MasterCase

User Manual

PRELIMINARY VERSION

24 January 2003

LEGGI E CONSERVA QUESTE ISTRUZIONI

READ AND SAVE THESE INSTRUCTIONS

CAREL

Technology & Evolution

CONTENTS

1. Introduction

MasterCase is the integrated system designed by Carel for the complete management of showcases. MasterCase controls and manages the entire refrigeration unit, both electrically and electronically. The use of power relays means that MasterCase does not require an extra electrical panel, and can directly control the lights, defrost heaters, fans, cooling actuators, and so on.
MasterCase can be connected to a local network to coordinate operations on a group of utilities, synchronising defrosts or sharing probes. Furthermore, MasterCase can be integrated into the PlantVisor system, which saves and displays all the data on the operation of the unit.
MasterCase is available for the control of showcases with both mechanical expansion valves and in the version with "built-in" driver for the management of proportional electronic expansion valves, which maximises the performance of the refrigeration unit.
The electronic valve optimises the evaporation temperature and superheating, and reduces the power consumption of the unit. Product conservation quality and lower weight loss are ensured by the greater temperature stability and the reduced need for defrosts using MasterCase.

1.1 Main characteristics of the MasterCase

Power supply
230V alternating current.

Appearance and assembly
The dark plastic container, the narrow, stretched shaped, and the rear supports for DIN rail mounting, make this controller ideal for supermarkets and for installation under the showcase. In addition, the 220Vac power supply and the relay outputs with voltage signals for the various loads (lights, fans, defrost, etc.…) mean significant time savings for the wiring and assembly of the electrical panel, the controller itself featuring an integrated electrical panel.

User interface
The user interface is from the series of standard PST terminals. This series, as well as being the same used by other Carel instruments (meaning a reduction in the number of product codes), offers various solutions: display only, small terminal with 3 digits and 3 buttons, and large terminal with 4 digits and 8 buttons. Each button is backlit by a LED to signal the status of the unit (actuators on, alarms, etc...).
The terminals are not required for the operation of the MasterCase, but rather are used to program the controller. The terminals can be installed at a distance of up to 10m from the instrument, and can be connected “live”, that is, when the instrument is on, without creating problems in operation.

Energy Savings - Advanced Software
Thanks to the numerous and innovative functions featured, the MasterCase not only controls all the various configurations of the showcases, but also ensures considerable advantages in terms of energy savings. In fact, the use of the night-time set point, the possibility of different types of intelligent defrosts, and the control of electronic expansion valves are just some of the functions that allow significant energy savings to be achieved.

Local network (LAN)
The MasterCase instruments can be connected together to create a LAN (**L**ocal **A**rea **N**etwork), in Master-Slave configuration, for the control of multiplexed showcases or multi-evaporator utilities. Each instrument can be configured as either the Master or a Slave by simply setting a parameter. This configuration allows the synchronisation and coordination of defrosts, the propagation of the status of the digital inputs, as well as the display on the Master of any alarms active on the Slaves. Up to 6 instruments (1 master and 5 slaves) can be connected together. The particularly reliable structure of the LAN (16-bit CRC error checking) means the values read by the control temperature and/or pressure probe on the master can be shared across the network, thus allowing a saving in the number of probes required. Finally, as regards the supervision software, the master acts as the interface for the slaves, as only the master needs to be fitted with the serial card and connected to the RS485 line to be able to manage all the instruments in the local network.

Alarm log
Each unit can save up to 10 alarms. Each new alarm is recorded in the log, deleting the oldest event if necessary.

RTC
The MasterCase can be fitted with an RTC card (with backup battery) for managing the defrosts at set times. In addition, this option allows the use of other functions, such as the setting of a night-time set point starting and ending at set times, the saving of the age of the event in the alarm log, and so on.

Third probe
This is used to measure the temperature at the hot point of the showcase and is used to help determine the reference control temperature. In addition, it can be used to manage the defrost function on a second evaporator.

Duty setting
This function allows the utility to be operated even when there is a control probe fault. In these cases, operation will continue for a time (in minutes) equal to the value set for the parameter “duty setting” (c4), with a fixed off time of 15 minutes.

Multifunction output
The auxiliary outputs (Aux1 and Aux2) are programmable and can duplicate the function of any of the outputs already present. In addition, they can be used as alarm outputs or hot wire outputs, and can be configured as additional defrost outputs that are independent of the standard defrost output, associated with probe 3.

Multifunction input
A total of five programmable digital inputs are available (see the list of parameters). These allow numerous possibilities, such as the enabling of defrosts, the management of immediate or delayed alarms, the control of a door switch, etc.... In addition, a digital input known as the virtual input can be configured, which is not physically connected but rather managed via the local network (for further details see the corresponding paragraph further on).

Continuous cycle
The continuous cycle function allows the utility controlled to be forced on for a time set by parameter. This function may be useful when requiring a rapid reduction in temperature, even below the set point.

In-circuit testing
The MasterCase series is manufactured using the most advanced SMD technology. All the controllers undergo “in-circuit testing” to check the components installed. These tests are performed on 100% of the products.

Probes
The instruments are designed to operate with NTC probes, as these offer greater precision across the rated operating range. The pressure probes used are ratiometric. All the probes are supplied by Carel.

Electronic valve
An optional card soldered directly onto the main board of the MasterCase (version MGE0000020) can be used to control the operation of an electronic expansion valve with stepper motor. This allows the possibility to directly control the injection of refrigerant into the evaporator. Consequently, lower and more stable superheating values can be achieved, as well as a higher evaporation temperature and consequently higher humidity and a more constant temperature in the showcase, guaranteeing better conservation and quality of the products.

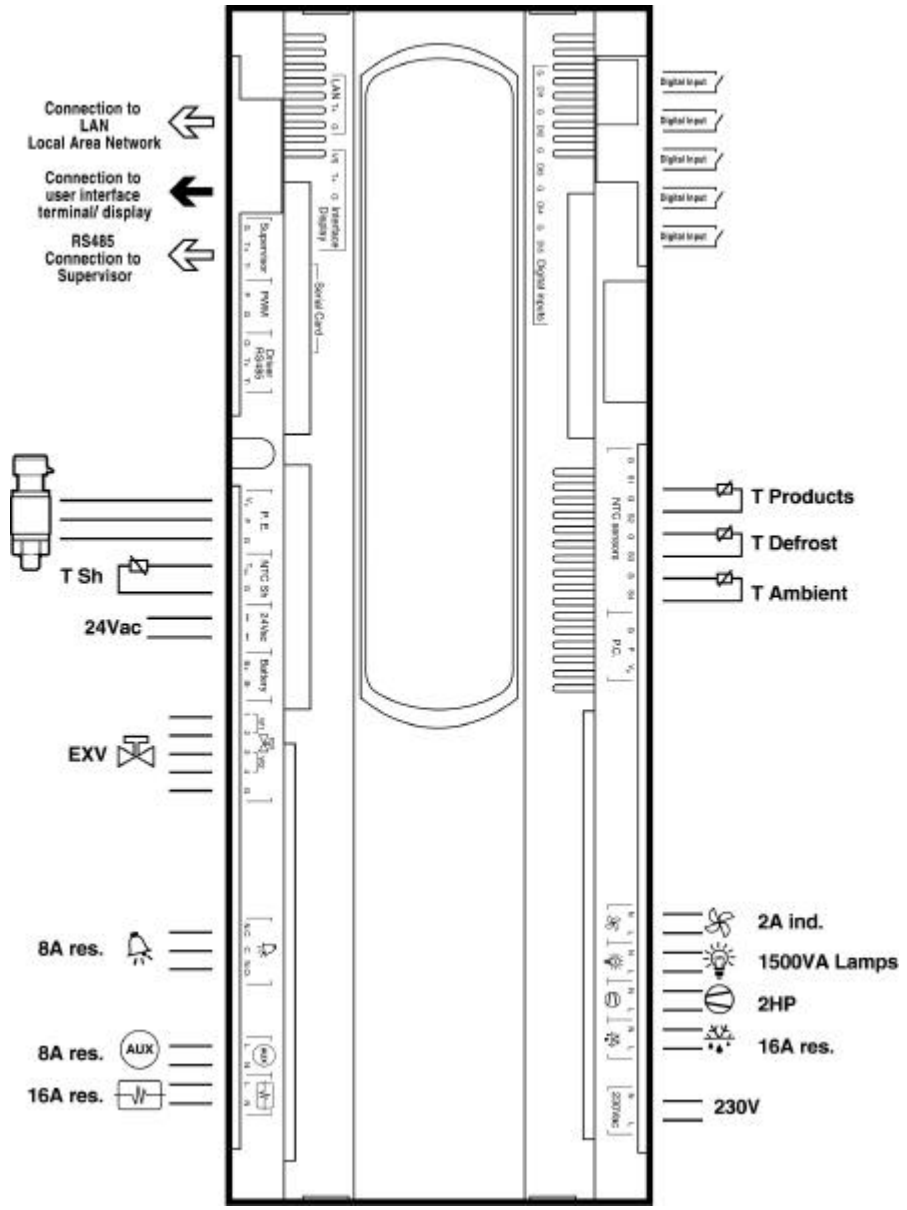
Watchdog (Surveillance)
This device prevents the microprocessor from losing control of the unit even in the presence of significant electromagnetic disturbance. In the event of abnormal operation, the watchdog re-establishes the initial operating status.

Electromagnetic compatibility
The instruments comply with the EU standards on electromagnetic compatibility.

CE mark and ISO 9001 certification
The quality and the safety of the MasterCase series instruments are guaranteed by Carel's ISO 9001 certified design and production system, and by the CE mark on the product.

2. Layout of the hardware

2.1 Meaning of the inputs and outputs



Digital Inputs

- inputs from voltage-free contacts, with 8mA closing current
- connection with removable terminals for wires from 0.25 to 2.5mm^2.
- max distance 30m for standards compatibility (surge)
- the function of the digital inputs can be programmed using the parameters (multifunction inputs)

G-DI1 => Multifunction digital input 1
G-DI2 => Multifunction digital input 2
G-DI3 => Multifunction digital input 3
G-DI4 => Multifunction digital input 4
G-DI5 => Multifunction digital input 5

NTC sensors

- inputs for standard Carel NTC probes (10 Kohm at 25 °C)
- connection with removable terminals for wires from 0.25 to 2.5mm^2
- maximum length of the cables 30m

G-S1 => Room probe
G-S2 => Defrost Probe
G-S3 => Third Probe
G-S4 => Not used

P.C. (condensing pressure) Currently not supported

Evaporator Fan

L => Line — 4A 250Vac (Inductive Load)
N => Neutral

Light

L => Line — 1000VA 250Vac (fluorescent tube)
N => Neutral

Compressor

L => Line — 12 (12)A 2HP 250Vac (Inductive Load)
N => Neutral

Defrost

L => Line — 12A 250Vac (Resistive Load)
N => Neutral

230Vac

- Power supply input from mains to two removable screw terminals, with max 12A current rating
- minimum recommended cross-section of the wires from 1.5 to 2.5mm^2.

L => Line — 230 Vac +10/-15% 50/60 Hz
N => Neutral — 230 Vac +10/-15% 50/60 Hz

Alarm

C => Common — 12A 250Vac (Resistive Load)
NO => Normally Open (Free Contact)
NC => Normally Closed

Rail Heat (AUX2)

L => Line — 12A 250Vac (Resistive Load)
N => Neutral

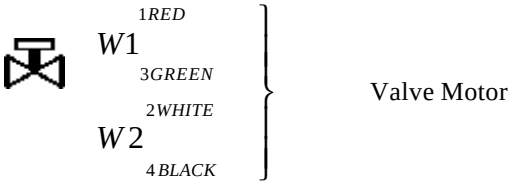
Auxiliary (AUX1)

L => Line — 12A 250Vac (Resistive Load)
N => Neutral

Note for all outputs:
- removable screw terminals for wires with a cross-section from 0.25 to 2.25mm^2

Valve

- maximum length of the cables 10m



Battery
B+ => Positive 24Vdc
B- => Negative

24Vac (0.5 Ampere)
~ => To 24Vac transformer output
~ => To 24Vac transformer output

NTC SH
G-Tsh => NTC superheating sensor

P.E. (evaporation pressure)
- for distances over 10m use shielded cables (2 wires plus shield connected to earth)

G => Ground
P => Input signal
Vp => Power supply

RS485 driver (Currently not supported)

PWM (Currently not supported)

Supervisor (network)
- Connector for optional card with RS485 driver for interfacing with the supervisor
- removable screw terminals for wires with cross-section from 0.25 to 2.25mm^2.
- serial speed envisaged 19200 bit/sec

G => Ground
T+ => Connect to positive Carel Supervisor RS485 serial line
T- => Connect to negative Carel Supervisor RS485 serial line

Terminal
- three wire serial connection, maximum length 10m
- power supply supplied by the controller, 24/35Vdc 1.5W max.

Vs => Power supply
T+ => Data signal
G => Ground

LAN (Local Area Network)
- network connection to other controllers, max. length 10m
- removable screw terminals for wires with cross-section from 0.25 to 2.25mm^2.

T+ => Data signal
G => Ground

PROGRAMMING KEY

The programming key should only be used when the controller is disconnected from the power supply (220Vac terminals not live), and with the valve driver card powered (24Vac power supply terminals).
The product code of the programming key is **PSOPZKEY00**.
For details on how to use the key refer to the corresponding instruction sheet.

2.2 Codes of the models and accessories

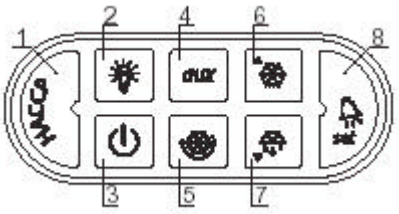
CODES	DESCRIPTION
MGE0000000	MasterCase
MGE0000020	MasterCase with built-in electronic valve driver
MGEOPZSER0	Optional card for RS485 serial connection
MGEOPZCLK0	Optional clock card (RTC)
PSOPZKEY00	Hardware programming key
MGECON0000	Connector kit for MasterCase MGE0000000
MGECON0020	Connector kit for MasterCase Valve MGE0000020
PST00VR100	SMALL red display
PST00SR300	SMALL red terminal
PST00LR200	LARGE red terminal
PSTCON0300	3m connection cable
PSTCON1000	10m connection cable

2.3 User interface

The MasterCase uses the series of standard PST terminals as the user interface.
This series, as well as being the same used by other Carel instruments (consequently allowing a reduction in product codes), offers various solutions:
- small terminal with 3 digits and 3 buttons (code PST00SR300);
- large terminal with 4 digits and 8 buttons (code PST00LR200);
- remote display with 3 digits (code PST00VR100).

Each button is backlit by a LED to signal the status of the unit (outputs active, alarms, etc...).
The terminals are not required for the operation of the MasterCase, but rather are used to program the controller. The terminals can be connected “live”, that is, when the instrument is on, without creating problems in operation.

2.3.1 Functions of the buttons and LEDs on the PJ Large Terminal (PST00LR200)



Button ① (red LED)
Normal operation
• pressed for 5 seconds deletes the HACCP alarm and resets the related signals (codes “HA” or “HF” on the display, the buzzer and the alarm relay) and deletes all the corresponding data saved.
LED
on steady
HACCP alarm.

Button (yellow LED)
Normal operation
• Pressed for 1 second activates/deactivates the AUX1 relay output (light)
LED
• on steady - AUX1 relay output (light) active

Button (green LED)
Normal operation
• Pressed for 5 seconds switches the unit ON/OFF.
LED
• On steady - controller on
Note: the ON/OFF function depends on an enabling parameter (if not enabled, the controller is always ON), the LED in any case displays the status.

Button (yellow LED)
No function associated.

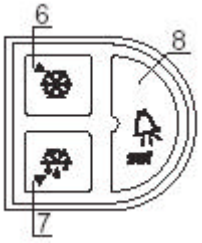
Button (green LED)
Normal operation
• Pressed for 5 seconds activates or deactivates the continuous cycle.
LED
• on steady - continuous cycle on.

Button (green LED)
Normal operation
• Pressed for 1 second switches the light on or off
• pressed together with button 8 displays the value of the third probe (S3)
• pressed together with button 7 for 5 seconds activates or deactivates the continuous cycle
Parameter programming
• Moves from one parameter to the next.
• Increases the value of the parameter displayed.
LED
• On steady - compressor on
• Flashing - compressor activation request in progress (cooling request)

Button (yellow LED)
Normal operation
• Pressed for 5 seconds starts a manual defrost, if the conditions are right.
• pressed together with button 6 for 5 seconds activates or deactivates the continuous cycle
• pressed together with button 8 displays the value read by the end defrost probe (S2)
• Pressed together with button 8 when starting the controller loads the default parameters.
Parameter programming
• Moves from one parameter to the previous.
• Decreases the value of the parameter displayed.
LED
• on steady - defrost on
• Flashing –defrost request in progress.

Button (red LED)
Normal operation
• Mutes the audible alarm (buzzer) and deactivates the alarm relay, if active.
• Pressed for 1 second displays and/or sets the set point
• Pressed for more than 5 seconds, when no alarm is present, accesses the menu of the type F parameters (frequent)
• pressed together with button 6 displays the value read by the third probe (S3)
• pressed together with button 7 displays the value read by the end defrost probe (S2)
• Pressed together with button 7 when starting the controller loads the default parameters.
Parameter programming
• Displays the value of the selected parameter or exits the display.
• Pressed for 5 seconds permanently saves the modifications made to the parameters.
LED
• on steady - alarm active.

2.3.2 Functions of the buttons and LEDs on the PJ Small Terminal (PST00SR300)



As regards the PJ Small terminal, the functions of the buttons are the same as seen for buttons , and on the PJ Large terminal.

3. Installation

3.1 Electrical connections

For details on the electrical connections to the main board, see the layout shown above.

WARNINGS

Avoid installing the controllers in environments with the following characteristics:

1. Relative humidity greater than 85%, non-condensing
2. Heavy vibration or shocks
3. Exposure to continuous water sprays
4. Exposure to corrosive or pollutant gases (e.g. sulphur or ammonia fumes, saline mist, smoke) so as to avoid corrosion and oxidisation
5. Strong magnetic and/or radio interference (therefore avoid installing the unit near transmitting antennae)
6. Exposure of the controllers to direct sunlight or the elements in general.

The following warnings must be heeded when making the connections during the pre-installation of the controllers:

1. The incorrect connection of the power supply may seriously damage the system.
2. Separate the probe signal and digital input cables as much as possible from the power and inductive load cables, to avoid possible electromagnetic disturbance. ***Never lay the power cables and the probe cables in the same channels.*** Avoid installing the probe cables in the immediate vicinity of power devices (thermal magnetic circuit breakers and the like). Reduce the path of the probe cables as much as possible, and avoid paths that surround power devices. Only use IP67 sensors for the end defrost probe; position the probes with the bulb placed vertically to assist the draining of any condensate. Remember that the thermistor temperature probes (NTC) have no polarity and therefore can be connected in either order.
3. If a connection to the supervisory network is envisaged, connect the shield of the 485 cable to the 485 ground on the instrument.
4. In the MGE0000020 models, if a series of units are installed in the same electrical panel, do not supply the 24Vac from a common transformer, but rather use a different transformer for each MasterCase.
5. The secondary of the transformers must not be earthed.

3.2 Configuring the controllers

3.2.1 Parameters relating to the hardware

When configuring an instrument that has just be installed, there are a number of parameters that are strictly related to the hardware connections.
These parameters are:
A1, A2,…, A5: configuration of the digital inputs;
/A: presence of the probes;
/4: virtual control probe (determines which probe is used for the control functions)
/7: presence of the remote display (determines the presence of the device and which probe is displayed on the remote display)
H5, H6: configuration of the auxiliary outputs;

P1(*): type of valve;

PI(*): type of pressure sensor;

PH(*): type of refrigerant used in the system.

(*) *only for models with the electronic valve control, code MGE0000020*
For the meaning and configuration of the parameters, see the corresponding section further on in the manual.

3.2.2 Stand-alone, local network (LAN) and supervisor configuration

There are three fundamental parameters used to configure an instrument for operation in a network (LAN or supervisor) or stand-alone operation: *In*, *H0* and *Sn*.
In defines the unit as the Master (*In* = 1) or a Slave (*In* = 0);
H0 represents the address of the instrument in the supervisor network for the Master or in the LAN for the Slaves;
Sn represents the number of Slaves present in the LAN (only set on the Master).

For the Master:
• the parameter “In” must be set to 1;
• the parameter “Sn” (Slave number): from 1 to 5, depending on the number of Slaves in the LAN;
- the parameter H0 (Serial address), in the event of connection to a supervisor network, must be set to a value equal to the sum of the address of the previous master plus its number of slaves plus one, that is:

H0 = H0_Prev_Master + Sn_Prev_Master + 1 (Fig. x.x.x)

When switching the instrument on, the display will show “uM”, Master unit.
If the instrument is fitted with the RTC card, the following parameters also need to be set:
• parameters “td”, “th”, “t”: weekday, hour, minute.
• parameters ”dx“, “hx”, “mx” with x = 1, 2,..., 10: days, hours and minutes corresponding to the defrost times, with 1 minute resolution.

For the Slaves:
• the parameter “In” must be set to 0;
• parameter “H0”: address of the slave in the LAN.
When switching the instrument on, the display will show “uSx” (x = 1..5 = value of “H0”).

3.2.3 Selecting the main operating parameters

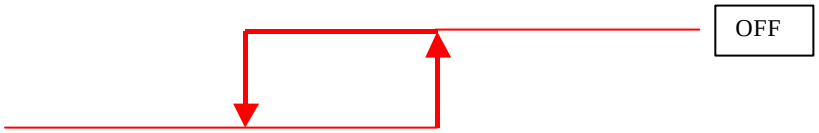
Setting the set point

The set point (parameter "St") is the main parameter, as it represents the reference value for the operation of the instrument.
It is simple to access and set, and this is done separately from the other parameters.
The default set point of the instrument is -20°C.
If this value is not compatible with the application, it can be modified as follows:

- press the button for one second to display the current set point. The value flashes;
- increase or decrease the set point using the and/or buttons until reaching the desired value;
- press again to confirm the new value.

Parameters relating to the set point

Differential (control hysteresis) – parameter "rd"
The default of this parameter is 2 degrees.
The value is "RELATIVE", that is, it is related to the set point, being added to this value.
The set point represents the point at which the instrument is switched off, while the activation point (On) is equal to the ***set point*** (St) + ***differential*** (rd):



Temperature alarm thresholds – parameters "AH", "AL" and "Ad"
These parameters are used to set the temperature thresholds above which the alarms are activated (activation of the alarm relays and the buzzer on the terminal).
The values of these parameters are also "RELATIVE" to the set point.
AH: high temperature alarm;
AL: low temperature alarm;
Ad: delay time from when the threshold is exceeded to the activation of the alarm, in minutes.
The actual temperature thresholds are determined as follows:

high temperature threshold = set point (St) + AH;
low temperature threshold = set point (St) - AL;

The default values of these parameters are AH = 0 and AL = 0 (alarms not enabled), and the delay is Ad = 120 minutes.

Main defrost parameters

If the instrument is used for managing the defrost function, a number of parameters need to be checked when starting the instrument, in particular:
• dI: interval in hours between defrosts (if set times with the RTC option are not used);
• dP: maximum defrost duration;
• d0: type of defrost;
• dt: end defrost temperature.

3.2.4 Loading the default values of the parameters.

During the installation of the instruments the operating parameters may be set incorrectly.
In other cases, significant electromagnetic disturbance may cause errors on the instrument when saving the data, with the display of the error "***EE***" (data saving error).
In these and in other cases it may be useful to reset the instrument by assigning the parameters the default values.
To perform this operation, proceed as follows:
• disconnect the instrument from the power supply;
• press the Set and Down buttons together and switch the instrument on, keeping the buttons pressed;
• when the display shows the combination of characters "-- 3", the buttons can be released.

At this point the instrument is automatically rebooted and is ready to operate correctly.

NOTE: If the error "***EE***" occurs quite frequently, the controller should be checked as the memory may be compromised and the initial precision not guaranteed.

4. LAN functions

The MasterCase instruments can be connected together to create a LAN (**L**ocal **A**rea **N**etwork), in Master-Slave configuration. The main purpose of the LAN is to allow communication between as series of instruments (maximum six: one Master and five Slaves) with synchronised operation, for the control of multi-evaporator utilities, such as multiplexed showcases. Each instrument can be configured as either the Master or a Slave by simply setting a parameter. This configuration allows the synchronisation and coordination of defrosts, the propagation of the status of the digital inputs, as well as display on the Master of any alarms active on the Slaves. The particularly reliable structure of the LAN (16-bit CRC error checking) means the values read by the control temperature and/or pressure probe on the master can be shared across the network, thus allowing a saving in the number of probes required. Finally, as regards the supervision software, the master acts as the interface for the slaves, as only the master needs to be fitted with the serial card and connected to the RS485 line to be able to manage all the instruments in the local network.

4.1 Network defrost in multiplexed installations

One of the functions that most requires synchronisation is the defrost function. The Master controls the defrosts on all of the Slaves connected. It waits for the defrost to be completed on all of the units before sending the end network defrost signal. The Slaves that have completed the defrost must wait for the end defrost signal from the Master before switching to the dripping phase. Once the end defrost signal is received, the Slaves go into dripping mode.
The defrost on each single unit and the network defrost are in any case stopped after the maximum defrost time, set using the parameter ("dP", default 30 min.).
The network defrost is performed cyclically, at a programmable interval set for the parameter dI. It can also be started:

- manually (pressing  for 5s on the Master);
- at set times (if the RTC option is present).

4.2 Remote alarm signals.

The unit configured as the Master in a LAN can signal remote alarms present on the Slave units, if enabled by setting the corresponding configuration parameter (parameter Ar = 1). All the Masters are enabled for this function as default.
If a terminal or display is not essential for the operation of the unit, and indeed in a LAN the Slave can operate perfectly without such user interface, this function is particularly useful for "centralising" the alarm management functions on the Master.
If the Master detects an alarm on a Slave unit (probe error, high or low temperature error, etc....), the display shows the signal "nX" (alternating with the display of the temperature) where X = 1, 2, 3, ... 5, the LAN address of the Slave in question. When the event occurs, the alarm relay on the Master is activated. The "nX" signal on the Master unit can be inhibited for one minute by pressing  .

4.3 Transmission of signals and probe readings

The particularly reliable and fast structure of the LAN (16-bit CRC error checking) allows the value read by the control probe and/or pressure probe to be sent across the network, allowing savings in terms of both materials installed and installation time.
The transmission of the pressure probe signal must be enabled on the Master using the parameter "PA", and the Slave must be enabled to receive the signal suing the parameter "Pb".
The control probe temperature sent by the Master is set on the Slaves by setting parameter "/A"=4.

5. Setting the parameters

The parameters have been grouped into two families:

- **Frequent** parameters (indicated by type **F** in the parameter tables)
- configuration parameters (indicated by type **C**), with access protected by a password to prevent unwanted tampering.

The parameters can be programmed as follows:

- from the keypad
- via LAN (download parameters from the Master to the Slaves)
- via an RS485 serial connection, if the optional card is fitted.

To set the parameters from the keypad, proceed as follows.

Accessing the type "F" parameters

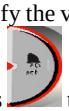
- press  for more than 5 seconds;
- the display shows the parameter "***PP***" (**P**arameter **P**assword);
- press  and  to scroll the parameters.

Accessing the type "C" parameters

- press  for more than 5 seconds;
- the display shows the parameter "***PP***" (**P**arameter **P**assword);
- press  ;
- press  or  until displaying 22 (password to access the type "C") parameters;
- confirm by pressing  .
- the display shows the parameter "PP" again;
- press  or  until displaying the parameter to be programmed.

Modifying the parameters

After having displayed the first parameter, either type C or type F, proceed as follows:

- press  or  until reaching the parameter to be programmed;
- press  to display the value associated;
- modify the value by pressing  and/or  ;
- press  to temporarily confirm the new value and return to the display of the parameter code;
- repeat all the operations in the point "Setting the parameters" to modify the values of other parameters.

Saving the new values:

- press the SET button  for five seconds to save the new value/values entered and exit the Parameter programming procedure.

***Important note*:** only pressing the  button *permanently* saves the *temporary* values entered during the operation. If the instrument is switched off before pressing  for five seconds, all the changes made and *temporarily* saved will be lost.

Exiting the programming procedure

To exit the procedure without saving the new values, do not press any button for at least 30 seconds (TIMEOUT).
In this way, the instrument returns to normal operation without making any modifications to the parameters.

5.1 Classification of the parameters

The parameters, as well as being divided by TYPE, are grouped into logical categories identified by the first letter or symbol. The following table shows the categories and the corresponding letters/symbols.

Letter/Symbol	Category
/	temperature probe management parameters
r	temperature control parameters
c	safety and control activation time parameters
d	defrost management parameters
A	alarm management parameters
F	evaporator fan management parameters
H	general configuration parameters (addresses, enabling of the functions, etc…)
t	clock and HACCP parameters
P	electronic valve management parameters

5.2 “Password” parameters

PP: access level password

The first parameter encountered when entering programming mode is a “password” parameter that allows access to all the parameters of the instrument; if the password is not entered, only the type “F” parameters can be accessed. This prevents access to the “C” parameters by unauthorised persons. Once having accessed the configuration parameters, the type “F” parameter can also be modified.
The procedure for accessing and modifying the parameters is described above.

PS: alarm log password

- after having reached the parameter “PS” (Password Log).
- enter 44 as the password for accessing the alarm log
- press  for more than 5 seconds to access the log.

ALARM LOG

All models of the *MasterCase* series feature an alarm log that saves up to 10 events. The models fitted with RTC also allow “the age” of each alarm to be saved, that is, the time in hours that has elapsed from when the alarm was recorded to when the log is accessed.
The following events are saved in the log:

- the high and low temperature alarms (“HI”, “LO”);
- the control probe error (“rE”);
- the end defrost probe error (“E2”);
- the defrost by temperature ended by timeout signal, if enabled as an alarm (“Ed”);
- the loss of LAN communication by a controller in network, either the Master or the Slaves (“MA” and “uS*x*”).

Accessing the display of the log

The alarm log is displayed by entering the value 44 for the password parameter “PS” (**L**og **P**assword) and confirming by pressing the Set button for 5 seconds.

Description of the alarm log

If the alarm log is empty, the display shows three bars (\\\), otherwise the following information is displayed in sequence:

- the index of the alarm in the log, preceded on the left by a graphic symbol;
- the code of the alarm;
- the time elapsed in hours (only for units fitted with RTC) since the event was saved.

If the RTC option is not present, the graphic symbol “_ _ _” is displayed instead of the time.
The three displays are shown cyclically in succession. In the log is scrolled by pressing the arrow buttons:

-  to display the older alarms
-  to display the more recent alarms.

The log can save 10 events.
The alarms appear in the log in the order they were saved in.
When a new alarm is saved, the older alarms are moved back a position in the list. If the log is full, the new alarm deletes the oldest alarm (**FIFO** logic: **F**irst **I**n **F**irst **O**ut).
If an alarm has been present in the log for over 199 hours, its age is replaced by the graphic symbol “_ _ _”.

NOTE: If the current time value is lost on the instrument, the display shows “tC” and the age of all the alarms saved is replaced by the graphic symbol “_ _”.

Exiting the log

To exit the display of the log, press  for one second, or alternatively do not press any button for 30 seconds.

Deleting the log

The alarm log can be deleted by pressing and holding  and  together for 5 seconds when the log is displayed. At the end of the operation the controller will exit the display of the log.

Pd: download password

- after having reached the parameter “Pd” (Download Password).
- enter 66 as the password on the Master unit with Slaves connected to download the parameters from the Master to the Slaves during the configuration of a multiplexed island
- press  for more than 5 seconds to start the download.

When the temperature is displayed again the download is complete.

DOWNLOAD PARAMETERS

All the MasterCase series instruments feature the possibility of transferring the values of the parameters from the Master to the Slaves via the LAN. This operation saves time when programming instruments in the same LAN with similar settings.
The table below lists the parameters that can be transferred via LAN from the Master to the Slaves.

TABLE OF DOWNLOADABLE PARAMETERS

CODE	DESCRIPTION
St	Control probe Set Point
/4	Virtual probe (%)
/6	Enable decimal point to display the temperature
/7	Remote display management
/9	Use third probe as end defrost probe
/A	Presence of probes
/t	User interface management
rd	Control differential
r1	Minimum temperature setting
r2	Maximum temperature setting
r3	Enable defrost ended by timeout signal
r4	Variation between daytime and night-time set point and vice-versa
r5	Enable Max and Min temperature monitoring
r6	Enable night-time control with the third probe
c0	Start compressor delay from controller on
c4	Compressor on time in Duty Setting operation
c6	Low temperature alarm bypass time after continuous cycle
cc	Continuous cycle duration
d0	Type of defrost
d2	Type of control for local network defrost
d3	Compressor on time with temp. < 1°C before starting defrost
d4	Defrost when switching the instrument on (YES/NO)
d5	Defrost delay when switching the instrument on
d6	Management of the terminal display and remote display during the defrost
d7	Enable skip defrost based on defrost duration
d8	Alarm bypass time after defrost
d9	Defrost priority over compressor safety
dd	Dripping time
dI	Interval between defrosts
dP	Maximum defrost duration
dt	End defrost temperature
A0	Fan alarm differential
A7	Digital input reading delay time
Ad	Delay in reading high and low temperature alarms
AH	High temperature alarm upper band
AL	Low temperature alarm lower band
F0	Fan management (always on or slave to the fan controller)
F1	Fan set point
F2	Fans off when compressor off
F3	Fans off in defrost
Fd	Fans off in post-dripping
H1	Enable / disable remote control
H3	Enable ON – OFF from keypad
H4	Enable ON – OFF from supervisor

Download failed signals

The Master displays the failure of the download to a Slave by showing the signal (alternating with the temperature) “d*x*”, where *x* = 1, 2, ..., 5, that is, the value of the parameter “H0” corresponding to the Slave on which the “data transfer” via LAN operation failed.

5.3 / = temperature probe management parameters

/	PROBE PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
/2	Measurement stability	C	1	15	-	1	
/4	Virtual probe (between probe 1 and probe 3) (0 = probe 1; 100 = probe 3)	C	0	100	-	0	•
/6	Enable decimal point (0 = No, 1 = Yes)	C	0	1	flag	1	•
/7	Remote display management 0 = not present 1 = room probe (S1) 2 = defrost probe (S2) 3 = third probe (S3) 4 = virtual probe 5 = terminal probe	C	0	5	-	0	•
/8	3rd probe calibration	C	-20.0	20.0	°C	0.0	
/9	Defrost also with probe 3: 1 = the defrost by temperature ends when the temperature detected by probe 2 and probe 3 are the temperature set for the parameter "dt"	C	0	1	flag	0	•
/A	Probes present 0 = defrost probe and third probe absent 1 = defrost probe absent and probe 3 present 2 = defrost probe present and probe 3 absent 3 = both defrost probe and probe 3 present 4 = control probe from master	C	0	4	-	0	•
/C	Control probe calibration	F	-20.0	20.0	°C	0.0	
/d	Defrost p robe calibration	C	-20.0	20.0	°C	0.0	
/t	User interface management 0 = not present 1 = room probe (S1) 2 = defrost probe (S2) 3 = third probe (S3) 4 = virtual probe 5 = terminal probe	C	0	5	-	4	•

/C: calibration or calibration offset of the room probe (S1)
The value assigned to this parameter is added to (positive value) or subtracted from (negative value) the temperature measured by probe S1. For example, to decrease the temperature by 2.3 degrees, set /C = -2.3. The offset may be set from -20 to +20 with precision to the tenth of a degree.
- *Default: 0.0 (no offset to probe reading).*

/2: measurement stability
Defines the coefficient used to stabilise the temperature measurement. Low values assigned to this parameter offer a prompt response of the sensor to variations in temperature; the reading is however more sensitive to disturbance. High values, on the other hand, slow down the response but guarantee greater immunity to disturbance, meaning a more stable reading.
- *Def.: 1.*

/4: virtual probe:
Defines a non-existent probe used for the normal control functions This parameter determines the weighted average used to calculate the reference control probe value based on the reading of the room probe (S1) and the third probe (S3). The formula is the following:

virtual probe = $\frac{(100-("/4"))xS1+("/4")xS3}{100}$;

If set to 0, the virtual probe coincides with the room probe (S1); if set to 100, the virtual probe coincides with the third probe (S3).
- *Def.: 0, room probe (S1).*

/6: decimal point
Enables or disables the display of the temperature with resolution to the tenth of a degree, in the range between -9.9 and 99.9 for the version with Small display, and between -99.9 and 999.9 for version with Large display.
0 = display without decimal point;
1 = display with decimal point.
- *Def.: 1, decimal point enabled.*

/t: display on user interface
Selects the probe reading displayed on the interface terminal
0 = Not present
1 = Room probe (S1)
2 = End defrost probe (S2)
3 = Third probe 3 (S3)
4 = Virtual control probe (depends on the parameter /4)
5 = Terminal probe (if present)
- *Def.: 4, displays the virtual probe.*

/7: display on remote display
Selects the probe reading displayed on the remote display
0 = Not present
1 = Room probe (S1)
2 = End defrost probe (S2)
3 = Third probe (S3)
4 = Virtual control probe (depends on the parameter /4)
5 = Terminal probe (if present)
- *Def.: 0, display not present.*

/8: third probe calibration
The value assigned to this parameter is added to (positive value) or subtracted from (negative value) the temperature measured by probe S3. For example, to decrease the temperature by 2.3 degrees, set /8 = -2.3. The offset may be set from -20 to +20 with precision to the tenth of a degree.
- *Default: 0.0 (no offset to probe reading).*

/9: defrost with probe 3
This parameter allows the third probe S3 to be used as the end defrost probe together with probe S2. In this case, the defrost by temperature ends when the temperature measured by both the probes is greater than or equal to the end defrost temperature (see parameter "dt"). Consequently, probe 3 can be used as a defrost probe on a second evaporator.
- *Def.: 0.*

/d: end defrost probe calibration (S2)
The value assigned to this parameter is added to (positive value) or subtracted from (negative value) the temperature measured by probe S2. For example, to decrease the temperature by 2.3 degrees, set /C = -2.3. The offset may be set from -20 to +20 with precision to the tenth of a degree.
- *Default: 0.0*

/A: probes present
The value of this parameter tells the instrument whether the probes S2 and/or S3 are connected. The value of 4 only makes sense on controllers configured as slaves as, with this setting, the slaves no longer uses their own probes for the control functions, but rather use the probe reading sent by the master.

Do not set the value to 4 on a controller configured as the Master.
The possible values of this parameter are as follows:
0 = defrost probe and third probe absent
1 = defrost probe absent and probe 3 present
2 = defrost probe present and probe 3 absent
3 = both defrost probe and probe 3 present
4 = control probe from master (**slaves only**).
The room probe (S1) is always considered as being present.
- *Def.:0.*

5.4 r = temperature control parameters

r	CONTROL PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
r1	Minimum temperature setting	C	-50.0	r2	°C	-50.0	-
r2	Maximum temperature setting	C	r1	90.0	°C	90.0	-
r3	Enable Ed alarm (defrost ended by timeout) 0 = No, 1 = Yes	C	0	1	flag	0	-
r4	Automatic variation of the night-time set point (curtain switch closed)	C	-20	20	°C	3.0	-
r5	Enable min. and max. temperature monitoring 0 = No; 1 = Yes	C	0	1	flag	0	-
r6	Night-time variation with third probe (1 = night-time with curtain lowered, control with probe 3; 0 = night-time control with the virtual probe)	C	0	1	flag	0	-
rd	Control differential (hysteresis)	F	0.1	20.0	°C	2.0	-
rH	Max. temperature measured in the interval "rt"	F	-	-	°C	-50	
rL	Min. temperature measured in the interval "rt"	F	-	-	°C	90	
rt	Min. and max. temperature monitoring time	F	0	999	hours	0	

rd: differential
Determines the value of the temperature control differential. Operation can be defined as follows:
temperature > set point + diff. (rd) → control on
temperature set point → control off
This is also shown in Figure xx.

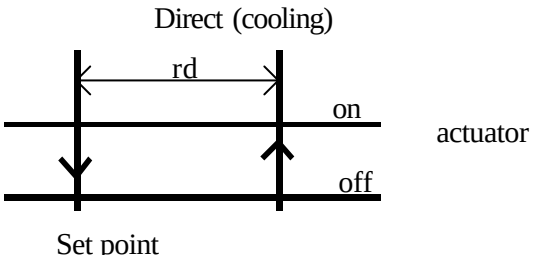


Fig. xx

- *Def.: 2.0.*

r1: Minimum temperature setting
Determines the minimum value that can be set for the set point. This parameter prevents the user from setting a set point that is lower than the corresponding value.
- *Def.: -50.0.*

r2: Maximum temperature setting
Determines the maximum value that can be set for the set point. This parameter prevents the user from setting a set point that is higher than the corresponding value.
- *Def.: 90.0.*

r3: enable end defrost by timeout signal
Enables the signal indicating the end of the defrost after the maximum time, set for the parameter "dP", using the code "Ed".
0 = signal disabled
1 = signal enabled
- *Def.: 0.*

r4: set point variation
The value set for this parameter will only be effective if the parameter "Stn" is set to 1 or 2. In this case, the set point will change either when a digital input configured as the "curtain switch" is closed (see parameters A1…A5 = 7), or at a set time if the controller is fitted with the RTC option (see parameters "hSn" and "hSd"). The set point varies by the value with sign saved for the parameter "r4", as follows:

new_set point = set point ("St") + "r4"

- *Def.: 3.0.*

r5: enable temperature monitoring
Enables temperature monitoring, recording the maximum ("rH") and minimum ("rL") temperatures reached in the interval "rt" (max 999h).
r5 = 0: temperature monitoring disabled
r5 = 1: temperature monitoring on probe S1 enabled
The monitoring starts from when "r5" is assigned the value 1.
To disable temperature monitoring, set "r5" to 0. After 199 hours, the maximum monitoring time allowed by the instrument, the max. and min. temperatures are no longer recorded. Set "r5" again to start a new monitoring cycle.
- *Def.: 0.*

r6: control with the third probe from digital input
This is used to move the temperature control to the third probe (S3) when a digital input configured as the "curtain switch" is closed (see parameters A1…A5 = 7).
r6 = 0: no change, control by virtual probe
r6 = 1: when the digital input is closed, control is performed using probe S3
- *Def.: 0.*

rt: temperature monitoring time
Once the temperature monitoring function (parameter "r5") has been enabled, this parameter records the time in hours from the start of the monitoring cycle.
- *Def.: read-only parameter, no default value.*

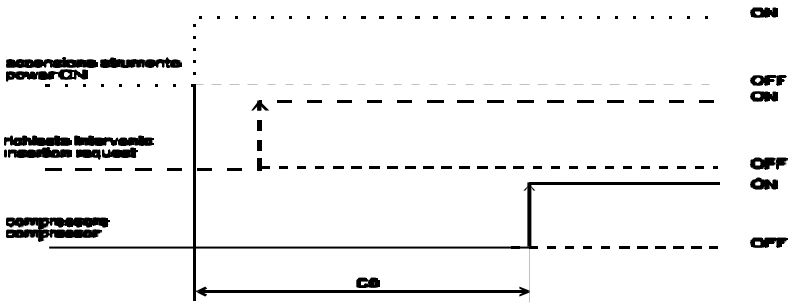
rH: maximum temperature measured in the time "rt"
Once the temperature monitoring function (parameter "r5") has been enabled, this parameter records the maximum temperature reached from the start of the monitoring cycle.
- *Def.: read-only parameter, no default value.*

rL: minimum temperature measured in the time "rL"
Once the temperature monitoring function (parameter "r5") has been enabled, this parameter records the minimum temperature reached from the start of the monitoring cycle.
- *Def.: read-only parameter, no default value.*

5.5 c = safety and control activation time parameters

c	TIMES AND SAFETY PARAMETERS	Type	Min	Max	UOM	Def.
c0	Control start delay when switching the instrument on	C	0	15	min	0
c4	Safety relay 0 = control always OFF 100 = control always ON	C	0	100	min	0
c6	Low temp. alarm bypass time after continuous cycle	C	0	15	hours	2
cc	Continuous cycle duration	C	0	15	hours	4

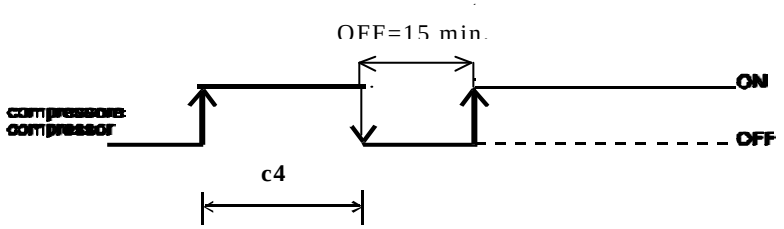
c0: Control start delay when switching the instrument on
This parameter is used to delay, by a set time in minutes, for the activation of the control functions from when the instrument is switched on. In multi-utility installations, the parameter "c0" can be used to avoid simultaneous starts of the various units, thus preventing the overloading of the refrigeration system when starting.



- Def.: 0 (minutes).

c4: Duty setting or safety relay
If the **"control probe error (rE)"** alarm occurs (that is, probes S1 and/or S3 faulty), this parameter allows the controller to keep operating the cooling utility, thus reducing or limiting any damage while awaiting the elimination of the fault. In practice, as there is no longer any temperature control, the controller operates in cycles, with an ON time equal to the value assigned to the parameter "c4" (in minutes) and a fixed OFF time of 15 minutes.
Two values of c4 bring about specific situations:
c4 = 0: controller **always OFF**;
c4 = 100: controller **always ON**.

If control error occurs while the controller is in a defrost or continuous cycle, it instantly exits the current status and goes into "duty setting" mode. It should be remembered that, in the event of a control error on a Master/Slave unit, local or manual defrosts and the continuous cycle functions are no longer available.
A Master with a "control probe error (rE)" may, on the other hand, manage the defrosts on the slaves served (network defrost).



- Def.: 0, control always off.

cc: continuous cycle duration
This is the time in hours that the controller is operated continuously for so as to lower the temperature, even below the set point. This function is started manually by pressing the buttons on the user interface. If cc=0, the continuous cycle is disabled. The controller exits the continuous cycle procedure when the time set for the parameter "cc" has elapsed, or alternatively when reaching the minimum temperature threshold set using the parameter "AL" (**minimum_threshold=set point-AL**).
- Def.: 4 (hours).

c6: alarm bypass after continuous cycle
This is the time in hours that the low temperature alarm is ignored, that is, not activated, after a continuous cycle. The low temperature alarm will be generated only if, after a time equal to the sum of **"c6" (in hours) + "Ad" (in minutes)**, where "Ad" is the general delay for the temperature alarm, the temperature is still below the low temperature threshold (set point - "AL").
- Def.: 2 (hours).

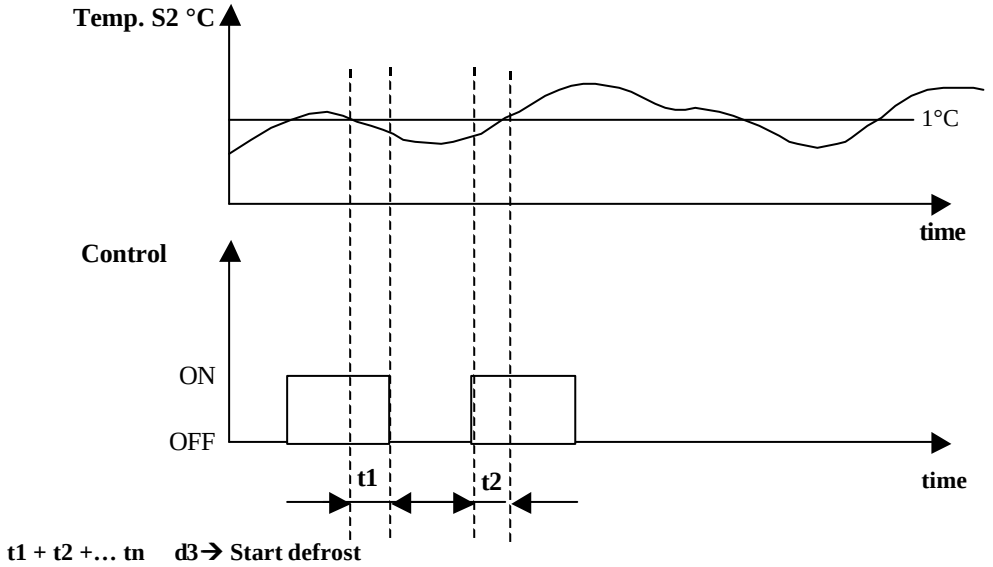
5.6 d = defrost management parameters

d	DEFROST PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
d0	Defrost type 0 = electric: ends at temperature and/or by timeout 1 = hot gas: ends at temperature and/or by timeout 2 = electric: ends by timeout 3= hot gas: ends by timeout	C	0	3	-	0	-
d2	LAN defrost command type 0 = start only 1 = start and stop	C	0	1	flag	1	-
d3	Compressor running time with ambient temperature below 1°C before forcing a defrost	C	0	192	hours	0	-
d4	Defrost when starting the instrument (0 = No, 1 = Yes)	C	0	1	flag	0	-
d5	Defrost delay when starting the instrument or from digital input	C	0	180	min	0	-
d6	Interface module and remote display management during defrost: 0 = No display lock. The temperature alternates with the "dF" symbols on both displays; 1 = Temperature locked on both displays	C	0	1	flag	0	-
d7	Enable skip defrost based on defrost time (0 = No, 1 = Yes)	C	0	1	flag	0	-
d8	High temperature alarm bypass time after defrost and if A4 = 5 or A8 = 5 alarm bypass time from door open	F	0	15	hours	1	-
d9	Defrost priority over compressor protection (0 = No, 1 =Yes)	C	0	1	flag	0	-
dd	Dripping time after defrost	F	0	15	min	2	-
dI	Interval between two defrosts	F	0	192	hours	8	-
dP	Maximum defrost duration	F	1	180	min	30	-
dt	Defrost end temperature	F	-50.0	30.0	°C	4.0	-
dM	Time between two successive cleaning signals	C	1	999	hours	1	
dPM	Cleaning signal duration	C	0	60	min	0	

d0: type of defrost
Establishes the type of defrost:
0 = electric heater, end at temperature or after maximum safety time (timeout)
1 = hot gas, end at temperature or after maximum safety time (timeout)
2 = electric heater, end by timeout
3 = hot gas, end by timeout
- *Def.: 0, electric heater defrost, end at temperature.*

d2: Type of defrost control
Determines whether the instrument, in a LAN, at the end of the defrost waits for an end defrost signal or not.
"d2" = 0 the instrument completes the defrost without waiting for the end signal (stand-alone instrument);
"d2" = 1 the instrument waits, at the end of the defrost, for the end signal sent by the Master via the LAN of multiplexed showcase.
Def.: 1.

d3: Running time with evaporator temperature below 1°C before starting a defrost.
Determines how long the controller operates (solenoid valve output/compressor active) when the temperature measured by probe S2 is below 1°C, after which a defrost is performed. To disable this function set the parameter to 0. For temperature values above 1°C and/or when the controller is inactive, the time is not counted. Obviously, the time is managed by an incremental counter that is set to zero only after the set value has been reached and the corresponding defrost performed.
Def.: 5 (hours).



t1 + t2 +… tn d3→ Start defrost

d4: Defrost when switching the instrument on

Starts a defrost when the instrument is switched on. The possible values are:
0 = no, no defrost is performed when switching the instrument on;
1 = yes, a defrost is performed when switching the instrument on.
This function may be useful in cases where, due to frequent power failures and the consequent resetting of the defrost timer (see parameter "dI"), the number of defrosts performed may be insufficient. In multi-utility systems, to avoid the simultaneous defrosting of all the units when power returns, set parameter "d5", corresponding to the defrost delay, to different values.
- *Def.: 0.*

d5: Defrost delay when switching the instrument on or from digital input

Represents the delay time in minutes before starting a defrost when the instrument is switched on (as set by parameter "d4") or from a digital input (set with parameters A1…A5 = 3 or 4).
- *Def.: 0.*

d6: user interface and remote display management during defrosts

During the defrosts, two types of behaviour can be set for the user interface and the remote display:
0 = display of the temperature, alternating with the symbol "dF" on both displays;
1 = both displays locked on the last value displayed before starting the defrost.
The display normally returns on both devices after the post-dripping phase (with normal control enabled).
- *Def.: 0.*

SKIP DEFROST

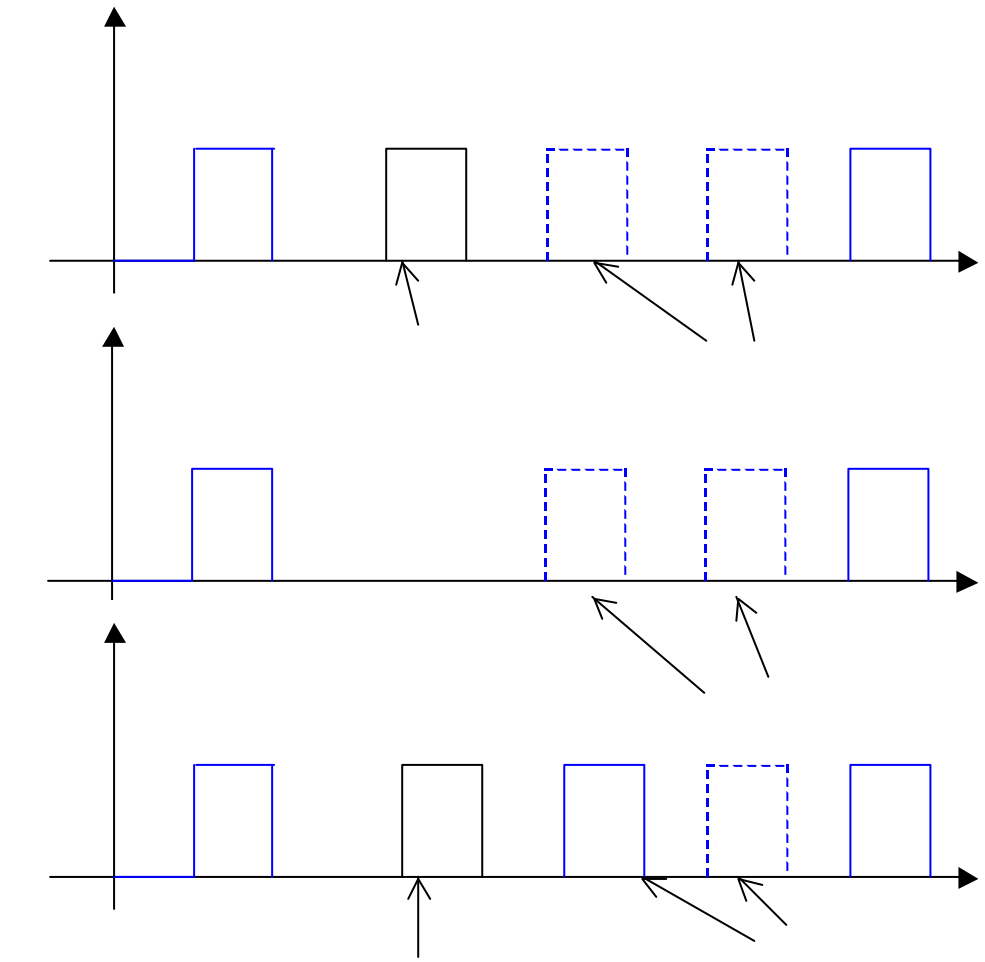
d7: enable "skip defrosts"

This parameter enables the algorithm by which, based on the actual time elapsed during the last defrost, the following defrost is performed or skipped. The following rules are considered:

- the maximum number of consecutive defrosts that can be skipped is 3, that is, after the third defrost skipped, the following one is always performed;
- after switching the instrument on, the first 8 defrosts are always performed;
- the number of events to be skipped is increased by a maximum of 1 at a time;
- the manual defrosts (started on the user interface) or by digital input are always performed and counted;
- the function can only be used with the defrosts that end at temperature ("d0" = 0 or 1).

"d7" = 1 skip defrosts enabled; "d7" = 0 skip defrosts disabled.

This function is based on a very simple but very effective principle. If the defrost lasts less than or equal to 65% of the time set for the parameter "dP" (maximum defrost time), the next defrost envisaged will be skipped. When the following defrost is performed, the check is repeated, and if the outcome is the same then the following two defrosts envisaged are skipped, and so on according to the criteria described above (maximum 3 successive defrosts skipped).
As soon as the defrost time exceeds 65% of the time "dP", the following defrost will be performed and the function will start again.
The following is a graphic representation of the function.



- *Def.: d7=0.*

d8: Alarm bypass time after defrost and/or door open
Indicates the time the temperature alarm signal is ignored from the end of a defrost and/or after the switching of a digital input configured as the "door switch" (see parameters A1…A5). In the latter case, it also indicates the maximum opening time for the door, in other words, after the set time, if the digital input (door) is still open, the instrument will start the control functions again, with an alarm signal on the display.
- *Def.:1 (hours).*

d9: Defrost priority over safety and control activation times
Cancels the safety times set using the parameters in family "c" when starting the defrost.
0 = the safety times are observed;
1 = the defrost has greater priority and the times set using the "c" parameters are ignored.
- *Def.: 0.*

dd: dripping time
This parameter is used to set the time in minutes following a defrost in which the controller and the evaporator fans are stopped, so as to allow the evaporator to drip.
- *Def.: 2 (minutes).*

dI: interval between "cyclical" defrosts
The parameter "dI" manages the so-called "cyclical" defrosts, in that they are repeated after the number of hours set for the parameter. The time is reset every time a defrost is performed (including non-cyclical defrosts). If "dI" is equal to 0 (dI = 0), cyclical defrosts are disabled. In a LAN, a cyclical defrost on the Master also starts a defrost on the Slaves connected (network defrost).
- *Def.: 8 (hours).*

dP: Maximum defrost duration
Determines the duration of the defrost in minutes for defrosts by time ("d0" = 0 or 1). For defrosts by temperature ("d0" = 2 or 3), "dP" represents the maximum safety duration of the defrost, that is, the defrost will in any case stop after the time "dP", even if the end defrost temperature has not been reached.
- *Def.: 30 (minutes).*

dt: end defrost temperature
This parameter is used to set the evaporator temperature measured by probe S2 at which the defrost is stopped. If when a defrost is started ("d0" = 0 or 1) the temperature ready by S2 is greater than the value of "dt", the unit goes directly into the dripping phase. If probe S2 is faulty, the defrost in any case ends after a maximum time (parameter "dP").
- *Def.: 4.*

CASE CLEANING MANAGEMENT

This function is used to manage the periodical cleaning of the showcase. By setting two specific parameters ("dM" and "dPM") and selecting a digital input (see parameters "A1"…"A5"), the instrument can be programmed to "signal" the need for cleaning and "oblige" the user to intervene.
The instrument enters "standby" status (only after the opening of the digital input), in which the control functions are stopped and the inputs and outputs deactivated.
The function is active only if one of the digital inputs is set as a "case cleaning input" ("A*x*"=10).

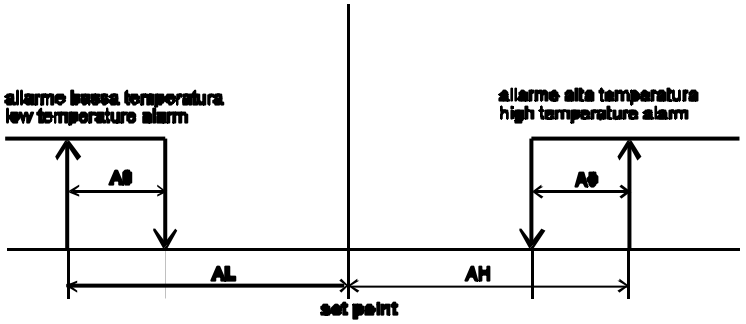
dM: time between two successive cleaning signals
This parameter is used to set the time in hours (range 1 - 1000) between one cleaning signal and the next. The time is counted starting from when a digital input is set ("A*x*" to 10) or when the instrument is switched on and one of the inputs has already been set to that value. When the time has elapsed, the instrument displays the message "CCM" and the buzzer sounds. The buzzer can be muted in the normal way or by opening the corresponding digital input.
- *Def.: 1 (hours).*

dPM: cleaning signal duration
This parameter is used to set the time in minutes (range 0 - 60) for the duration of the cleaning signal. When the time "dM" has elapsed, the controller awaits the opening of the digital input associated with this function, and only if the input remains open for a time at least equal to "dPM" will the signal on the display ("CCM") be cancelled and, unless already deactivated manually, the buzzer muted. At this point, the counter "dM" will start again for the following signal. Otherwise the buzzer will sound again and the signal will remain on the display.
- *Def.: 0 (minutes).*

5.7 A = alarm management parameters

A	ALARM PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
A0	Fan (see parameter F1) and alarm differential	C	0.1	20.0	°C	2.0	•
A1...5	Digital input configurations	C	0	10	-	0	
A7	Detection delay time for the "*delayed alarm*" input (A*n* = 2)	C	0	180	min	0	•
A8	Virtual digital input configuration	C	0	10	-	0	
Ad	Temperature alarm delay	C	0	180	min	120	•
AH	High temperature alarm: indicates the maximum variation from the set point. AH = 0 disables the high temperature alarm	F	0	20.0	°C	0.0	•
AL	Low temperature alarm: indicates the maximum variation from the set point. AL = 0 disables the low temperature alarm	F	0	20.0	°C	0.0	•
Ar	Slave alarm signal enabled on Master (1=remote alarms enabled on Master)	C	0	1	flag	1	

A0: Fan and alarm differential
Represents the differential used to establish the temperature threshold for the deactivation of a high or low temperature alarm ("AL" and "AH") (see the figure below) and for the management of the fans (see parameter "F1"). In the case of the alarms, the value of A0 is used to determine the points at which the temperature alarm is deactivated.
- *Def.: 2.0.*



AH: High temperature alarm
This value is related to the set point. It indicates the maximum deviation allowed from the set point above which a high temperature alarm is activated, indicated by the code "HI" on the display and signalled audibly by the buzzer. In numerical terms:

Control temperature > Set point ("St") + "AH" ➔ *HIGH TEMPERATURE ALARM* ("HI")

Changing the set point therefore automatically changes the alarm threshold.
The point at which the alarm is deactivated is as follows:

Control temperature Set point ("St") + "AH" - "A0"

When the alarm condition is no longer present the corresponding audible signal and message the display are automatically cancelled.
- *Def.: 0.0.*

AL: Low temperature alarm
This value is related to the set point. It indicates the maximum deviation allowed from the set point set point below which a low temperature alarm is activated, indicated by the code "LO" on the display and signalled audibly by the buzzer. In numerical terms:

Control temperature < Set point ("St") - "AL" ➔ *LOW TEMPERATURE ALARM* ("LO")

Changing the set point therefore automatically changes the alarm threshold.
The point at which the alarm is deactivated is as follows:

Control temperature Set point ("St") - "AL" + "A0"

When the alarm condition is no longer present the corresponding audible signal and message the display are automatically cancelled.
It should be remembered that the low temperature alarm threshold is also used in the continuous cycle (see parameter "cc") as the minimum value for stopping the function.
- *Def.: 0.0.*

NOTE: the temperature alarms are not generated in the following cases:
- *during a defrost;*
- *during the continuous cycle.*

Ad: temperature alarm delay
Indicates after how many minutes the temperature alarm is signalled from when the corresponding alarm threshold has been exceeded. If the alarm condition is longer present before the time "Ad" has elapsed, no alarm signal is generated.
The temperature alarm delay has no effect on two special functions: the defrost and the continuous cycle. To delay a temperature alarm **after** these functions, use the parameters "d8" for the defrost and "c6" for the continuous cycle.
- *Def.: 120 (minutes).*

DIGITAL INPUT CONFIGURATIONS

The MasterCase series instruments feature five digital inputs that can be configured using parameters A1, A2, A3, A4 and A5 (following A1…A5) respectively, associated with the inputs DI1 to DI5. In addition, a further parameter, "A8", is used to manage a digital input called the "virtual" input, as it is not physically present on the instrument, but rather associated with the status of digital input DI1 on the Master in a LAN (Master-Slave configuration).

On a Master controller, the input will be associated with a specific signal from the Supervisor, otherwise parameter "A8" will have no function.

The functions corresponding to each value of A4…A5 / A8 are described below:

A1…A5 / A8 = 0: digital input disabled

The corresponding digital input is not used and ignores the closing/opening of any contacts connected to it.

A1…A5 / A8 = 1: input associated with an immediate external alarm

The digital input can be connected to an external alarm that requires immediate activation (for example, high pressure alarm, etc…). The alarm is generated when the contact is opened, and causes the display of the code "IA", the activation of the buzzer and the total shutdown of the controller and all the related outputs. When the alarm condition is no longer present, the unit returns to normal temperature control operation.

A1…A5/A8 = 2: input associated with a delayed external alarm

The operating mode is the same as for value 1 above, in this case however the alarm signal can be delayed by a time, in minutes, equal to the value set for the parameter "A7".

A1...A5/A8 = 3: input associated with a defrost enabling signal

This setting is used to enable/disable the defrost function. When the contact is open the defrost is inhibited, when the contact is closed the defrost is enabled. If the contact is closed, but there is no defrost request, the defrost is obviously not performed. If the contact is closed and a defrost is in progress, when the digital input is opened the current defrost is stopped and the successive defrosts are inhibited, until the next time the digital contact is closed.

Possible applications

This function is useful, for example, in the case of multiplexed showcases with hot gas defrost. In these systems, the defrosts are performed in "islands" and therefore, at any one time, some islands are enabled to defrost, and others are disabled. Another use of the function is to prevent defrosts on the units accessible to the public during opening times.

NOTE: the enabling/disabling of the defrost from a digital contact is effected locally. A Master, with A1...A5/A8=3 and with the corresponding digital input open, may not defrost locally, while it may start the defrost on the units served (manual, cyclical or set time defrost).

A1...A5 /A8 = 4: input associated with an immediate defrost from external contact

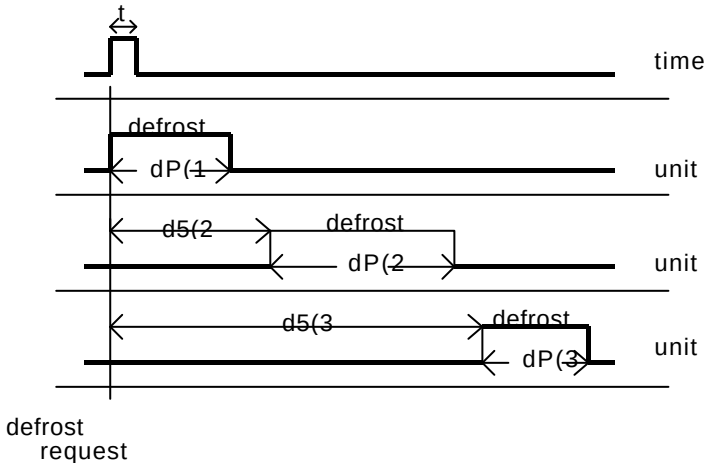
When the corresponding digital input is closed, a defrost is started, according to the criteria set for the type "d" parameters.

Possible applications

This function is useful when defrosts need to be performed on a series of utilities coordinated by an external timer. To avoid simultaneous defrosts, the parameter "d5" can be used to delay the start of the defrost on each unit. Another use of the function is to prevent defrosts on the units accessible to the public during opening times.

NOTE: in the case of a Master with Slaves, when its own digital contact closes a network defrost will start, even if the Master will not defrost locally.

The following drawing explains the above function:



KEY:

t = impulse from the timer to start the defrost: the minimum duration must be 0.5 seconds

dP(1) = maximum defrost duration, unit 1

d5(2) = defrost delay from external contact for unit 2. This must be greater than dP(1), otherwise the defrosts will overlap.

Similar meanings for d5(3) and dP(3)

A1…A5 / A8 = 5: Door switch
This function is used to manage the door switch on a cold room. When the contact (door) is opened, the control functions and the fans are stopped and the light output is activated. When the contact closes the unit starts again in the previous operating mode, delaying any temperature alarms for a number of hours equal to the value of the parameter "d8". If the door, and consequently the contact, remain open for a time greater than "d8", the display shows the alarm code "dr" and the controller returns to the operating mode it was in prior to the opening of the door. Specifically:

- if the controller was in Duty Setting mode, it returns to Duty Setting;
- if the controller was in continuous cycle mode, it returns to continuous cycle mode, and the maximum duration of the continuous cycle is extended by the time the door was open;
- if the controller was in defrost mode, it remains in defrost mode;

When the controller is restarted, the set safety times are observed (see type "c" parameters).

A1…A5 / A8 = 6: Remote ON/OFF
By setting the input for this function the controller can be switched on/off using an external contact.
Contact closed = controller **On**;
Contact open = controller **Off.**
Switching off is not equivalent to disconnecting power, but rather is a "logical Off", that is, the controller goes into "standby", ignoring all the digital inputs and outputs, the defrost requests, continuous cycle and Duty Setting. The controller however still continues to display the temperature, alternating with the message "Off". If the instrument that is Off is a Master connected to a series of Slaves, it is in any case able to manage the network defrost and signal the alarms on the remote units.

A1…A5 / A8 = 7: curtain switch
The digital input set to this value is used to activate/deactivate the "light" relay output when the corresponding contact is opened/closed. In addition, if the parameter "Stn" is set to 1, the set point will be varied by the value of the parameter "r4".

A1...A5 / A8 = 8: duty setting operation
The opening of the contact associated with the digital input set with this value will switch the controller to "duty setting" operation, as described earlier (see parameter "c4").

A1...A5 / A8 = 9: door switch with controller On
The behaviour of the controller when the digital input set to this value is opened is the same as for the "door switch" (A*n* = 5) with the difference that in this case the outputs remain active (ON). This configuration can be used in cases where the door is opened and closed frequently, for short periods (frozen food display cabinets, etc…).

A1...A5 / A8 = 10: case cleaning management
This configuration of the digital input is used to manage the "case cleaning" function, as described earlier (see parameters "dM" and "dPM").

<u>Warning</u>
For the correct management of the functions associated with the digital inputs, the values of A1...A5, A8 must be different from one another, or alternatively must be equal to zero. That is, if A1...A5, A8 are assigned values other than zero, the following must be true: A1 ≠ … ≠ A5 ≠ A8.
- *Def.: 0.*

A7: external alarm detection delay
Sets the delay (in minutes) relating to the external alarm from digital input, when A1...A5 / A8 = 2.
- *Def.: 0 (minutes).*

Ar: enable Master for the alarm signals on the Slaves
This parameter allows the Master unit to be enabled to display the presence in its LAN of one or more Slaves with alarms. If an alarm is activated on a Slave, on the Master the display shows the signal "n*x*" alternating with the temperature, where *x* is the address of the Slave in question (*x* = 1, ..., 5). This type of alarm also activates the buzzer and the alarm relay.
"Ar" = 0, function disabled;
"Ar" = 1, function enabled.
- *Def.: 1.*

5.8 F = evaporator fan management parameters

F	PARAMETERS FANS	Type	Min	Max	UOM	Def.	To LAN
F0	Fan management: 0 = fans always on (except in special cases: see parameters F2, F3, Fd) 1 = fans controlled according to the absolute set point F1	C	0	1	flag	0	-
F1	Absolute fan control set point	F	-40.0	50.0	°C	5.0	-
F2	Fans off when compressor off (0 = No, 1 = Yes) Active if F0 = 0	C	0	1	flag	1	-
F3	Fans off in defrost (0 = No, 1 = Yes) Valid for all values of F0	C	0	1	flag	1	-
Fd	Fans off in post-dripping	F	0	15	min	1	-

F0: fan management
The fans can be managed by the "fan controller", which manages them according to the temperature measured by the end defrost probe S2 (see parameter "F1"), or alternatively can be always on, and stop when the controller is switched off (see parameter "F2").
"F0" = 0, fans managed based on the parameter "F2";
"F0" = 1, fans subject to the "fan controller" (see parameter "F1").
It should be remembered that if a dripping phase (parameter "dd" ≠ 0) and/or post-dripping phase (parameter "Fd" ≠ 0) is set, the fans are always off in these phases.
- *Def.: F0=0.*

F1: (absolute) fan control set point (parameter valid only if F0=1)
The fans are controlled according to the following formula:
Temperature S2 < "F1" - "A0" → fans on;
Temperature S2 "F1" → fans off.
- *Def.: 5.*

F2: fans off when the controller is off (parameter valid only if F0=0)
This is used to decide whether the fans must be always on (except in cases "F3", "dd" and "Fd") or only when the controller is on.
"F2" = 0, no, fans always on;
"F2" = 1, yes, fans off when the controller is off.
- *Def.: 0.*

F3: fans off in defrost (parameter always valid)
This is used to decide whether the fans must be on or off during the defrost.
"F3" = 0, no, fans always on during the defrost;
"F3" = 1, yes, fans off during the defrost.
It should be remembered that during the dripping wait (in the case of network defrosts), dripping (if featured) and post-dripping (if featured) times, the fans are always off.
- *Def.: 1.*

Fd: fans off in post-dripping
Indicates the time (in minutes) after the dripping phase (see parameter "dd"), known as the "post-dripping" phase, that the fans stay off for, even if the controller, and thus the power supply to evaporator, have already restarted. This is useful to allow the evaporator to return to the normal operating temperature after defrosting and to freeze the remaining moisture and droplets, thus avoiding wetting the goods inside the showcase when the fans are started.
- *Def.: 1 (minutes).*

5.9 H = other settings

H	OTHER SETTINGS	Type	Min.	Max.	UOM	Def.	To LAN
H0	Serial address	C	0	199	-	1	
H1	Enable/Disable IR remote control	C	0	1	flag	0	-
H2	Infrared remote control code	C	0	99	-	0	
H3	Enable ON/OFF from keypad	C	0	1	flag	1	-
H4	Enable ON/OFF from supervisor	C	0	1	flag	0	-
H5	AUX1 configuration	C	0	8	-	0	
H6	AUX2 configuration (hot wire)	C	0	8	-	5	

H0: serial address
Assigns the instrument an address to which it responds when connected to a supervisory or telemaintenance system. It is also used for the serial connection or network connection.
In a Master-Slave LAN configuration, for the Slaves it represents the local address (from 1 to 5) in the LAN.
Make sure that if a series of Masters with their own LANs are connected to a supervisor network (RS485), the address of each Master must be set considering the number of Slaves present in the previous LAN. This concept is expressed by the following formula:

"H0" = "H0"_previous_Master + "Sn"_previous_Master + 1

- *Def.: 1.*

H1: enable/disable remote control
Enables the use of the infrared remote control.
- *Def.: 0.*

H2: remote control enabling code
This is used to enter a code to distinguish, when programming from the remote control, between various controllers located in the same area.
- *Def.: 0.*

H3: enable On/Off from keypad
Enables or disables the ON/OFF button on the user interface.
"H3" = 0, On/Off button disabled;
"H3" = 1, On/Off button enabled.
- *Def.: 1.*

H4: enable On/Off from supervisor:
Enables or disables the remote ON/OFF signal from the supervisor.
"H4" = 0, Remote ON/OFF from the supervisor disabled;
"H4" = 1, Remote ON/OFF from the supervisor enabled.
- *Def.: 0.*

H5: AUX1 configuration
This is used to configure the auxiliary output as a repeat of any one of the other outputs. Specifically:
"H5" = 0, output disabled;
"H5" = 1, ON/OFF valve output;
works in parallel to the controller and can used to control a solenoid valve;
"H5" = 2, compressor output;
repeats the operation of the main control output (symbol);
"H5" = 3, light and/or curtain output;
"H5" = 4, fan output;
"H5" = 5, hot wire output (rail heat);
the output is always active except for when the control is in standby;
"H5" = 6, alarm output;
"H5" = 7, evaporator 1 defrost output;
manages a second defrost output that works in parallel with the main defrost output;
"H5" = 8, evaporator 2 defrost output.
In association with the setting of parameter "/9" = 1 (defrost with probe S3), a second defrost output can be managed, independently of the main output and related to the value read by probe S3. It can therefore be used to control an electric defrost heater on a second evaporator.
- *Def.: 0.*

H6: AUX2 configuration
Same as parameter "H5". As default this output is configured for the control of the hot wire (rail heat).
- *Def.: 5.*

5.10 LAN parameters

	LAN PARAMETERS	Type	Min	Max	UOM	Def.
Sn	Number of Slaves. 0 = LAN not present	C	0	5	-	0
In	Configuration of the unit as Master or Slave In = 1, Master unit In = 0, Slave unit	C	0	1	flag	0

Sn: number of Slaves
This parameter is only valid on the controllers configured as the Master (parameter "In" = 1) and is used, in a LAN, to tell the Master controller how many Slaves it must manage.
- *Def.: 0.*

In: master/slave configuration
The value of this parameter configures the unit as the Master or a Slave. When the controller is started, the display will show "uM" (**Master unit**) if "In" = 1, or "uS*x*" (**Slave unit** number ***x***, *x* = 1 ... 5: address of the slave in the LAN) if "In" = 0.
"In" = 1, unit configured as Master;
"In" = 0, unit configured as Slave.
- *Def.: 0.*

Suggestions
- During the installation of a LAN make sure that the values of H0 on the various units are all different;
- The value of H0 assigned to any Slave must not be higher than the value of "Sn" on the Master;
- A LAN must not have more than one unit configured as the Master.

5.11 “Set point” parameters

	SET POINT	Type	Min.	Max.	UOM	Def.	To LAN
St	Operating temperature set point	F	r1	r2	°C	-20.0	-
Stn	Select night-time set point mode	C	0	2	-	0	
hSn	Night-time set point start time	C	0	23	hours	0	
hSd	Night-time set point end time	C	0	23	hours	0	
SL1	Absolute minimum temperature, probe S1 SL1= 90°C function disabled	C	-50.0	90.0	°C	90.0	

St: temperature set point
Represents the reference control temperature.
See the paragraph dedicated to this parameter.
- *Def.: -20.0.*

Stn: select night-time set point mode
The parameter Stn can be used to configure the controller to automatically change the night-time set point.
The parameter may have the following values:
“Stn” = 0, no night-time set point;
There will be no night-time variation in the set point, irrespective of the value set for the parameter “r4” (positive or negative change in the set point).
“Stn” = 1, set point variation from digital input;
If Stn = 1, when the status of the digital input programmed as the curtain switch (A*x* = 7) changes, the reference set point will also be changed according to the value of the parameter “r4” (positive or negative change in the set point). If no digital input is programmed as the curtain switch (A*x* 7), there will be no night-time variation of set point. If, on the other hand, A*x* = 7 but Stn 1, when the status of the *x*-th digital input changes there will be no variation in the set point, but rather the simple activation of the output (light).
The action corresponding to the parameter r6 (night-time control on probe 3) will be only be related to the setting and the status of the *x*-th digital input.
“Stn” = 2, variation by RTC;
If the controller is fitted with the RTC option, the controller can be programmed to change from the daytime to the night-time set point and vice-versa by setting two time bands.
See the figure below.
- *Def.: 0.*

hSn: Night-time set point start time
If the night-time set point from RTC function is used, this parameter indicates the time that the set point is changed (see parameter “r4”) and the reference probe is changed, if set (see parameter “r6”).
See the figure below.
- *Def.: 0.*

hSd: Night-time set point end time
If the night-time set point from RTC function is used, this parameter indicates the time at which the function is stopped.
See the figure below.
- Def.: 0.

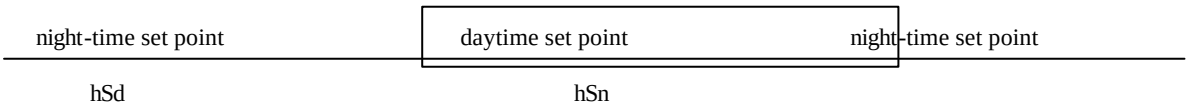
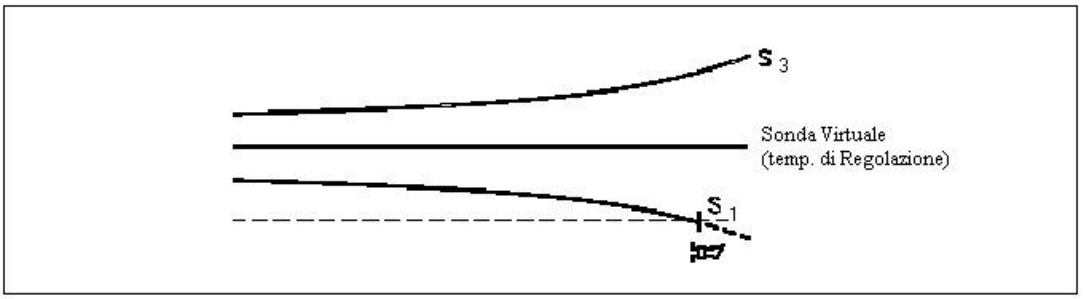


Fig. *xx*

MINIMUM OUTLET AIR TEMPERATURE ALARM

This function should be used when the controller is set to use the “virtual probe”



In this case, in fact, the temperature control is based on a “weighted” value of the two probes (S1 and S3). This means that despite the fact that the reference is constant, the temperature of the two probes may in reality differ significantly, with the risk of having an evaporator air outlet temperature (that is, the air that comes into contact with the product) that is dangerously low.

SL1: minimum temperature for probe S1
If the temperature read by probe S1 falls below the minimum value “SL1”, the controller is stopped and an alarm is activated (code displayed => ”L01”). When the temperature increases by 2°C above “SL1”, the controller restarts and the alarm is reset.
If the value of the parameter “SL1” is equal to the maximum limit (90.0°C) and/or the parameter “/4” is set to 0, the function is disabled.
- *Def.: 90.0.*

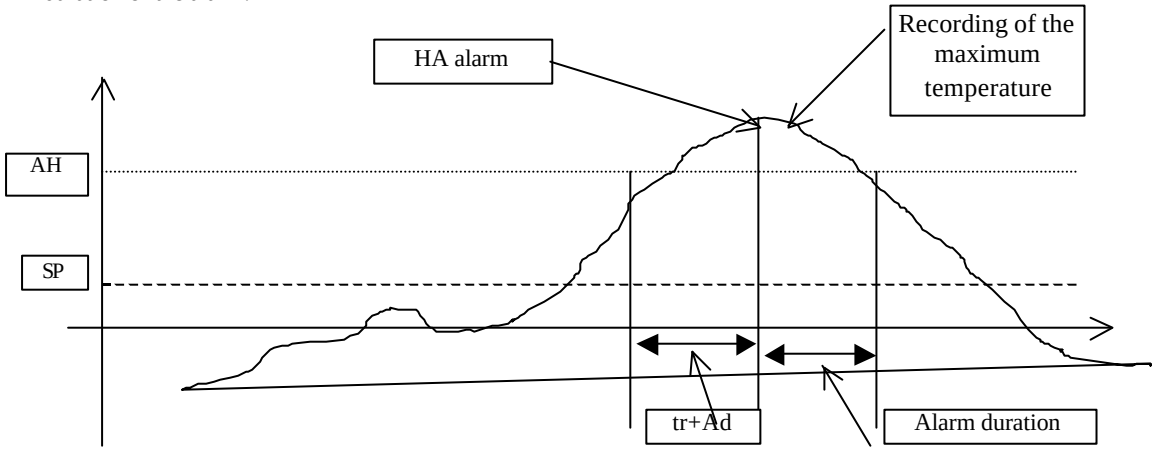
5.12 HACCP parameters

	HACCP PARAMETERS	Type	Min	Max	UOM	Def.	To LAN
tr	HA alarm delay (HACCP) 0 HACCP disabled	C	0	127	min	0	
tA	Type of HACCP alarm: 0 no alarm 1 HA alarm 2 HF alarm	C	0	2		0	
tO	Weekday last HACCP alarm	C	0	7	Days	0	
tH	Hour last HACCP alarm	C	0	23	Hours	0	
tM	Minutes last HACCP alarm	C	0	59	Min	0	
tt	Maximum temperature measured during the HACCP alarm	C	-50.0	90.0	°C/°F	-50.0	
tE	Duration of the HACCP alarm	C	0	199	Hours	0	
to	Reset HA HF alarms	C	0	1	flag	0	

HACCP

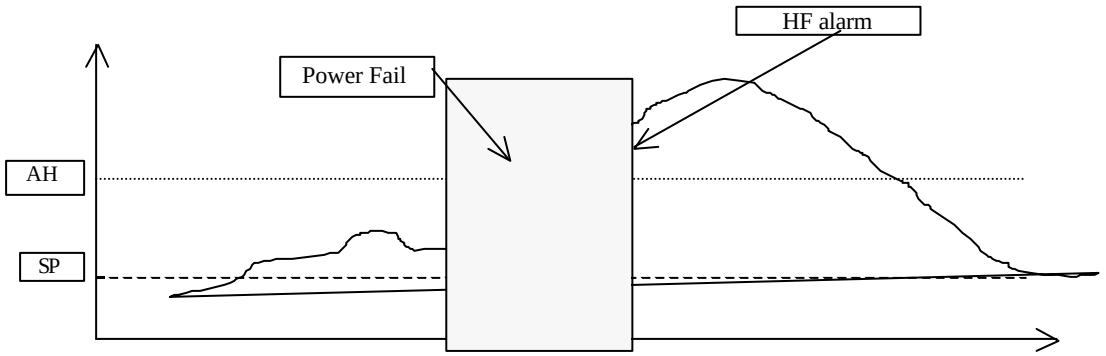
This function allows advanced control of the operating temperature and the recording of any faults due to power failures or increases in the operating temperature for various reasons (faults, severe operating conditions, user errors, etc…).
This function can **only** be activated **on the controllers with the RTC option inserted.**
Two types of HACCP alarm are featured, identified on the display with the following codes respectively:
"HA" - if, during operation, the temperature measured is greater than the threshold represented by the sum of the parameters "AH" (high temperature alarm threshold) and "St" (set point), for a time greater than the sum of the parameter "tr" (specific for the HACCP alarms) and the parameter "Ad" (temperature alarm delay), the alarm HA is activated. When the event occurs the following data are saved:

- hour, minutes and weekday;
- type of alarm;
- maximum temperature reached after the activation of the alarm;
- duration of the alarm.



"HF" – this is activated after a power failure if, when power returns, the temperature is higher than the threshold of "AH" + "St". The following data are saved:

- hour, minutes and weekday;
- type of alarm;
- maximum temperature reached after the activation of the alarm;
- duration of the alarm (in this case, the time also includes the duration of the power failure).



When an HA or HF alarm is activated, the display shows the codes "HA" or "HF", the alarm LED and the HACCP LED come on, the buzzer sounds and the alarm relay is activated.
Pressing SET for one second deactivates the alarm relay and mutes the buzzer. To delete the data saved, enter Parameter programming mode, set parameter "Ad" from 1 to 0 and confirm the operation, or alternatively press the HACCP button for 5 seconds.
Note: *the HF alarm is acquired and consequently the corresponding data are saved only if the power failure lasts for more than 1 minute.*

tr: HA alarm delay
Delay in the activation of the HA alarm.
- *Def.:0.*

tA: type of HACCP alarm
Identifies the type of the most recent HACCP alarm ("HA" or “HF”):
“tA” = 0, no alarm;
“tA” = 1, HA alarm;
“tA” = 2, HF alarm.
Read-only parameter.
- *Def.: 0.*

tO: weekday last alarm
Displays the weekday on which the last HACCP alarm occurred:
"Ad" = 1…7, Monday…Sunday.
Read-only parameter.
- *Def.: 0.*

tH: hour last alarm
Displays the hour at which the last HACCP alarm occurred:
Read-only parameter.
- *Def.: 0.*

tM: minutes last alarm
Displays the minutes at which the last HACCP alarm occurred:
Read-only parameter.
- *Def.: 0.*

tt: maximum temperature during alarm
Displays the maximum temperature reached during the last HACCP alarm:
Read-only parameter.
- *Def.: -50.0.*

tE: duration of the HACCP alarm
Duration of the last HACCP alarm:
Read-only parameter.
- *Def.: 0.*

to: reset HACCP alarms
Deletes all the data saved for the HACCP alarm, restoring the default values.
- *Def.: 0.*

5.13 RTC (Real Time Clock) parameters

	RTC PARAMETERS	Type	Min	Max	UOM	Def.	To LAN
td	Current weekday	F	1	7	days	1	
th	Current hour	F	0	23	hours	0	
t’	Current minutes	F	0	59	min	0	
d1	Day of first defrost	C	0	10	days	0	
h1	Hour of first defrost	C	0	23	hours	0	
m1	Minutes (of hour h1 on the current day) for starting the defrost	C	0	59	min	0	
d2	Day of the second defrost	C	0	10	days	0	
h2	Hour of the second defrost	C	0	23	hours	0	
m2	Minutes (of hour h2 on the current day) for starting the defrost	C	0	59	min	0	
-----	----------	-------	--------	-------	------	----	
-----	----------	-------	--------	-------	------	----	
d8	Day of the eighth defrost	C	0	10	days	0	
h8	Hour of the eighth defrost	C	0	23	hours	0	
m8	Minutes (of hour h8 on the current day) for starting the defrost	C	0	59	min	0	

td, th, t’: current day**,** hour and minutes
These can be modified as if they were type “F” parameters.

d*x*, h*x*, m*x*: are respectively the weekday, hour and minutes set for the *x*-th defrost.
For example, to start a defrost at 3:30 a.m. on Monday, set d*x* = 1, h*x* = 3 and m*x* = 30 (*x* = 1, 2, ... 8).
To inhibit the defrost, set d*x* = 0.
If d*x* = 8 the defrosts will be performed from Monday to Friday at hour h*x* and minutes m*x*.
If d*x* = 9 the defrosts will be performed on Saturday and Sunday at hour h*x* and minutes m*x*.
If d*x* = 10 the defrosts will be performed every day of the week at hour h*x* and minutes m*x*.

5.14 Electronic valve (EEV) option

The MasterCase controller is also available in a version with a built-in electronic expansion valve controller (code MGE0000020).
The following components also need to be added:

- an NTC temperature probe for reading the evaporation temperature;
- a ratiometric pressure probe for reading the evaporation pressure;
- a motorised expansion valve;
- a 24Vac 15V/A safety transformer (with a 1A slow-blow fuse on the secondary).

P	VALVE PARAMETERS	Type	Min	Max	UOM	Def.	To LAN
P1	Valve model	C	0	2	-	2	
P3	Superheating set point	C	0.0	25.0	°C	5.0	
PA	Enable propagation of pressure probe from Master (set only on the Master)	C	0	1	flag	0	
Pb	Enable evaporation pressure probe via the local network (set only on the slaves) 0 = local probe 1 = Master probe	C	0	1	flag	0	
Pc	Pressure probe alarm delay	C	0	255	min	5	
PE	Display superheating	C	-	-	°C	-	
PH	Type of gas 0 = R134a 1 = R22 2 = R404a 3 = R410a 4 = R407c	C	0	4	-	2	
Pi	Evaporation pressure probe model	C	0	2	-	0	
OSH	Superheating offset	C	0.0	60.0	-	0.0	

P1: valve model
The MasterCase controller can manage 3 different models of valve. Parameter P1 is used to set the model installed.
"P1" = 0, Carel E2V 1* 16mm valve (-nn 390 steps);
"P1" = 1, Sporlan valve (models SEI-0.5, SEI-1, SEI-2, SEI-3.5, SEI-6, SEI-8.5, SEI-11).
"P1" = 2, Carel 16mm valve (EV-nn 480passi);
- *Def.: 2.*

P3: superheating set point
Parameter P3 is used to set the superheating set point at the evaporator outlet.
- *Def.: 5.0.*
Note: *too low values for the set point may compromise the stability of the showcase control functions. It is recommended to not set the value below 3°C.*

PA: enable propagation of evaporation pressure probe on local network
In the event of a multiplexed showcase with the controllers connected in Master/Slave configuration, a single evaporation pressure probe can be connected to the Master and the value sent across the LAN to the Slaves, so that all the multiplexed islands use the same probe.
"PA" = 0, propagation disabled;
"PA" = 1, propagation enabled.
This parameter can only be set to 1 on the Master
- *Def.: 0.*

Pb: enable evaporation pressure probe via the local network
To enable the propagation of the pressure probe reading via the local network, parameter PB must be used to enable each Slave to use the reading sent by the Master for calculating the superheating value.
"PB" = 0, use the local pressure probe;
"PB" = 1, use the pressure probe reading sent by the Master via the LAN.
This parameter may only be set on the Slaves
- *Def.: 0.*

Pc: pressure probe alarm delay
The MasterCase controller checks that the pressure values read by the ratiometric pressure probes are within the limits envisaged for the model set (see parameter Pi). In addition, the probes are also checked to see if they are disconnected or short-circuited. In all these cases, a time can be set for the controller to wait for the fault to pass before signalling the alarm. It should be remembered the controller also signals if the probes are out-of-range, and so the delay set must allow for any transitory excess pressure values on the unit.
- *Def.: 5, (minutes).*

PE: display superheating value (read-only)
The parameter PE (read-only) can be used to enable the display of the superheating value acquired by the MasterCase controller.
- *Def.: read-only parameter.*

PH: refrigerant type
Parameter PH is used to set the type of refrigerant used in the system.
PH = 0, R134a
PH = 1, R22
PH = 2, R404a
PH = 3, R410a
PH = 4, R407c
- *Def.: 2.*

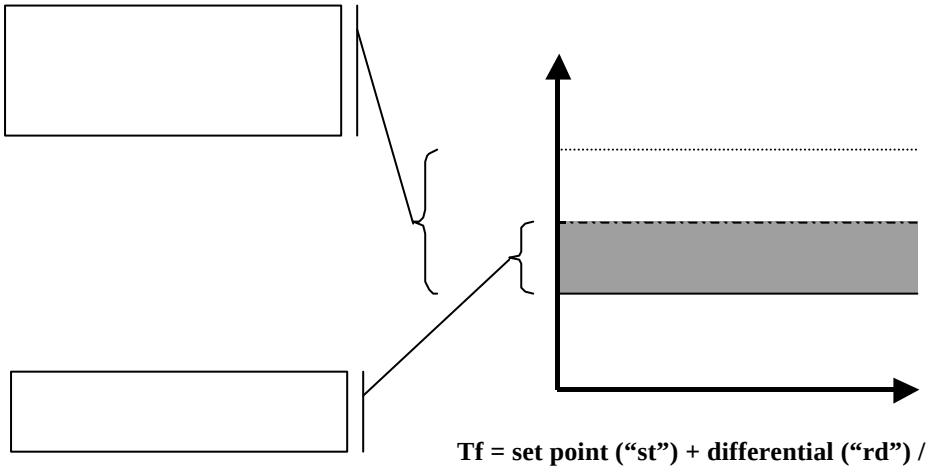
Pi: pressure probe model on the evaporator
This parameter is used to set the model of the probe installed at the evaporator outlet.

"Pi" = 0 probe with range -1013 - 4,168 mbarg (0/75 psia);
"Pi" = 1 probe with range -1013 - 9329 mbarg (0/150 psia);
"Pi" = 2 probe with range 0 - 34474 mbarg (0/500 psia).
In accordance with the operating pressure of the system, it is recommended to use the probe with the maximum value as near as possible to the max pressure reached during normal operation (excluding transitory conditions).
- *Def.: 0.*

SMART THERMOSTAT

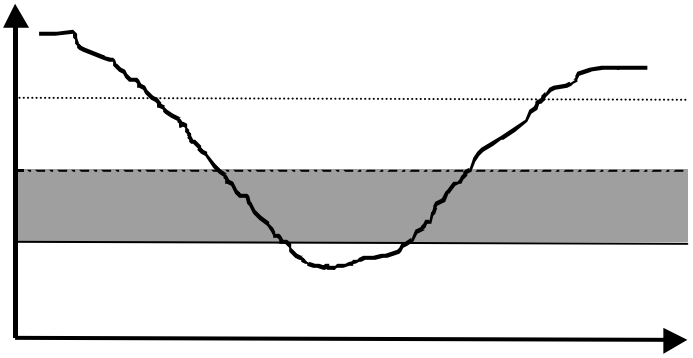
This function allows, using a parameter that acts on the superheating value measured, the typical swings in temperature due to the ON/OFF control of the solenoid valve to be reduced or even eliminated. In practice, the closer the temperature gets to the set point, the further the controller decreases the cooling capacity of the evaporator, by closing the expansion valve.
In the best cases, the real temperature of the showcase thus becomes very stable around the set point, without the solenoid valve ever closing, but rather by exclusively controlling the expansion of the refrigerant.

OSH: superheating offset
The parameter "OSH" determines the deviation from the actual superheating value measured that is applied when the temperature controlled enters in the activation zone of the function, that is, the threshold above the set point at which modulation of the cooling capacity of the showcase starts.
"OSH" = 0, function disabled.

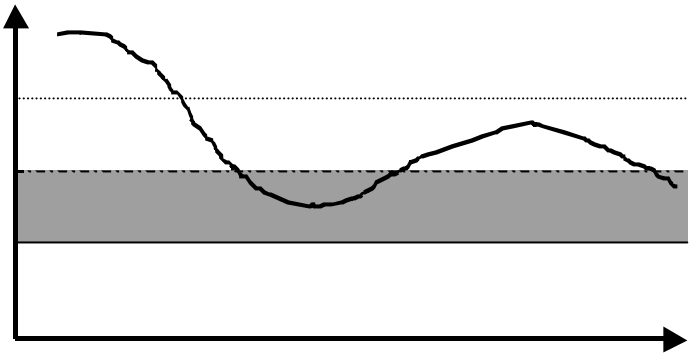


Tf = set point ("st") + differential ("rd") / 2

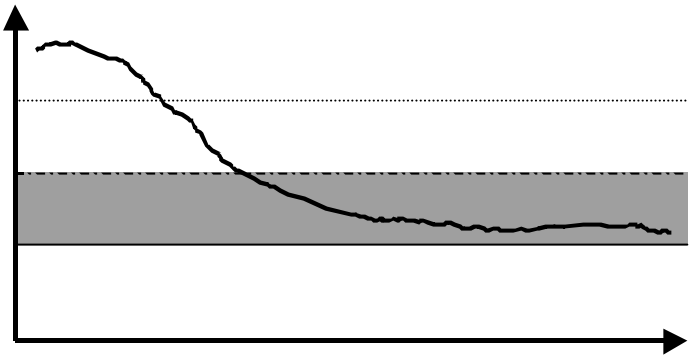
PRACTICAL EXAMPLES



Function disabled or enabled with the value of the parameter OSH too low.



Function enabled with the value of the parameter OSH too high. The advantages of the function are not exploited adequately.



Function enabled with the optimum value of the parameter OSH. Except for sudden variations in the load or disturbance in the system, the showcase will remain in ON for a longer time than with traditional control, yet with a temperature and relative humidity that are much more stable and nearer to the set point.
- *Def.: 0.0.*

6. Alarms

6.1 Abnormal operation or special conditions

The MasterCase series instruments are able to automatically detect the main malfunctions. **Always check the connectors wired onto the cable from the terminal to the controller.**
In the event of malfunctions, the controller responds as follows:

- the malfunction is signalled on the display with a corresponding alarm code. In particular, the instrument displays the alarm code alternating with the temperature read by the probe;
  in the event of more than one alarm, these are displayed in succession, alternating with the temperature;
- for some alarms, the buzzer, if present, and the alarm relay are activated.

Pressing  mutes the buzzer and de-energises the relay, while the alarm code disappears only when causes of the alarm are no longer present. The alarm codes are shown in the table below:

ALARM CODE	BUZZER and AUX RELAY	DESCRIPTION	MODELS where featured
rE	active	control probe error	ALL
E1	not active	room probe error	ALL
E2	not active	defrost probe error	ALL
E3	not active	probe 3 error	ALL
E0	not active	terminal probe error (display)	ALL
IA	active	immediate external alarm	ALL, if the external alarm is connected
dA	active	delayed external alarm	ALL, if the external alarm is connected
L0	active	low temperature alarm	ALL
HI	active	high temperature alarm	ALL
EE	not active	data saving error	ALL
HA	active	HA alarm (HACCP)	ALL
HF	active	HF alarm (HACCP)	ALL
Ed	not active	defrost ended by time-out	ALL
Ed1	active	superheating temperature sensor (NTC Sh) on driver board out-of-range	On MasterCase with EEV management (code MGE0000020)
Ed2	active	evaporation pressure sensor (PE) on driver board out-of-range	On MasterCase with EEV management (code MGE0000020)
Edc	active	loss of internal communication between EEV driver board and controller	On MasterCase with EEV management (code MGE0000020)
dr	not active	door switch error (door open timeout)	ALL
dF	not active	defrost in progress	ALL
tC	not active	RTC invalid	On the Master with RTC
MA	not active	lost contact with the Master	On the Slave units
uX (X= 1,...,5)	not active	Slave X not communicating	On the Master units
nX (X= 1,...,5)	active	Slave X alarm	On the Master units
dX (X= 1,....5)	not active	download failed to Slave X	On the Master units

6.2 Description of the signals and alarm codes shown on the display

rE FLASHING
Control probe error:

- Probes not working: the probe signal is discontinued or short-circuited;
- Probes not compatible with the instrument.

E1 FLASHING
Room probe error:

- Probe not working: the probe signal is discontinued or short-circuited;
- Probe not compatible with the instrument;

E2 FLASHING
Evaporator probe error:

- Probe not working: the probe signal is discontinued or short-circuited;
- Probe not compatible with the instrument;

E3 FLASHING
Probe 3 error:

- Probe not working: the probe signal is discontinued or short-circuited;
- Probe not compatible with the instrument;

E0 FLASHING
Terminal probe error:
This error appears only if the display of the terminal probe is selected using the parameters /t =5 or /7=5, on the interface or the remote display respectively. It is cancelled if the display returns to one of the probes available.
- Probe not working: the probe signal is discontinued or short-circuited;
- Probe not compatible with the instrument;

IA FLASHING
Immediate alarm from digital input:
- Check the status of the digital input and the value of the corresponding parameter A1...A5 / A8.

dA FLASHING
Delayed alarm from digital input:
- Check the status of the digital input and the value of the corresponding parameters A1...A5 / A8 and A7.

L0 FLASHING
Low temperature alarm. The virtual probe has read a temperature lower than the set point by a value greater than the parameter AL:
- Check the parameters AL, Ad and A0.

The alarm is reset automatically when the temperature returns within the set limits (see parameter AL).

HI FLASHING
High temperature alarm. The virtual probe has read a temperature higher than the set point by a value greater than the parameter "AH" + "St".
- check the parameters "AH", "Ad", "St" and "A0";
- check the correct operation of the temperature probes;
- the alarm is reset automatically when the temperature returns within the set limits (see parameter "AH").

EE DISPLAYED DURING OPERATION OR ON STARTING
Data acquisition error.
- Try to restore the default parameter values.

HA
HACCP alarm, type HA
A high temperature alarm has been detected, based on the settings of the parameters tr, Ad, AH, St.
- Check the HACCP parameters;
- check the temperature and the correct operation of the temperature probes.

HF
HACCP alarm, type HF
A high temperature alarm has been detected, based on the settings of the parameters tr, Ad, AH, St.
A power failure has occurred for more than one minute, and when power returned the temperature was higher than AH+St.
- Check the HACCP parameters;
- Check the temperature.

Ed FLASHING
The last defrost ended as the maximum time (parameter "dP") exceeded, before reaching the end defrost temperature. The signal is active only if parameter "r3" = 1. The signal **remains on until a defrost is performed that ends at the set temperature.**
- Check parameters "d0", "dt" and "dP";
- Check the efficiency of the defrost devices.

Ed1 FLASHING
Evaporation pressure sensor (PE) on the driver board out-of-range.
The valve is controlled by reading the superheating, which in turn is the difference between the value measured by the pressure probe and the temperature probe (NTC Sh). If this probe is faulty or out-of-range, the controller is no longer able to manage the valve, and starts operating in safety mode (to avoid the presence of liquid at the evaporator outlet), while still guaranteeing a minimum of cooling. The safety position is calculated by taking 50% of the average position of the valve in the last hour of operation. The valve will remain in the safety position until the problem is no longer present, or in any case for no longer than 1 hour, after which the valve will be closed.
- check the electrical connections.

Ed2 FLASHING
Superheating temperature sensor (NTC Sh) on the driver board out-of-range.
See the description of the alarm "Ed1".
- check the electrical connections.

Edc FLASHING
Loss of internal communication between the controller and the built-in driver board (electronic valve option).
In this case, the alarm will cause the driver board to immediately close the electronic valve.
- try restarting the controller (switch it off and on again);
- check that the driver is powered (24Vac connection from external transformer).

The fault signal is automatically reset when the problem is no longer present.

dr Door open for more than the time set for parameter d8.
- Check that the door is closed.
- Check the door switch.

dF FLASHING
Defrost in progress:

- This is not an alarm signal, but rather an indication that the instrument is performing a defrost.
- It appears only if parameter d6 = 0, or d6 = 2.

tC flashing
RTC error on the unit fitted with RTC and configured as the Master

- Set the hour and minutes from the user interface

MA flashing on Slave
Slave not communicating with the Master.

- Check the electrical connections on the LAN;
- check the settings of the parameters “In”, “Sn” and “H0”;
- these network signals (on both the Master and the Slaves) are reset automatically as soon as communication is restored between the Master and the Slaves.

“n1,… n5” flashing on the Master
Local alarm on Slave n1, …, n5.

- Check

“u1, … u5” flashing on Master
Loss of communication with Slave 1, …, 5 (for at least a minute)

- Check the electrical connections on the LAN;
- check the settings of the parameters “In”, “Sn” and “H0”;
- these network signals (on both the Master and the Slaves) are reset automatically as soon as communication is restored between the Master and the Slaves.

“d1, ..., d5” flashing on Master
Parameter download failed to unit “uS1, ..., uS5”

- Check the wiring on the LAN;
- repeat the download procedure.

7. MASTERCASE parameter table

	PARAMETERS	Type	Min.	Max.	UOM	Psw.	To LAN
PP	PARAMETER PASSWORD	F	00	199	-	22	
PS	LOG PASSWORD	F	00	199	-	44	
Pd	DOWNLOAD PASSWORD	F	00	199	-	66	

/	PROBE PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
/2	Measurement stability	C	1	15	-	1	
/4	Virtual probe (between probe 1 and probe 3) (0 = probe 1; 100 = probe 3)	C	0	100	-	0	•
/6	Enable decimal point (0 = No, 1 = Yes)	C	0	1	flag	1	•
/7	Remote display management 0 = not present 1 = room probe (S1) 2 = defrost probe (S2) 3 = third probe (S3) 4 = virtual probe 5 = terminal probe	C	0	5	-	0	•
/8	3rd probe calibration	C	-20.0	20.0	°C	0.0	
/9	Defrost also with probe 3: 1 = the defrost at temperature ends when the temperature read by probe 2 and probe 3 are the temperature set for the parameter "dt"	C	0	1	flag	0	•
/A	Probes present 0 = defrost probe and third probe absent 1 = defrost probe absent and probe 3 present 2 = defrost probe present and probe 3 absent 3 = both defrost probe and probe 3 present 4 = control probe from master	C	0	4	-	0	•
/C	Control probe calibration	F	-20.0	20.0	°C	0.0	
/d	Defrost probe calibration	C	-20.0	20.0	°C	0.0	
/t	User interface management 0 = not present 1 = room probe (S1) 2 = defrost probe (S2) 3 = third probe (S3) 4 = virtual probe 5 = terminal probe	C	0	5	-	4	•

A	ALARM PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
A0	Fan (see F1 parameter) and alarm differential	C	0.1	20.0	°C	2.0	•
A1...5	Digital input configurations 0 = input disabled 1 = immediate external alarm input 2 = delayed external alarm input 3 = enable defrost from external contact input 4 = start defrost from external contact input 5 = door switch input 6 = remote on-off input 7 = curtain switch input 8 = duty setting activation input 9 = door switch with compressor on input 10 = periodical case cleaning input	C	0	10	-	0	
A7	Detection delay time for the "*delayed alarm*" input (A*n* = 2)	C	0	180	min	0	•
A8	Virtual digital input configuration	C	0	10	-	0	
Ad	Temperature alarm delay	C	0	180	min	120	•
AH	High temperature alarm: indicates the maximum variation from the set point. AH = 0 disables the high temperature alarm	F	0	20.0	°C	0.0	•
AL	Low temperature alarm: indicates the maximum variation from the set point. AL = 0 disables the low temperature alarm	F	0	20.0	°C	0.0	•
Ar	Enable Slave remote alarm signal on Master (1=remote alarms enabled on Master)	C	0	1	flag	1	

c	COMMON PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
c0	Control start delay when starting the instrument	C	0	15	min	0	•
c4	Safety relay (0 = always OFF, 100 = always ON)	C	0	100	min	0	•
c6	Low temp. alarm bypass time after continuous cycle	C	0	15	hours	2	•
cc	Continuous cycle duration	C	0	15	hours	4	•

d	DEFROST PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
d0	Defrost type 0 = electric: ends at temperature and/or by timeout 1 = hot gas: ends at temperature and/or by timeout 2 = electric: ends by timeout 3= hot gas: ends by timeout	C	0	3	-	0	•
d2	LAN defrost command type 0 = start only 1 = start and stop	C	0	1	flag	1	•
d3	Compressor running time with ambient temperature below 1°C before forcing a defrost	C	0	192	hours	0	•
d4	Defrost when starting the instrument (0 = No, 1 = Yes)	C	0	1	flag	0	•
d5	Defrost delay when starting the instrument or from digital input	C	0	180	min	0	•
d6	Interface module and remote display management during defrost: 0 = No display lock. The temperature alternates with the “dF” symbol on both displays; 1 = Temperature locked on both displays	C	0	1	flag	0	•
d7	Enable skip defrost based on defrost time (0 = No, 1 = Yes)	C	0	1	flag	0	•
d8	High temperature alarm bypass time after defrost and if A4=5 or A8=5 alarm bypass time from door open	F	0	15	hours	1	•
d9	Defrost priority over compressor protection (0 = No, 1 =Yes)	C	0	1	flag	0	•
dd	Dripping time after defrost	F	0	15	min	2	•
dI	Interval between two defrosts	F	0	192	hours	8	•
dP	Maximum defrost duration	F	1	180	min	30	•
dt	Defrost end temperature	F	-50.0	30.0	°C	4.0	•
dM	Time between two successive cleaning signals	C	1	999	hours	1	
dPM	Cleaning signal duration	C	0	60	min	0	

F	FAN PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
F0	Fan management: 0 = fans always ON (except in special cases: see F2, F3, Fd) 1 = fans controlled according to the absolute set point F1	C	0	1	flag	0	•
F1	Fan control absolute set point	F	-40.0	50.0	°C	5.0	•
F2	Fans OFF with compressor OFF (0=No, 1=Yes) if F0 = 0	C	0	1	flag	1	•
F3	Fans OFF during defrost (0 = No, 1 = Yes) Valid for all values of F0	C	0	1	flag	1	•
Fd	Fans off in post-dripping	F	0	15	min	1	•

H	OTHER SETTINGS	Type	Min.	Max.	UOM	Def.	To LAN
H0	Serial address	C	0	199	-	1	
H1	Enable/Disable IR remote control	C	0	1	flag	0	•
H2	Infrared remote control code	C	0	99	-	0	
H3	Enable ON/OFF from keypad	C	0	1	flag	1	•
H4	Enable ON/OFF from supervisor	C	0	1	flag	0	•
H5	AUX1 configuration: 0 = output disabled 1 = ON/OFF valve output 2 = compressor output 3 = light and/or curtain output 4 = fan output 5 = hot wire output 6 = alarm output 7 = evaporator 1 defrost output 8 = evaporator 2 defrost output	C	0	8	-	0	
H6	AUX2 configuration (hot wire): for the values see H5	C	0	8	-	5	

	LAN PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
In	Configuration of unit as Master (In = 1) or Slave (In = 0)	C	0	1	flag	0	

r	CONTROL PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
r1	Minimum temperature setting	C	-50.0	r2	°C	-50.0	•
r2	Maximum temperature setting	C	r1	90.0	°C	90.0	•
r3	Enable Ed alarm (defrost ended by timeout) 0 = No, 1 = Yes	C	0	1	flag	0	•
r4	Automatic variation of the night-time set point (curtain switch closed)	C	-20	20	°C	3.0	•
r5	Enable min. and max. temperature monitoring 0 = No; 1 = Yes	C	0	1	flag	0	•
r6	Night-time variation with third probe (1 = night-time with curtain down, control with probe 3; 0 = night-time control with the virtual probe)	C	0	1	flag	0	•
rd	Control differential (hysteresis)	F	0.1	20.0	°C	2.0	•
rH	Max. temperature measured in the interval “rt”	F	-	-	°C	-50	
rL	Min temperature measured in the interval “rt”	F	-	-	°C	90	
rt	Min. and max. temperature monitoring time	F	0	999	hours	0	

	SET POINT	Type	Min.	Max.	UOM	Def.	To LAN
St	Temperature set point	F	r1	r2	°C	-20.0	•
Stn	Select night-time set point mode	C	0	2	flag	0	
hSn	Night-time set point start time	C	0	23	hours	0	
hSd	Night-time set point end time	C	0	23	hours	0	
SL1	Absolute minimum temperature, probe S1 SL1= 90°C function disabled	C	-50.0	90.0	°C	90°	

	LAN PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
Sn	Number of Slaves (0= LAN not present)	C	0	5	-	0	

t	HACCP PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
tr	HA alarm delay 0 HACCP disabled	C	0	180	min	0	
tA	HACCP alarm type: 0 no alarms 1 HA alarm 2 HF alarm	C	0	2	-	0	
tO	Last HACCP alarm: day	C	0	7	day	0	
tH	Last HACCP alarm: hour	C	0	23	hours	0	
tM	Last HACCP alarm: minutes	C	0	59	min	0	
tt	Max. temperature read during HACCP alarm	C	-50.0	90.0	°C	-50.0	
tE	HACCP alarm duration	C	0	199	hours	0	
to	Reset HACCP alarms	C	0	1	flag	0	

	RTC PARAMETERS	Type	Min.	Max.	UOM	Def.	To LAN
d1	Day of the first defrost **(see Note 2)**	C	0	10	-	0	
h1	Hour of the first defrost	C	0	23	hours	0	
m1	Minutes (of hour h1 on the current day) for starting the defrost	C	0	59	min	0	
d2	Day of the second defrost **(see Note 2)**	C	0	10	-	0	
h2	Hour of the second defrost	C	0	23	hours	0	
m2	Minutes (of hour h2 on the current day) for starting the defrost	C	0	59	min	0	
-----	----------	-------	-------	-------	------	0	
-----	----------	-------	-------	-------	------	0	
d8	Day of the eight defrost **(see Note 2)**	C	0	10	-	0	
h8	Hour of the eighth defrost	C	0	23	hours	0	
m8	Minutes (of hour h8 on the current day) for starting the defrost	C	0	59	min	0	
td	Current weekday	F	1	7	day	1	
th	Current hour	F	0	23	hours	0	
t’	Current minutes	F	0	59	min	0	

P	VALVE PARAMETERS	Type	Min	Max	UOM	Def.	To LAN
P1	Valve model 0 = Carel E2V 1*(390 steps) 1 = Sporlan 2 = Carel E2V 2* (480 steps)	C	0	2	-	2	
P3	Superheating set point	C	0.0	25.0	°C	5.0	
PA	Enable Master probe on Slaves	C	0	1	flag	0	
Pb	Pressure probe from Master	C	0	1	flag	0	
Pc	Delay pressure probe alarm	C	0	255	min	5	
PE	Superheating (read-only parameter)	C	-	-	°C	-	
PH	Refrigerant type 0 = R134a 1 = R22 2 = R404a 3 = R410a 4 = R407c	C	0	4	-	2	
Pi	Evap. pressure probe type	C	0	2	-	0	
OSH	Superheating offset	C	0.0	60.0	-	0.0	

Note 1

Value of A1…A5/A8	Meaning	Operation
0	input not active	
1	immediate external alarm	Contact open = alarm active
2	delayed external alarm	Contact open = alarm active. Delay: see parameter A7
3	enable defrost	Contact open = defrost not enabled
4	start defrost	The defrost starts when the contact closes. It can be used for real time defrosts. Simply connect a timer to the digital input, and select A4=4. To disable the cyclical defrosts generated by the controller automatically, set dI=0.
5	door switch	Contact open = door open. When the door opens the compressor and the fans are turned off. If the door remains open longer for than d8, the controller restarts normal operation (compressor and fans ON, if required).
6	remote ON/OFF	Contact closed = ON. Contact open = OFF
7	curtain switch	Contact closed = curtain down. If the input is selected as a curtain switch, the controller modifies the set point when contact closes, adding the value of the parameter r4. If r4=3.0 (default value), the set point is increased by 3 degrees from the value used when the curtain is raised.
8	duty setting operation	Contact closed = duty setting activated Contact open = deactivated
9	door switch with compressor ON	As for number 5, but the compressor stays ON.
10	case cleaning input	

Note 2

0	No event
1…7	Monday … Sunday
8	From Monday To Friday
9	Saturday and Sunday
10	All Weekdays

CAREL

Technology & Evolution

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Preliminary versione dated 24/01/03