

# CONTENTS

<b>General features</b>	<b>1</b>
Models available	1
Main features of the Infrared Series	2
<b>Front panel and buttons</b>	<b>4</b>
LED display – Indicators	4
Keypad	5
<b>Installation</b>	<b>6</b>
Standard configuration	6
Cautions	7
Selection of the main working parameters – Other important parameters	8
<b>List of the working parameters to be checked before starting the unit</b>	<b>9</b>
<b>How to modify the working parameters</b>	<b>10</b>
Gaining access – How to modify the parameters	10
How to exit the procedure – How to exit the procedure without memorizing the modified data	10
<b>Reset procedure</b>	<b>11</b>
<b>Remote control unit</b>	<b>12</b>
Technical specifications – Keypad description	12
Buttons used to activate/deactivate the use of the remote control unit	12
Buttons used to modify the main parameters (directly accessible buttons)	13
Buttons for the remote control of the IR instruments	13
<b>How to use the remote control unit</b>	<b>13</b>
Access without code	13
Access with code	14
<b>Further information</b>	<b>15</b>
Configuration parameters – The password	15
/ = parameters for the management of the temperature sensors	16
r = parameters for the temperature regulation	18
c = parameters for the compressor management	19
d = parameters for the defrost management	21
A = parameters for the alarm control	24
F = parameters for controlling evaporator fans	28
<b>Summary diagram of the evaporator fan operation</b>	<b>29</b>
<b>Notes for the new release</b>	<b>31</b>
<b>Wiring diagrams</b>	<b>34</b>
Wiring diagram for multiple units – IR32 panel mounting connections	34
<b>Operating states of the equipment</b>	<b>38</b>
Sequence of main phases	38
<b>Alarms and troubleshooting</b>	<b>39</b>
What to do if the IR32S, IRDRSE/S0 fails to work	41
What to do if the IR32Y fails to work	41
What to do if the IR32P or IR32C, IRDRC fails to work	43
<b>Technical characteristics</b>	<b>44</b>
<b>Temperature/resistance ratios for NTC thermistors.</b>	<b>48</b>
<b>IR32 dimensions</b>	<b>50</b>
<b>Code numbers for ordering controls and accessories</b>	<b>51</b>
<b>IR96: microprocessor-based freezer controller</b>	<b>53</b>
<b>New functions</b>	<b>53</b>
<b>Technical features – Connections</b>	<b>55</b>
<b>Ir96: keys functioning</b>	<b>56</b>
<b>Functioning</b>	<b>56</b>
<b>IR96: parameters</b>	<b>58</b>
Parameters modification	58
New-set values memorisation	58
<b>List of parameters</b>	<b>59</b>
<b>Description of particular parameters and performances</b>	<b>61</b>
Memorisation of minimum/maximum temperature	61
Functioning of the relay 4	61
Type of sensor – Digital Inputs Configuration	61
<b>IR96: alarms</b>	<b>62</b>
<b>Dimensions</b>	<b>62</b>

# GENERAL FEATURES

## Models available

The electronic controllers of the Infrared series have been specifically designed for the control and regulation of refrigeration units. These new instruments are microprocessor based and come complete with a LED display. Carel offers a wide range of models to ensure that the exact instrument is available for your application at the most competitive price. In brief, here is a list of the main models available:

- IR32M** An electronic digital thermometer, capable of displaying the temperature from one or two sensors. It is the ideal solution for applications requiring temperature display. It is possible to display the temperature of either the first sensor or the second one alternatively by simply connecting a switch to the thermometer. Additionally, the modification of a specific parameter will allow you to get the weighted average of the two sensors. For further information see the parameter 'r4' (virtual sensor).
- IR32S** The ideal solution for regulation of '*static*' refrigeration units (without evaporator fans) working at *normal* temperature ranges (above 0°C). IR32S works both as a thermometer – it displays the temperature – and as an electronic thermostat: it activates the compressor (or the solenoid valve in piped systems) to keep the temperature at the set value. You can select the time-interval between successive defrosting cycles as well as their duration. IR32S can be used **simply as a thermostat**. In this case it proves to be extremely useful in cooling or heating applications where it activates compressors, heaters, etc. IR32S, in fact, can work either in the 'Direct' (Cooling) or 'Reverse' (Heating) functioning mode, by simply selecting the dedicated parameter (see 'r3' below) or acting on the digital input. The operating temperature range is 40/90°C (-40 /130 °C with PTC sensor).
- IRDRSE**
- IRDRS0**
- IR32Y** Specifically designed for the control and regulation of '*static*' refrigeration units working at *low* temperature ranges (below 0°C), requiring '*active*' defrost (that is, electrical or hot gas defrost). IR32Y, in fact, works not only as a thermometer and a thermostat at the same time, but it also controls defrost. You can select the time-interval between successive defrost cycles as well as their duration. Defrosting will be stopped when the defrost end temperature is reached (it is necessary to connect a defrost sensor to the evaporator). A timed fail safe is included as standard in the event that the defrost end temperature is not reached. A parameter will allow you to select the defrost end mode most suitable to your application, i.e. time/temperature or time/time.
- IR32P** Specifically designed for the control and regulation of *ventilated* refrigeration units (with evaporator fan) working at *low* temperatures. It features the same functions described above for IR32Y plus control of the evaporator fans, thus optimizing their ON/OFF routines in relation to the specific characteristics of your unit. IR32P has no relays; therefore it is necessary to add a power card, either the S90RDPW200 or the S90OEM4PWR. The first card has 3 relays for the control of compressor, fan and defrosting. The compressor relay can control units up to 1 Hp at 240Vac. The second card has 4 relays; it allows you to enjoy the benefits of the 'Multifunction output' to operate an auxiliary output (cold room light, de-misting fan, etc.) or to send a remote alarm signal. Both cards can be powered with either 24 Vac or 240Vac.
- IR32C** It is a complete solution for the control and the management of *ventilated* units working at *low* temperatures. It performs all the functions of the IR32P model complete with the S90OEM4PWR card, **with everything packed into one case**. Thanks to the very latest technology, we have achieved a unique product that integrates the 4 relays (2000 VA) into a case just 74mm wide, 72mm deep and 33mm height, without sacrificing performance and reliability.
- IRDRC**
- IR96** Ir96 is a microprocessor based controller designed for the management of freezer with gravity or forced-air evaporators. It has 5 relay outputs available to control all the main actuators: compressor (directly up to 1Hp single-phase), evaporator fans and defrosting. The fourth relay allows remote signalling of any malfunctioning (high temperature, faulty sensors,...). The fifth relay can be used to control the unit lights or other auxiliary functions. Two programmable digital inputs allow innovative performances: automatic alarm management, real time defrosting, management of lights subjected to the door switch.

## Main features of the Infrared series

### ***Power supply***

All the instruments of the Infrared series – except IR32P – come complete with **WIDE RANGE** power supply, allowing you to power your units with either direct or alternating current, from 12 to 24Volt. The 'S' model is also available with a UNIVERSAL or a HIGH range power supply that allow to extend the power supply range: from 24 to 240V or from 110 to 240V respectively. All Infrared instruments fit automatically to the voltage supplied.

With the UNIVERSAL and HIGH range power supply **any external transformer to change from 24Vac to 240Vac or from 110 to 240V is not required**. Such features simplify your work and provide the maximum reliability as the controller is capable of **adjusting perfectly any fluctuation of supply**

IR32P is powered by means of the power card and can be supplied either with 24Vac or 240Vac.

### ***Soft touch keypad***

It is made of silicone for both functional reasons (especially when pressing the keys) and aesthetic reasons (it matches the new lines and structures of the latest refrigeration units). The Infrared series is the result of specific ergonomic choices designed to simplify all procedures. Setting or modifying a parameter, for example, now requires the touch of just **one** button.

### ***LED Display***

The LED display shows **two and half digits'** ranging from -40 to +90°C (-40/+130 with PTC sensor); the temperature value appears with one decimal point (you can omit it by acting on the dedicated parameter) ranging from -19.9 to +19.9. In addition there are up to 4 LED indicators (depending on the model) that light up when the output they represent is ON. They will flash in case of external problems relative to the output (see Multifunction input) or during active/current procedures.

### ***Buzzer***

All controllers come complete with an alarm buzzer upon request.

### ***Remote control***

To make it easier to set and display the working parameters, you can request your controller complete with the Infrared receiver. In this case you will be able to use the **remote control unit** to perform any operation. One remote control unit can be used for several IR32 instruments placed within the same room, with no interference since each controller can be identified by a specific access code.

### ***Duty setting***

A completely new function allows the compressor to run even if the regulation sensor is damaged. In case of short-circuit or open-circuit sensor, the compressor is instructed to start on the basis of time-intervals (minutes) selected through the 'duty setting' parameter ('c4') and to turn OFF every 15 minutes (fixed time-interval).

### ***Multifunction input***

The Infrared instruments come complete with a digital input that can be used in different ways, depending on the value given to the parameter 'A4'. The multifunction input can be used to enable/disable defrost, to act on serious alarm conditions requiring either the immediate (for example, high pressure alarms) or delayed lockout of the unit (low pressure alarms).

### ***Multifunction output***

Some models come complete with a fourth relay for the remote alarm signal or to drive auxiliary ON/OFF devices.

### ***Keypad protection***

The keypad and/or the remote control unit can be deactivated to prevent unauthorized personnel from modifying settings (especially when the controller is located in a public area).

### ***Continuous cycle***

This function operates the ON routines of the compressor for a 't' time selected through a dedicated parameter. This is particularly useful when a rapid fall of temperature is required.

### ***Serial connection***

All instruments can be equipped with a 'serial' card that can be fitted any time, even after the controller has been installed. The serial output allows you to connect the controller to a supervisory and/or telaintenance system.

In addition, Carel has developed 'MODi', a special program for the trouble-free configuration of the Infrared instruments via Personal Computer through a serial output. 'Modi' proves to be extremely useful especially when you need to configure several controllers.

### ***Virtual sensor***

All models equipped with two sensors (all except IR32S) may be adjusted to regulate the unit on the basis of the weighted average temperature or the two sensors. It is also possible to choose which sensor – either the first or the second one – will be the most important one for the determination of the final value. The value relative to the virtual sensor will appear on the display (see parameter '4').

### ***Dimensions***

Even the most sophisticated model has standard dimensions. Panel mountings usually require a 71x29mm drilling template thus making it extremely simple and fast to replace older controllers with new Infrared instruments.

### ***Protection index***

The O-RING inside the front panel of the instrument and the material of the keypad ensure a very high protection index (IP65). All controllers come complete with a flat gasket that contributes to increase the protection index of the panel housing the controller.

### ***Fastening the controller***

Fastening the controller is achieved using a small clamp made of plastic. No screws are required.

### ***Test-in-circuit***

The instruments of the Infrared series are the result of the most advanced SMD technology. All controllers are built using high quality components. Quality control includes a rigorous 'TEST-IN-CIRCUIT' on each single component to ensure that your controller is entirely reliable.

### ***NTC sensor***

The Infrared instruments have been designed to be connected to Carel NTC sensors since they give greater precision than different sensor models. However, special versions capable of receiving the most common types of PTC sensors are available upon request.

### ***Watch dog***

It is a special device that will protect the microprocessor of the controller even in the event of strong electromagnetic noises. In case of abnormal conditions the watch dog restores the initial functioning status of your unit. **Only Carel controllers come complete with this exclusive safety device.**

### ***Immunity against noise***

The INFRARED series complies with the EEC standards regarding the electromagnetic compatibility.



***& ISO9001 Approvals***

Quality and safety of the INFRARED series are assured by the ISO 9001 design and production certificate as well as the CE labelling.

# FRONT PANEL AND KEYS

Each Infrared controller comes complete with:

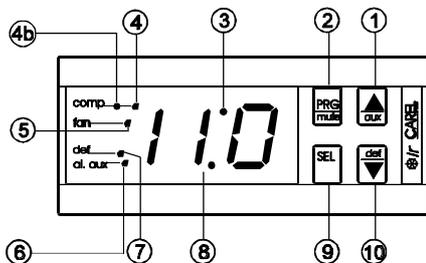
- **Wide Range** power supply
- display 2 and 1/2 digits
- temperature decimal point
- LEDs indicating the outputs status (the number of LEDs depends on the model)
- 4 keys for programming the unit (except IR32M);

The following options are also available upon request:

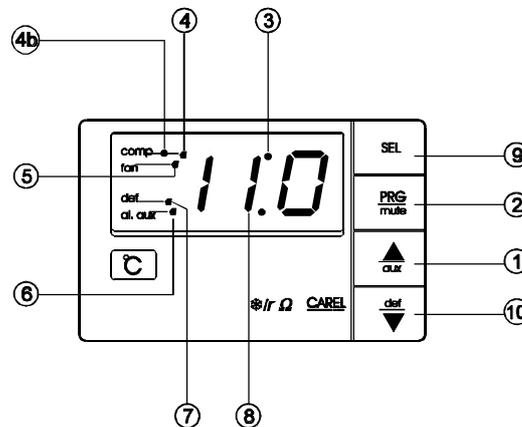
- **Universal** power supply (IR32S only)
- alarm buzzer
- infrared receiver for programming the unit via remote control
- serial card for connection to a supervisory and/or telemaintenance system such as Carel **MasterPlant** for the control and regulation of refrigeration units.

**Note:** you are requested to indicate the optional functions you need when placing the order. Only the serial card can be fitted after the controller has been installed. The IRDRSE and IR32SOU versions are not equipped with the serial output.

## Panel mounting version



## DIN-RAIL mounting version



## LED display

The display shows the temperature values (range: -40/90 or -40/+130 with PTC sensor). The temperature measured by the sensor is displayed to a 10th degree resolution ranging from -19.9 to +19.9. It is possible to exclude the decimal part of the degree by modifying the value of the /6 parameter. The display will show one of the following values/codes, depending on the function being performed.

- normal functioning: value measured by the ambient sensor;
- parameter selection stage: code of the parameter or its value;
- when an alarm condition occurs: the code of the alarm flashes alternatively to the value of the temperature.

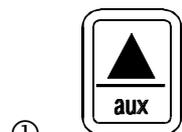
## Indicators

On the display there are some luminous indicators (see ③ to ⑧ above). They indicate:

- 3** current transmission via remote unit (the controller must be equipped with IR receiver);
- 4** compressor ON routine (IR32S, IR32Y, IR32C, IR32P e IRDRC);  
if the IR32S as been set to work as the 'T' model (see parameter H1=0), this LED indicates the status (ON or OFF), of the controlled output (compressor or other devices); in the IRDRSE/S0 models **comp** indication is replaced with the symbol ❄
- 4b** continuous cycle ON routine (all models except IR32M)
- 5** fan ON routine (models IR32C, IR32P and IRDRC);  
second sensor reading (model IR32M);  
REVERSE function mode (heating) - models IR32S - configured to work as thermostats (H1=0)
- 6** fourth relay active (IR32C and IR32P only)
- 7** defrost ON routine - models IR32S, IR32Y, IR32C and IR32P; in IRDRS, IRDRSE and IRDRS0 models the indication **def** is replaced with the symbol ❄
- 8** decimal point

## Keypad

The buttons on the front panel of the instrument allow you to perform the following functions:



- goes to the next parameter;
- increases the value of the parameter;  
*if pressed simultaneously to the button no. 10 (\*):*
- activates/deactivates the continuous cycle;  
*in models IR32C and IR32P complete with S90OEM4PWR:*
- activates/deactivates the auxiliary output



- silences the buzzer (if present);  
*if pressed for more than 5 seconds:*
- allows you to enter the 'F' parameters section (Frequent);  
*if pressed for more than 5 seconds together with the button no. 9:*
- allows you to enter the 'C' parameters section (Configuration);  
*if pressed when turning ON the instrument:*
- activates the RESET procedure



- displays and/or selects the SET-POINT;
- displays the value of the selected parameter;  
*if pressed for more than 5 seconds together with the button no. 2:*
- allows you to enter type 'C' parameters (Configuration);



- goes to the previous parameter;
- decreases the value of the parameter;  
*if pressed for more than 5 seconds:*
- activates a manual defrosting cycle (except version IR32S with parameter H1=0);  
*if pressed together with the button no. 1 (\*):*
- activates/deactivates the continuous cycle.

(\*) Warning: in order to activate a continuous cycle, press the button no. 10 first and then the button no. 1.

# INSTALLATION

## Standard configuration

All Infrared controllers are supplied ready to use. The values of the main working parameters have been factory-set on the basis of the most frequent and common requirements to meet the greatest number of application needs. It is always possible to change the preset values to personalize the unit according to your requirements. The notes below show the default values as well as the parameters that can be modified in relation to the type of refrigeration unit to be controlled (set-point, differential, etc.). We will also list all the parameters whose values should always be carefully checked before starting the unit.

The factory-set program makes your unit perform the following main functions:

**IR32M:** specifically programmed for the detection of two different temperature values. Connect a switch to the digital input to switch from the first to the second sensor. IR32M can be connected to either NTC or PTC sensors, as specified when placing the order.

**IR32S, IRDRSE and IRDRS0:** configured as a thermostat with DIRECT functioning mode (to control cooling), set-point = 0 °C and differential= 2 °C. The default values also include a high temperature alarm set at 10 °C above the set-point and a low temperature alarm set at -10 °C below the set-point. Should you change the default set-point (0 °C), the deviation values relative to the alarms will remain +/-10 degrees above and below the new set-point. When the continuous cycle functioning mode is ON, it will last 4 hours. After this cycle the temperature alarm will be delayed for two hours.

**IR32Y:** features the same functions as IR32S. In addition, it is programmed to control timed electric defrost (duration = 30 minutes) and 8-hour intervals between successive defrost cycles. The temperature displayed during the defrost cycle will be that acquired before the beginning of the cycle. At the end of the defrost cycle the evaporator will drain down for 2 minutes and the high temperature alarm will be inhibited for 1 hour.

**IR32P:** performs the same functions as IR32Y plus the control and regulation of the evaporator fans, these will be stopped when the compressor is off and during each defrost cycle. At the end of the drain-down time, the fans will remain off for 3 minutes; this time-delay is necessary to restore the normal temperature of the evaporator before re-starting the fans. In the IR32P models the defrost cycle will be interrupted as soon as the evaporator sensor measures a temperature corresponding to 4°C (defrost based on temperature). The defrost cycle, however, will last max. 30 minutes. If your controller is complete with the S90OEM4PWR card, the fourth relay will change state thus indicating an alarm condition.

**IR32C, IRDRC:** has the same configuration as IR32P plus the 4-relay card. For IR96, please see on page 36.

The following operations should be performed to ensure trouble-free operation of the Infrared unit:

- 1) installation;
- 2) connection to sensors, power supply and output contactors;
- 3) working parameters selection.

### **Installation**

- 1) insert the instrument into the previously adjusted hole.
- 2) fasten the instrument to the panel by means of the dedicated clamp.

### **Connection**

- 1) carry out all electrical connections following the instructions given in this guide (see "Caution" at the end of this chapter);
- 2) connect the sensors following the installation instructions carefully.

**NOTE:** all IR32 and IRDR instruments have been designed for NTC sensors. However, should your system comprise PTC sensors, ask for a PTC model when placing the order (it is available only for panel mounting IR32).

## Cautions

**Warning:** Before making any electrical installation read the instructions and take careful note of the diagrams on the following pages. Remember that all safety devices necessary to correct operation must be fitted in advance.

***Installation should be avoided in the following circumstances:***

1. Relative humidity greater than 85%.
2. Heavy vibration or shocks.
3. Exposure to continuous water sprays.
4. Exposure to corrosive or pollutant gases (e.g. sulphurous or ammoniacal fumes, saline mist, smoke) so as to avoid corrosion and oxidation.
5. Strong magnetic and/or radio interference (therefore installation of the equipment near transmitter aerials should be avoided).
6. Exposure of controls to direct solar radiation and other climatic influences.

***The following must be observed when connecting the controllers:***

1. Connecting a power supply of the incorrect voltage can seriously damage the system.
2. Use the correct type of connectors. Slacken each screw, insert the lead and then tighten the screws. Finally, tug gently to make sure there is a secure grip.
3. So as to avoid any possible electro-magnetic interference, separate as far as possible the signal leads from the sensors, and the digital inputs from the induction and power leads. **Do not place power leads and sensor leads in the same channels.** Furthermore, avoid placing sensor leads in the immediate vicinity of powered components (thermo-magnetic contacts or others).  
Keep the sensor leads as short as possible and avoid their sharing routes with power leads. As defrost sensors use only guaranteed IP67 sensors; place the sensors with the bulb upright in a position to assist drainage of any condensation which may occur. Note that thermistor temperature sensors (NTC or PTC) have no polarity and the terminals may therefore be connected either way.
4. Sensors can be located at distances of up to a maximum of 100 meters from the control. To connect sensors, leads with a minimum cross-section of 1 square millimetre should be used, and may be screened. In this case the screening should be connected to terminal 7 on the control; it should not be connected to earth or to any fitting at the other end of the screening (i.e. the end nearer to the sensor).
5. Whatever may be provided for through the IR32SER board, it is necessary to take care when earthing the system. In particular:
  - a) the secondary side of transformers supplying the equipment must not be earthed. If it should be necessary to connect to a transformer which has a secondary earth, an insulating transformer must be interposed. If necessary, Carel has available an insulating transformer with the following characteristics: 24Vac to 24Vac, 20VA, reference no. 0907651AXX.
  - b) if several controls are connected to the same transformer, care must be taken with polarity when wiring: terminals "4" of all controls must all be connected to the same terminal on the transformer; terminals "5" of the controls must all be connected to the other transformer terminal. See diagram for further details.
6. Avoid touching with the fingers the electronic components mounted on the boards, so as to avoid electrostatic discharges from the operator to the components, as these could become seriously damaged.

## Selection of the main working parameters

### Setting the main working parameters - Ambient set-point

The factory set-point is 0°C. Should you need a different value, more suitable to your specific application requirements, observe the following instructions:

- press  for 1 second: the set-point value will appear on the display;
- after a while, the value will begin to flash;
- increase or decrease the set-point using the  and/or  keys until you reach the requested value;
- press  again to confirm the new value;

### Setting the differential (hysteresis of the regulator)

The factory-set differential is 2°C. Should you need a different value, more suitable to your specific application requirements, operate as follows:

- press  for more than 5 seconds (in case of active alarm, silence the buzzer first);
- the code of the first modifiable parameter (/C) appears on the display;
- press either  or  until the code 'rd' appears;
- press  to display the relative value;
- increase or decrease the value using either the  or  buttons until you reach the requested value;
- press  again to confirm temporarily the new value and display the code of the parameter;
- press  to memorize the new value and exit the procedure.

## Other important parameters

### For all the models:

As indicated above, all Infrared instruments have been programmed to detect both the high and the low temperature alarm. In the event of abnormal conditions the internal buzzer (if present) will sound and the display will show the code of the alarm, that is 'HI' for high temperature, 'LO' for low temperature.

High/Low temperature alarms are generated by abnormal temperature conditions:

- **high temperature alarm:** the temperature measured by the ambient sensor is 'AH' degrees (or more) above the set-point: ambient temperature > set-point + AH;
- **low temperature alarm:** the temperature measured by the ambient sensor is 'AL' degrees (or more) below the set-point: ambient temperature < set point - AL.

On the basis of the default values, **AL = 10** and **AH = 10**.

In the event of a temperature alarm, the relative message will be delayed for 120 minutes (Ad = 120). After that the 'HI' or 'LO' alarm will be generated. No alarms will be generated if normal temperature conditions are restored within the Ad time-interval (the temperature should range within +/-10 degrees of the selected set point).

While installing the unit, the temperature might take more than 120 minutes (Ad time) to range between the set limits. Consequently the temperature alarm will be generated. In order to avoid this problem, we suggest - during this stage only - increasing the Ad time-interval, by increasing the value of the Ad parameter.

## Models IR32S, IRDRS, IRDRSE and IR32Y

### Configuration of the 'type' of instrument

The INFRARED series comprises two models - IR32S and IR32Y - with different operating modes. Both models feature the H1 parameter (see below) allowing you to select one of the two operating modes. IR32S, IRDRS and IRDRSE can operate either as a simple thermostat (H1=0, default value) or as a thermostat and defrost controller for static units operating at normal temperatures (the defrost cycle starts when the compressor stops, H1=1). For the second type of operating logic, it is necessary to configure the instrument and give H1 the value '1' (H1=1, see below 'How to modify the working parameters').

IR32Y controls and regulates both temperature and defrost for static units working at low temperature ranges. The defrost cycle can use the timed ('X' functioning mode) or temperature end (evaporator temperature, 'Y' functioning mode). In the second case the instrument requires another sensor - called the defrost end sensor - to be placed on the evaporator (when in the 'X' functioning mode, the input for the 'defrost end sensor' remains free). The 'H1' parameter allows you to select either the 'X' or 'Y' functioning logic. When H1=0 (default value), the instrument works in the 'X' logic (end of defrost based on time). If you want the end of defrost based on temperature, select the 'Y' logic, that is H1=1 (see below 'How to modify the working parameters').

### Defrost parameters

When using the Infrared unit to control defrost, check the following parameters before starting the unit:

#### Models IR32S, IRDRS and IRDRSE (with H1=1), IR32Y, IR32C, IRDRC and IR32P:

**dI: Time-interval between defrost cycles:** defrost cycles occur periodically, depending on the time-intervals (hours) set through the 'dI' parameter. When the time-interval is 0 (dI=0), the defrosting cycle is never carried out unless it is forced via keypad (manual defrost) or via the digital input (see A4 parameter). Temperature alarms are inhibited during each defrost. *Def.: 8 (hours)*

**dP: Maximum defrost time:** the dP parameter determines the maximum duration of the defrosting cycle (minutes). In the models without evaporator fan (IR32S with H1=1 and IR32Y with H1=0) this parameter indicates the actual duration of the defrost. *Def.: 30 minutes*

#### Models IR32Y, IR32C, IRDRC and IR32P

**d0: Type of defrost:** in the models equipped with defrost relay (IR32Y, IR32C and IR32P) 'd0' determines the type of defrost, that is: 0 = electrical defrosting, 1 = hot gas defrosting. *Def.: d0=0, electrical defrosting*

**dt: Defrosting end SET-POINT:** in the models equipped with defrost end sensor (IR32Y with H1=1, IR32C, IRDRC and IR32P) 'dt' allows you to set the defrost end temperature. Remember, however, that the maximum duration of the defrost cycle corresponds to the value (in minutes) given to the dP parameter. When the temperature measured by the defrost end sensor is higher than the defrost end set point set by the User, the defrost cycle will be omitted. *Def.: 4 °C*

## LIST OF THE WORKING PARAMETERS TO BE CHECKED BEFORE STARTING THE UNIT

Code	Parameter	Type	Min	Max	M.u.	Def
<i>PARAMETERS OF THE REGULATOR</i>						
rd	Control differential	F	0.1	+19.9	°C/°F	2
<i>DEFROST PARAMETERS</i>						
d0	Type of defrost (0=electrical, 1=hot gas)	C	0	1	flag	0
dI	Time-intervals between def. cycles	F	0	199	hours	8
dt	Defrost end set-point	F	-40	+199	°C/°F	4
<i>ALARM PARAMETERS</i>						
Ad	Temperature alarm delay	F	0	+199	min	120
<i>OTHERS FUNCTIONS</i>						
H1	Model [IR32Y: 0=type X; 1=type Y] [IR32S, IRDRSE/S0: 0=type T; 1=type S]	C	0	1	flag	0

# HOW TO MODIFY THE WORKING PARAMETERS

The microprocessor of the INFRARED instruments allows you to configure the functions of your controller according to the application requirements. To simplify this operation, we have divided the Working Parameters into two main groups:

- frequently used parameters (indicated as 'F' parameters in the tables below);
- configuration parameters ('C'), protected by a code or password to prevent unauthorised access to the data.

All parameters can be modified via keypad (except IR32M, with no keys) as well as via remote control unit or serial line. In order to modify the parameters via front panel keypad, observe the following instructions:

## Gaining access

### To gain access to the 'F' parameters:

- press the  for more than 5 seconds (in case of alarm condition, silence the buzzer first);
- the display shows the code of the first modifiable parameter (/C);

### To gain access to the 'C' parameters:

- press the  and  buttons simultaneously for more than 5 seconds;
- the display shows 00;
- press either the  or  button until '22' (the password) appears;
- confirm pressing ;
- the display shows the code of the first modifiable parameter, that is '/C'.

## How to modify the parameters

**Modifying parameters:** after having displayed the first parameter, either 'C' or 'F', follow these instructions:

- press either  or  until you reach the parameter whose value needs to be changed;
  - press  to display its current value;
  - increase or decrease its value using the  or  key until you reach the requested value;
  - press  to memorize **temporarily** the new value and display the code of the parameter again;
  - press again either  or  to go to the next parameter you want to change;
- then repeat the operations as indicated above, starting from "press .."

## How to exit the procedure

### How to memorize the new set values

- Press  to memorize the new values and exit the procedure.

**Important:** it is necessary to press  to memorize the new values. In case of power failure before  has been pressed, all modifications will be lost. Whenever you modify the value of a parameter, we strongly recommend writing it down in the dedicated column situated on page 46 of this guide (see column 'New value').

## How to exit the procedure without memorizing the modified data

- do not press any key for at least 60 seconds (TIME OUT). The instrument will return to its normal functioning mode.

# RESET PROCEDURE

In case of abnormal conditions – strong electromagnetic noises, for example – there might be errors when storing data. Consequently the unit might not work correctly. When the microprocessor identifies an error in the process of storing data, one of the following groups of letters will be displayed:

## EA, EB or EE

In order to restore normal working conditions, it is necessary to RESET the instrument (for the instruments having serial number < 5,000 see the note at the end of this guide). Please note that RESETTING the instrument is quite an unusual procedure, as well as the causes that can make it necessary. We would also like to point out that competitive controllers are not capable of dealing with such serious conditions which would normally lead to inevitable damages to the instrument. This is the reason why Carel have implemented the RESET function in all the controllers of the INFRARED series, thus providing safer and more reliable instruments, always capable of restoring their normal functions without any problem. Should this error message appear without any apparent reason, we strongly recommend inspecting the unit carefully and finding out the causes that generated it. (Please also find useful information at the end of the "Installation" chapter);

### To reset the controller:

- turn off the instrument;
- press  and, keeping it pressed, turn on the controller;
- the display shows " **C** ";
- after a few seconds, the instrument automatically allows you to gain access to the 'C' parameters where you can modify the default values according to your specific requirements. Also the /0 parameter will be displayed thus allowing you to select the type of sensor you want to use (NTC or PTC):

**Important: after the RESET procedure the values of each single parameter will be exactly the factory-set ones (default values). Any modification made before the reset procedure will therefore be lost.**

If you are using an instrument set to receive a PTC sensor, it is necessary to set the parameter /0=1 because the default value appearing after the reset procedure will be 0 (/0=0, NTC sensor).

For further information see the parameters relative to the sensors.

- if your instrument requires default values, normal working conditions will be restored by simply pressing .
- if the instrument requires a different configuration, it is necessary to modify all parameters whose values are different from the factory-settings.

After having modified the parameters, press  to exit the procedure and come back to the normal working mode.

**Note:** the reset procedure should be carried out by expert personnel only. We would like to point out, however, that such a procedure **does not damage** the instrument but it simply restores its factory-set configuration. As a result, you can resort to this in the event of confused or incorrect modification of the working parameters. In this case, in fact, resetting the controller will allow you to recover the factory-set configuration and restart the modification procedure, without any problem.

Should 'EE' persist, even after the above procedure has been carried out, press  until the message disappears. If you do not manage to clear the EE error, it will be necessary to replace the controller. If the EE message occurs frequently or disappears with difficulty, it is better to get in contact with the nearest service centre to check the precision of the instrument.

# REMOTE CONTROL UNIT

The IR32 Infrared instruments can be easily and quickly programmed by means of the remote control unit. Until now programming multi-function instruments dedicated to refrigeration was a very complex procedure. This is why Carel have enhanced the IR32 series with the remote control unit, used not only to program the controller from a remote position but also to allow the End-User to set the main working parameters easily and fast. **Today, modifying any parameter of an IR32 instrument is as easy as turning the volume of your TV 5or 6.** An interesting feature of the Infrared series is the possibility of selecting the access code (H3) for each controller to further simplify the use of the remote control. In fact, if your installation includes several controllers, selecting a specific access code will allow you to modify only the parameters of the unit the code refers to, without interfering with the other controllers. Changing the value of a parameter requires a special procedure (see 'START' button). Further safety is also provided by the 'H2' parameter that allows you to protect your system from unwilling or unauthorised access or modification of all set data.

## Technical specifications

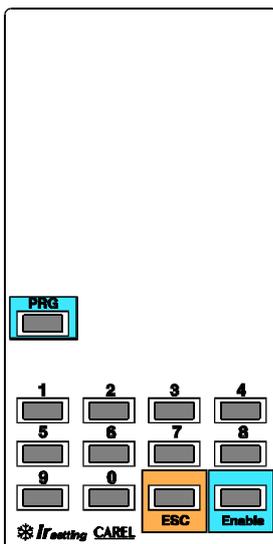
Power supply	no.2 1.5V alkaline batteries (type UM-4 AAA, IEC R03)
Case	plastic
Dimensions	60x160x18mm
Storage	-25/+70°C
Operating temperature	0/50°C
Transmission	Infrared
Weight	80g (without batteries)

## Keypad description

On the basis of the function performed, the buttons on the remote control unit, have been grouped as follows:

- buttons to activate/deactivate the use of the remote control unit;
- pre-programmed buttons for the modification of the values of the main parameters;
- buttons for the remote control of the IR32 keypad.

## Buttons used to activate/deactivate the use of the remote control unit



The buttons shown on the left are the remote control unit ON/OFF buttons. They also allow you to memorize any new parameter value.

**MEMO** 1) ends the programming procedure and memorizes the new values given to the parameters;

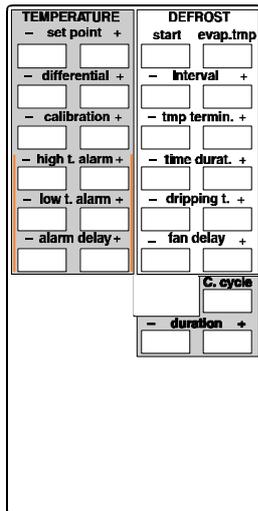
2) silences the buzzer when programming the IR controller via remote control unit;

**CANCEL** interrupts the transmission without memorizing the modifications;

**START** enables the use of the remote control unit;

**NUMERIC BUTTONS:** allow you to select the access code. We advise you to give each controller a specific access code, especially when your control panel includes several IR instruments or when all of them are exposed to the beam of the remote control unit. In this way you will be able to modify exactly the parameters you want to change, without interfering with the data of the other controllers. (See also 'How to use the remote control unit' and 'How to select the password').

## Buttons used to modify the main parameters (directly accessible buttons)

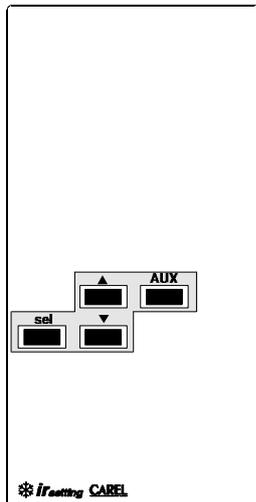


The most frequently used parameters are indicated on the remote control unit. They are grouped in three light-grey zones:

- temperature parameters;
- defrost parameters;
- continuous cycle parameters.

For the correct use of the buttons see **'How to use the remote control unit'** below.

## Buttons for the remote control of the IR instruments



The green zone of the remote control unit reproduces exactly the keypad of the IR instruments and allows you to perform the same operations, as you would perform if you were using the keypad.

Here are the main functions of the buttons:

SEL displays the value of the selected parameter;

- ▲ 1) goes to the next parameter;
- 2) increases the displayed data (parameters selection phase);

AUX activates/deactivates the auxiliary output;

- ▼ 1) goes to the previous parameter;
- 2) decreases the displayed value (parameters selection phase).

# HOW TO USE THE REMOTE CONTROL UNIT

## Access without code

### 1) How to enable the controller to receive the remote control unit transmission

- press the 'START' button to operate the remote control unit;
- the controller's LED indicator above the digits flashes and the first parameter - '/C' - is immediately displayed.

### 2) Modifying the main parameters

- press either the + or - button relative to the parameter you want to modify. The display will show the **code of the selected parameter** (see the codes of the parameters listed in the Instruction Sheet of the instrument). Press the button again to display the **value** associated to the selected parameter and
- press + to increase it;
- press - to decrease it.

The section including directly accessible buttons also comprises 3 buttons that activate/deactivate the function they represent:

#### **DEFROST SECTION:**

**START** activates/deactivates a manual defrost cycle;

**°C evap.** displays the temperature value measured by the defrost end sensor (if present) or the value measured by the second sensor (IR32M model).

**Important:** this function is always active. Consequently the temperature measured by the second sensor will be always displayed without having to press the 'START' button or select the access code (see point 5 below).

#### **CONTINUOUS CYCLE SECTION:**

**C.cont.** activates a continuous cycle;

- to exit the programming procedure see point 4 below.

### **3) How to modify the parameters not directly indicated by a specific button**

The other parameters - not directly associated to a specific button on the remote control unit - can be easily modified as follows:

- perform the same operations described in point 1 above until the first parameter '/C' appears on the display;

#### **3.1)**

- press either ▲ or ▼ until the display shows the parameter you want to modify;
- press SEL to display the value of the selected parameter;
- press either ▲ or ▼ to increase/decrease its value;
- press SEL to confirm temporarily the new value and display again the code of the parameter;
- to modify another parameter repeat the operations described above starting from point 3.1;
- exit the programming procedure as described in point 4 below.

### **4) How to exit the programming procedure**

- press PRG to exit and memorize all modifications;
- press CANCEL to exit without memorizing the previous modifications;
- do not press any button for at least 60 seconds (TIME OUT).  
In this way the previous modifications will be cancelled.

## **Access with code**

### **5) How to enable the controller to receive the remote control unit transmission**

- press 'START' to operate the remote control unit;
- all the controllers exposed to the beam of the remote control unit will display their own access code;
- select the access code of the controller whose parameter you intend to modify using the numeric section on the remote control unit. Select the code correctly (if the code of the controller is 05, press 0 and 5).
- the controller's LED indicator above the digits flashes and, simultaneously, the code of the first parameter '/C' appears on the display.
- perform the same operations described in point 2) or 3) above.

## **How to select the access code**

### **Setting the access code**

All IR32 controllers have no factory-set access codes. The User can choose and set his own access codes by simply modifying the H3 parameter as follows:

- press 'START' to operate the remote control unit;
- the controller's LED indicator above the digits flashes and the first parameter (/C) appears immediately.
- press ▼ to display the H3 parameter;
- press SEL to display its value (default 00);
- press ▲ to select the requested value (from 01 to 199);
- press SEL to confirm the new value and display again the H3 code;
- press MEMO to memorize the access code and exit the procedure.

### **Removing the code**

- repeat the operations described above and give the H3 parameter the value 00 (**H3=00**). In this way you can program your controller/s without selecting the access code.

## FURTHER INFORMATION

### Configuration parameters

As already mentioned, (see chapter 'How to change the operating parameters'), there are two types of parameter:

- parameters used frequently (indicated by 'F' in the following tables)
- configuration parameters (type C) which are protected by a password to prevent unwanted modification.

#### *Categorisation of parameters*

Besides being divided into **TYPES**, the parameters are grouped into logical categories labelled by letters indicating their function. The categories and their identifying letters are given below:

Category	Description
Flashing 00	Does not indicate a category, but merely that the password must be entered in order to gain access to the configuration parameters.
/	parameters relative to the temperature sensor
r	parameters relative to the temperature regulation
C	parameters relative to the compressor management
d	parameters relative to the defrost management
A	parameters relative to the alarm management
F	parameters relative to the evaporator fan management
H	general parameter configuration

### NEW RELEASE

The instruments with serial number greater than 100,000 have a new software release – compatible with the previous one – offering new functionalities described in detail in the following chapter.

### The password

#### Flashing 00: PASSWORD

This is a protective device which intentionally "complicates" access to Configuration parameters in order to prevent accidental changes or any that might be made by unauthorised persons. Type C parameters are in fact those which alter the control configuration. Once the configuration parameters have been entered by use of the password, the system allows the user to alter type F parameters as requested.

The password request (flashing 00) appears when the two buttons  and  are pressed at the same time. Access to type C parameters is gained as follows:

- press  or  to produce 22 or the correct password;
- confirm with ;
- the code of the first modifiable parameter is displayed, that is '/C'. (On controls with serial number less than 5,000, '/O' is displayed instead of '/C'. See the relative note on page 49).

In the following paragraphs all the parameters will be described, indicating in which versions they are available and what values can be assigned to them. (Remember that on version IR32M the parameters are modifiable only through the remote controller and the serial input).

There will also be indicated the **default value** (Def.), which is the value given to the parameter in the factory. Furthermore it will be stated whether the parameter is modifiable through the remote controller with "**direct access**", that is, whether there is a specific button for modifying it on the remote controller. It should be remembered that ALL the parameters are modifiable through the remote controller; the 16 most frequent parameters can however be modified directly by means of a dedicated button ("direct access").

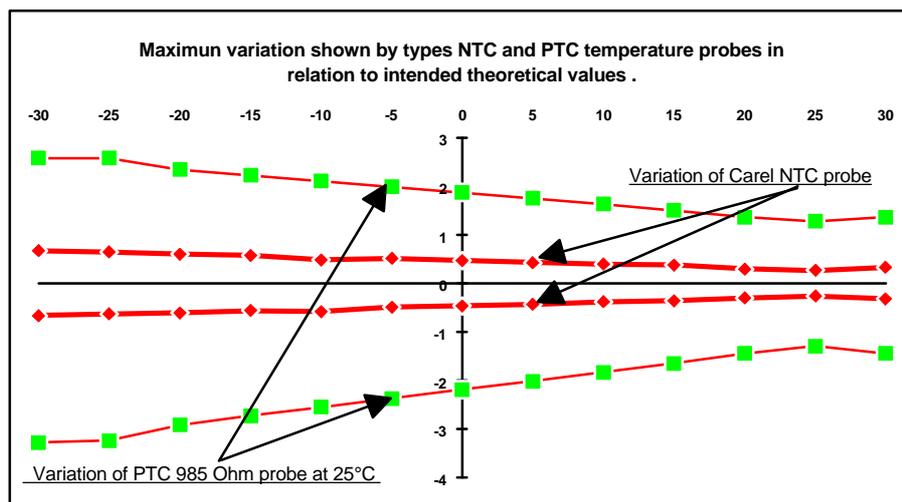
## / = Parameters for the management of the temperature sensors

	SENSOR PARAMETERS	Type	Min.	Max.	Unit	Def
/0	Type of sensor (0=NTC, 1=PTC)	C	0	1	-	0
/C	Calibration	F	-20	+20	+C/+F	0.0
/2	Stability measurement	C	1	15	-	4
/3	Sensor reading speed	C	1	15	-	8
/4	Virtual sensor	C	0	100		0
/5	°C / °F (0=°C, 1=°F)	C	0	1	flag	0
/6	Decimal point (0=yes, 1=no)	C	0	1	flag	0

**Note:** for the set times to become operative, the instrument must be switched off and on again.

### Short descriptive note about sensors with thermistors types NTC and PTC:

Equipment of the IR32 series is designed to work with NTC Carel temperature sensors, or sensors using thermistors with a negative characteristic (NTC stands for Negative Temperature Coefficient). This type of thermistor modifies an electrical parameter (its own resistance) in inverse proportion to any change in temperature; that is, the resistance falls as the temperature rises, and vice versa. Other types of thermistor are on the market. Widely available are PTC thermistors with a resistance of 985 Ohms at 25°C. PTC stands for Positive Temperature Coefficient; by contrast with the NTC, these increase their resistance directly according to the temperature increasing. As you can see in the diagram below, (the horizontal axis represents the operating range, the vertical axis the error), the NTC type of sensor shows greater accuracy than the PTC version. This is why the NTC sensors have been adopted as standard.



It is nevertheless possible to use Infrared equipment with PTC sensors of the 985 Ohm, 25°C type by specifying the model required.

### /0: Type of sensor

This parameter is displayed only during the reset procedure (see relative chapter). On equipment with a serial number less than 5000 the parameter /0 is displayed whenever access is gained to type C parameters. On this point please refer to the specific note at the end of the manual. The parameter /0 allows users to specify the type of sensor being used, i.e. whether NTC (/0=0) or PTC (/0=1). As indicated previously, it is emphasised that IR32 equipment is normally designed to work with NTC sensors. To be able to work with PTC sensors rather than NTC, a modification is required which can only be carried out in the factory, and it is not enough to shift the parameter /0 to =1. If PTC sensors are to be used, therefore, it is essential to specify the requested code at the time of ordering (see chapter 'Ordering codes 'I').

Parameter /0 is useful in only one situation: that is where the equipment has been acquired to work with a PTC sensor and, in addition, due to serious malfunction, it has been reset (see "Reset procedure"). After the reset, the microprocessor installs the parameter /0=0, which is the value intended for the NTC sensor and therefore incompatible with hardware designed for a PTC sensor. In such an event it is necessary to operate manually to set the parameter /0 to the correct value, i.e. /0=1 (operation with PTC sensor). Any other use can cause malfunctioning.

Default for standard models /0=0

Default for PTC models /0=1. Available on all panel mounting models

### ***/C: Calibration offset***

This parameter allows the temperature shown on the display to be corrected. The value assigned to this parameter is added to (if positive) or subtracted from (if negative) the temperature transmitted by the sensor. For example, if it is wished to reduce the temperature displayed by 2.3 degrees, /C should be set to = -2.3. The calibration offset can be varied from -20 to +20 with a precision to a tenth of a degree, from -19.9 to +19.9. Default is 0.0, i.e. no offset is applied to the sensor's reading.

This parameter can be accessed directly from the remote control.

### ***/2: Stability of measurement***

This parameter is employed to control the stability with which the temperature is measured. Low values assigned to this parameter produce a prompt response by the sensor to variations in temperature; however, the display becomes correspondingly sensitive to changes. High values slow down the response, causing less fluctuation and a more stable reading. Default value is 4. Available on all models.

### ***/3: Sensor reading speed***

This parameter stabilises the maximum temperature variation within a period equal to 200ms (equipment cycle period). Small values of this parameter restrict the variation in temperature within the short period, and thus reduce the equipment's susceptibility to erratic impulses.

**Note:** If it is wished to alter both this parameter and the previous one, it is recommended to operate in a consistent manner: if /2 is increased, it is correct to leave /3 unchanged or to reduce it. Vice versa if /2 is decreased. Default value is 8. Available on all models.

### ***/4: Virtual sensor***

In equipment with two sensors (IR32M, IR32Y, IR32C, IDRDC and IR32P), this parameter allows a choice as to whether temperature is regulated by reference to one sensor alone (P1 on the IR32M) or by reference to a weighted average of the two sensors. This parameter is useful in special applications. For example, it is possible to place the ambient sensor in the suction and the defrost sensor in series. Control can be effected via the weighted average of the two values read. The formula used by the microprocessor is:

$$\text{virtual sensor} = \text{ambient} - \frac{(\text{ambient} - \text{defrost}) \times (\text{value of /4})}{100}$$

When /4=0, control is effected using the ambient sensor. This is the typical situation.

When /4=100, control is effected by reference to the values read by the defrost sensor (sensor P2 on IR32M).

When /4=50, control is effected by reference to a "virtual" sensor, which is given by the average between the ambient sensor (or P1) and the defrost sensor (or sensor P2). With values above 50 the defrost sensor exerts greater influence; with lesser values the ambient sensor does. If the defrost sensor suffers a failure, the equipment is controlled by the ambient sensor. On the IR32M version, the parameter must remain at zero (0), as this control system has no second sensor. Default: 0, control by ambient sensor (P1 on the IR32M).

Available on IR32M, IR32Y, IR32P, IR32C and IRDRC).

### ***/5: Selection of °F or °C***

Defines the unit of measurement.

0 = for working in degrees Celsius,

1 = for working in degrees Fahrenheit.

In passing from one to the other there is automatic conversion of set and differential into the new unit.

Default = 0, working in degrees Celsius. Available on all models.

### ***/6: Decimal point***

Allows the display of temperature with or without tenths of degrees ranging from -19.9 to +19.9.

0= data displayed with tenths of degrees;

1= data displayed without tenths of degrees.

Default: 0, decimal place shown. Available on all models.

## r = parameters for the temperature regulation

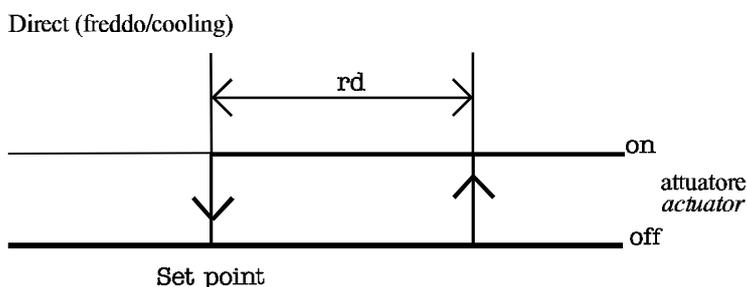
	REGULATION PARAMETERS	Type	Min.	Max.	U.m.	Def.
rd	Regulation delta (differential)	F	0.1	+19.9	°C/°F	2
r1	Set minimum allowed	C	-40	r2	°C/°F	-40
r2	Set maximum allowed	C	r1	+199	°C/°F	90
r3	Direct/reverse operation (Dir r3=0, rev r3=1;IR32S only)	C	0	1	flag	0

**Note:** for the set times to become operative, the instrument must be switched off and on again.

### rd: Regulation delta

Sets the value of the differential, or hysteresis, used in regulating the temperature. A narrow differential, i.e. one with a low number, ensures a temperature which differs little from the setpoint (or optimal operating temperature), but which requires frequent switching on and off of the main operating components (normally the compressor). It is possible to prolong the life of the compressor by appropriately setting the parameters to define the number of start-ups per hour and the minimum switch-off period (see the Compressor parameters).

In all Infrared refrigeration equipment the differential is placed to the right of the setpoint as indicated below (DIRECT operation):



Default: rd=2. Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC. Parameter with direct access from remote commander.

### r1: SET minimum allowed

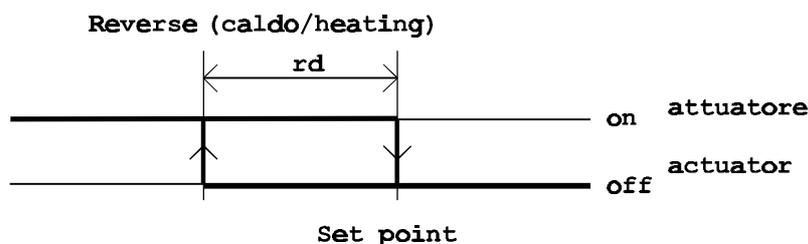
This parameter sets the minimum value that can be given to the setpoint. Using this parameter prevents the user from fixing a setpoint lower than the value assigned to r1. Default: -40. Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

### r2: SET maximum allowed

This parameter sets the maximum value accepted as a setpoint. Use of this parameter prevents the user from fixing a setpoint greater than the value assigned to r2. Default: +90. Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

### r3: DIRECT/REVERSE

Model IR32S is also designed to operate as a **thermostat** (parameter H1=0, see below). In "thermostat" operation it is possible to select the function "**cooling**" (or DIRECT, as typically used in refrigeration) or the function "**heating**" (or REVERSE, as used typically in heating). It should be remembered that in the REVERSE mode the differential is to the left of the setpoint as indicated in the diagram below. Model IR32S has a further parameter in the "r" category for selecting the mode of operation, parameter r3.



When r3=0 you have the DIRECT operation (refrigeration). When r3=1 you have the REVERSE operation (heating). See also the description of parameter A4. Default: r3=0 (DIRECT) with H1=0 on model IR32S, IRDRSE/S0. This parameter is not available on other models. Available on IR32S, IRDRSE/S0.

**For the r3, r4, r5, rt, rH, rL parameters:** see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000

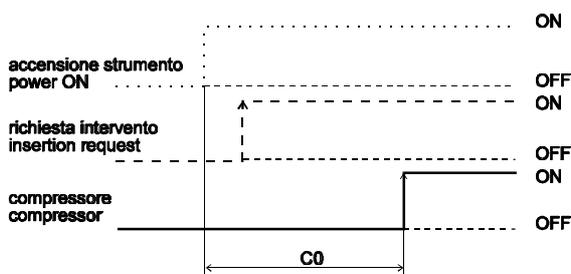
## c = parameters for the compressor management

	COMPRESSOR PARAMETERS	Type	Min.	Max.	U.m.	Def.
c0	Delay in compressor insertion after switching on equipment	C	0	15	mins	0
c1	Minimum time between two successive insertions of compressor	C	0	15	mins	0
c2	Minimum compressor down time	C	0	15	mins	0
c3	Minimum compressor operating time	C	0	15	mins	0
c4	Duty setting (compressor safety: 0=OFF, 1=ON)	C	0	100	mins	0
cc	Duration of continuous cycle	C	0	15	hrs	4
c6	Alarm cut-out after continuous cycle	C	0	15	hrs	2

**Note:** for the set times to become operative, the instrument must be switched off and on again.

### *c0 Delay in switching on compressor and fans (if controlled) after switching on the equipment.*

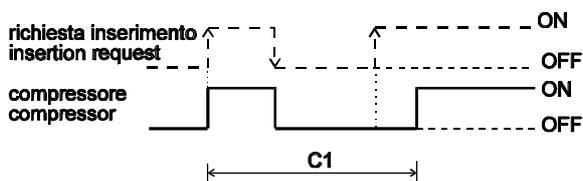
From the moment when the equipment receives its power supply, start-up of the compressor is delayed by a period equivalent to the value assigned to this parameter. This delay serves to protect the compressor from repeated start-ups when there is some interruption in the power supply. For example, if the parameter is set at  $c0=6$ , the compressor will wait for six minutes after power is restored before starting up. Thus if there are several power failures close together (in this case at intervals of less than six minutes), the compressor will not start up. In the case of installations with more than one compressor, the parameter A0 can also be used to avoid simultaneous start-ups of several compressors; it is sufficient to assign a different value to A0 for each compressor.



Default:  $c0=0$  (no minimum period is assigned to the delay between switching on equipment and activation of the compressor). Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC

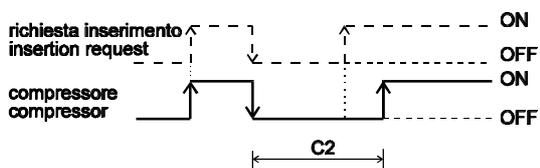
### *c1: Minimum time between two start-ups of compressor.*

This sets the **minimum** time in minutes which must elapse between two insertions of the compressor, independently of the temperature and of the setpoint. By setting this parameter it is possible to restrict the number of start-ups per hour. For example, if the greatest number of start-ups permitted in an hour must be 10, it is sufficient to set  $c1=6$ .



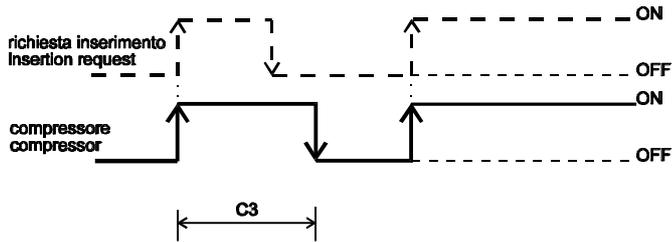
Default:  $c1=0$  (No minimum interval between two insertions is set.) Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

*c2: Minimum compressor down-time:* this sets the minimum time in minutes for which the compressor may remain inactive. The compressor will not be started up if the minimum time selected has not elapsed ( $c2$ ). This parameter is useful for equalising pressure after switch-off in the case of installations with hermetic and capillary compressors.



Default:  $c2=0$  (No minimum down-time for the compressor is set.) Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

**c3: Minimum compressor operating time:** this sets the shortest period for which the compressor may operate. The compressor will not be switched off if it has not been active for a time equivalent to the minimum selected.



Default: C3=0 (No minimum operating period has been set).

Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC

**c4: Duty setting or safety relay:** if the **Control sensor** alarm is activated, (or if the ambient sensor is short-circuited or disconnected), this parameter allows the compressor to function while the fault is being repaired. As the compressor is unable to function on the basis of temperature (because of the faulty sensor), it is activated cyclically with an operating time ("ON time") in minutes equivalent to the value assigned to c4 and a fixed OFF time of 15 minutes. There are two values of c4 which produce particular functioning. If **c4=0**, the compressor will remain permanently OFF in case of a defective sensor; if **c4=100**, the compressor will remain permanently ON, the 15 minutes off-time being cancelled. The following particular situations should also be considered:

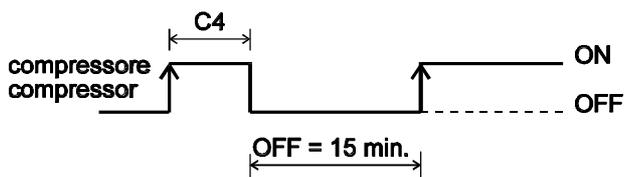
- If the control sensor fault occurs while the compressor is OFF, the compressor will start up (subject to limits imposed by parameters c1 and c2) and remains ON for the period set by c4. At this point the "duty setting" begins. This mode is indicated by the "COMP" LED which flashes during the compressor's off-time and

stays permanently lit when the compressor is operating. The fans continue to operate according to the chosen parameters (see category F).

- If the sensor defect alarm is signalled while the compressor is operating, the compressor is switched off (without regard to the minimum operating time which may have been selected under parameter c3), and remains off for 15 minutes; (the "COMP" LED flashes during this phase). After this, periodic operation commences according to the operating time set under c4.
- If the sensor defect alarm is signalled while the equipment is defrosting or in continuous cycle, control immediately leaves the state in which it happens to be and initiates the duty setting. To re-start defrosting

or continuous cycle operation it is necessary to replace the ambient sensor. Since it is not possible to effect defrosting by manual means, a replacement sensor should be available in case of any malfunction.

If the sensor fault disappears, the equipment will return to normal operation. If at the moment of disappearance the compressor is operating, it will continue for a period equivalent to the value of c3; if it is off, it will remain off for a period equivalent to the value of c2



Default: 0 (Compressor always off in case of defective ambient sensor.)

Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

**cc: Duration of the continuous cycle:** it is the period in hours for which the compressor remains in operation so as to lower the temperature even below the setpoint. If cc=0, the continuous cycle is not activated. Control leaves continuous cycle mode when the period set under parameter cc has elapsed, or when the minimum temperature set has been reached (see minimum temperature alarm, parameter AL). Default: 4 (hours). Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC. Parameter with direct access from remote control.

**c6: Alarm cut-out after continuous cycle operation:** the time in hours for which the temperature alarm is de-activated after continuous cycle operation. If the temperature of the refrigerated unit should drop, after continuous cycle operation, to a level below the minimum temperature (setpoint AL), the activation of the low temperature alarm is delayed for the period set under parameter c6. It should be remembered that at that temperature (setpoint AL), the continuous cycle is automatically de-activated. Default: 2 (hours). Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

## d = Parameters for the defrost management

	DEFROSTING PARAMETERS	Type	Min	Max	Unit	Def
d0	Type of defrosting (0=resistance, 1= hot gas)	C	0	1	flag	0
dI	Interval between defrosts	F	0	199	ore	8
dt	End of defrost temp setpoint	F	-40	+199	°C/°F	4
dP	Max duration of defrost	F	1	199	min	30
d4	Defrost at power ON (0=no, 1=yes)	C	0	1	flag	0
d5	Defrost delay from power ON or start of Multifunction	C	0	199	min	0
d6	Interrupt display during defrost	C	0	1	flag	1
dd	Dripping time	F	0	15	min	2
d8	Alarm cut-out time after defrost and/or open door	F	0	15	ore	1
d9	Defrost priority over compressor protection (0=no, 1=yes)	C	0	1	flag	0
d/	Reading defrost sensor	F	-	-	°C/°F	-
dC	Time basis (0=hours/min, 1=minutes/seconds)	C	1	1	flag	0

**Note:** for the set times to become operative, the instrument must be switched off and on again.

### ***d0: Type of defrosting***

This parameter sets the type of defrosting for equipment fitted with defrosting relays:

0 = defrosting by resistance;

1 = defrosting by hot gas.

Default: d0=0, resistance defrosting. Available on IR32Y, IR32P, IR32C and IRDRC.

**Note:** see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)

### ***dI: Interval between two defrost cycles***

Defrosting is effected periodically at intervals equivalent to dI (in hours or minutes, see parameter dC). The dI period is counted from the END of the previous defrost. If the period equals 0 (dI=0), defrosting will not begin unless commanded by the keypad or a digital input. Temperature alarms are over-ridden during defrosting.

Default: 8 (hours). Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

Parameter with direct access from remote control.

### ***dt: SETPOINT for temperature at end of defrost***

On equipment supplied with an end of defrost sensor (IR32Y with H1=1, IR32C and IR32P), this parameter allows the temperature of the evaporator requested at the end of defrosting to be set. (The temperature of the evaporator is taken from the defrosting sensor.) If, at the start of a defrosting cycle, the temperature indicated by the defrosting sensor is higher than the temperature set for the end of defrosting, the cycle will not be effected. In the case of a malfunction of the defrosting sensor, control will effect a defrost lasting for a period equivalent to the value set for dP. Thus if the end of defrost setpoint can not be reached, the defrosting will be interrupted after a maximum period equivalent to the value in minutes of dP, and the fault will be displayed Ed. This will remain displayed until a "correct" defrosting cycle is effected, or there is a change in temperature.

Default: 4°C. Available on IR32Y, IR32P, IR32C and IRDRC.

Parameter with direct access from remote control.

### ***dP: Maximum duration of defrosting***

This parameter determines duration of the defrosting in minutes (or seconds, see parameter dC). On equipment without defrost sensors on the evaporator (IR32S with H1=1 and IR32Y with H1=0), this parameter represents the actual duration of the defrost.

Default: 30 minutes. Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

Parameter with direct access from remote control.

**Note:** see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)

#### ***d4: Defrosting at power ON***

It activates a defrost as the power supply is switched on. A request to defrost on start-up has priority over insertion of the compressor and over activation of a continuous cycle. Possible values are:

0 = no, defrosting on start-up of equipment;

1 = yes, defrost is effected on start-up.

Commanding a defrost as the power supply is switched on can be useful in certain particular situations, for example if the installation suffers from frequent power break-downs. If there is a power failure, the internal clock which calculates the intervals between two defrosts will be set back to zero. In an extreme case, if the frequency of power failure were to be greater than the frequency of defrosting (for example a power failure every 8 hours with a defrost interval of 10 hours), control would never command a defrost. In such a situation it is better to activate defrosting as the power comes on, especially if defrosting is set at a temperature (evaporator sensor) intended to avoid unnecessary defrostings or if their duration is reduced.

In the case of multi-unit installations, if defrosting at power-on is chosen, it can happen that when power is restored, all units begin defrosting at the same time, therefore the supply can be overloaded. To avoid this consequence, use can be made of parameter d5, which permits an initial delay in defrosting; this delay obviously has to be different for each unit. Default: d4=0 (no defrost at power-on). Available on IR32S, IR32Y, IR32P and IR32C.

#### ***d5: Delay of defrost at power-on or start of Multi-function***

This parameter sets the time which is to elapse between the controller power on and the start of defrosting. When digital input is used, either to initiate defrosting (see parameter A4=3) or to convey a defrosting command from an external contact (see parameter A4=4), this parameter represents the delay occurring between the initiation of defrosting, or a request for it, and its actual commencement. The digital input for defrosting (see parameter A4) can be usefully employed to carry out defrosting in real time. It is sufficient to connect a timer at the multifunction digital input (see parameter A4). Defrosting will be activated when the timer contacts close. Where several units are connected to the same timer, we suggest to use the parameter d5 to delay the various defrostings, so as to avoid any overload on the supply. Furthermore, to avoid unwanted defrosting being commanded by the equipment internal clock, we suggest set at 0 to the parameter d1, (defrosts only from keypad or from multi-function contact).

Default: d5=0 (no delay in defrost at power-on or from multi-function input).

Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

#### ***d6: Blocking display during defrosting***

This parameter gives consent to block the display of ambient temperature at the last value read before defrosting began. Display resumes normally when the measurement first reaches the setpoint o, or in any case within the time set as "alarm cut-out during defrost (parameter d8). If the display is not blocked during defrosting the equipment will display the signal dF rather than the value received from the control sensor. This is to indicate that a possibly high temperature is due to the defrosting process.

Default: d6=1 (during defrosting the display shows the last temperature read before defrosting began).

Available on IR32S, IR32Y, IR32P and IR32C.

#### ***dd: Dripping time***

This parameter makes it possible to close down the compressor and the evaporator fans after a defrosting, so as to hasten the dripping from the evaporator. The value of the parameter indicates the minutes of shut-down. If dd=0, no dripping time is provided for, with the result that the compressor will be re-activated immediately defrosting is over.

Default: dd=2 minutes. Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

Parameter with direct access from remote control.

#### ***d8: Period of alarm cut-out after defrosting and/or open door***

This indicates the time for which a high temperature alarm will be inhibited at the end of a defrosting and/or after the door of a store-room has been opened; in the case of Multi-function input being connected to the door-switch (see parameter A4).

Default: d8=1 hour of cut-out. Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

<p><b>Note:</b> see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)</p>
---

### ***d9: Defrost priority over compressor protection***

This parameter cancels the compressor protection times (c1: minimum time between two successive start-ups, c2: minimum shut-down time and c3: minimum operating time) at the start of defrosting.

0= protection times are observed;

1= protection times are not observed; defrosting has greater priority and takes no account of the compressor timings.

As an example, it is useful for avoiding delay in hot gas defrosting when the compressor has only just shut off and has been restarted with a minimum time between two insertions. **It must be remembered however that in this event the maximum number of compressor start-ups per hour may not be observed.**

Default: d9=0 (defrosting is subject to the compressor's timings - it should be remembered that in the default state these are set at zero). For equipment with serial number less than 5,000 d9=1 in default state.

Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

### ***d/: Reading defrost sensor***

By choosing this parameter it is possible to display the value being read by the defrost sensor, in equipment

where that is fitted. When the parameter d/ has been selected, pressing  will not allow the value to be changed, but the value registered by the defrost sensor can be read.

Available on IR32Y, IR32P, IR32C and IRDRC.

Parameter with direct access from remote control.

### ***dC: Time bases***

Consent to alter the units of measurement used in counting times for parameters dl (interval between defrosting) and dP (duration of defrosting).

0 = dl is expressed in hours and dP in minutes;

1 = dl is expressed in minutes and dP in seconds.

The parameter dC=1 can be useful for speedily testing the operation of defrosting with reduced times.

**It is however considered that if defrosting requires insertion of the compressor (hot gas defrosting) and the parameter d9=1 there can be a risk of damaging the compressor by too many start-ups at short intervals.**

On the other hand, the parameter dC=1 can be very useful when it is wished to use the IR32Y version for controlling air dehumidifiers. The defrosting cycle then becomes the condensate discharge cycle, which needs to be initiated at short intervals (minutes) and for very brief periods (seconds). Contact your Carel agent for further information.

Default: dC=0, that is, the defrost interval dl is expressed in hours, and dP, the maximum duration of defrosting, in minutes.

Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

## A = parameters for the alarm control

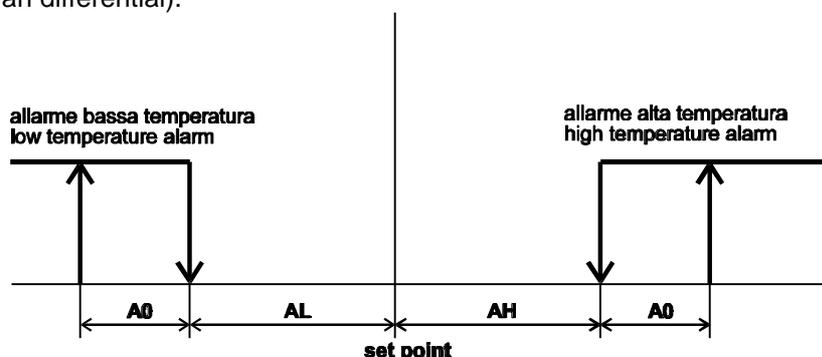
	ALARM PARAMETERS	Type	Min	Max	Unit	Def
A0	Alarm and fan differentials	C	0.1	+20	°C/°F	0.2
AL	Low temp alarm (relative to set)	F	0	+199	°C/°F	10
AH	High temp alarm (relative to set)	F	0	+199	°C/°F	10
Ad	Temperature alarm delay	C	0	199	min	120
A4	Multifunction input configuration IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C, IRDRC, IR32M	C	0	5	-	0 3
A5	(should be kept at zero)	C	0	5	-	0
A6	Duty setting in case of external alarm (0=OFF, 1=ON)	C	0	100	min	0
A7	External alarm delay (A4=2 multi-function input)	C	0	199	min	0

**Note:** for the set times to become operative, the instrument must be switched off and on again.

### A0: Alarm and fan differentials

This parameter represents the differential used for activating the high and low temperature alarms (AL and AH – see the diagram below) and for the control of the fans (see F parameters). In the case of the alarms, as can be seen from the diagram, the value A0 contributes to determining the points at which the temperature alarms actually occur.

Default: 0.2 degrees. Available on IR32S, IRDRSE/S0 and IR32Y (alarm differential), and IR32P and IR32C, IRDRC alarm and fan differential).



### AL: Minimum temperature alarm

This parameter allows the low temperature alarm to be selected. The value of AL does not indicate the temperature at which the alarm will sound, **but rather the maximum deviation from the setpoint** (i.e. the requested operating temperature) that is permitted. The low temperature alarm is given as follows:

$$\text{Low temperature alarm} = (\text{setpoint}) - (\text{value of AL}) - A0$$

Note that changing the setpoint automatically changes the temperature at which the low temperature alarm will be given, while the maximum differential permitted (AL) remains as set. The low temperature alarm is automatically re-instated. This means that if the temperature returns above the minimum value set, the alarm signal is automatically cancelled. Finally, it should be remembered that the low temperature alarm is also operative in the continuous cycle mode (see relevant section). If the temperature drops to the alarm level, the continuous cycle is automatically de-activated, even if the period of time selected has not been completed. De-activation does not disable the alarm signal.

Default: AL=10

Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C, IRDRC. Parameter with access from remote control.

### AH: High temperature alarm

It allows the high temperature alarm to be set. The value of AH does not indicate the temperature at which the alarm is given, but rather **the maximum deviation allowed from the setpoint** (i.e. the requested operating temperature). Therefore:

$$\text{High temperature alarm} = (\text{setpoint}) + (\text{value of AH}) + A0$$

Note that changing the setpoint automatically changes the high temperature alarm, while the the maximum deviation permitted remains the same. The high temperature alarm is also automatically re-instated.

Default: AH=10.

Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC. Parameter with access from remote control.

### ***Ad: Temperature alarm delay***

This indicates how many minutes of delay are requested before a registered deviation is signalled. If during the delay Ad the temperature returns to permitted limits, the alarm will not be signalled. If there is a further alarm state, the delay will begin again at zero.

Setting a delay in signalling temperature alarms can help to avoid false alarms due to interference with the sensor or situations lasting only a limited time, such as briefly opening the door of a store-room. Alarm delays do not affect two particular functions: defrosting and continuous cycle. To delay any temperature alarms after these functions, parameters d8 for defrosting and c6 for continuous cycle must be adjusted. Remember that temperature alarms are not generated during defrosting and continuous cycle operation.

**Default:** Ad=120 (120 minutes' delay in signalling temperature alarms). The default for equipment with serial numbers below 5000 is Ad=0. See note at end of manual. Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC. Parameter with direct access from remote control.

### ***A4: Configuration of Multi-function digital input***

This defines the effect of MULTIFUNCTION digital input.

MULTIFUNCTION digital input can have varying significance, according to the values given to this parameter and as a function of the type of control employed. The various functions are described below:

**Note:** see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)

**A4=0: INPUT NOT ACTIVE:** **MULTIFUNCTION** digital input is not used. This is the value set in the factory for all versions except model IR32M.

**A4=1 IMMEDIATE EXTERNAL ALARM:** it is possible to connect to the digital input an external alarm which will request immediate intervention (for example a high pressure or compressor temperature alarm). In particular the alarm is registered when the contact is opened (normal operation being in the closed state). Activation of the alarm produces a display signal (see alarm A1), sound the buzzer if so designed and initiates the following actions:

**compressor:** functions according to values under parameter A6 (blocking compressor by external alarm);

**fans:** continue to work according to fan parameters (F). If the external alarm is registered during defrosting or a continuous cycle, control exits from the procedures.

When the **alarm ceases** the equipment resumes operation as follows:

**Defrost:** the opportunity to defrost is reinstated. The next defrosting is effected after the interval dl (interval between defrosting) that has been set;

**Compressor:** If the compressor is operating at the moment when the alarm ceases, it remains operating and follows the minimum on-time that has been set (parameter c2). If the compressor is off, it is kept off for a minimum equivalent to that set under parameter c3.

**Important note:** it should be remembered that to guarantee the safety of the unit in case of serious alarms it is necessary always to fit the unit itself with all the electro-mechanical safety devices needed to ensure correct operation.

### ***A4=2 Delayed external alarm***

The significance, connection and mode of operation are similar to those already indicated for the parameter A4=1. However, when A4=2 it is possible to delay the alarm signal for a period in minutes equivalent to value chosen for A7 (see below). This arrangement is particularly useful for controlling the low pressure alarm. In fact it often happens that on first starting up, the unit registers a low pressure alarm due to ambient conditions rather than to any malfunctioning of the equipment. By setting a delay on the alarm, false alarms are avoided. In fact, by calculating the delay appropriately, if the low pressure is due to environmental factors (low temperature), the alarm will be automatically re-instated before the delay set has elapsed. After the set delay period, effects on the compressor, fans, defrosting and continuous cycle are the same as when A4=1.

If A4 is set to equal 3, the effect varies according to the model of equipment in use:

#### **Version IR32M:**

#### **A4=3: SENSOR SELECTION**

Allows the digital input to be used to display the temperature registered by sensor 1 or sensor 2. When the contact is open the reading on P1 is displayed, when contact is closed, P2. **Default:** A4=3 digital input for sensor selection.

### Version IR32S with H1=0 (thermostat function):

#### A4=3: DIRECT/REVERSE OPERATION

The digital input is used to choose the DIRECT function (for refrigeration) or the REVERSE function (for heating - see also parameter r3). When the contact is open the equipment works in DIRECT mode, when the contact is closed, in REVERSE. It is therefore possible to connect, for example, a switch which will command, according to its position, heating or cooling.

If **A4=3** the state of the digital input takes priority over parameter r3; that is, the value assigned to r3 becomes immaterial and only the state of (open or closed) of the digital input counts.

### All other versions, including IR32S with H1=1:

#### A4=3: PREPARATION FOR DEFROSTING

It is possible to connect an external contact to the multi-function input to prepare for or to inhibit defrosting. When the contact is open, defrosting is inhibited, and when closed, defrosting becomes possible. If the contact is closed, but defrosting has not been requested by the controller, obviously defrosting will not occur. If the contact is closed and defrosting is under way, any opening of the contact will cause defrosting to be interrupted immediately, and the equipment will resume normal operation (without carrying out the dripping or post-dripping phases). The "DEF" LED begins to flash, indicating that the request for defrosting remains unsatisfied and will await the next consent signal (the closure of the contact).

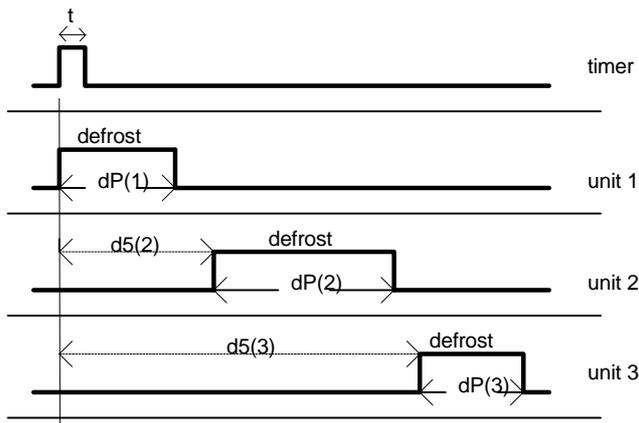
This function is useful, for example, with refrigerated cabinets fitted with hot gas defrosting. With these installations it is necessary to defrost an "island" at a time, so at anyone moment, some islands will be empowered to defrost and others inhibited.

Another use for this function is to inhibit defrosting of those units exposed to the public during shopping hours. A request for defrosting which arises when the contact is open will remain in waiting until the contact is closed.

#### A4=4: INITIATION OF DEFROSTING BY EXTERNAL CONTACT

This function allows activation of defrosting by an external contact. This defrosting has priority over "internal" defrosting ordered by parameter, or from the keypad. Where defrosting occurs through external contact all the "d" parameters selected remain valid. In particular it can be useful to set dI=0 so as to permit only manual or externally ordered defrosting, and excluding defrostings ordered by the internal clock.

This function is useful if is necessary to carry out a **defrosting in real time**. To do this it is sufficient to connect a mechanical or electronic timer to the digital input. When the timer contact changes from open to closed, a request for defrosting is passed. As described under parameter d5, it is possible to link more than one unit to the same timer. By choosing the value of parameter d5 appropriately for each unit it is possible to avoid simultaneous defrosting by more than unit.



richiesta sbrinamento  
defrost request

#### Explanation:

**t** = impulse from timer to initiate defrosting; minimum duration must be 0.5 seconds;

**dP(1)** = maximum duration of defrosting, unit 1;

**d5(2)** = external contact's defrost delay for unit 2. This must be greater than dP(1) if two units are not to defrost at the same time.

**Similarly for d5(3) and dP(3).**

#### A4=5: DOOR SWITCH

By setting A4 = 5 it is possible to control the switch at the store-room door. When the switch is opened the compressor is switched off. If the IR32C or IR32P versions with S90OEM4PWR are being used, the control automatically also cuts off the evaporator fan (often positioned above the door), and, if the parameter H1=0 referring to the room light automatically goes on via output AUX. When the door is closed (and also the Multifunction contact), the equipment resumes the previous operation, delaying any temperature alarm by a number of hours equivalent to the value of d8. On re-starting the compressor however, any protective time constraints selected will be respected (see c parameters). **Note: even if the fan is controlled by the fan controller (see category F), the fans will be shut down.**

The table below summarises the functions served by the digital input according to the values assigned to A4 and to the equipment version being used.

Parameter value	Function	M	T (*)	S	X (**)	Y	C	P
0	Input not active	•	•	•	•	•	•	•
1	Immediate external alarm Contact open = alarm active closed = inactive		•	•	•	•	•	•
2	External alarm with delay Contact open = alarm active closed = inactive		•	•	•	•	•	•
3	Sensor selection Contact open = first sensor closed = second	•						
	Direct/Reverse Contact open = direct closed = reverse		•					
	Ready to defrost Contact open = defrost possible closed = impossible			•	•	•	•	•
4	Start of defrost			•	•	•	•	•
5	Door switch Contact open = door open closed = door closed						•	•
<b>Default values</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Note: (\*) T refers to the IR32S version when used in thermostatic operation, i.e. with parameter H1=0.

(\*\*) X refers to the IR32Y version with time defrost as well as temperature, i.e. with parameter H1=0.

**A5: This parameter is not controlled on the versions being considered and must be left at 0.**

Default: A5=0 Refers to models IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

**Note:** see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)

#### A6: Cut-out of compressor by external alarm

The function of this parameter is similar to that of parameter c4 (duty setting). As well as acting on the sensor alarm, it acts on the external alarm via the multi-function input (A4=1 or A4=2). When an external alarm occurs (whether immediate or delayed), the compressor works for a period equivalent to the value given to parameter A6 (in minutes), while remaining off for a fixed period of 15 minutes. When given two particular values A6 serves the following functions: **A6=0**: the compressor always remains off; **A6=100**: the compressor always remains on. The fans continue to be controlled by according to the selected parameters (see category F). **If the duty setting for the sensor alarm (parameter c4) is also active, control uses the value of c4.**

Default: A6=0 (compressor cuts out if there is an external alarm). Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

#### A7: Delay in registration of external alarm (multi-function input)

Sets the delay (in minutes) in registering the external alarm when A4=2.

Default: A7=0 Available on IR32S, IRDRSE/S0, IR32Y, IR32P, IR32C and IRDRC.

## F = parameters for controlling evaporator fans

FAN PARAMETERS		Type	Min	Max	Unit	Def
F0	Fan control LED by fan controller (0=no, 1=yes)	C	0	1	flag	0
F1	Fan cut-out temperature (relative to ambient temperature)	F	0	+20	°C/°F	5
F2	STOP fans when compressor idle (0=no, 1=yes)	C	0	1	flag	1
F3	Stop fans during defrost (0=no, 1=yes)	C	0	1	flag	1
Fd	Stop after dripping	F	0	15	min	1

**Note:** for the set times to become operative, the instrument must be switched off and on again.

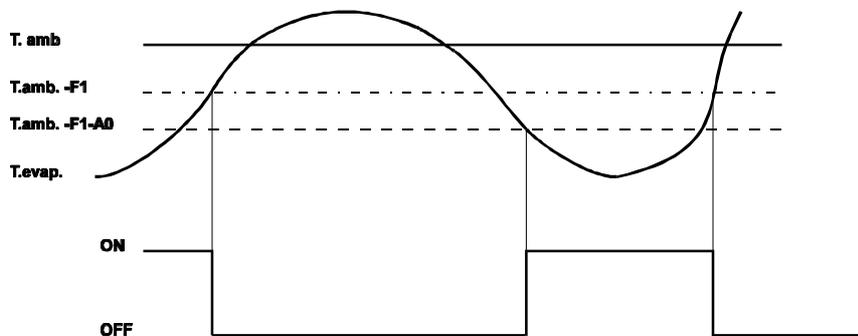
### F0: Fans controlled by fan controller

Fans can be put under the control of the fan controller, which manages them according to the temperature registered by the defrost and control sensors. Alternatively, the fans can work constantly, with the possibility of switching them off when the compressor is idle (see parameter F2), during defrosting (see parameter F3), during a period of dripping (see parameter Fd) and for a further period after dripping (see parameter F1). Permitted values for this parameter are: **F0=0 (=no)**. In this case fans are not controlled by the fan controller, but by parameters F2, F3 and Fd. **F0=1 (=yes)**. In this case the fans are managed by the fan controller (see parameter F1). It should be remembered that if a dripping period has been provided for (dd not=0), the fans will be cut out all the same. Default: F0=0 (not managed by fan controller). Available on IR32P, IR32C and IRDRC.

**Note:** see the following chapter “Notes for the new release” to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)

### F1: Fan cut-out temperature (operative only when F0=1)

The controller activates the fans only when the temperature of the evaporator is far enough below the ambient temperature. Parameter F1 sets the minimum difference which there must be between the ambient and evaporator temperatures for the fans to be activated. Once switched off, the fans will start up again when the difference between the two sensors is equal to F1+A0, where A0 is the fan controller differential. (See diagram.)



Default: F1=5, i.e. the fans remain operative until the evaporator temperature is 5 degrees below the ambient temperature. Available on IR32P, IR32C and IRDRC.

**Note:** see the following chapter “Notes for the new release” to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)

### F2: STOP fans when compressor idle (parameter operative only when F0=0).

It allows a choice to be made as to whether the fans should operate continuously (except F3, dd and Fd) or only when the compressor is working. If F0=1 the fans are managed by the fan controller and therefore working or idle according to the difference between evaporator and ambient temperatures, **independently of the state of the compressor**.

**F2=0 (=no):** Fans operate even if compressor is idle.

**F2=1 (=yes):** Fans are idle when the compressor is not working.

Default: F2=1, fans are off when compressor is off.

Available on IR32P, IR32C and IRDRC.

**F3: Stop fans during defrosting (parameter operative only when F0=0)**

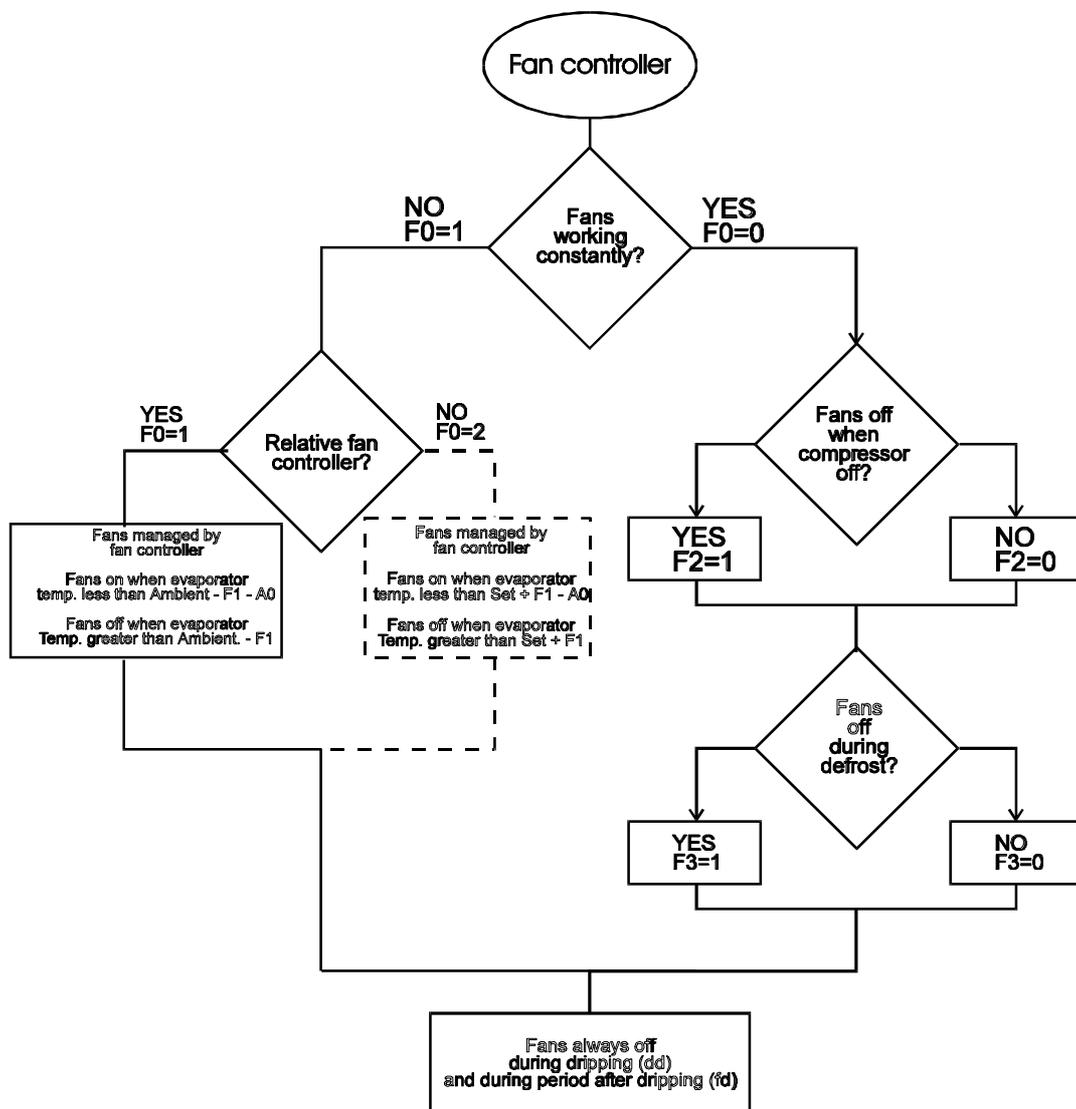
Allows a choice to be made as to whether the fans should operate during defrosting. Inactive if the fans are managed by the fan controller. **F3=0 (no):** fans working during defrosting; **F3=1 (yes):** fans do not work during defrosting. Note that during dripping time, if provided for, fans are always off. Default: F3=1, evaporator fans off during defrosting. Available on IR32P, IR32C and IRDRC.

**Fd: Cut-out after dripping (operative under both F0=0 and F0=1)**

After defrosting, the fans can be blocked for a further period, in minutes, defined by the value given to Fd. This is useful for allowing the evaporator to return to temperature after defrosting, thus avoiding forcing "warm" air into the interior of the refrigerator. Where the fan controller is in command, it is not necessary to select a time for Fd, as the controller starts the fans when the evaporator is at the right temperature. If the fan controller is

in command (i.e. F0=1), assigning any value other than zero to Fd causes the fans to **remain off** for a period equivalent to the value of Fd, independently of the temperature of the evaporator. Default: Fd=1 minutes of cut-out after dripping. Available on IR32P, IR32C and IRDRC. Parameter with direct access from remote control.

**DIAGRAM OF THE EVAPORATOR FAN OPERATION**



**N.B.** The broken lines of the diagram refer to the instruments with serial number greater than 100,000; see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000).

## H = other settings

	OTHER SETTINGS	Type	Min	Max	Unit	Def
H0	Serial address	C	0	15	-	0
H1	Particular configurations: IR32S, IRDRSE/S0 and IR32Y IR32C, IRDRC and IR32P	C	0	1	flag	0 1
H2	Possibility of changing parameter set from keypad (0=no, 1=yes)	C	0	1	flag	1
H3	Remote commander readiness code	C	0	199	-	0

**Note:** for the set times to become operative, the instrument must be switched off and on again.

### H0: Serial address

It allows equipment to be provided with an address to which it will respond when connected to a control or remote assistance system. Also known as serial or network connection. Default: H0=0; Available on all models.

### H1: Special configurations

This parameter allows particular functions which vary with different models to be defined. These are:

**IR32S, IRDRSE/S0:** the IR32S can operate as a simple thermostat (H1=0 is set in the factory), or as a thermostat and defrost controller for static units at normal temperature (defrosting by shut-down of compressor, H1=1). If the second type of operation is required, it is necessary to change the unit's configuration by setting H1=1. Default: H1=0, thermostatic operation.

**IR32Y:** the IR32Y is a thermostatic model with defrost control for static low temperature units. Defrosting can be effected by time ("X" operation) or can be initiated on the evaporator reaching the requested temperature ("Y" operation). In this second case it is necessary to fit the equipment with a second sensor, known as the "defrost sensor". By setting parameter H1, X or Y operation can be selected. With H1=0 (the value set in the factory), the equipment operates in the X mode (defrost by elapsed time). To choose Y mode (defrost by temperature) H1=1 must be set. Default: H1=0, mode X operation.

**IR32P, IR32C and IRDRC:** decides whether the fourth relay is used as an auxiliary output (for lighting, anti-mist fan or other on/off function) or as an alarm output.

In the first case (auxiliary output) it is possible to start and stop the item connected by pressing  button. If the relay is connected to the equipment's light it is possible to switch it on and off not only by pressing the button, but also automatically when the door is opened or shut by connecting the door switch (see parameter A4). In the second case the relay signals any alarm situations, allowing a siren or other remote alarm indicator to be activated. The possibilities are: 0 = auxiliary output; 1 = alarm output. Default: H1=1, alarm relay.

### H2: Inhibit the Keypad and/or the Remote Control

Using H2 parameter is possible to prevent modification of the SET POINT and every parameters, when the controller is exposed:

Parameter	Keypad	Remote Control
0	inhibited	enabled
1	enabled	enabled
2	inhibited	inhibited
3	enabled	inhibited

If the **Keypad is inhibited** it is no possible to modify SET POINT and the "F" parameters, but it is possible to visualise their value. "C" Parameters, accessible by means of a password, can be **modified** also with the procedure above described. With the remote control inhibited it is possible only to visualise the value of parameters, but no change them.

**Note:** if H2 is setted to "2" or "3" by the remote control, it is immediately inhibited (pushing "MEMO" button is not required). To enable again the remote control, set H2 to "0" or "1" using the keypad

### H3: Remote programming enabling code

Parameter H3 allows an access code to the control. As already indicated, this makes use of the remote control possible when there are several controls on the same panel without danger of interference. For more detail, see the section on remote programming. Default: H3=00, parameters can be changed from the keypad. Available on all models.

**Note:** see the following chapter "Notes for the new release" to a more detailed description of this parameter functionalities, effective for the instrument with serial number greater than 100,000)

## NOTES FOR THE NEW RELEASE

The instruments of the Infrared series with the serial number greater than 100,000 offer new useful functionalities (see the following description) and at the same time they maintain the compability with the previous series, retaining all their parameters.

### Memorization of the minimum and maximum temperature. For all the models

This instrument allows the registration of the minimum and maximum temperature read by the ambient sensor during an interval which can reach up to 199 hours (more than 8 days). To activate this function, operate as follows:

1. select the parameter 'r5'=1. This is a 'Configuration' parameter.
2. Visualize the parameter 'rt' (type F parameter). By pressing the button 'SEL', the instrument visualizes how long (hours) the minimum and maximum temperature memorization has been active (if the memorization has just been enabled, rt will be associated to the value '0'). If you want to restart the memorization of the temperatures, press the '6' button during the visualization of memorization hours.

The instrument will clear the memorization hours and will start with monitoring again.

3. To visualize the max. temperature detected by the sensor, refer to the value associated with rH.
4. To visualize the min temperature detected by the sensor, refer to the value associated with rL.

After a maximum interval of 199 hours, the rH and rL values are cleared and the memorization will start again.

	Description of the new parameters	Type	Min	Max	U.M.	Def
r5	Enabling min. and max. temperature monitoring (0=no, 1=yes)	C	0	1	flag	0
rt	Effective interval of min and max. temperature monitoring	F	0	199	hours	-
rH	Max. temperature monitored on the rt interval	F	-50	+90	°C/°F	-
rL	Min temperature monitored on the rt interval	F	-50	+90	°C/°F	-

These functions are now available on the IR32M model which – in addition to the insertion of the Ad delay– allows – on the version with the infrared receiver – the modification of the high and low temperature alarms by IR remote controller.

Particularly, the management of the energization delay of the temperature alarms (Ad) has been improved on all the models here enclosed. Notice that it is possible to reset a temperature alarm simply by pressing the '6' button for 5 seconds.

**Warning:** if the instrument is not connected to a UPS, a short power failure will clear the values rt, rL and rH. When the voltage is supplied again, the controller will automatically start the monitoring again with rt =0.

### Time defrosting. IR32Y, IR32C, IR32P and IRDRC models

The duration of the defrosting can be controlled by:

- ✓ temperature according to the defrost sensor located on the evaporator. In any case the defrosting will be deactivated after a max. security duration (selectable).The alarm Ed (defrost end for 'max. security duration') can be disabled.
- ✓ time, useful for special applications, like 'water defrost method'.

If the Ed alarm has not been deactivated, in case of intervention it is possible to clear it by pressing the button '6' for 5 seconds at least. Notice that if you utilize the defrost by time, the second sensor can monitor the air-off temperature. It is also possible to control the unit by a virtual sensor, that is proportional both to the air-on and air off temperature. *Important note: with the time defrosting, possible defaults of the second sensor are non detected.*

	Description of the new parameters	Type	Min	Max	U.M.	Def
r3	Enabling Ed alarm (defrosting inhibited as the max. duration is reached, dP parameter) 0=no, 1=yes.	C	0	1	flag	0
d0	Type of defrosting (0= resistance, 1= hot gas, 2= water or resistance by time, 3= hot gas by time)	C	0	3	flag	0
dP	Max. duration of the defrosting or effective duration if d0=2 or 3	F	1	199	min	30

**Interval between 2 defrosting. For all the models except IR32M**

The defrost duration does not affect the interval between two defrosts. In fact the defrost interval is calculated starting from the beginning of the defrost cycle (so, not from the end of the cycle, as in the previous series).

**Curtain-switch control. For all the models excepted IR32M**

The digital input of the instrument can be programmed to control the 'curtain -switch'. When the curtain is closed – and consequently the digital input connected to the 'curtain -switch' is closed – the control increases automatically the set-point of a selectable value. If the auxiliary output (AUX) controls the unit light, the light is automatically switched off when the curtain is closed and switched on when it is open.

	Description of the new parameters	Type	Min	Max	U.M.	Def
r4	Automatic variation of the set-point during the night (or when the Curtain-switch is closed, with A4 or A5=7)	C	0	+20	°C/°F	3.0
A4	Configuration of the digital input No 1	C	0	7	-	0
A5	Configuration of the digital input No. 2 (only IRDR* models)	C	0	7	-	0

**Management of the evaporator fans. IR32C, IR32P e IRDRC models**

During the normal functioning, the controls of the Infrared series can control the evaporator fans as follows:

- ✓ continuously;
- ✓ only when the compressor is active;
- ✓ according to the temperature difference between the evaporator and the ambient temperature.

Now a new option is available: the evaporator fans can be driven also according to the absolute temperature of the evaporator. The F3 parameter is now fully operative.

	Description of the new parameters	Type	Min	Max	U.M.	Def
F0	Management of fans: 0 = fans always ON – specific phases excluded (see F2, F3 and Fd parameters) 1= thermostatic fans on the basis of the difference between ambient and evaporator temperature, 2= thermostatic fans according to the evaporator temperature	C	0	2	flag	0
F1	Starting temperature of the fans: if F0=1 the fans are ON if evaporator temperature < (ambient temperature - F1 - A0); the fans are OFF if evaporator temperature > ambient temperature - F1. if F0=2, the fans are ON if evaporator temperature < (Setpoint + F1 - A0); the fans are OFF if evaporator temperature > (Setpoint + F1)	F	0	+20	°C/°F	5

**Management of the new algorithm 'switch door'. For all the models excepted IR32M**

When the door is open:

- ✓ the light is open (only IR32C and IRDRC models with an AUX output programmed to control the management of light);
- ✓ the compressor is OFF and the evaporator fans are OFF;
- ✓ the measure displayed flashes;
- ✓ the temperature alarms are disabled.

After a selectable time (d8) has elapsed, the controller returns to its normal functioning, and the temperature alarms are activated. The new algorithm solves any problem due to a switch-door malfunctioning.

	Description of the new parameters	Type	Min	Max	U.M.	Def
A4	Digital input configuration No. 1	C	0	7	-	0
A5	Digital input configuration No. 2 (only IRDR* models)	C	0	7	-	0
H1	Selection functioning of the relay 4: 0=auxiliary output, 1=alarm normally closed, 2= alarm normally energized	C	0	1	flag	0
d8	If A4 or A5=5, max. stop time of the unit with door open. Furthermore time to exclude the alarm after the defrost.	F	0	15	hours	1

### 'Smart' remote On/Off. For all the models

The digital input can be programmed also as remote On/Off.

When the controller is OFF:

- ✓ the temperature is displayed;
- ✓ the compressor anti-cycling protection (min. time between 2 switch on) is active;
- ✓ the AUX output remains operative;
- ✓ the measure displayed is visualized alternatively with two horizontal lines.

### N.O. and N.C. alarm relay. IR32C, IR32P and IRDRC models

The AUX output working in alarm in the IR32C and IRDRC models can operate both as Normally Open and as Normally Closed. The functioning with the N.C. alarm relay ensures the maximum security because the alarm is active also in case of power failure or disconnection of cables.

	Description of the new parameters	Type	Min	Max	U.M.	Def
H1	Selection of relay 4 functioning: 0=auxiliary output, 1=alarm N.C., 2= alarm N.O.	C	0	2	flag	0

### Functioning up to - 50°C (for all the models) and sensor calibration (IR32Y, IR32C, IR32P and IRDRC).

The instrument can work up to -50°C. Therefore it can be used to control the temperature reducer.

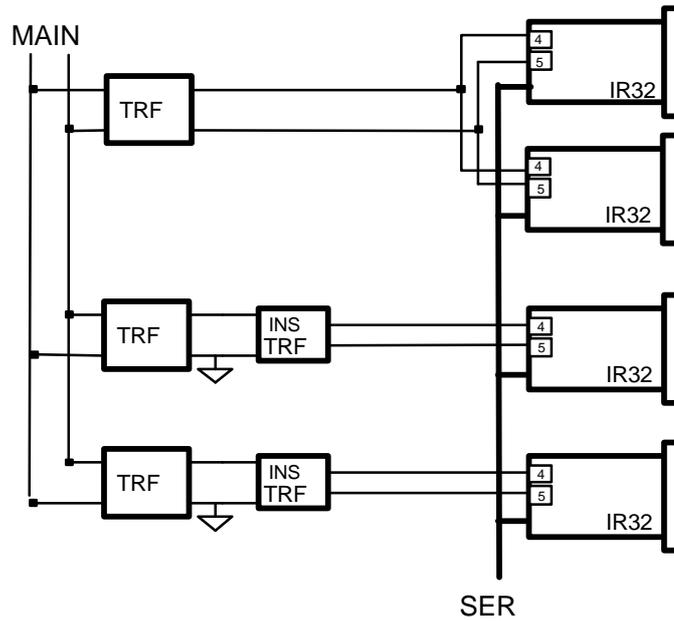
The calibration is operative in the ambient temperature sensor only, that is on the displayed value.

### Programmable digital inputs: list of the options

Value A4 / A5	Meaning	Functioning
0	not active input	
1	immediate external alarm	Contact open=alarm active
2	external alarm with delay	Contact open=alarm active. Delay: see parameter A7
3	enabling of defrost	Contact open =defrost not enabled
4	start of defrost	Defrost is activated when the contact closes. It can be used for real time defrosting. You only need to connect to the digital input a real clock with power back-up, select A4=4 (if the chosen input is Id1) or A5=4 (if the chosen input is Id2, only for the IRDR model). To exclude cyclic defrost automatically activated by the control, set dl=0.
5	door switch	Contact open=door open. When the door is open the compressor and the fan are turned off. If H1=0 (models IR32C, IR32P and IRDRC only) Aux output is activated to switch on the lights. If the door stays open for a time longer than d8, the display will begin to flash and the controller will restart the normal functioning (compressor and fan ON, in case of need).
6	remote On/Off	Contact close=ON. (On the IRDR models, if A4 =6 and A5=6 the control is ON with both the contacts OFF).
7	curtain switch	Contact closed= curtain down. If the input is selected as curtain switch, when the contact closes the control modifies the set point adding the value of the parameter r4. With r4=3.0 (pre-programmed value), the set is increased of 3 degrees compared to the value used with open curtain. If the auxiliary output is used for the light management (only for IR32C, IR32P and IRDRC models) the curtain lowering automatically switches off the light while the curtain raising switches it on.

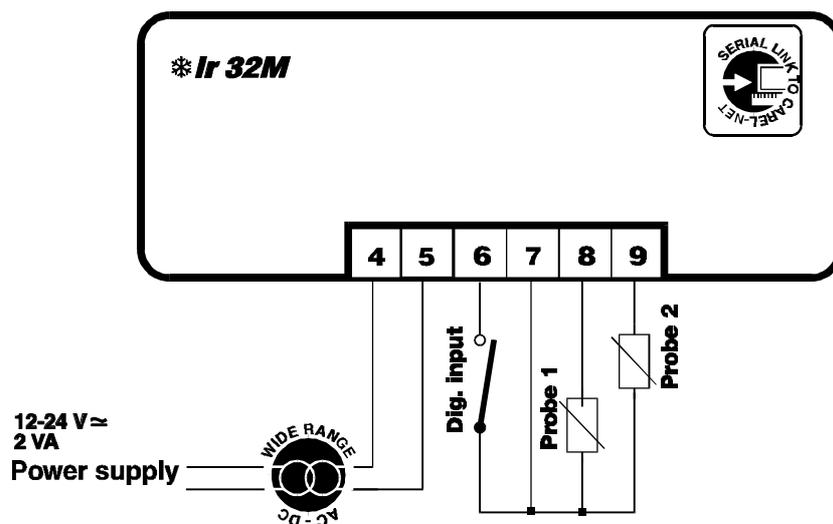
# WIRING DIAGRAMS

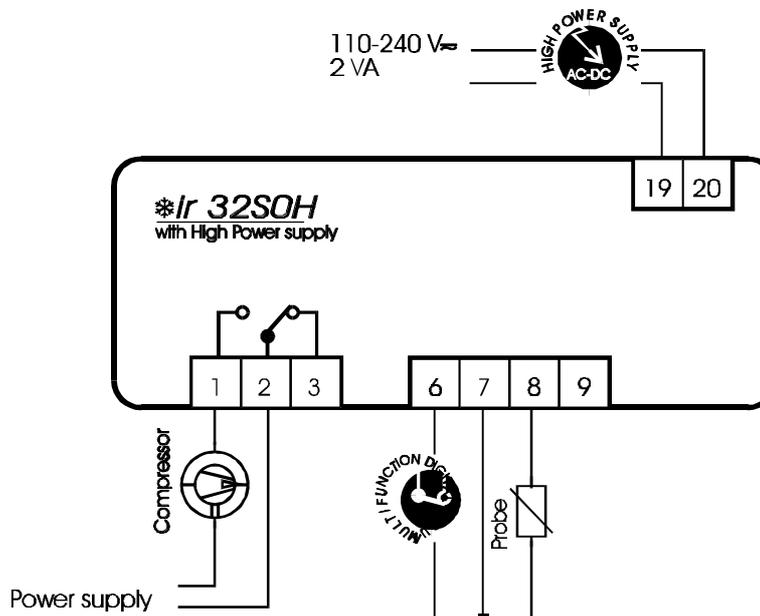
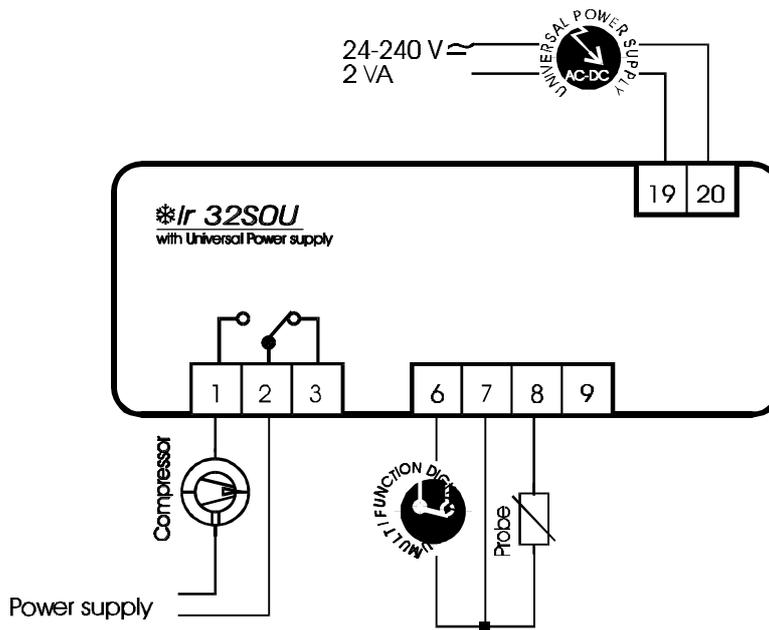
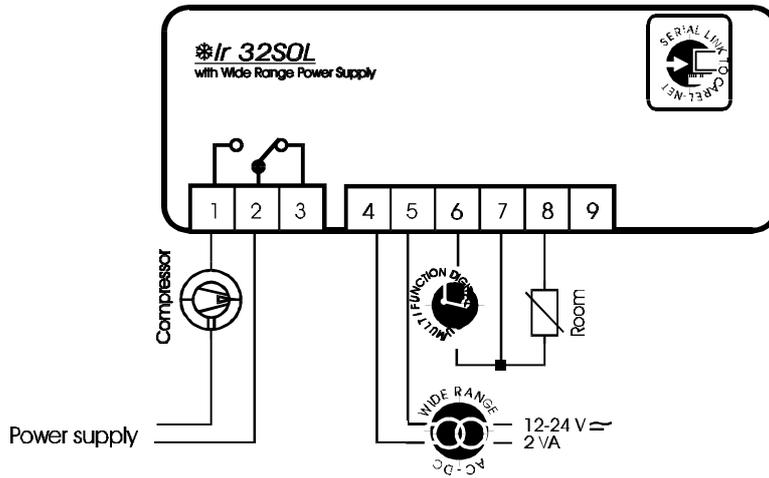
## Wiring diagram for multiple units:



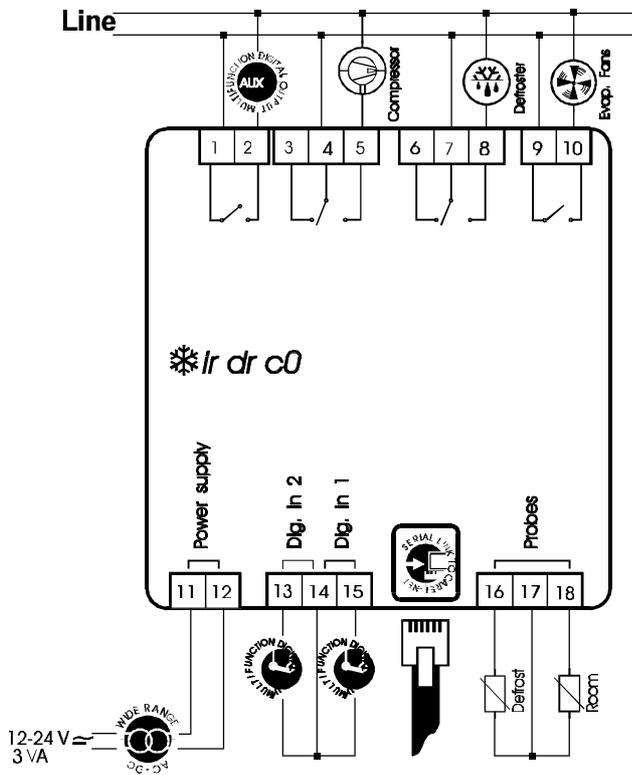
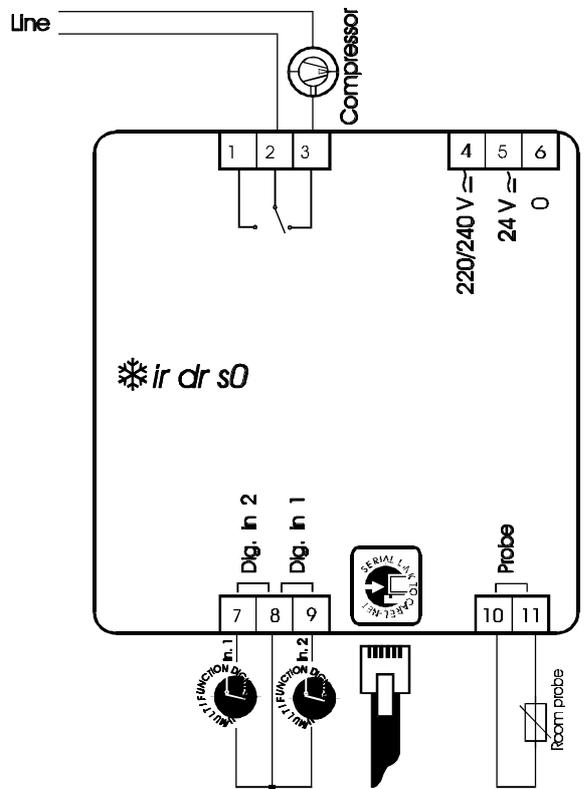
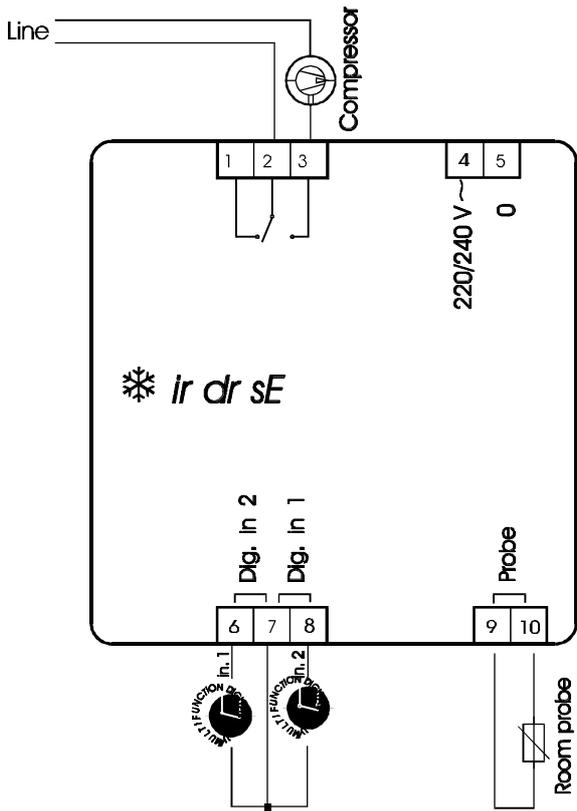
**MAIN** = mains power supply  
**TRF** = transformer  
**INS TRF** = insulating transformer  
 =earth  
**SER** = multiple connection to the control system.

## IR32 panel mounting connections:









## OPERATING STATES OF THE EQUIPMENT

As indicated above, the display LEDs can be in three states:

- **off**, when the function indicated or the actuator is not operative;
- **on**, when the function indicated or the actuator is operative;
- **flashing**, when the function is held up by an alarm situation, by a delay, or by a particular state of the Multifunction input.

There are however various particular operating states not directly indicated by the displays. This can lead to erroneous interpretation of the equipment's operating state. For convenience, the state of the display in such situations is given below:

"PARTICULAR" STATE	COMP LED	FAN LED	DEF LED	C.CYCLE LED
Defrost interval	→	→	off	→
Awaiting defrost	→	→	off	→
Defrost requested	→	→	flashing	→
Defrost in progress	→	→	on	→
Dripping	off	off	off	→
Post-dripping	→	flashing	→	→
Serious alarm	→	→	→	→

→ signifies that the LED may be on, off or flashing as a function of other parameters and ambient factors (temperature, operating set, differential etc.). General remarks made earlier on the state of LEDs should be borne in mind.

## SEQUENCE OF MAIN PHASES

For easy reference we give below a diagram showing the sequence of all the possible phases in the process of defrosting. It should be remembered that some phases (e.g. dripping or post-dripping) can be activated or inhibited by an appropriate choice of parameters. The type of activators being controlled and the type of control depend on the type and configuration of equipment selected.

PHASE	normal operation	defrost	dripping	post dripping	resumption of normal
Models applicable	all (*)	IR32S, IRDRSE/S0 when H1=1, all others	IR32S, IRDRSE/S0 when H1=1, all others	IR32C, IRDRC and IR32P	all (*)
Action	unit's temperature controlled	evaporator defrosted as chosen	compressor and evaporator fans (latter on IR32C, IRDRC and IR32P only) are shutdown in order to help drainage of water after defrosting.	fans are shut off to allow the evaporator again operating temperature	control of temperature resumed

(\*) The thermometer version IR32M is obviously excepted.



The sequence progresses from left to right.

# ALARMS AND TROUBLESHOOTING

## Defective or incorrect operation

Equipment in the Infrared range are able to signal most incorrect operation automatically. When any malfunction occurs the microprocessor initiates the following actions:

- the malfunction is signalled on the display with an appropriate alarm signal. More specifically, the display shows alternatively the alarm code and the temperature read by the sensor. If more than one alarm occurs at the same time, they are signalled successively.
- For some alarms an internal buzzer, if fitted, gives an audible warning.
- For these alarms, the AUX relay, where fitted and if configured as an alarm output, will operate.



By pressing the  button the buzzer will stop and the relay disconnect, while the alarm code will disappear only when the cause has been eliminated. The alarm codes are listed in the table below:

ALARM CODE	BUZZER AND AUX RELAY	CAUSE	MODELS APPLICABLE
E0	active	control sensor error	ALL
E1	inactive	defrost sensor error	IR32Y, IR32C, IRDRC, IR32P
AL	active	immediate external alarm	ALL, if external alarm connected
Ad	active	delayed external alarm	ALL, if external alarm connected
LO	active	low temperature alarm	ALL
HL	active	high temperature alarm	ALL
EA, EE, Eb	inactive	data memorisation error	ALL
Ed	inactive	defrost end by time-out	IR32Y, IR32C, IRDRC, IR32P
dF	inactive	defrost in progress	ALL

## Description of the main alarm signals

### **FLASHING LED**

Initiation of the relative function is delayed for a period while awaiting an external consent or while held up by another process still in progress. For example, if a defrost is requested during continuous cycle operation, the defrost will be held up until the continuous cycle is complete, and the appropriate LED (Def) will flash.

#### ***E0 FLASHING: control sensor error***

- sensor not working because the signal has been interrupted or there is a short-circuit
- sensor not compatible with the equipment
- parameter /0 does not correspond to unit's hardware set-up.

#### ***E1 FLASHING: evaporator sensor error***

- Sensor not working because the signal interrupted or there is a short circuit
- sensor not compatible with the equipment
- parameter /0 does not correspond to unit's hardware set-up.

#### ***AI FLASHING: immediate Multi-function digital input***

- check Multi-function input and parameter A4.

#### ***Ad FLASHING: delayed Multi-function digital input***

- Check Multi-function input and parameters A4 and A7.

#### ***LO FLASHING: low temperature alarm.***

The sensor has registered a temperature further below the set value than the value given to parameter AL.

- Check parameters AL, Ad and A0.

The alarm will cease as soon as the temperature returns within the limits selected (see parameter AL).

***HI FLASHING: high temperature alarm.***

The sensor has registered a temperature further above the set value than the value given to parameter AH.

- Check parameters AH, Ad and A0.

The alarm will cease as soon as the temperature returns within the limits selected (see parameter AH).

***EA, EB, EE DISPLAYED DURING OPERATION OR SWITCHING-ON***

Data acquisition error. See the section "Reset procedure".

***Ed FLASHING:***

the last defrost has stopped due to expiry of the maximum time rather than because the end of defrost set has been reached.

- Check parameters dt, dP and d4.
- Check effectiveness of the defrost.

If the next defrost ends on temperature the signal will disappear automatically.

***dF FLASHING; defrosting in progress.***

- This is not an alarm signal but an indication that that the equipment is carrying out a defrost. Appears only if parameter d6=0.

**Note:** The following pages list some other incorrect operating situations, model by model. The most likely causes and corrective action are indicated. The CAREL organisation remains at your service with suggestions and information.

**What to do if the remote commander does not work:**

- see that there are batteries and that they are correctly inserted;
- see that the batteries are not discharged;
- see that the equipment is designed for remote control (the last letter but one of the code must be R);
- see that there are no obstacles between the remote control and the controller;
- see that the transmitter on the remote control and the infra-red receptor on the control are not dirty;
- see that the distance between the remote commander and the control is not more than 3 metres.

If you can enter the parameters without the possibility to modify their value, check that the protection procedure is not active (see the description of the H2 parameter).

## What to do if the IR32S, IRDRSE/S0 fails to work

PROBLEMS	CAUSE	CHECK
compressor will not start : <ul style="list-style-type: none"> <li>power on</li> <li>compressor LED off</li> </ul>	if H1=0 wrong mode: heating instead of cooling or vice versa	parameter r3 if A4=3, check state of digital input
compressor will not start : <ul style="list-style-type: none"> <li>power on</li> <li>compressor LED flashing</li> </ul>	compressor delay operating	parameter c0, c1 and c2
temperature is outside set limits but no alarm signalled and buzzer, if fitted, does not sound	alarm delay operating	check Ad
AL or Ad alarm signalled (Multi-function input) without in fact being active	Multi-function input generates alarm as power goes on	check connection of input and whether it is off in normal operation
alarm connected to Multi-function input does not operate	alarm delay operating or programming error	see whether A4=1 or A4=2; if A4=1 check state of digital input; if A4=2 check A7
defrost not activated : <ul style="list-style-type: none"> <li>power on</li> <li>defrost LED off</li> </ul>	if H1=1 <ul style="list-style-type: none"> <li>defrost cycle too short (dp)</li> <li>interval between defrosting dl=0: in this case defrost will not be activated</li> </ul>	parameter dP and dl
manual defrost not activated and defrost LED flashing	compressor protection delays operating	parameter d9 (select d9=1, see instructions)
high temperature alarm given after defrosting	alarm delay after defrost too short or alarm threshold too low	parameters d8 and AH
when H1=1, display override remains even after defrost	ambient temperature has not yet reached value set, or time d8 has not yet elapsed	wait or reduce d8
after changing a value, or programming continues to work with old values	unit has not yet updated of re-start unit, parameters has not been satisfactorily completed, pressing 	switch off and parameter, control or programme again correctly
cycle continuous is not activated	it is necessary to press   before	see note on page 8

***With the factory settings it can happen that within the 120 minutes delay set (Ad) the unit fails to reach the range of +/- 10 degrees (AL and AH) around the set-point selected for the temperature alarm. If this occurs we suggest to increase the delay by changing parameter Ad.***

## What to do if the IR32Y fails to work

PROBLEMS	CAUSE	CHECK
compressor will not start : • power on • compressor LED flashing	<ul style="list-style-type: none"> <li>compressor delay in operation if A4=3</li> <li>post-defrost dripping in progress</li> </ul>	parameters c0, c1, c2 and dd
temperature is outside set limits but no alarm signalled and buzzer, if fitted, does not sound	alarm delay operating	check Ad
AL or Ad alarm signalled (Multi-function input) without in fact being active	Multi-function input generates alarm as power goes on	check connection of input and whether it is off in normal operation
alarm connected to Multi-function input does not operate	alarm delay operating or parameter programming error	see whether A4=1 or A4=2; if A4=1 check state of digital input; if a4=2 check A7
defrost not activated : • power on • defrost LED off	if H1=0 <ul style="list-style-type: none"> <li>defrost cycle too short (dp)</li> <li>interval between defrosting dl=0: in this case defrost will not be activated</li> </ul>	parameter dp and dl
defrost not activated: • power on • defrost LED flashing	if H1=1 end defrost temperature is too low. Suggest checking defrost sensor and temperature reading on evaporator (parameter d/)	parameter dt and d/ defrost sensor
manual defrost not activated and defrost LED flashing	compressor protection delays operating	parameter d9 (select d9=1, see instructions)
high temperature alarm given after defrosting	alarm delay after defrost too short or alarm threshold too low	parameters d8 and AH
display override remains even after defrost	ambient temperature has not yet reached value set, or time d8 has not yet elapsed	wait or reduce d8
after changing a value, or programming continues to work with old values	unit has not yet updated of re-start unit, parameters has not been satisfactorily completed, pressing 	switch off and parameter, control or programme again correctly
cycle continuous is not activated	it is necessary to press  before 	see note on page 8

***With the factory settings it can happen that within the 120 minutes delay set (Ad) the unit fails to reach the range of +/- 10 degrees (AL and AH) around the set-point selected for the temperature alarm. If this occurs we suggest to increase the delay, by changing parameter Ad.***

## What to do if the IR32P or IR32C, IRDRC fails to work

PROBLEMS	CAUSE	CHECK
compressor will not start : <ul style="list-style-type: none"> <li>power on</li> <li>compressor LED flashing</li> </ul>	<ul style="list-style-type: none"> <li>compressor delay in operating</li> <li>post-defrost dripping in progress</li> </ul>	parameters c0, c1, c2 and dd
temperature is outside set limits but no alarm signalled and buzzer, if fitted, does not sound	alarm delay operating	check Ad
AL or Ad alarm signalled (Multi-function input) without in fact being active	Multi-function input generates alarm as power goes on	check connection of input and whether it is off in normal operation
alarm connected to Multi-function input does not operate	alarm delay operating or parameter programming error	see whether A4=1 or A4=2; if A4=1 check state of digital input; if A4=2 check A7
defrost not activated: <ul style="list-style-type: none"> <li>power on</li> <li>defrost LED flashing</li> </ul>	end defrost temperature too low. Suggest checking defrost sensor and temperature reading on evaporator (parameter /d)	parameter dt and d/ defrost sensor
manual defrost not activated and defrost LED flashing	compressor protection delays operating	parameter d9 (select d9=1, see instructions)
high temperature alarm given after defrosting	alarm delay after defrost too short or alarm threshold too low	parameters d8 and AH
after changing a value, or programming continues to work with old values	unit has not yet updated of re-start unit, parameters has not been satisfactorily completed, pressing 	switch off and parameter, control or programme again correctly
display override remains even after defrost	ambient temperature has not yet reached value set, or time d8 has not yet elapsed	wait or reduce d8
<ul style="list-style-type: none"> <li>fans do not start</li> <li>fan power on</li> <li>compressor LED flashing</li> <li>fan LED flashing</li> </ul>	<ul style="list-style-type: none"> <li>compressor and fan delay selected</li> <li>if F0=1 (fans under fan controller)</li> <li>evaporator is warm: temperature can be read by selecting parameter /d</li> <li>dripping is in progress</li> <li>delta (F1) selected is too high</li> <li>a post dripping delay is operating</li> <li>if F0=0</li> <li>F2=1 and compressor off</li> <li>dripping is in progress</li> <li>closing down after dripping</li> </ul>	<p>check c0</p> <p>parameters F0, F1, FD, dd and d/</p> <p>parameters F0, F2, dd and Fd</p>
cycle continuous is not activated	it is necessary to press  button before "aux" Button.	see note on page 8

***With the factory settings it can happen that within the 120 minutes delay set (Ad) the unit fails to reach the range of  $\pm 10$  degrees (AL and AH) around the set-point selected for the temperature alarm. If this occurs we suggest to increase the delay by changing parameter Ad.***

## TECHNICAL CHARACTERISTICS

Models	IR32M	IR32S	IRDRS0	IRDRSE	IR32Y	IR32P	IR32C	IRDRC
<b>Power supply:</b> Wide range: 12-24Vac/dc, ±10%, 50/60Hz Universal: 24-240Vac/dc, ±10%, 50/60Hz 24 Vac e 220 Vac on power board	•	12-24 Vac/dc  110-240 Vac/dc (mod. IR32S*H)	•	230	•	•	•	•
<b>Consumption</b>	2VA	2VA	3VA	3VA	2VA	2VA/3VA	3VA	3VA
<b>Accuracy:</b> NTC Carel	±1°C							
PTC	±3°C	±3°C			±3°C	±3°C	±3°C	
Type of sensor used for control: NTC Carel (10 KΩ a 25°C): standard ON PTC 985 Ohms a 25 ° C, <b>upon request:</b>	• •	• •	•	•	• •	• •	• •	•
Type of sensor used for defrosting: NTC Carel (10 KΩ a 25°C), standard ON: PTC 985 Ohms a 25 ° C, <b>upon request:</b>					• •	• •	• •	•
Range of operation: -40÷90°C (-40÷130 °C with PTC)	•	•			•	•	•	
Operating conditions: 0-60°C, with relative humidity less than 80%rH	•	• 0-50 °C (mod. IR32S*H)	•	•	•	•	•	•
Storage conditions: -25÷70°C, with relative humidity less than 80%rH (* ) 0/50°C, <80rH%, for IR32S with universal power supply	•	•	•	•	•	•	•	•
<b>User interface</b>								
LED display with 2 and a half digits	•	•	•	•	•	•	•	•
Signal buzzer optional ON		•		standard	•	•	•	•
Compressor ON indicator		•	•	•	•	•	•	•
Defrost ON indicator		•	•	•	•	•	•	•
Fan ON indicator						•	•	•
Continuous cycle ON indicator		•	•	•	•	•	•	•
<b>Particular functions</b>								
Duty setting		•	•	•	•	•	•	•
Continuous cycle		•	•	•	•	•	•	•
Multi-function input	•	•	•	•	•	•	•	•
Multi-function output (IR32P only with S90OEM4PWR)						•	•	•
Serial connection	•	•	•		•	•	•	•
Keypad protection		•	•	•	•	•	•	•
Virtual sensor	•				•	•	•	•
Decimal point	•	•	•	•	•	•	•	•

Models	IR32M	IR32S	IRDRS0	IRDRSE	IR32Y	IR32P	IR32C	IRDRC
<b>Programming</b>								
Keypad		•	•	•	•	•	•	
Remote commander (optional)	•	•			•	•	•	
<b>Mechanical characteristics</b>								
Dimensions:								
33 x 75 x 72:					•		•	
33 x 75 x 64:	•	•				•		
Index of protection: IP65 (front panel)	•	•			•	•	•	
IP40 (front panel)			•	•				•
Stirrup-catch fixing:	•	•			•	•	•	
<b>Quality and accuracy</b>								
Test in circuit	•	•			•	•	•	
Watch dog	•	•			•	•	•	
Immunity from interference according to standards IEC 801-2 and 801-4 level 4	•	•	•	•	•	•	•	•

<b>GENERAL SPECIFICATIONS (for all models)</b>	
Connection	Screw terminals for cables with min. 0.5mm <sup>2</sup> - max. 1,5mm <sup>2</sup> cross-section
Classification according to protection against shock	Class I
Number of automatic cycles for each automatic action (e.g.: relay)	100.000
Ageing period (operating hours)	60.000
Type of action-disconnection	1C
PTI of materials used for insulation	250 V
Period of electric stress across insulating parts	Long
Environmental pollution	Normal
Heat and fire resistance category	D
Category (surge immunity)	1
Software class and structure	Class A (EN60730-1)
Time constant	35 s in forced air
Disposal of the product	avoid disposing the device in domestic rubbish. To dispose the device refer to the environmental protection laws in force in your Country

<b>Electrical characteristics of relays fitted in all models except the compressor relay on board S90RDPW200</b>	<b>Electrical characteristics of the compressor relay fitted on board S90RDPW200</b>
Maximum peak current: 10A	Maximum peak current: 70A
Maximum operating current: 8A	Maximum operating current: 20A
Maximum operating power: 2000VA	Maximum operating power: 5000VA
Maximum operating resistance load at 220Vac: 1760W	Maximum operating resistance load at 220Vac: 4400W
Maximum inductance load 300 W at 220Vac (cos.psi=0.7)	Maximum inductance load 1800 W at 220Vac (cos.φ=0.7)
Maximum operating tension: 250Vac	Maximum operating tension: 250Vac

## SUMMARY OF ALL THE PARAMETERS

	<i>SENSOR PARAMETERS</i>	Type	Min	Max	Unit	Def	New
/0	Type of sensor (0=NTC,1=PTC)	C	0	1	-	0	
/C	Calibration	F	-20	+20	°C/°F	0.0	
/2	Measurement stability	C	1	15	-	4	
/3	Sensor reading speed	C	1	15	-	8	
/4	Virtual sensor	C	0	100		0	
/5	°C /°F (0=°C, 1=°F)	C	0	1	flag	0	
/6	Decimal point (0=yes, 1=no)	C	0	1	flag	0	

	<i>CONTROL PARAMETERS</i>	Type	Min	Max	Unit	Def	New
rd	Control differential	F	0.1	19.9	°C/°F	2	
r1	Minimum set allowed	C	-40	r2	°C/°F	-40	
r2	Maximum set allowed	C	r1	199	°C/°F	90	
r3	Direct / Reverse operation (Direct r3=0, Reverse r3=1)	C	0	1	flag	0	

	<i>COMPRESSOR PARAMETERS</i>	Type	Min	Max	Unit	Def	New
c0	Compressor start-up delay after unit start-up	C	0	15	min	0	
c1	Minimum interval between two compressor start-up	C	0	15	min	0	
c2	Minimum compressor off-time	C	0	15	min	0	
c3	Minimum compressor on-time	C	0	15	min	0	
c4	Duty setting (compressor safety, 0=OFF,100=ON)	C	0	100	min	0	
cc	Duration of continuous cycle	C	0	15	hrs	4	
c6	Alarm cut-out after continuous cycle	C	0	15	hrs	2	

	<i>DEFROST PARAMETERS</i>	Type	Min	Max	Unit	Def	New
d0	Type of defrost (0=resistance, 1= hot gas)	C	0	1	flag	0	
d1	Interval between defrost	F	0	199	hrs	8	
dt	End defrost temperature set	F	-40	199	°C/°F	4	
dP	Maximum duration of defrost	F	1	199	min	30	
d4	Defrost on unit start-up (0=no, 1=yes)	C	0	1	flag	0	
d5	Defrost delay after unit start-up or multi-function input	C	0	199	min	0	
d6	Display override during defrost (0=no, 1=yes)	C	0	1	flag	1	
dd	Dripping time	F	0	15	min	2	
d8	Duration of alarm cut-out after defrost and/or opening door	F	0	15	hrs	1	
d9	Defrost has priority over compressor protection (0=no, 1=yes)	C	0	1	flag	0	
d/	Defrost sensor reading	F	-	-	°C/°F	-	
dC	Time basis (0=hrs/mins, 1=minutes/seconds)	C	0	1	flag	0	

	<i>ALARM PARAMETERS</i>	Type	Min	Max	Unit	Def	New
A0	Alarm and fan differential	C	0.1	+20	°C/°F	0.2	
AL	Low temperature alarm (deviation from set point)	F	0	199	°C/°F	10	
AH	High temperature alarm (deviation from set point)	F	0	199	°C/°F	10	
Ad	Temperature alarm delay	C	0	199	min	120	
A4	Multi-function input configuration IR32S, Y and C, IR32M	C	0	5	-	0	
A5	Multi-function input configuration: IRDRS, SE, IRDRC For Rail Din mounting: must be kept 0	C	0	5	-	0	
A6	Duty setting for external alarm(0=OFF, 100=ON)	C	0	100	min	0	
A7	External alarm delay (A4=2, Multi-function input)	C	0	199	min	0	

	<i>FAN PARAMETERS</i>	Type	Min	Max	Unit	Def	New
F0	Fans under fan regulator (0=no, 1=yes)	C	0	1	flag	0	
F1	Fan shut-off temperature (relative to ambient)	F	0	+20	°C/°F	5	
F2	Stop fans when compressor off (0=no, 1=yes)	C	0	1	flag	1	
F3	Stop fans during defrost (0=no, 1=yes)	C	0	1	flag	1	
Fd	End post-dripping	F	0	15	min	3	

	<i>OTHER SETTING</i>	Type	Min	Max	Unit	Def	New
H0	Address within network	C	0	15	-	0	
H1	Type configuration: IR32S and IR32Y IR32C and IR32P	C	0	1	flag	0 1	
H2	Changing sets by keypad (0=no, 1=yes)	C	0	1	flag	1	
H3	Code to permit remote programming	C	0	199	-	00	

## TEMPERATURE/RESISTANCE RATIOS FOR NTC THERMISTORS

As indicated in the description of parameter /0, temperature sensors using the NTC thermistors normally fitted in Infrared control systems change an electrical parameter, i.e. their resistance, as the temperature varies. Below are listed the resistance values corresponding to the various temperatures. In the case of any malfunction or any inaccurate control, users are advised to check the operation of the sensors in the following manner:

- with a standard thermometer determine the temperature sensed by the sensor
- with an ohmmeter measure the resistance at the head of the sensor and compare it with the values in the table.

In view of the variation shown by thermistors, three resistance values are given in the table for each temperature.:

- Rstd = the typical resistance value at the temperature indicated;
- Rmin is the minimum value;
- Rmax is the maximum value.

For the sake of simplicity, the values relative to only a limited number of temperatures are given. Intermediate values can be adequately determined by interpolation.

Temperature/Resistance ratios for the Carel NTC temperature sensor			
Temperature	Rmin	Rstd	Rmax
-40 °C	181.10 kΩ	188.40 kΩ	195.90 kΩ
-30 °C	107.50 kΩ	111.30 kΩ	115.10 kΩ
-20 °C	65.80 kΩ	67.74 kΩ	69.74 kΩ
-10 °C	41.43 kΩ	42.25 kΩ	43.50 kΩ
0 °C	26.74 kΩ	27.28 kΩ	27.83 kΩ
10 °C	17.67 kΩ	17.95 kΩ	18.24 kΩ
20°C	11.95 kΩ	12.09 kΩ	12.23 kΩ
30 °C	8.21 kΩ	8.31 kΩ	8.41 kΩ
40 °C	5.73 kΩ	5.82 kΩ	5.92 kΩ
50 °C	4.08 kΩ	4.16 kΩ	4.24 kΩ
60 °C	2.95 kΩ	3.02 kΩ	3.09 kΩ
70 °C	2.17 kΩ	2.22 kΩ	2.28 kΩ
80 °C	1.62 kΩ	1.66 kΩ	1.71 kΩ
90 °C	1.22 kΩ	1.26 kΩ	1.30 kΩ

## NOTES FOR CONTROLS WITH SERIAL NUMBERS BELOW 5,000

If the unit has a serial number lower than 5000 (see **serial number** on the label placed on the back of the unit), the factory settings of two parameters will differ from other units:

### ALARM PARAMETERS

Type    Min    Max    Unit    Def

Ad	Temperature alarm delay	C	0	199	min	0
----	-------------------------	---	---	-----	-----	---

### DEFROST PARAMETERS

Type    Min    Max    Unit    Def

Ad	Defrost has priority over compressor protection (0=no, 1=yes)	C	0	1	Flag	1
----	---	---	---	---	------	---

In addition, whenever type C parameters are accessed (via the keypad or via remote commander), the unit displays the parameter /0.

As indicated in the description of the sensor parameters, this parameter can only be modified in exceptional situations.

Finally, these units have a different reset procedure from that described previously. This is as follows:

### Reset procedure for units with serial number below 5000.

In very exceptional operating situations (strong interference impulses of electromagnetic origin), the unit may reveal errors in its internal memorisation of data. These errors can affect the correct operation of the unit. If the microprocessor identifies an error in data memorisation, the display will show one of the following:

## EE, EB or EE.

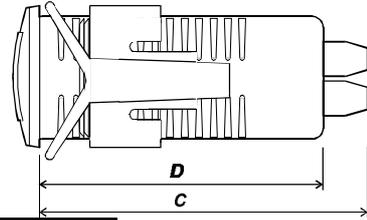
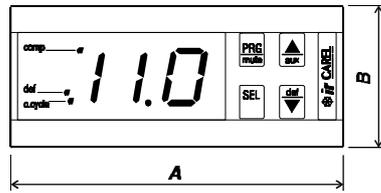
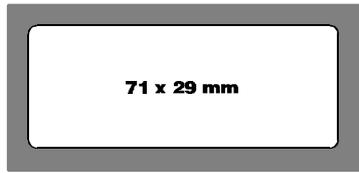
To re-start correct operation a particular RESET procedure must be carried out:

- switch off power supply to the unit;
- while pressing the , switch on the unit (Note: RESET procedure returns all parameters to their default state. Thus any changes made to the working parameters will be lost. In particular, **if using a unit designed for PTC sensor**, it is necessary to reprogram the correct value for parameter /0, i.e. /0=1).
- the display will read **\_\_C\_\_**;
- after a few seconds the unit will begin normal operation.

If the error indicator EE should persist, press the def button to remove the indication. If the error EE persists further, it will be necessary to replace the unit. If the indication disappears it is possible to continue using the unit. However, it is wise to have the control checked as soon as possible, since its original accuracy may not be maintained.

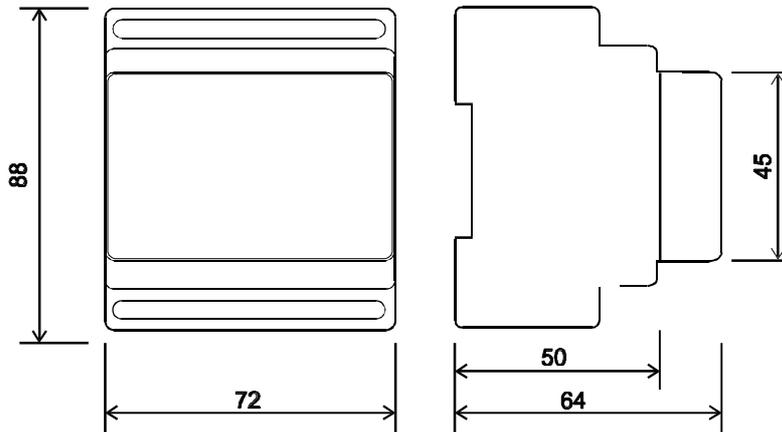
# IR32 DIMENSIONS

## IR32

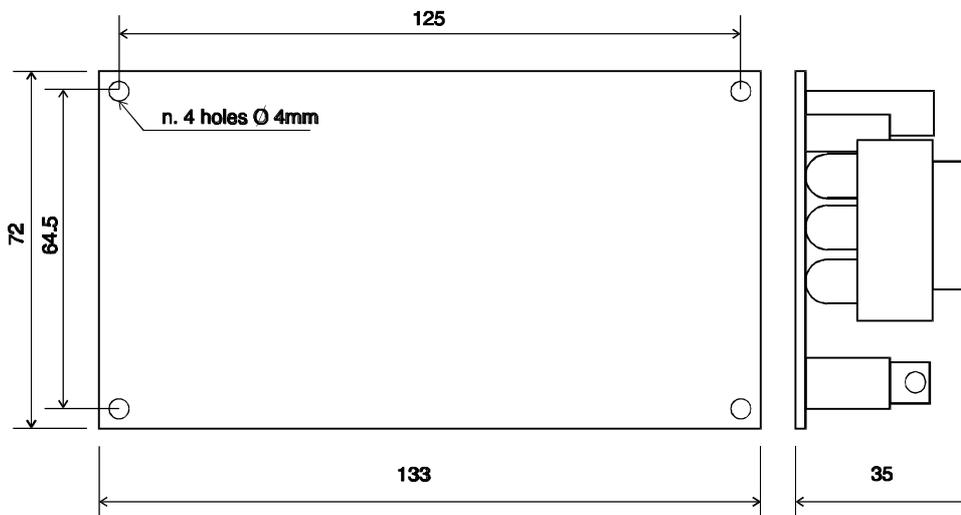


	IR32M, IR32S, IR32P	IR32Y IR32C
A	75	75
B	33	33
C	64	72
D	64	64

## IRDR and S90RDPW2



## S90OEM4PWR



# CODE NUMBERS FOR ORDERING CONTROLS AND ACCESSORIES

## NTC Sensors

Description	Operating range	Index of protection	Code
NTC, bulb 6x15mm	-50÷50°C	IP67	NTC0**HP00
NTC, bulb 6x40mm	-50÷100°C	IP67	NTC0**W*00
NTC for insertion	-50÷110°C	IP67	NTCINF0600
NTC for wall mounting	-10÷70°C	IP30	ASWT011000
NTC for duct mounting	-10÷70°C	IP55 (*)	ASDT011000
NTC for wall mounting (temperature + humidity)	0÷50°C / 10÷90% rH	IP30	ASWC111000
NTC for duct mounting (temperature + humidity)	0÷50°C / 10÷90% rH	IP55 (*)	ASDC111000

(\*) the index of protection above mentioned refers to the case: IP40 refers to the sensor.

## PTC Sensors

Description	Operating range	Index of protection	Code
PTC, bulb 6x40, 1,5m	0÷150°C	IP65	PTC0150000
PTC, bulb 6X40, 1,5m	-50÷100°C	IP67	PTC015W000
PTC, bulb 6x180, 6m	-50÷100°C	IP67	PTC060WA00

## PANEL MOUNTING THERMOMETER

### Thermometer

IR32M: 2½ digits, NTC, 12-24Vac/dc	IR32M0L000
------------------------------------	------------

### Panel mounting thermostats with defrost timer

IR32S: 2½digits, 12-24Vac/dc	IR32S0L000
IR32S: 2½digits, 12-24Vac/dc, for remote control, with buzzer	IR32S0LBR0
IR32S: 2½digits, 24-240Vac/dc	IR32S0U000
IR32S: 2½digits, 24-240Vac/dc, for remote control, with buzzer	IR32S0UBR0
IR32S: 2½digits, 110-240Vac/dc	IR32S0H000
IR32S: 2½digits, 110-240Vac/dc, for remote control, with buzzer	IR32S0HBR0

### Panel mounting thermostats and defrost controls for static units at low temperature

IR32Y: 2½digits, 12-24Vac/dc	IR32Y0L000
IR32Y: 2½digits, 12-24Vac/dc, for remote control	IR32Y0LBR0

### Panel mounting thermostats and defrost controls for ventilated units at low temperature

IR32C: 2½digits, 12-24Vac/dc	IR32C0L000
IR32C: 2½digits, 12-24Vac/dc	IR32C0LBR0
IR32P: 2½digits (*)	IR32P0L000
IR32P: 2½digits, for remote control (*)	IR32P0LBR0

(\*) IR32P: must be used with S90RDPW200 (24-240 supply voltage, 3 relays, 4 Din modules casing) or S90OEM4PWR (24-240 supply voltage, 4 relays, PC board) connected by S90CONN000/1/2.

### Options

Alarm buzzer	IR32***B**
IR receiver	IR32***B**
IR32 serial output board	IR32SER000

## DIN RAIL MOUNTING THERMOSTATS

### Din Rail mounting thermostats with defrost timer

IRDRSE: 2½digits, 230Vac, no buzzer, no option for serial interface, 2 digital inputs, for remote control	IRDRSE0000
IRDRS0: 2½digits, 24-240Vac, buzzer, optional serial interface, 2 digital inputs, for remote control	IRDRS00000

### Din Rail mounting thermostats and defrost controls for ventilated unit at low temperature

IRDRC0: 2½digits, 12-24Vac/dc, buzzer, optional serial interface, 2 digital inputs, 4 relay outputs, for remote control	IRDRC00000
---	------------

### Options

Serial output board for IR Din-Rail and IR96	IRDRSER000
--	------------

### Remote Control

Italian version	IRTRRI0000
English version	IRTRRE0000
French version	IRTRRF0000
Spanish version	IRTRRS0000
German version	IRTRRG0000

### Transformers

TRA 12 UNI: 3 VA, 110/12 Vac,	TRA12UNI11
TRA 12 UNI: 3 VA, 230/12 Vac,	TRA12UNI00
TRA 12 UNI: 3 VA, 240/12 Vac,	TRA12VDE00
TRA 24 UNI: 3 VA, 230/24 Vac,	TRA2400001
TRA DIN: 4 VA, 230/24 Vac	TRADR4W024

### Network components

T-device connection	TCONN60000
---------------------	------------

## **IR96: MICROPROCESSOR-BASED FREEZER CONTROLLER FOR MEDIUM OR LOW TEMPERATURE RANGE FORCED AIR UNITS**

Ir96 is a microprocessor based controller designed for the management of freezer with gravity or forced-air evaporators. It has 5 relay outputs available to control all the main actuators: compressor (directly up to 1Hp single-phase), evaporator fans and defrosting. The fourth relay allows remote signalling of any malfunctioning (high temperature, faulty sensors,...). The fifth relay can be used to control the unit lights or other auxiliary functions (for example de-misting fans). Two programmable digital inputs allow innovative performances: automatic alarm management, real time defrosting, management of lights subjected to the door switch.

Ir96 can be supplied directly with 230 Vac ( $\pm 15\%$ ), since it is equipped with an internal transformer (it is necessary to protect the instrument with a 1 A protection fuse). Ir96 set-point is selectable from -50 to +90 °C and temperature can be displayed with a resolution of a tenth of degree from -19.9 to +19.9. It comes complete with an alarm buzzer and an infrared receiver for remote control programming. It is moreover pre-arranged for serial card installation which allows to connect the instrument to supervisory and telemaintenance systems.

Ir96 is an evolution of Infrared Series for commercial refrigeration. Its software has been up-dated considering all the suggestions of our customers. Following we will see in detail the new functions.

### **NEW FUNCTIONS**

#### **Min-Max temperature data logging**

Ir96 allows to record the minimum and the Maximum temperature values read by the ambient sensor during an interval which can reach up to 199 hours (more than 8 days).

In any moment it is possible to restart the logging period by pushing a button.

*Refer to parameters rt, rH, rL next pages.*

#### **Defrost duration also 'by time'**

The defrost duration can be controlled:

- by temperature, according to the defrost sensor, with a Maximum safety duration. In this case the Ed alarm (defrost end by time) can be disabled.
- only by time. This is useful on special applications like 'water defrost method'.  
Using the defrost by time, the 2nd sensor can monitor the 'air-off' temperature.  
It is moreover possible to drive the unit according to a virtual sensor, proportional to both the 'air-on' and the 'air-off' temperature.

*Refer to parameters d0, dP next pages.*

#### **Interval between defrosts**

On Ir96 the interval between defrosts is constant.

It is calculated starting from the beginning of the defrost cycle.

In this way the defrost duration does not affect the interval between two defrosts.

*Refer to parameters dl next pages.*

#### **Curtain-switch control**

The digital input on Ir96 can be programmed to control the curtain switch.

When the curtain is closed the control automatically increases the set-point of a selectable value.

The light is automatically switched off when the curtain is closed and switched on when it is open.

*Refer to parameters A4, A5, r4 next pages.*

#### **Evaporator fan management**

On normal functioning, the controls of Infrared series can energize the evaporator fan:

- continuously
- only when the compressor is energized
- according to the temperature difference between evaporator and room temperature

Furthermore a special management is possible during defrost and dripping time.

Now on Ir96 a new option is available:

- the evaporator fan can be driven also according to the absolute temperature of the evaporator.

*Refer to parameters F0, F1 next pages.*

### **New algo for door-switch management**

When the door is open

- the light switches ON
- the compressor & the evaporator fan switch OFF
- the temperature alarms are disabled

After a selectable time has elapsed, the control returns to its normal functioning.

The new algo overrides any problems due to a switch- door malfunctioning.

*Refer to parameters A4, A5, H1, d8 next pages.*

### **'Smart' On/Off button**

When the control is OFF

- the temperature is displayed
- the compressor anti-cycling protection is active
- the light-button remains operative

Furthermore

- the ON/OFF state is memorized on EEPROM. In case of power failure the control returns to the previous state.
- the digital input can be programmed as remote ON/OFF. In this case the ON/OFF button on the front panel is disabled.

*Refer to parameters A4, A5, c2 next pages.*

### **N.O and N.C. alarm relay**

On Ir96 the alarm relay can work either with Normally Open or Normally Closed contact.

The latter assures the maximum safety because the alarm is active also in case of power failure or wires disconnection.

*Refer to the parameters H1.*

### **IR96 new functions: -50°C and new algo for calibration**

Ir96 can work up to -50°C. In this way it can be used as 'quick chill' control.

On Ir96 the calibration is operative only on ambient temperature sensor, that is on the displayed value.

*Refer to the parameters r1,r2*

### **Programmable digital inputs: summary of the options**

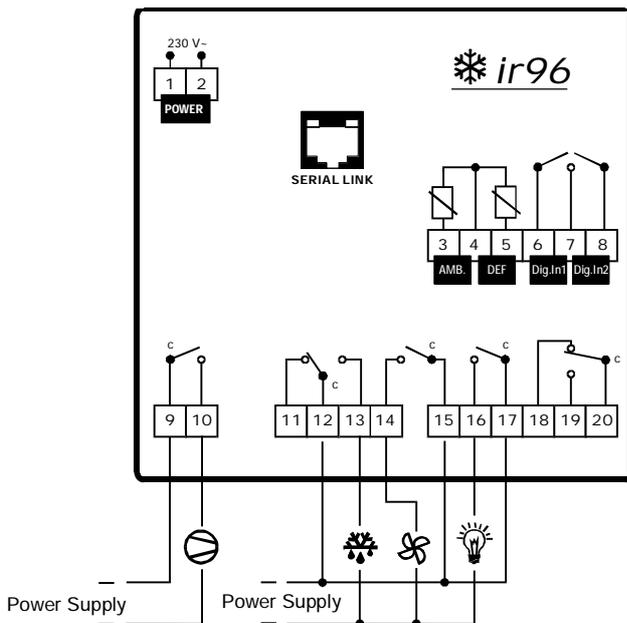
- real time defrost
- immediate input alarm
- delayed input alarm
- door switch control
- curtain switch control
- remote ON/OFF

## TECHNICAL FEATURES

Set-point:	-50T90 (-50/+90°C; -58/+194°F)
Power supply	230 ±15% ~
Consumption	4 VA
Precision	±1°C, ±2°F
Case	plastic,
Installation	incorporated
Working temperature	0÷50°C; 32÷122°F
Storage conditions	-10/+70°C; 14/158 °F
Connections	digital inputs and sensor on plug-in connectors, outputs on faston connectors
Display	2 and a half digits
Signalling: <i>luminous</i> <i>acoustic</i>	compressor, continuous cycle, defrosting, fan, IR activated, alarm/ light alarm buzzer
Inputs	refrigerating room sensor, defrosting sensor, multi-function inputs
Type of sensor:	NTC CAREL 10KΩ a 25°C (for codes see Carel price-list)
Relay outputs (all)	Disconnection of type 1B according to ECC EN 60730-1
<i>Compressor</i>	SPST relay, max.switching capacity: 20A/250V ~
<i>Defrosting</i>	SPDT relay, max.switching capacity: 8A/250V ~
<i>Fan</i>	SPST relay, max.switch.capac.: 16A/250V ~
<i>Light/aux output</i>	SPST relay, max.switch.capac.: 16A/250V ~
<i>Alarm output</i>	SPDT relay, max.switching capacity: 8A/250V ~
Kind of environmental pollution	normal
Frontal protection index	IP54

**Important warning:** the cables to be connected to the controller contacts should resist to the maximum operating temperature which is determined by considering the expected maximum ambient temperature + the controller overheating equal to 20°C. Moreover, it is necessary to protect the controller with a 1A, 250V ~ protection fuse should be placed.

## CONNECTIONS



**Caution:** with respect to safety rules follow the below quoted instructions carefully:

- The cables to be connected to the controller contacts should resist the maximum operating temperature which is determined by considering the maximum ambient temperature expected + the controller auto-heating equal to 20 °C.
- Moreover, it is necessary to protect the controller with a 1A, 250V ~ fuse.
- Connect the terminals 12, 15 and 17 to the same electric potential, as shown in the picture

## IR96: BUTTONS FUNCTIONING

### LIGHTS BUTTON:



- activates/deactivates the unit lights (or any other aux. output connected to the 4th relay)
- increases the value of data on display during selection of set-point and parameters

### MANUAL DEFROST BUTTON:



- decreases the value of data on display during selection of set-point and parameters
  - if pressed during an alarm signalling, it resets the relay, silences the buzzer and deletes the alarm code on display even if the cause of the alarm remains.
- if pressed for more than 5 seconds:*
- forces a manual defrosting cycle

### SET BUTTON:



- selects the set-point (see section "set-point")
  - displays the value of the selected parameter (see section "parameters modification")
- if pressed for more than 5 seconds together with the PRG button:*
- allows access to the configuration menu (see section "parameters second level")

### PRG BUTTON:



- silences the buzzer, while the alarm code remains as long as the alarm condition remains
- if pressed on turning On the instrument:*
- allows selection of default parameters (see section "alarms and signalling")
- if pressed for more than 5 seconds:*
- allows access to the frequent parameters selection menu
- if pressed for more than 5 seconds together with the sel button:*
- allows access to the configuration menu (see section "parameters second level")

### CONTINUOUS CYCLE BUTTON:



- if pressed for more than 5 seconds:*
- activates/deactivates a continuous cycle, that is the forced activation of the compressor for a period to be selected (see parameter "duration of continuous cycle")

### ON/OFF BUTTON:



- allows the switching On/Off of the refrigerating unit

**Warning:** when the controller is OFF all outputs, with the exception of the light button and the lights output, will be deactivated and the OFF led will be flashing. The ON/OFF button can be deactivated and the unit can be switched On/Off by using a digital input (see digital inputs configuration). It is necessary to select the 'c2' parameter to ensure that, between one switching Off and the following switching On, the minimum time the compressor is Off is maintained.

### LED INDICATORS



cooling inserted



fan evaporator activated



defrosting in progress



lights On



'continuous cycle' functioning

**off**

unit deactivated

*if one of the LED is flashing, see the section "alarms and signalling"*

## FUNCTIONING

During normal functioning the display shows the value read by the ambient sensor. In case of alarm the temperature values will flash alternately to the alarm code. When the controller is deactivated (OFF status) the 'OFF' led flashes while the display shows the temperature read by the sensor.

### SET-POINT:

1. press for one second the button  to visualise the set-point value;
2. after some seconds, the selected value will flash;

3. either increase or decrease the set-point value by pressing the buttons  and 

4. press the button  again to confirm the newly set value.

### MANUAL DEFROSTING:

press the button  for more than 5 seconds to force a defrosting cycle which will be activated only if the conditions are favourable (for example, the defrost sensor should be lower than the selected defrost end temperature. For further information see the technical manual)

### BUZZER SILENCING:

press the button . Besides silencing the buzzer, the alarm relay is reset, while the alarm code remains memorised until the cause of the alarm has been removed.

### ENABLING OF AUXILIARY OUTPUT:

press the button  to activate/deactivate the lights or any other auxiliary output.

### CONTINUOUS CYCLE:

To activate the 'continuous cycle' functioning press the button  for at least 5 seconds (compressor activated for the time selected with the 'cc, parameter = duration of 'continuous cycle').

So as to deactivate the continuous cycle functioning, press the button  again for 5 seconds.

## IR96: PARAMETERS

The parameters have been organised on two levels:

**FIRST LEVEL:** frequent parameters. They are indicated with F in the table and the *password* is not necessary to gain access to them. To modify them operate as follows:

1. press the button  for more than 5 seconds (in case of alarm, first silence the buzzer);
2. the display shows the code of the first parameter to be modified.
3. To modify the parameters see the section "*parameters modification*".

**SECOND LEVEL:** configuration parameters. They are indicated with C in the table and it is necessary to insert the *password* for any modification, as indicated here below:

1. press simultaneously the buttons  and  for more than 5 seconds;
  2. the display shows 00;
  3. press the buttons  and  until 22 (password) is displayed;
  4. confirm by pressing ;
  5. the display shows the code of the first parameter to be modified.
- To modify the parameters see the following section "*parameters modification*".

### Parameters Modification:

To modify a parameter operate as follows:

1. press  and/or  until the parameter to be modified is displayed (see the parameters table);
2. press the button  to visualise the value associated to the parameter;
3. modify its value by pressing the buttons  and/or  until you reach the requested value;
4. press the button  to confirm temporarily the newly set value and to go back to the parameter code visualisation;
5. repeat all operations from the point "press  and/or  " to modify other parameters values;

### New-Set Values Memorisation:

Press the button  to memorise all newly-set values and exit the procedure.

To exit without modifying the parameters: do not press any button for at least 60 seconds ( TIME OUT exit).

**Warning:** if the button  is not pressed after modifying operations, all effected modifications will be lost.

## LIST OF PARAMETERS

	Parameter	Kind	Min	Max	U.M.	Def
<b>PA</b>	<b>PASSWORD</b>	<b>C</b>	<b>00</b>	<b>+199</b>	<b>-</b>	<b>22</b>
<b>I</b>	<b>SENSOR PARAMETERS</b>					
/0	Type of sensor (must be 0)[Accessible only after RESET]		0	1	-	0
/C	Ambient sensor calibration	F	-20	+20	°C/°F	0.0
/2	Measurement stability	C	1	15	-	4
/3	Sensor reading speed	C	1	15	-	8
/4	Sensors average (see installation manual)	C	0	100	-	0
/5	°C /°F (0=°C, 1=°F)	C	0	1	flag	0
/6	Enabling of decimal point (0=yes, 1=no)	C	0	1	flag	0
<b>r</b>	<b>CONTROL PARAMETERS</b>					
rd	Control differential (hysteresis)	F	0.1	+19.9	°C/°F	2
r1	Minimum set allowed	C	-50	r2	°C/°F	-50
r2	Maximum set allowed	C	r1	+199	°C/°F	90
r3	Enabling of Ed alarm (defrost interrupted because maximum duration has been reached, param. dP) 0=no, 1=yes	C	0	1	flag	0
r4	Automatic set-point variation during night functioning (that is when the curtain switch is closed, with either A4 or A5=7)	C	0	+20	°C/°F	3.0
r5	Enabling of min./max. temp. monitoring (0=no, 1=yes)	C	0	1	flag	0
rt	Actual interval in max./min. temperature reading	F	0	199	hours	-
rH	Maximum temperature read in the rt interval	F	-50	+90	°C/°F	-
rL	Minimum temperature read in the rt interval	F	-50	+90	°C/°F	-
<b>c</b>	<b>COMPRESSOR PARAMETERS</b>					
c0	Compressor start-up delay after unit start-up	C	0	15	min	0
c1	Minimum interval between two compressor start-up	C	0	15	min	0
c2	Minimum compressor off-time	C	0	15	min	0
c3	Minimum compressor on-time	C	0	15	min	0
c4	Relay safety (0=OFF, 100=ON). See Duty setting	C	0	100	min	0
cc	Duration of continuous cycle	C	0	15	hours	4
c6	Alarm cut-out after continuous cycle	C	0	15	hours	2
<b>d</b>	<b>DEFROST PARAMETERS</b>					
d0	Type of defrost (0= heater, 1= hot gas, 2= water/resistance by time, 3= hot gas by time)	C	0	3	flag	0
dl	Interval between two defrost phases	F	0	199	hours	8
dt	End defrost temperature set	F	-50	+199	°C/°F	4
dP	Maximum duration of defrost or real duration for d0=2 or 3	F	1	199	min	30
d4	Defrost on unit start-up (0=no, 1=yes)	C	0	1	flag	0
d5	Defrost delay after unit start-up or digital input (A4 or A5 =4)	C	0	199	min	0
d6	Display override during defrost (0=no, 1=yes)	C	0	1	flag	1
dd	Dripping time after defrost	F	0	15	min	2
d8	Duration of alarm cut-out after defrost and, if A4 or A5=5, after door opening	F	0	15	hours	1
d9	Defrost has priority over compressor protection (0=no, 1=yes)	C	0	1	flag	0
d/	Defrost temperature sensor reading	F	-	-	°C/°F	-
dC	Time basis (0=hours/min, 1=min/sec)	C	0	1	flag	0

<b>ALARM PARAMETERS</b>						
A0	Alarm and fan differential	C	0.1	+20	°C/°F	0.2
AL	Low temperature alarm (indicates the max. allowed deviation from the set- point). If = 0 disables the low temperature alarm	F	0	+199	°C/°F	0
AH	High temperature alarm (indicates the max. allowed deviation from the set-point). If = 0 disables the high temperature alarm	F	0	+199	°C/°F	0
Ad	Temperature alarm delay	C	0	199	min	120
A4	Digital input n.1 configuration	C	0	7	-	0
A5	Digital input n.2 configuration	C	0	7	-	0
A6	Cut-out of compressor by external alarm: 0=OFF, 100=ON Enabled if either A4 or A5= 1 or 2, see Duty setting and digital input	C	0	100	min	0
A7	Delay in registration of the input <<delayed alarm>> (A4 or A5 = 2)	C	0	199	min	0

<b>F FAN PARAMETERS</b>						
F0	Management of fans: 0 = always activated fans except on specific phases (see parameters F2, F3, and Fd) 1= fans controlled by a thermostat according to the difference between ambient temp. and evap. temp., 2= fans controlled by a thermostat according to the evaporator temperature	C	0	2	flag	0
F1	Fans activation temperature: if F0=1 it is the minimum difference between ambient temp. and evap. temp. (t. evap. < t.amb.) if F0=2, the fan is ON if Evap.temp<Setpoint + F1 - A0 the fan is OFF if Evap.temp. > Setpoint + F1	F	0	+20	°C/°F	5
F2	Stop fans when compr. is Off (0=no, 1=yes). <i>Active if F0=0</i>	C	0	1	flag	1
F3	Stop fans during defrost (0=no,1=yes). This parameter is active for any value of F0	C	0	1	flag	1
Fd	Stop after dripping. Active for any value of F0	F	0	15	min	1

<b>H OTHER SETTING</b>						
H0	Address within network	C	0	15	-	0
H1	Selection of relay 4 functioning: 0= auxiliary output, 1=normally de-energised alarm, 2= normally energised alarm	C	0	2	flag	0
H2	0= buttons inhibited; 2= buttons & IR inhibited; 3=IR inhibited	C	0	3	flag	1
H3	Code to enable remote programming	C	00	199	-	00

# DESCRIPTION OF PARTICULAR PARAMETERS AND PERFORMANCES

## Memorisation of Minimum/Maximum Temperature:

IR96 allows to record the minimum and the maximum temperature read by the 'ambient' sensor during an interval which can reach up to 199 hours (more than 8 days). To activate this function, operate as follow:

1. select parameter 'r5'=1. This is a 'Configuration' parameter
2. visualise the parameter 'rt' (type F parameter). By pressing the button  the instrument displays how long the min./max. temperature memorisation has been active (if the memorisation has just been enabled, rt will be associated to the value '0'). If you want to restart the temperature memorisation, press the button  during the visualisation of memorisation hours. The instrument will clear the memorisation hours and will start with monitoring again.
3. to see the maximum temperature read by the sensor, refer to the value associated to rH
4. to see the minimum temperature read by the sensor, refer to the value associated to rL

**Warning:** if the instrument is not connected to a UPS, a short power failure will clear the values rt, rL e rH. When voltage is supplied again, the controller will automatically start the monitoring again with rt =0.

## Functioning of the relay 4

With H1 = 0 relay 4 can be used as auxiliary output. If either A4 or A5=5 the output allows the automatic lights management if the connection of the door switch to the selected input has been effected (Dig.In1 if A4=5 or Dig.In2 if A5=5, see wiring diagram).

If H1 = 1 the fourth relay becomes an alarm output. The relay is normally de-energised and on alarm condition the contact will close. If H1 = 2 the fourth relay is still an alarm output, but the relay is normally energised (contact closed) and on alarm condition the contact will open. By pressing the button Mute the relay commutes only if the cause of the alarm has been removed. The fifth relay is always active as an alarm output: by pressing the button Mute this relay, unlikely the relay 4 with H1=1 or H2=2, always resets even with an alarm pending.

## Type of sensor (Accessible Only After Reset, See Ea, Eb, Ee)

The value of parameter /0 should be absolutely 0

Selection of Duty Setting (Parameters A6 and C4)

If the *control sensor alarm (E0 flashing)* is activated, the parameter c4 allows the compressor to function:

c4= value between 1 and 99: states the compressor On-time (expressed in minutes), followed by a fixed Off-time equal to 15 min.;

c4=0: compressor always Off;

c4=100: compressor always On.

If an *external alarm (Al or Ad flashing)* is activated on the digital input (A4=1; A4=2), the parameter A6 allows the compressor to function:

A6= value between 1 and 99: states the compressor On-time (expressed in minutes), followed by a fixed Off-time equal to 15 min.;

A6=0: compressor always Off;

A6=100: compressor always On.

## Digital Inputs Configuration

Digital input 1 and 2 can take on different functioning modes according to the value given to the parameter A4, relative to the ID1 input, and to A5 relative to Id2. The main: see the table "programmable digital inputs: list of the options" at 33 page.

## IR96: ALARMS

### **FLASHING LED: actuator set delay**

Insertion of the relative function is delayed for a period while awaiting an external consent or while held up by another process still in progress.

### **TEMPERATURE FLASHING: door open or door switch broken.**

Close the door or control the door switch.

### **E0 FLASHING: control sensor error**

Sensor not compatible with the equipment; sensor cable interrupted or short circuit.

Faulty sensor: disconnect the sensor from the instrument and measure the resistance (NTC: 0°C=27K Ohms)

### **E1 FLASHING: evaporator sensor error**

Sensor not compatible with the equipment; sensor cable interrupted or short circuit.

Faulty sensor: disconnect the sensor from the instrument and measure the resistance (NTC: 0°C=27KΩ)

### **IA FLASHING: alarm from digital input**

Check 'Multi-function' inputs and parameters A4 and A5

### **Ad FLASHING: delayed alarm from digital input**

Check 'Multi-function' inputs and parameters A4, A5 and A7

### **LO FLASHING: low temperature alarm (temperature lower than SET-AL-A0)**

Check parameters AL, Ad and A0

The alarm will cease as soon as the temperature returns within the limits selected.

### **HI FLASHING: high temperature alarm (temperature higher than SET +AH + A0)**

Check parameters AH, Ad and A0

The alarm will cease as soon as the temperature returns within the limits selected.

### **EA, EB, EE: data acquisition error. RESET procedure**

In order to restore normal working conditions, reset the default value of the parameters with this procedure:

- turn off the instrument;
- press the PRG button and, keeping it pressed, turn on the controller;
- the display shows "-c-";
- after a few seconds, the instrument enters the RESET procedure and allows the modification of parameters. (\*)
- should EE persist, press the button 6 until the message disappears.

(\*) Any modification made before the reset procedure will be lost

### **Ed FLASHING: defrost end by timeout**

- check parameters dt, dP and d4
- check effectiveness of the defrost
- in case inhibit the alarm Ed through the r3 parameter

### **dF FLASHING: defrosting in progress**

This is not an alarm signal, but it indicates that the instrument is carrying out a defrost. Appears only if parameter d6=0.

## DIMENSIONS

