in operation, the digital input is closed.
Using the parameter **A1 (type of input 1),** configure the input for the function "**READ ONLY=0".** This function is used to display the status of this input on the supervisory system **(ON/OFF).** This function disables the delay times **D(1),** the maintenance time **DK(1),** and the alarms: **(general alarm AG and input 1 alarm AF1).** It is in fact a read-only function!

5) Connect digital input 2 to the compressor 2 or solenoid 2 status signal.
In general, when in operation, the digital input is closed.
Using the parameter **A2 (type of input 2),** configure the input for the function "**READ ONLY=0".** This function is used to display the status of this input on the supervisory system **(ON/OFF).**
This function disables the delay times **D(2),** the maintenance time **DK(2),** and the alarms: **(general alarm AG and input 2 alarm AF2).** It is in fact a read-only function!

6) Connect digital input 5 to the compressor 3 or of the solenoid 3 status signal.
In general, when in operation, the digital input is closed.
Using the parameter **A5 (type of input 5),** configure the input for the function "**READ ONLY=0".** This function is used to display the status of this input on the supervisory system **(ON/OFF).**
This function disables the delay times **D(5),** the maintenance time **DK(5),** and the alarms: **(general alarm AG and input 5 alarm AF5).** It is in fact a read-only function!

7) Connect digital input 6 to the main electrical panel or an alarm device linked to the compressor pack.
Using the parameter **A6 (type of input 6),** configure the input for the function "**ALARM WITH INPUT OPEN=1" or "ALARM WITH INPUT CLOSED=2".**
This function is used to display the status of this input on the supervisory system **(ON/OFF)**, as well as to activate an alarm. An alarm delay time or disable time can be set, **D(6),** which starts after the opening (if A6=1) or the closing (if A6=2) of the digital input.
The parameter **DK(6)**, on the other hand, is the alarm maintenance time, that is, the period that the alarm remains on for when the input returns to its initial status (closed A6=1; open A6=2).

8) Configuring the relay as linked to the internal alarms:
Set parameter **OUT=1** (relay linked to internal alarms). The relay will now be activated/deactivated by an alarm detected by the instrument.
This function is linked to the **MODE** parameter (relay energised/de-energised at rest): **= 1 normally energised; = 0 normally de-energised.**

6. Meaning of the LEDs

Green LED on = device correctly powered.
Green LED off = device not powered: check if the power supply is inserted correctly or if the instrument is properly connected to the cable.

Yellow LED on = data communication in progress.
Yellow LED off = no communication with the supervisory system.

Red LED off = no alarms present.
Red LED flashing = alarm active (probe fault, alarm thresholds exceeded, alarms, timeout).
Red LED on = alarms disabled

Buzzer = Activated according to settings of the corresponding parameters.

Other types of alarms are sent via RS 485 to the master (CAREL device or supervisory software).

7. Control parameter database

Normal analogue	Read/Write	Description	Management
1	R/W	[H1] high alarm threshold for probe 1	
2	R/W	[L1] low alarm threshold for probe 1	
3	R/W	[H2] high alarm threshold for probe 2	
4	R/W	[L2] low alarm threshold for probe 2	
5	R/W	[H3] high alarm threshold for probe 3	
6	R/W	[L3] low alarm threshold for probe 3	
7	R/W	[H4] high alarm threshold for probe 4	
8	R/W	[L4] low alarm threshold for probe 4	
9	R/W	[V3L] low value probe 3 (only valid for models 2/3/4/5)	
10	R/W	[V3H] high value probe 3 (only valid for models 2/3/4/5)	
11	R/W	[V4L] low value probe 4 (only valid for models 2/3/4/5)	
12	R/W	[V4H] high value probe 4 (only valid for models 2/3/4/5)	
13	R/W	[O1] offset for probe 1	
14	R/W	[O2] offset for probe 2	
15	R/W	[O3] offset for probe 3	
16	R/W	[O4] offset for probe 4	
17	R/W	[DS1] reading variation for probe 1	
18	R/W	[DS2] reading variation for probe 2	
19	R/W	[DS3] reading variation for probe 3	
20	R/W	[DS4] reading variation for probe 4	

Status analogue	Read/write	Description	Management
21	R	[S1] value probe 1	
22	R	[S2] value probe 2	
23	R	[S3] value probe 3	
24	R	[S4] value probe 4	

Normal integer	Read/write	Description	Management
1	R/W	[MOD] type of instrument	
2	R/W	[#PROBES] number of probes present	
3	R/W	[A1] type of input 1	
4	R/W	[A2] type of input 2	
5	R/W	[A3] type of input 3	Not man.
6	R/W	[A4] type of input 4	Not man.
7	R/W	[A5] type of input 5	
8	R/W	[A6] type of input 6	
9	R/W	[D1] seconds, alarm delay, defrost timeout, alarm disable time or maximum cleaning cycle time for input 1	
10	R/W	[D2] seconds, alarm delay, defrost timeout, alarm disable time or maximum cleaning cycle time for input 2	
11	R/W	[D3] seconds, alarm delay, defrost timeout, alarm disable time or maximum cleaning cycle time for input 3	Not man.
12	R/W	[D4] seconds, alarm delay, defrost timeout, alarm disable time or maximum cleaning cycle time for input 4	Not man.
13	R/W	[D5] seconds, alarm delay, defrost timeout, alarm disable time or maximum cleaning cycle time for input 5	
14	R/W	[D6] seconds, alarm delay, defrost timeout, alarm disable time or maximum cleaning cycle time for input 6	
15	R/W	[N1] probe 1 associated with input x	
16	R/W	[R1] alarm delay time, in minutes, for probe 1	
17	R/W	[F1] filter for probe 1	
18	R/W	[N2] probe 2 associated with input x	
19	R/W	[R2] alarm delay time, in minutes, for probe 2	
20	R/W	[F2] filter for probe 2	
21	R/W	[N3] probe 3 associated with input x	
22	R/W	[R3] alarm delay time, in minutes, for probe 3	
23	R/W	[F3] filter for probe 3	
24	R/W	[N4] probe 4 associated with input x	
25	R/W	[R4] alarm delay time, in minutes, for probe 4	
26	R/W	[F4] filter for probe 4	

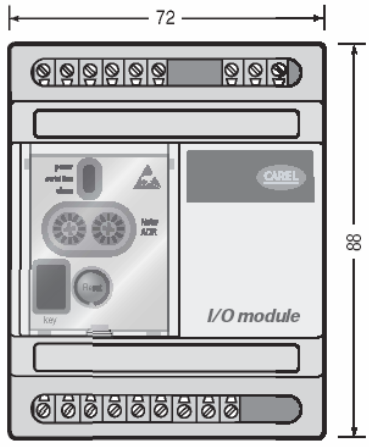
27	R/W	[OUT] selection of the RELAY operating modes	
28	R/W	[MODE] selection of the status of the alarm relay at stable state	
29	R/W	[LINK1] matrix for assigning the alarms to the outputs (1/2)	
30	R/W	[LINK2] matrix for assigning the alarms to the outputs (1/2)	
31	R/W	[OUTL1] matrix of output status according to the alarms (1/2)	
32	R/W	[OUTL2] matrix of output status according to the alarms (1/2)	
33	R/W	[PRIORITY] output priority in the event of multiple alarms	
34	R/W	[ALCOMM] output status in the event of communication alarms	
35	R/W	[DK1] alarm delay time, in seconds, for digital input 1	
36	R/W	[DK2] alarm delay time, in seconds, for digital input 2	
37	R/W	[DK3] alarm delay time, in seconds, for digital input 3	Not man.
38	R/W	[DK4] alarm delay time, in seconds, for digital input 4	Not man.
39	R/W	[DK5] alarm delay time, in seconds, for digital input 5	
40	R/W	[DK6] alarm delay time, in seconds, for digital input 6	

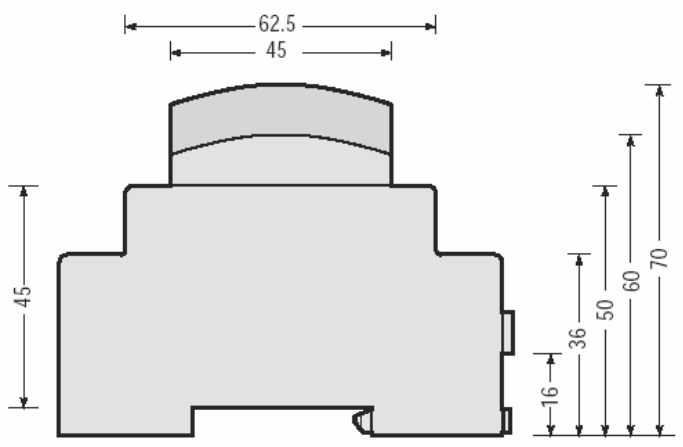
Normal digital	Read/Write	Description	Management
1	R/W	[BUZ] selection of the buzzer operating modes	
2	R/W	[CF] Centigrade / Fahrenheit selection	
3	R/W	[MTD1] defrost timeout mode input 1	
4	R/W	[MTD2] defrost timeout mode input 2	
5	R/W	[MTD3] defrost timeout mode input 3	Not man.
6	R/W	[MTD4] defrost timeout mode input 4	Not man.
7	R/W	[MTD5] defrost timeout mode input 5	
8	R/W	[MTD6] defrost timeout mode input 6	
9	R/W	[RELÈ 1 PWUP] output	
10	R/W	[RELÈ 2 PWUP] output	Not man.
11	R/W	[RELÈ 3 PWUP] output	Not man.
12	R/W	[RELÈ 4 PWUP] output	Not man.
13	R/W	[BUZZ-OUT] output	

Status digital	Read/Write	Description	Management
14	R	[DI1] status of input 1	
15	R	[DI2] status of input 2	
16	R	[DI3] status of input 3	Not man.
17	R	[DI4] status of input 4	Not man.
18	R	[DI5] status of input 5 (only valid if selected instead of probe 1)	
19	R	[DI6] status of input 6 (only valid if selected instead of probe 2)	
20	R	[AG] general alarm	
21	R/W	[AT1H] high alarm, probe 1	
22	R/W	[AT1L] low alarm, probe 1	
23	R/W	[AT2H] high alarm, probe 2	
24	R/W	[AT2L] low alarm, probe 2	
25	R/W	[AT3H] high alarm, probe 3	
26	R/W	[AT3L] low alarm, probe 3	
27	R/W	[AT4H] high alarm, probe 4	
28	R/W	[AT4L] low alarm, probe 4	
29	R/W	[AF1] input 1 alarm	
30	R/W	[AF2] input 2 alarm	
31	R/W	[AF3] input 3 alarm	Not man.
32	R/W	[AF4] input 4 alarm	Not man.
33	R/W	[AF5] input 5 alarm	
34	R/W	[AF6] input 6 alarm	

Status digital	Read/Write	Description	Management
35	R	[AS1] probe 1 fault alarm	
36	R	[AS2] probe 2 fault alarm	
37	R	[AS3] probe 3 fault alarm	
38	R	[AS4] probe 4 fault alarm	
39	R	[AHW] hardware alarm (signal)	
40	R/W	[TD1] defrost timeout input 1 (signal or alarm)	
41	R/W	[TD2] defrost timeout input 2 (signal or alarm)	
42	R/W	[TD3] defrost timeout input 3 (signal or alarm)	Not man.
43	R/W	[TD4] defrost timeout input 4 (signal or alarm)	Not man.
44	R/W	[TD5] defrost timeout input 5 (signal or alarm)	
45	R/W	[TD6] defrost timeout input 6 (signal or alarm)	
46	R/W	[CT] cleaning cycle timeout (signal)	
47	R	[BUZZ] status	
48	R	[RELE 1] status	
49	R	[RELE 2] status	Not man.
50	R	[RELE 3] status	Not man.
51	R	[RELE 4] status	Not man.
52	R/W	BUZZER[ON/OFF] from serial	
53	R/W	RELE 1 [ON/OFF] from serial	
54	R/W	RELE 2 [ON/OFF] from serial	Not man.
55	R/W	RELE 3 [ON/OFF] from serial	Not man.
56	R/W	RELE 4 [ON/OFF] from serial	Not man.

8. Dimensions





9. Technical specifications

Power supply	model: IOM**230**: 230 Vac +10 to -10% 50/60 Hz; model: IOM**115**: 115 Vac +10 to -10% 50/60 Hz; model: IOM**024**: 24 Vac +10 to -10% 50/60 Hz;
Power input	4 VA
Rated power	2.7 VA
Digital inputs	DI1,DI2 voltage contacts: 230 Vac for model: IOM**230** 115 Vac for model: IOM**115** 24 Vac for model: IOM**024**; maximum distance <10 m DI5,DI6 (on S1,S2): voltage free contacts (10 mA) maximum distance <10 m
Analogue inputs	S1, S2, S3, S4: CAREL standard NTC 10 k.at 25 °C (range of measurement -50T90 °C). maximum distance <10 m S3,S4: 4 to 20 mA probe or 0 to 5 V rat. probe maximum distance <10 m
Analogue input resolution	NTC probe: 0.1 °C 4 to 20 mA probe: maximum resolution in relation to set range, 10 bit. 0 to 5 V rat. probe maximum resolution in relation to set range, 10 bit.
Analogue input precision (excluding probe error)	NTC error: ± 0.5 °C range -30T60 °C; ± 1.5 °C range -50T-30/ 60T90 °C 4 to 20 mA error: ± 1 % full scale in specified range 5 V rat. error: ± 0.5 % full scale in specified range
Relay output	2000 VA, 250 Vac UL873: 8 A resistive, 2 A FLA, 12 A LRA EN 60730-1: 2 A resistive, 2 A inductive cos.φ=0.4, 2(2) A
Power supplì to additional probes S3, S4	S3, S4 as NTC Vcc=14.64 V S3, S4 as 5 V rat.: Vcc=5.02 V S3, S4 as 4 to 20 mA: Vcc=14.64 V
RESET button	Mutes the internal buzzer activated in the event of no serial communication for more than 5 minutes.
Connections	Screw terminals for power supply, digital inputs, analogue inputs, relay output, power supply output to probes: max cross-section of the wires 1.5 mm^2. Removable connector terminal for LAN 485 connection: max. cross-section of wires 1.5 mm^2, max. number of connections/disconnections 50 (use shielded cable with shield connected to GND). Vertical 4-pin connector for programming key: max. number of connections/disconnections 10.
Assembly	In electrical panel on standard DIN rail.
Display / configuration	Read and write parameters via LAN 485 (from CAREL devices or supervisory software). Configuration is also possible using a programming key, code: PSOPZKEY00
Operatine conditions	Operating temperature: 0T50 °C Operating humidity: 20 to 80% rH non condensing
Storage conditions	Storage temperature: -20 T70 °C Storage humidity: 0 to 80% rH non condensing
Environmental pollution:	normal
Category of resistance to fire and heat	class D (UL94-V0)
PTI of insulating material	≥250 V
Classification accordino to protection against electric shock	To be integrated into class I and II devices
Software class and structure	A

Warning: the adjustments on the front panel should be carried out with the operator "earthed", to avoid creating electrostatic discharges.

CAREL reserves the right to make modifications or changes to its products without prior notice.

CAREL

Technology & Evolution

CAREL S.p.A.
Via dell'Industria, 11 - 35020 Brugine - Padova (Italy)
Tel. (+39) 049.9716611 Fax (+39) 049.9716600
http://www.carek.com - e-mail: carel@carel.com

Agenzia / *Agency:*

Cod.: +030220240 rel. 1.1 del 20/06/05