TC-900E Log Ver.04

DIGITAL CONTROLLER FOR FREEZING SYSTEMS WITH DEFROST SCHEDULING AND INTERNAL DATALOGGER

Full Gauge® CONTROLS

⚠ Have this manual in the palm of your hand by **FG Finder** application.

| ❄↓ Fast Freezing | 🔒 Functions lockdown | ⏻ Control functions shutdown | ☀ Luminosity sensor | 🕐 Hourmeter | 🔑 Serial programming | **LOG** Datalogger | **Sitrad** Supervisory system | **IP 65** FRONT Protection level |

TC900ELOGV04-01T-17729

NSF COMPONENT

c **UL** us
E251415

1. DESCRIPTION

Designed to better safeguard frozen products. **TC-900E Log** is equipped with 3 relays (Comp, Defrost & Fan), 2 temperature sensors, 2 digital inputs, real-time clock, data logger and light intensity sensor. A third temperature sensor can be connected to one of it's digital input for either defrost management of second evaporator; condenser temperature control or to activate economic set point. Other salient features include hour-meter to clock the working hours of compressor for preventive maintenance, internal buzzer, IP65 frontal, min-max temperature record, temperature sensor response time control, fast freezing mode, tamper-proof function, control functions shutdown and RS485 serial communication port for Sitrad real-time monitoring and management.
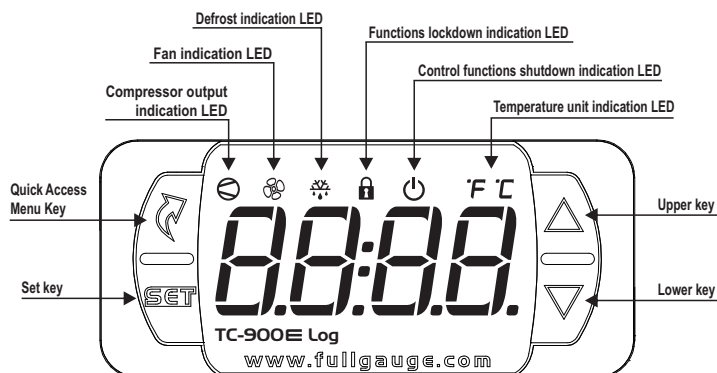Product conforming to UL Inc. (United States and Canada) and NSF (United States).

2. APPLICATION

• Walk-in freezers
• Display freezers
• Upright freezers

3. TECHNICAL SPECIFICATIONS

Power supply	**TC-900E Log:** 115 or 230Vac ±10% (50/60Hz) **TC-900EL Log:** 12 or 24Vac/dc +10%
Control temperature	-50°C to 105°C / -58°F to 221°F
Operating temperature	0 to 50°C / 32 to 122°F
Load current (outputs)	**COMP:** 12(8)A / 240Vac 1HP **DEFR:** 10A / 240Vac 2400W **FANS:** 5(3)A / 240Vac
Maximum consumption of device	1.5 VA
Operating humidity	10 to 85 %RH (without condensation)
Dimensions (mm)	76 x 34 x 77 mm (WxHxD)
Dimensions of the clipping for fixing of the instrument	71 ± 0,5 x 29 ± 0,5 mm (see item 5)

4. INDICATIONS AND KEYS

Defrost indication LED
Fan indication LED
Functions lockdown indication LED
Compressor output indication LED
Control functions shutdown indication LED
Temperature unit indication LED
Quick Access Menu Key
Upper key
Set key
Lower key

TC-900E Log
www.fullgauge.com

5. INSTALLATION - ASSEMBLING AND ELECTRICAL CONNECTIONS

71 ± 0,5 mm
29 ± 0,5 mm

Dimension of the clipping for fixing of the instrument in panel

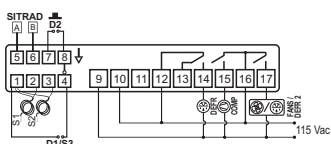Panel (Side View)
Panel (Front View)
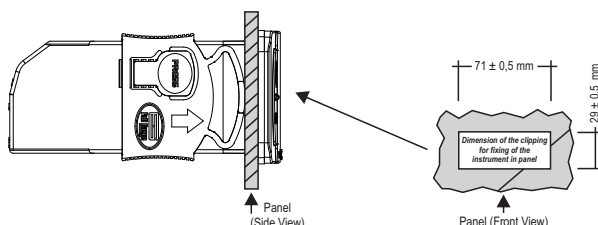
⚠ **ATTENTION**

FOR INSTALLATIONS WHERE A SEALING IS REQUIRED TO AVOID LIQUID CONTACT, THE CUT FOR THE CONTROLLER MUST BE OF 70,5X29mm MAXIMUM. THE SIDE LOCKS MUST BE FIXED SO IT PRESSES THE RUBBER SEALING AVOIDING INFILTRATION BETWEEN THE CUT AND THE CONTROLLER.
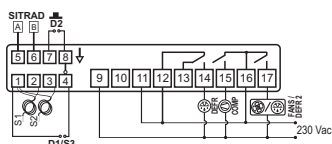
⚠ **IMPORTANT**

THE USE OF APPROPRIATE TOOLS IS ESSENTIAL TO AVOID DAMAGE IN THE CONNECTION AT INSTRUMENT TERMINALS:

⊖ SCREWDRIVER SLOT 3/32"(2.4mm) FOR ADJUSTMENTS IN THE SIGNAL TERMINALS;
⊕ SCREWDRIVER PHILLIPS #1 FOR ADJUSTMENTS IN THE POWER TERMINALS;

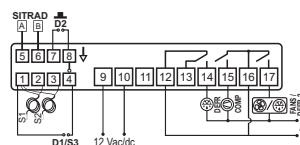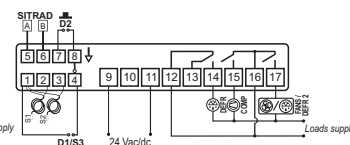### Connection 115 Vac

SITRAD
A B D2
5 6 7 8
1 2 3 4   9 10 11 12 13 14 15 16 17
S1 S2
D1/S3
115 Vac

Connection 230 Vac

SITRAD
A B D2
5 6 7 8
1 2 3 4   9 10 11 12 13 14 15 16 17
S1 S2
D1/S3
230 Vac

Connection 12 Vac/dc

SITRAD
A B D2
5 6 7 8
1 2 3 4   9 10 11 12 13 14 15 16 17
S1 S2
D1/S3   12 Vac/dc
DEFR COMP FANS/DEFR 2
Loads supply

Connection 24 Vac/dc

SITRAD
A B D2
5 6 7 8
1 2 3 4   9 10 11 12 13 14 15 16 17
S1 S2
D1/S3   24 Vac/dc
DEFR COMP FANS/DEFR 2
Loads supply

The **sensor S1** must be in the ambient.
The **sensor S2** must be placed in the evaporator through metallic cramp.

LEGEND: ↓ **To the terminal ↓ of the connecting block**

6. OPERATIONS

6.1 Quick Access Menu Map

To access or navigate the quick access menu using the 🔄 (short press) key while the controller is displaying the temperature. For every touch, the next function in the list is displayed. To confirm, use the **SET** (short press) key.

FAST FREEZING (ON/OFF) — `FASt`

EXIT FUNCTION — `----`

RESET HIGH AND LOW PRESSURE ALARMS — `HPLP`

ECONOMIC SETPOINT (ON/OFF) — `ECO`

FUNCTION SELECTION — `Func`

DEFROST (ON/OFF) — `dEFr`

ON/OFF DATA LOGGER (MANUAL MODE) — `dtL`

FUNCTIONS LOCKDOWN — `LOC`

DATE AND TIME SETTING — `CLO`

CONTROL FUNCTIONS SHUTDOWN (ON/OFF) — `CtrL`

DISPLAY HOURMETER — `Hour`

PRESET SELECTION — `rEC`
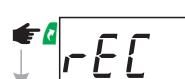
ERASE MIN. AND MAX. VALUES — `CrE9`

NORMAL SETPOINT — `SP`

ECONOMIC SETPOINT — `SP-E`

MIN. AND MAX. TEMPERATURE RECORD — `rE9`
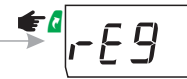
6.2 Quick access keys map

When the controller is on temperature display, the following keys serve as a shortcut for the following functions:

SET	Hold down for 2 seconds: setpoint adjustment.
SET	Hold down for 4 seconds: preset selection.
SET	Short touch: the current day, month, year, day of the week, hour, and minute will be shown in sequence on the display.
▽	Short touch: displays the current process.
▽	Hold down for 2 seconds: inhibits the audible alarm.
△	Hold down for 2 seconds: resets the counter when the hour meter is being displayed.
△	Short touch: displays the maximum and minimum measurements recorded.
△	Hold down for 2 seconds: clears history when records are displayed.
△	Hold down for 4 seconds: carries out manual defrost.
🔄	Short touch: enter the quick access menu.
🔄	Pressed for 5 seconds: turn on/turn off the control functions.
△ and ▽	Hold down for 10 seconds: manual datalogger activation.
△ and ▽	Short touch: Go to menu selection.

6.3 Basic Operations

6.3.1 Operating mode

This controller is able to operate in two different modes:

Basic mode: It has 30 functions, in addition to defrost schedule and datalogger features.

Advanced mode: It has 90 functions and, in addition to the defrost schedule and datalogger features, has a digital filter, function lock, control function switch off, economic setpoint, fast freezing, audible alarm (buzzer), digital input, and configuration for use of a third sensor.

To select the controller's operating mode, access function F00 on menu $\boxed{F u n c}$.

➡ **NOTE:** The features of the advanced mode will be disabled when the controller is configured to operate in the basic mode (F00=0).

➡ **NOTE 2:** The features described in items 6.3.3, 6.3.4, 6.3.7, 6.3.8, and 6.3.9 will only be available when the controller is configured to operate in advanced mode (F00=1).

6.3.2 Adjusting the desired temperature (setpoint)

Hold down the key 🔘 or 2 seconds to enter the setpoint adjustment menu. The message $\boxed{S P}$ will be shown in the display, followed by the value to adjust the normal setpoint
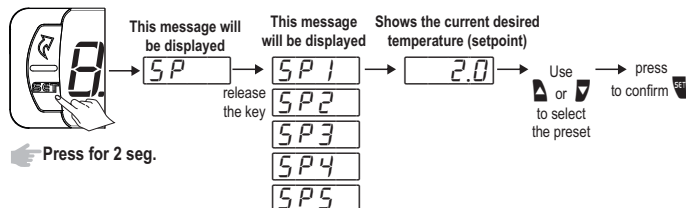

If the controller is configured to operate in advanced mode, the message $\boxed{S P \text{-} E}$ will be displayed to indicate the adjustment of the economic setpoint. Use the keys ▲ or ▼ again to change the value and press 🔘 to confirm.

Finally the indication $\boxed{----}$ is signaled concluding the configuration. The setpoints may also be adjusted individually in the quick access menu.

If the controller is configured to operate in advanced mode, with presets, will be possible select the active preset.

To select the desired preset, press and hold the 🔘 key for 4s, until the $\boxed{r E c}$. Message appears, and then release it. Use the ▲ or ▼ keys to select the desired preset (1,2,3,4 or 5) and press 🔘 to confirm.
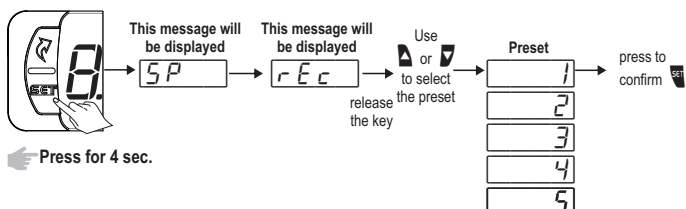
6.3.3 Fast Freezing 🔘

In fast freezing mode the refrigeration output is continuously switched on to speed up the cooling or freezing process. This operating mode may be activated or deactivated on the quick access menu through the option $\boxed{F A S t}$ or using an external switch connected to the digital input (F57 or F58). It can also be automatically deactivated by temperature (F38) or time (F39). During the fast freezing period, the indication of the operating compressor flashes rapidly and the defrost continues. When the fast freezing mode is activated, if the controller identifies a defrost schedules to start by this time period, the defrost will start in advance and then the fast freezing mode will be activated.

6.3.4 Economic setpoint (SPE)

The $\boxed{S P \text{-} E}$ is more economical for the system as it uses more flexible parameters to control the temperature (F32 - Economic setpoint and F33 - Control differential). When activated, the message $\boxed{E C O}$ will be displayed alternatively with the temperature and other messages. Economic mode can be activated or deactivated using the following commands:

Function	Command	Action
F34	Door closed time to activate	Activates
F35	Temperature difference S3-S1 to activate	Stays activated
F36	Temperature difference S3-S1 to deactivate	Deactivates
F37	Maximum time in the economy mode	Deactivates
F37	Maximum time in the economy mode = 0 (no)	Stays deactivated
F57 / F58	Door open indication (digital input)	Stays deactivated
F57 / F58	External switch (digital input)	Activates / Deactivates
-	Action through the quick access menu ($\boxed{E C O}$)	Activates / Deactivates
-	Room temperature reading error (S1)	Stays deactivated
-	When the instrument is switched on	Deactivates
-	Light intensity below the value configured in $\boxed{O F F}$ (menu $\boxed{L U n I}$)	Activates
-	Light intensity above the value configured in $\boxed{O n}$ (menu $\boxed{L U n I}$)	Deactivates

6.3.5 Manual defrost 🔲

The defrost process can be manually activated/deactivated through the quick access menu in the option $\boxed{d E F r}$ or by pressing the key ▲ for 4 seconds, or using the external switch connected to the digital input (F57 or F58). The activation or deactivation will be indicated by the message $\boxed{d E F r}$ $\boxed{O n}$ or $\boxed{d E F r}$ $\boxed{O F F}$ respectively.

6.3.6 How to determine the end of defrost by temperature

a) Reconfigure the functions related to the end of defrost to the maximum value:
- Time in refrigeration (interval between defrosts) **F08 = 999min.**
- Evaporator temperature to end the defrost **F13 = 105°C / 221°F**
- Maximum defrost time **F14 = 90min.**

b) Wait some time until a layer of ice forms on the evaporator.

c) Perform a manual defrost (using the key ▲ browse to $\boxed{d E F r}$ and press 🔘 or press the key ▲ for 4 seconds).

d) Visually monitor the melting.

e) Wait until all the ice on the evaporator melts and then consider the defrost finished.

f) When the defrost is finished, check the temperature on the evaporator (S2) using the key ▼ (see item 6.3.9).

g) Adjust the end of defrost temperature using the value read in S2:
- Evaporator temperature to end the defrost **F13 = Temp. S2.**

h) As a safety measure, readjust the maximum defrost time according to the type of defrost configured.

Example:
- Electric defrost (by resistance) **F14 = 45min.**
- Defrost by hot gas **F14 = 20min.**

i) Finally, adjust the refrigeration time **(F08)** with the desired value.

6.3.7 Defrost with two evaporators

With S3 configured as the sensor for the 2nd evaporator (F57), the Fan output gives way to the control of the second resistance. The defrost is always started with both outputs activated. The resistances are individually switched off as the respective evaporators reach the temperature to end the defrost. The draining process is initiated when both outputs are switched off or after the maximum defrost time has elapsed.

➡ **NOTE:** With these configurations, all the Fan features are disregarded, including the Fan Delay process.

6.3.8 Functions Lock 🔒

The use of the functions lockdown adds greater security to the operation of the controller. When it is active, the setpoint and other parameters are visible to the user, but are protected against undue changes (F62=2) or you can block changes of control functions and leave the adjustment of the setpoint enabled (F62=1). To activate the functions lock, access the $\boxed{L O C}$ option in the quick access menu.

Then $\boxed{n o}$ message will be displayed (lock must be enabled and inactive). With that on the display, press the ▼ key for the time configured for the functions lock (F63), the activation is indicated by the $\boxed{L O C}$ $\boxed{O n}$ message. To enable the use of this function, F62 must be configured with 1 or 2. When trying to change the parameters, the $\boxed{L O C}$ message indicates that the functions lock is active, to deactivate it, turn the controller off and then turn it on again with the ▼ key pressed.

Keep the key pressed until the $\boxed{L O C}$ $\boxed{O F F}$ message indicates the unlocking **(10 seconds)**.

➡ **NOTE:** This feature is available only in the advanced mode (F00=1).

6.3.9 Control Functions Shutdown

The shutdown of the control functions allows the controller to operate only as a temperature indicator, keeping the control outputs and alarms off. The use of this feature is enabled or disabled by the shutdown function of the control functions (F64). When enabled, the control functions and alarms are switched off ($\boxed{C t r L}$ $\boxed{O F F}$) or on ($\boxed{C t r L}$ $\boxed{O n}$) in the quick access menu through the $\boxed{C t r L}$ option. When the control functions are off, the message $\boxed{O F F}$ is displayed alternating with the temperature and other messages. Also is possible turn on/ turn off the control functions by pressing the key 🔲 for 5 seconds.

Note: The time defined in the startup delay function begins counting once the control functions are switched on again.

6.3.10 Process stage, elapsed time, and temperature on sensors S2 and S3

The controller's operating status can be viewed by pressing the key ▼ (short touch). A sequence of messages will be presented indicating the current process, time (hh: mm) elapsed in this stage, evaporator temperature (S2), and S3 temperature. If the sensors are disabled the respective measurements will not be displayed.

Process stages:
$\boxed{d E L}$ - Initial delay (delay in the instrument start-up)
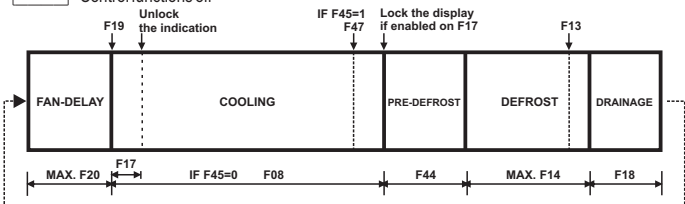$\boxed{F A n}$ - Fan-delay (delay for the fan to return)
$\boxed{r E F r}$ - Cooling
$\boxed{P r E}$ - Pre-Defrost
$\boxed{d E F r}$ - Defrost
$\boxed{d r A i}$ - Drainage
$\boxed{----}$ - Control functions off

6.3.11 Minimum and Maximum Temperature Record

The display of minimum and maximum temperature records can be checked through the quick access menu or by pressing the key ▲ while the temperature is being displayed. The minimum and maximum temperatures recorded for each sensor will be sequentially displayed preceded by the identification messages $\boxed{r E 9}$ $\boxed{t - 1}$ for the room sensor (S1), $\boxed{t - 2}$ for S2 (when active), and $\boxed{t - 3}$ for S3 (when active). To erase the minimum and maximum values recorded, keep the key ▲ pressed for 2 seconds while the records are being displayed or use the option $\boxed{C r E 9}$ in the quick access menu. The message $\boxed{r S E t}$ indicates that the records were erased.

6.3.12 Hourmeter

The hourmeter indicates the number of working hours of the compressor. The hourmeter can be viewed through the quick access menu (🔧) in the option $\boxed{Hour}$ and the working time of the compressor is displayed in hours. The maximum working time of the compressor can be configured through the function F66. When the number of working hours of the compressor reaches the value set in this function, the display will show a warning ($\boxed{ANAi}$), indicating that the compressor must be serviced. To turn the warning off or to reset the hourmeter counter, access the option $\boxed{Hour}$ in the quick access menu 🔧, press ▣ and then press ▣ for 2 seconds while the compressor working time is being displayed until the message $\boxed{r5tH}$ is displayed.

6.3.13 View current date and time

Quickly pressing the key ▣ (short touch) makes it possible to view the current date and time set in the controller. The current day ($\boxed{--d}$), month ($\boxed{--\tilde{n}}$), year ($\boxed{--y}$), day of the week ($\boxed{dAy-}$), and hour and minute ($\boxed{00:00}$) will be shown in sequence on the display. It is also possible to view the date and time through the quick access menu in the option $\boxed{CLO}$.

➡ **NOTE:** The controller leaves the factory with the clock disabled, to set the clock in operation proceed as described in item 6.4.4

Example: $\boxed{dAy1}$ is Sunday.

6.3.14 Manual datalogger activation

The manual activation of the internal record of temperature values and state of control outputs (Datalogger) is performed through the quick access menu in the option $\boxed{dtL}$. The message $\boxed{dtL}$ will be displayed followed by the message $\boxed{On}$ when the datalogger is activated or $\boxed{OFF}$ when it is deactivated. It is also possible to activate the datalogger manually by pressing the keys ▲ and ▼ for 10 seconds.

NOTE: For correct operation of the datalogger, it is necessary to set the clock. See item 6.4.4

6.3.15 Selection of temperature measurament units

To select the temperature measurament units the system will use to operate, press ▲ and ▼ simultaneously while the temperature is being displayed, enter the option $\boxed{CodE}$ using the access code $\boxed{231}$ and then press ▣ .Then select the desired unit $\boxed{oC}$ or $\boxed{oF}$ using the keys ▲ or ▼ , and press ▣ to confirm.

➡ **NOTE:** Whenever the units are changed, the configuration of the functions assume the factory default, so they need to be configured again.

6.4 Advanced Operations

6.4.1 Access to the main menu

The main menu can be accessed through the quick access menu, option $\boxed{Func}$ or by pressing ▲ and ▼ simultaneously (short touch) while the temperature is being displayed.
The following options will be displayed:

$\boxed{CodE}$ - Entry to the access code
$\boxed{Func}$ - Change the parameters
$\boxed{CLO}$ - Adjust or visualization of the date and time
$\boxed{Log}$ - Datalogger configuration
$\boxed{Prog}$ - Defrost schedule configuration by hour programming
$\boxed{LUNi}$ - Configuration of the economic setpoint activation sensor

➡ **NOTE:** The menu $\boxed{Prog}$ is enabled only if function F01 - Defrost by hour programming is configured with 1.

6.4.2 Access code

To allow changing the parameters or adjusting the clock, enter the option $\boxed{CodE}$ pressing ▣ (short touch) and enter the access code 123 (one hundred and twenty-three) using the keys ▲ or ▼ and confirm with ▣ .

6.4.3 Changing the controller parameters

In the main menu select the option $\boxed{Func}$ and then the desired function using the keys ▲ or ▼ . Press ▣ (short touch) after selecting the function to view its value. Use ▲ or ▼ to change the value and press ▣ when ready to save the configured value and return to the function menu. To leave the menu and return to the normal operating mode (temperature indication), press ▣ (long touch) until $\boxed{----}$ appears.

➡ **NOTE:** If the function lock is active, the controller will show the message $\boxed{LOC}$, in the display upon pressing ▲ or ▼ and will not allow adjusting the parameters.

6.4.4 Date and time adjustment

Select the option $\boxed{CLO}$ in the main menu. The controller will enter the date and time adjustment mode if the access code $\boxed{123}$ was correctly entered. Use ▲ or ▼ to change the value and press ▣ when ready to save the configured value. If the date entered is invalid, the message $\boxed{ECLO}$ will be shown on the display.You can also set the date and time using the provided menu. In this case, it is not necessary to enter the access code.

⚠**IMPORTANT:** The controller has an auxiliary internal power supply to keep the clock running for at least 72 hours in case of power failure. If the controller remains off for a long period of time, the message $\boxed{ECLO}$ will be displayed to indicate that the clock is not programmed. In this case, the date and time must be adjusted and the controller must be kept on for 10 hours to fully recharge the auxiliary power supply.

6.4.5 Defrost schedule

The function menu allows configuring the schedule of defrosts distributed among equal periods of time according to the programmed number of defrosts per day. To do this, enable the defrost schedule by configuring F01 with 2, and configure the number of defrosts per day and the preferred time using functions F25 to F30.
In this case the defrost schedule allows creating a program for Monday to Friday, a program for Saturday, and another program for Sunday.
Example: For the Monday to Friday program, if the preferred time is set to 1 PM (and the number of defrost cycles is set to 4 and the interval is 6 hours), the defrost will be performed at 1 AM, 7 AM, 1 PM and 7 PM of the same day.

MONDAY TO FRIDAY

01:00	07:00	13:00	19:00
↓	↓	↓	↓
DEFROST	DEFROST	DEFROST	DEFROST
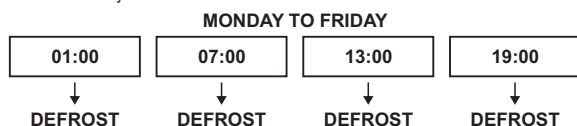
It is also possible to create a defrost schedule with different times (the defrosts do not need to be equally spaced) for each day of the week with up to eight defrosts per day through the menu $\boxed{Prog}$. For this menu to be available, function $\boxed{F01}$ must be configured with 1.
To configure the defrost schedule in menu $\boxed{Prog}$:

a) Press ▲ and ▼ (short touch) simultaneously, the option $\boxed{CodE}$ will be displayed to request the access code.
b) Press ▣ and enter the access code 123 using the keys ▲ or ▼ , confirming with ▣ . The option $\boxed{CodE}$ will appear again.

c) Browse the menu using the keys ▲ or ▼ until the option $\boxed{Prog}$ appears, and then press ▣ .
d) Use the keys ▲ or ▼ to select the day of the week to create the defrost schedule and press ▣ .
e) Again use the keys ▲ or ▼ to select which of the eight available defrosts will be configured and press ▣ .
f) The time configured for the chosen defrost will be displayed. Use the keys ▲ or ▼ to change the time and press ▣ again to return to de defrost programming menu.
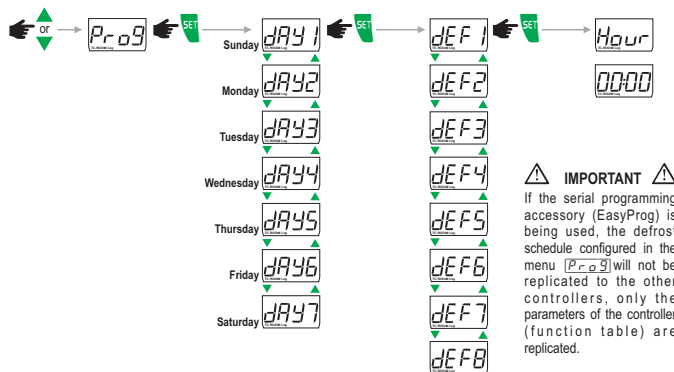**g)** To leave the defrost programming menu and return to the previous menu, press ▣ until the message $\boxed{----}$ is displayed.

➡ **NOTE:** To disable the programming of undesirable defrosts, displace the adjustment to the maximum using the key ▲ until the message $\boxed{OFF}$ is displayed.
➡ **NOTE2:** The access code is not required to view the times programmed in the defrost schedule (without changing them).
➡ **NOTE3:** For the defrosts to be performed by the schedule (programmed times), at least one (1) defrost must be programmed for each day of the week. Otherwise the defrosts will be performed by the normal process (after the cooling time is over or by temperature, as configured in F45), and function F01 will be automatically configured with "0".
➡ **NOTE4:** To set the defrost timer, you need to set the clock. See item 6.4.4

⚠ **IMPORTANT** ⚠
If the serial programming accessory (EasyProg) is being used, the defrost schedule configured in the menu $\boxed{Prog}$ will not be replicated to the other controllers, only the parameters of the controller (function table) are replicated.

6.4.6 Internal datalogger (internal memory)

The configuration functions of the datalogger are available in menu $\boxed{Log}$.
When the datalogger is enabled (F86), it is possible to store records in the controller's internal memory. It can be configured to store records by time interval (F87), by temperature variation (F88), and/or by the variation of the state of the digital output or inputs (F89). The activation of alarms also performs the storage of records. The information contained in a record are: Temperature of sensors S1, S2 (if enabled), and S3 (if enabled), state of the control outputs, door state (if the digital input is configured as door contact), active alarms and their respective timestamp.
➡ **NOTE:** No records are stored in the datalogger if the clock is not programmed.

6.4.7 Configuration of the economic setpoint activation sensor

The option $\boxed{LUNi}$ in the main menu allows configuring the sensor to activate the economic setpoint through the following functions:
$\boxed{On}$ Light intensity for which the room is considered bright (deactivate the economic setpoint).
$\boxed{OFF}$ Light intensity for which the room is considered dark (activate the economic setpoint).
$\boxed{tiNE}$ Time for which the controller must be exposed to the luminosity levels configured to activate and deactivate the economic setpoint.
➡ **NOTE:** The sensor is disabled if the time configured in function $\boxed{tiNE}$ is equal to zero.
To configure it correctly perform the following steps:
a) In the main menu use the keys ▲ or ▼ until reaching option $\boxed{LUNi}$, then press ▣ .
b) Keep the room where the controller will work with the light intensity for which the room is considered to be bright, for which the economic setpoint must not be activated.
c) Browse to the option $\boxed{On}$, press ▣ and the message $\boxed{----}$ will keep flashing. Make sure that the room is exposed to the desired light intensity to deactivate the economic setpoint and press ▣ again.
**d)** Now change the luminosity of the room where the controller will work to a level regarded as dark, for which the economic setpoint must be activated.
e) Browse to the option $\boxed{OFF}$, press ▣ and the message $\boxed{\_\_\_\_}$ will keep flashing. Make sure that the room is exposed to the desired light intensity to activate the economic setpoint and press ▣ again.
f) Now that the light intensities are configured the luminosity sensor feature can be enabled through option $\boxed{tiNE}$.
g) Browse to option $\boxed{tiNE}$, press ▣ , then, using the keys ▲ or ▼ change the value of the time in minutes for which the luminosity must be above the $\boxed{On}$ threshold for the room to be considered bright, which will be the same time that the luminosity must be below the $\boxed{OFF}$ threshold for the room to be considered dark.
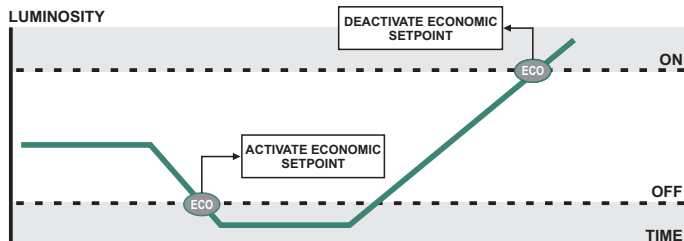
➡ **NOTE:** Even with the luminosity sensor enabled, the other forms of activating/deactivating the economic setpoint still work, as described in item 6.3.4.
➡ **NOTE:** If the light intensity configured to deactivate the economic setpoint is lower than the light intensity configured to activate the economic setpoint, or vice-versa, the luminosity sensor will be deactivated.
➡ **NOTE:** The conditions to activate/deactivate the economic setpoint are listed on the table in item 6.3.4.

6.5 Table of parameters

Fun	Description	CELSIUS (°C)				FAHRENHEIT (°F)			
		Min	Max	Unit	Default	Min	Max	Unit	Default
F00	Controller's operating mode	0	1	-	0	0	1	-	0
F01	Defrost by hour programming	0	2	-	0	0	2	-	0
F02	Control differential (normal hysteresis)	0.1	20	°C	2	1	36	°F	3
F03	Minimum setpoint allowed to the end user	-50	105	°C	-50	-58	221	°F	-58
F04	Maximum setpoint allowed to the end user	-50	105	°C	105	-58	221	°F	221
F05	Startup delay (power up)	0(NO)	30	min.	0(NO)	0(NO)	30	min.	0(NO)
F06	Low room temperature alarm (S1)	-50	105	°C	-50	-58	221	°F	-58
F07	High room temperature alarm (S1)	-50	105	°C	105	-58	221	°F	221
F08	Time in refrigeration (interval between defrosts)	1	999	min.	240	1	999	min.	240
F09	Minimum compressor on time	0(NO)	9999	sec.	0	0(NO)	9999	sec.	0
F10	Minimum compressor off time	0(NO)	9999	sec.	0	0(NO)	9999	sec.	0
F11	Compressor state with a disconnected or faulty room sensor (S1)	0	2	-	1	0	2	-	1
F12	Defrost at instrument startup	0(NO)	1(YES)	-	0(NO)	0(NO)	1(YES)	-	0(NO)
F13	Evaporator temperature (S2 / S3) to determine the end of defrost	-50	105	°C	30	-58	221	°F	86
F14	Maximum defrost time	0(NO)	90	min.	30	0(NO)	90	min.	30
F15	Fan on during defrost	0(OFF)	1(ON)	-	0(OFF)	0(OFF)	1(ON)	-	0(OFF)
F16	Defrost type	0	1	-	0	0	1	-	0
F17	Temperature indication (S1) locked during defrost	-1(NO)	99	min.	-1(NO)	-1(NO)	99	min.	-1(NO)
F18	Draining time (defrost water dripping)	0(NO)	99	min.	1	0(NO)	99	min.	1
F19	Evaporator temperature (S2 / S3) for the fan to return after draining	-50	105	°C	20	-58	221	°F	68
F20	Maximum time for the fan to return after draining (fan-delay)	0(NO)	30	min.	1	0(NO)	30	min.	1
F21	Fan operating mode during refrigeration	0	7	-	4	0	7	-	4
F22	Fan stop due to high temperature in the evaporator	-50	105	°C	50	-58	221	°F	122
F23	Room temperature indication offset S1	-50	50	°C	0	-90	90	°F	0
F24	Address of the instrument in the RS-485 network	1	247	-	1	1	247	-	1

Defrost schedule menu (displayed if F01=2)

Fun	Description	Min	Max	Unit	Default	Min	Max	Unit	Default
F25	Number of defrosts per day (Monday to Friday)	1	12	-	4	1	12	-	4
F26	Preferred time to start defrosting (Monday to Friday)	00:00	23:50	-	06:00	00:00	23:50	-	06:00
F27	Number of defrosts per day (Saturday)	1	12	-	4	1	12	-	4
F28	Preferred time to start defrosting (Saturday)	00:00	23:50	-	06:00	00:00	23:50	-	06:00
F29	Number of defrosts per day (Sunday)	1	12	-	4	1	12	-	4
F30	Preferred time to start defrosting (Sunday)	00:00	23:50	-	06:00	00:00	23:50	-	06:00

Advanced function menu (displayed if F00=1)

Fun	Description	CELSIUS (°C)				FAHRENHEIT (°F)			
		Min	Max	Unit	Default	Min	Max	Unit	Default
F31	Normal setpoint	-50	105	°C	-15	-58	221	°F	5
F32	Economic setpoint (SPE)	-50	105	°C	-10	-58	221	°F	14
F33	Economic setpoint control differential (hysteresis)	0.1	20	°C	2	1	36	°F	3
F34	Door closed time to operate in economy mode	0(NO)	999	min.	0(NO)	0(NO)	999	min.	0(NO)
F35	Temperature difference (S3-S1) below which the economic setpoint is activated	0.1	20	°C	2	1	36	°F	3
F36	Temperature difference (S3-S1) below which the normal setpoint is activated	0.1	20	°C	5	1	36	°F	9
F37	Maximum time on power-saving mode	0(NO)	100(tOFF)	h.	0(NO)	0(NO)	100(tOFF)	h.	0(NO)
F38	Temperature limit for Fast Freezing	-50	105	°C	-25	-58	221	°F	-13
F39	Maximum Fast Freezing time	0(NO)	999	min.	0(NO)	0(NO)	999	min.	0(NO)
F40	Fan on time	1	99	min.	2	1	99	min.	2
F41	Fan off time	1	99	min.	8	1	99	min.	8
F42	Compressor on time in case of S1 fault	0	999	min.	0	0	999	min.	0
F43	Compressor off time in case of S1 fault	0	999	min.	0	0	999	min.	0
F44	Time to collect the gas before starting the defrost	0(NO)	999	min.	0(NO)	0(NO)	999	min.	0(NO)
F45	Condition to start the defrost (0= time / 1= temperature)	0	1	-	0	0	1	-	0
F46	Maximum open door time for instantaneous defrost	0(NO)	999	min.	0(NO)	0(NO)	999	min.	0(NO)
F47	Evaporator temperature (S2 / S3) to start defrosting	-50	105	°C	-50	-58	221	°F	-58
F48	Door open time to switch off the fan	-1(NO)	999	min.	-1(NO)	-1(NO)	999	min.	-1(NO)
F49	Door open time to switch off the control outputs	0(NO)	999	min.	0(NO)	0(NO)	999	min.	0(NO)
F50	Maximum condenser temperature (S3) to switch off the control outputs	0(NO)	105	°C	55	32(NO)	221	°F	131
F51	Control differential for the maximum condenser temperature (hysteresis)	0.1	20	°C	5	1	36	°F	9
F52	Compressor on time without reaching the setpoint to switch off the control outputs	0(NO)	999	min.	0(NO)	0(NO)	999	min.	0(NO)
F53	Room temperature alarm delay	0(NO)	999	min.	30	0(NO)	999	min.	30
F54	Condenser high temperature alarm (S3)	0	105	°C	45	32	221	°F	113
F55	Open door time for the alarm to go on	0(NO)	999	min.	0(NO)	0(NO)	999	min.	0(NO)
F56	Enable buzzer (0-OFF/1-ON)	0(OFF)	1(ON)	-	0(OFF)	0(OFF)	1(ON)	-	0(OFF)
F57	Function of the input 1 / sensor S3	0(OFF)	17	-	0(OFF)	0(OFF)	17	-	0(OFF)
F58	Function of the digital input 2	0(OFF)	14	-	0(OFF)	0(OFF)	14	-	0(OFF)
F59	Evaporator temperature indication offset S2	-50.1(OFF)	50	°C	0	-90(OFF)	90	°F	0
F60	S3 sensor temperature indication offset	-50	50	°C	0	-90	90	°F	0
F61	Intensity of the digital filter applied to sensor (0-deactivated)	0	9	-	0	0	9	-	0
F62	Function lock	0	2	-	0	0	2	-	0
F63	Time for functions lockdown	15	60	sec.	15	15	60	sec.	15
F64	Control functions shutdown	0(NO)	4	-	0(NO)	0(NO)	4	-	0(NO)
F65	Operating mode of the room temperature alarms (S1)	0	1	-	1	0	1	-	1
F66	Maximum operating time of the COMP output for maintenance	0(NO)	9999	h.	0(NO)	0(NO)	9999	h.	0(NO)
F67	Time to confirm a low evaporator (S2 / S3) temperature to start defrosting (if F45=1)	0	90	min.	0	0	90	min.	0
F68	Time to confirm high pressure event	0	60	sec.	5	0	60	sec.	5
F69	Time to confirm low pressure event	0	180	sec.	20	0	180	sec.	20
F70	Time to ignore measurement of low pressure at start up	30	600	sec.	60	30	600	sec.	60
F71	Delay time to return to control after a high pressure event	1	10	min.	3	1	10	min.	3
F72	Delay time to return to control after a low pressure event	1	10	min.	3	1	10	min.	3

*The minimum and maximum values depend on the values configured in F03 and F04.

Fun	Description	CELSIUS (°C)				FAHRENHEIT (°F)			
		Min	Max	Unit	Default	Min	Max	Unit	Default
F73	Enable second defrost output	0(NO)	1(YES)	-	0(NO)	0(NO)	1(YES)	-	0(NO)
F74	Enable preset SP2	0(NO)	1(YES)	-	0(NO)	0(NO)	1(YES)	-	0(NO)
F75	Enable preset SP3	0(NO)	1(YES)	-	0(NO)	0(NO)	1(YES)	-	0(NO)
F76	Enable preset SP4	0(NO)	1(YES)	-	0(NO)	0(NO)	1(YES)	-	0(NO)
F77	Enable preset SP5	0(NO)	1(YES)	-	0(NO)	0(NO)	1(YES)	-	0(NO)
F78	Normal setpoint SP2	-50	105	°C	-26	-58	221	°F	-14
F79	Normal setpoint SP3	-50	105	°C	-23	-58	221	°F	-9
F80	Normal setpoint SP4	-50	105	°C	0,0	-58	221	°F	32
F81	Normal setpoint SP5	-50	105	°C	4,0	-58	221	°F	39
F82	Economic setpoint SP2	-50	105	°C	-24	-58	221	°F	-11
F83	Economic setpoint SP3	-50	105	°C	-20	-58	221	°F	-4
F84	Economic setpoint SP4	-50	105	°C	4,0	-58	221	°F	39
F85	Economic setpoint SP5	-50	105	°C	6,0	-58	221	°F	42

6.5.1 Description of parameters

F00 - Controller's operating mode:
Configures if the controller operates in the basic mode (30 functions) or in the advanced mode (76 functions)
  0 - Basic mode
  1 - Advanced mode
➡ NOTE: The features of the advanced mode will be disabled when the controller is in the basic mode.

F01 - Defrost by hourly programming:
This function allows enabling the schedule of defrosts by time.
  0 - The defrosts happen normally after the end of the cooling stage or by temperature as configured in F45.
  1 - The defrosts happen in programmed times with non-linear distribution according to the weekly schedule configured in menu Prog.
  2 - The defrosts happen in programmed times with linear distribution according to the weekly schedule configured through functions F25 to F30.
➡ NOTE: The functions related to the defrost schedule configuration (F25 to F30) will only be enabled when this function is configured with the value 2 and menu Prog will only be enabled when this function is configured with the value 1.
➡ NOTE2: If the defrost schedule is enabled, i.e. if this function is configured with 1 or 2, the defrost will not be performed after the end of the cooling stage or by temperature, but only on the scheduled time.
➡ NOTE3: The defrost by temperature configured in function F45 will only be available when the controller is in the advanced mode.

F02 - Control differential (normal hysteresis):
It is the difference in temperature (hysteresis) between TURNING ON and OFF the refrigeration control output in the normal mode and Fast freezing.

F03 - Minimum setpoint allowed to the end user:
A threshold aimed at preventing an exceedingly low temperature setpoint from being inadvertently adjusted.

F04 - Maximum setpoint allowed to the end user:
A threshold aimed at preventing an exceedingly high temperature setpoint from being inadvertently adjusted.

F05 - Startup delay (power up):
When the instrument is powered up with this function enabled it will only indicate the temperature and remain with all outputs switched off for the defined time. In facilities with many equipments, attributing different values for the startup delay of each instrument will avoid energy peaks by activating the loads at different times.

F06 - Low room temperature alarm (S1):
It is the room temperature (S1) below which the instrument will activate the visual (AtLo) and audible (F56) low temperature alarm. The temperature configured in this function can have its absolute value or relative to the setpoint depending on the value configured in F65. The differential to switch off the alarm is fixed on 0.1 °C/1 °F. This alarm is ignored until the instrument reaches the control temperature for the first time. During the operation in Fast Freezing the low temperature alarm remains disabled. After exiting this process it is reactivated when the temperature is out of the alarm condition.

F07 - High room temperature alarm (S1):
It is the room temperature (S1) above which the instrument will activate the visual (AtH,) and audible (F56) high temperature alarm. The temperature configured in this function can have its absolute value or relative to the setpoint depending on the value configured in F65. The differential to switch off the alarm is fixed on 0.1 °C/1 °F. This alarm considers the temperature being displayed and it is influenced by the temperature indication locked during the defrost (F17). This warning is ignored until the instrument reaches the control temperature for the first time.

F08 - Time in refrigeration (interval between defrosts):
When the defrost is configured to start by time (F45), this function establishes the maximum time duration of the cooling process. In this case, the defrost will be started whenever the time elapsed during the cooling mode reaches the value configured in this function. If the condition to start the defrost is the evaporator temperature and the controller is not indicating a reading error for this sensor, the time in refrigeration will not be considered.

F09 - Minimum compressor on time:
It is the minimum time for which the compressor remains switched on, i.e. the length of time between the last start up and the next stop. It is aimed at avoiding high voltage surges in the power lines, potentially extending lifespan of compressor.

F10 - Minimum compressor off time:
It is the minimum time the compressor will remain off, i.e. the length of time between the last stop and the next start up. It is aimed at relieving the discharge pressure and increase the service life of the compressor.

F11 - Compressor state with a disconnected or faulty room sensor (S1):
If the room sensor (S1) is shorted, disconnected, or out of range, the compressor will assume the state configured in this function.
  0 - Compressor off
  1 - Compressor on
  2 - Cycling according to the times defined in F42 and F43.

F12 - Defrost at instrument startup:
It allows performing a defrost when the controller is powered on, for example when the electric power returns (in case of power failure).

F13 - Evaporator temperature (S2 / S3) to determine the end of defrost:
The defrost will be ended when the evaporator temperature reaches a value equal or higher than the value configured in this function. If sensor S3 is configured as the second evaporator sensor (F57), the controller will switch off the defrost outputs individually and the defrost process will be ended when both are off.

F14 - Maximum defrost time:
This parameter defines the maximum defrost time. If the defrost is not ended by temperature when this time has elapsed, a dot will keep flashing in the lower right corner of the display. If sensor 2 is switched off, the defrost process end will be always defined by time, thus no warning signal is required. If the maximum defrost time is configured as 0 (no), the defrost process will not be performed.

F15 - Fan on during defrost:
It defines whether the fan will remain on during the defrost. The cases of natural defrost and defrost by finned resistances installed outside of the evaporator are examples of the usage of the fan on.

F16 - Defrost type:
  0 - Electric defrost (by resistance), where only the defrost output is activated
  1 - Defrost by hot gas, where the compressor output and defrost output are activated

F17 - Temperature indication (S1) locked during defrost:
This function is aimed at avoiding viewing the room temperature rise due to the defrost cycle. The last temperature measured in the refrigeration cycle will be locked in the display during the defrost. The indication will be unlocked when this temperature is reached again or when the time configured in this function is exceeded after the start of the following refrigeration cycle (whichever comes first). This function may be disabled if configured with no (-1).

F18 - Draining time (defrost water dripping):
Time required for dripping, i.e. to drain the last drops of the evaporator. During this period, all outputs remain turned off. If you do not want this stage, adjust this time to no.

F19 - Evaporator temperature (S2 / S3) for the fan to return after draining:
The fan-delay cycle is started after the draining phase. The compressor is activated immediately because the evaporator temperature is high but the fan is activated only after the temperature on the evaporator drops below the adjusted value. This process is required to remove the heat that already exists on the evaporator as a result of the defrost to avoid transferring it to the environment.

F20 - Maximum time for the fan to return after draining (fan-delay):
For safety reasons, if the evaporator temperature does not reach the value adjusted in function F19 or if sensor (S2 / S3) is disconnected, the fan will return after the time adjusted in this function has elapsed.

F21 - Fan operating mode during refrigeration:
This parameter allows configuring how the fan output will behave during the refrigeration cycle. In this case, the working options take into account the state of the compressor output and the setpoint with which the instrument is operating. When configured to cycle, the on and off times are defined by F40 and F41.

Mode	Comp. Relay ON	Comp. Relay off with Normal or FF* SP*	Comp. Relay off with Economic SP*
0	Fan Relay ON	Fan Relay CYCLING	Fan Relay CYCLING
1	Fan Relay ON	Fan Relay CYCLING	Fan Relay ON
2	Fan Relay ON	Fan Relay CYCLING	Fan Relay OFF
3	Fan Relay ON	Fan Relay ON	Fan Relay CYCLING
4	Fan Relay ON	Fan Relay ON	Fan Relay ON
5	Fan Relay ON	Fan Relay ON	Fan Relay OFF
6	Fan Relay ON	Fan Relay OFF	Fan Relay CYCLING
7	Fan Relay ON	Fan Relay OFF	Fan Relay OFF

*LEGEND:
SP: Setpoint
FF: Fast Freezing

F22 - Fan stop due to high temperature in the evaporator:
This aims at switching off the evaporator fan until the evaporator temperature approaches the temperature provided in the project design, thus avoiding high suction pressures and temperatures that could damage the compressor.
During the refrigeration process if the evaporator temperature exceeds the adjusted value, the fan is switched off, being switched on again with a fixed hysteresis of 2°C / 4°F. It is a valuable resource when, for example, a cold storage installation is started up after several days of inactivity, or when a walk-in chamber or display is replenished with goods.

F23 - Room temperature indication offset S1:
It allows compensating possible deviations in the room temperature reading (S1) caused by the replacement of the sensor or changes in the cable length.

F24 - Address of the instrument in the RS-485 network:
Equipment's network address for communicating with Sitrad software.
➡ **NOTE:** Every single controller within the network must have different address.

F25 - Number of defrosts per day (Monday to Friday):
The defrost cycles are evenly distributed in accordance with the number of defrosts set per day, always considering the preferred time. The values can be adjusted to 1, 2, 3, 4, 6, 8, or 12. This function works with the Monday to Friday operation schedule.

F26 - Preferred time to start defrosting (Monday to Friday):
A preferred time (reference time) for the daily defrost to be performed must be set. This function works with the Monday to Friday operation schedule.

F27 - Number of defrosts per day (Saturday):
The defrost cycles are evenly distributed in accordance with the number of defrosts set per day, always considering the preferred time. The values can be adjusted to 1, 2, 3, 4, 6, 8, or 12. This function works with the Saturday operation schedule.

F28 - Preferred time to start defrosting (Saturday):
A preferred time (reference time) for the daily defrost to be performed must be set. This function works with the Saturday operation schedule.

F29 - Number of defrosts per day (Sunday):
The defrost cycles are evenly distributed in accordance with the number of defrosts set per day, always considering the preferred time. The value can be adjusted to 1, 2, 3, 4, 6, 8, or 12. This function works with the Sunday operation schedule.

F30 - Preferred time to start defrosting (Sunday):
A preferred time (reference time) for the daily defrost to be performed must be set. This function works with the Sunday operation schedule.

F31 - Normal setpoint:
It is the desired room temperature. It is the reference value for the temperature control.

F32 - Economic setpoint (SPE):
It is the desired room temperature when the instrument is operating in economy mode.

F33 - Economic setpoint control differential (hysteresis):
It is the temperature difference (hysteresis) between switching ON and OFF the refrigeration control output in the economy mode.

F34 - Door closed time for activating the economy mode:
If the door is kept closed for a time equal or greater than the one configured in this function and the normal setpoint is or has been reached, the controller will activate the economy mode. After that the controller will operate with the economic setpoint until any condition to deactivate it is met (see 6.3.3). This function is disabled when configured with no (0).

F35 - Temperature difference (S3-S1) below which the economic setpoint is activated:
When the temperature difference between sensor 3 and sensor 1 is below the value adjusted in this parameter, the controller starts to operate in the economy mode.

F36 - Temperature difference (S3-S1) above which the normal setpoint is activated:
When the temperature difference between sensor 3 and sensor 1 is above the value adjusted in this parameter, the controller starts to operate with the normal setpoint.

F37 - Maximum time on power-saving mode:
It allows configuring the maximum time in economy mode. After this time the setpoint returns to the normal operation setpoint. This time is disregarded if configured as $tOFF$.

F38 - Temperature limit for Fast Freezing:
It is the minimum temperature that the instrument can reach during the fast freezing process.

F39 - Maximum Fast Freezing time:
It is the time duration of the fast freezing process.

F40 - Fan on time:
F41 - Fan off time:
They define the time for which the fan is kept on and off when operating in the cyclic mode.

F42 - Compressor on time in case of S1 fault:
F43 - Compressor off time in case of S1 fault:
They define the compressor on and off times when it is operated in the cyclic mode. This condition happens when sensor S1 is disconnected (or faulty) and when parameter F11 is configured as 2 .

F44 - Time to collect the gas before starting the defrost:
When starting the defrost the controller will keep only the fan on during this time to take advantage of the residual energy of the gas. This time will be disregarded in case of defrost at power up.

F45 - Condition to start the defrost (0 - time / 1 - temperature):
It defines the condition to start the defrost:
0 - Time
1 - Temperature
Before starting the defrost process the controller will observe the minimum time of compressor on or off (F09 and F10) and the gas collection stage (F44).
➡ **NOTE:** This function is ignored when the defrost schedule is enabled (F01 = 1 or F01 = 2).

F46 - Maximum open door time for instantaneous defrost:
During the cooling step, if the door is kept open for a time longer than the one defined in this function, the instantaneous defrost will take place. If the door is open at the beginning of the refrigeration process, the counting of this time is reset. This function is disabled when configured with no (0).

F47 - Evaporator temperature (S2/S3) to start defrosting:
When the evaporator temperature is below the value configured in this function the controller will start the defrost. If sensor S3 is configured as the second evaporator sensor (F57), the controller will start the defrost as soon as one of the sensors, S2 or S3, meets this condition. This function is disregarded when the condition to start the defrost is time (F45).

F48 - Door open time to switch off the fan:
For safety reasons, after a time with the door open equal or longer than the one adjusted in this function has elapsed, the fan will be switched off in the refrigeration step. This function is disabled when configured with no (-1).

F49 - Door open time to switch off the control outputs:
For safety reasons, after a time with the door open equal or longer than the time adjusted in this function has elapsed, the outputs will be switched off (compressor, fan, and defrost). This function is disabled when configured with no (0).

F50 - Maximum condenser temperature (S3) to switch off the control outputs:
Above this temperature, in addition to the indication of the visual and audible alarms ($AtC2$) the loads activated by the outputs will be switched off. This alarm will be deactivated if the S3 input is configured (F57) for another function. This alarm is ignored until the controller reaches the control temperature for the first time.

F51 - Control differential for the maximum condenser temperature (hysteresis):
For the loads to be switched on again, the temperature in sensor S3 (condenser) must drop to the value adjusted in F50 minus the value configured in this parameter.

F52 - Compressor on time without reaching the setpoint to switch off the control outputs:
It is the maximum time the compressor will remain on without reaching the setpoint during the cooling process. If this time is exceeded, the outputs will be switched off (compressor, fan, and defrost), and the visual and audible alarms will be activated $Alrc$. This function can be disabled by adjusting it to the minimum value no (0).
➡ **NOTE:** In this condition the controller must be switched off and on again to resume normal operation.

F53 - Room temperature alarm delay:
When this configuration is active, the temperature must remain in the alarm condition for the time defined in this parameter so the alarm can be triggered.
It will avoid false alarms originating from punctual temperature variations, like after a defrost.

F54 - High condenser temperature alarm (S3):
It is the condenser temperature above which the controller will indicate the visual ($AtC1$) and audible (F56) high temperature alarm. This alarm will be deactivated if the S3 input is configured (F57) for another function. This alarm is ignored until the instrument reaches the control temperature for the first time.

F55 - Open door time for the alarm to go on:
If the door is kept open for a time equal or longer than the one configured in this parameter the controller will activate a visual and audible (F56) door open alarm. The alarms are suspended when the door is closed. The visual alarm can be inhibited through the key ⬇ (pressed for 2 seconds). For the door open alarm to work, one of the digital inputs must be configured as door contact (F57 and F58). This function is disabled when configured with no (0).

F56 - Enable buzzer:
Allows enabling and disabling the internal buzzer for alarm signaling.

F57 - Function of the digital input 1 / sensor S3:
OFF	Off
1	Digital input: Activate economic setpoint (NO switch)
2	Digital input: Force defrost (NO switch)
3	Digital input: Force fast freezing (NO switch)
4	Digital input: External alarm (NO)
5	Digital input: Door contact (NO)
6	Digital input: Activate economic setpoint (NC switch)
7	Digital input: Force defrost (NF switch)
8	Digital input: Force fast freezing (NC switch)
9	Digital input: External alarm (NC)
10	Digital input: Door contact (NC)
11	Sensor S3: Temperature difference for economic setpoint (S3-S1)
12	Sensor S3: Condenser temperature control
13	Sensor S3: Second evaporator temperature control
14	Digital input: pressostat 1 status, contact NO
15	Digital input: pressostat 1 status, contact NC
16	Digital input: high pressure switch, contact NO
17	Digital input: high pressure switch, contact NC

F58 - Function of the digital input 2:
OFF Off
1 Digital input: Activate economic setpoint (NO switch)
2 Digital input: Force defrost (NO switch)
3 Digital input: Force fast freezing (NO switch)
4 Digital input: External alarm (NO)
5 Digital input: Door contact (NO)
6 Digital input: Activate economic setpoint (NC switch)
7 Digital input: Force defrost (NF switch)
8 Digital input: Force fast freezing (NC switch)
9 Digital input: External alarm (NC)
10 Digital input: Door contact (NC)
11 Digital input: pressostat 2 status, contact NO
12 Digital input: pressostat 2 status, contact NC
13 Digital input: low pressure switch, contact NO
14 Digital input: low pressure switch, contact NC

NOTE: When digital input is configured as pressure switch, it allows turn off the compressor outputs, fans and defrost, displaying the associated alarm to this alarm origin. When there are no longer pressostat event, the controler returns to initial process configurated.

F59 - S2 Evaporator temperature indication offset:
It allows compensation for possible deviations in the evaporator temperature reading (S2) caused by the replacement of the sensor or changes in the cable length. Sensor S2 can be switched off by adjusting the function to the minimum value until the message OFF is displayed. In this condition all the functions that rely on the reading of sensor S2 will be disabled.

F60 - S3 sensor temperature indication offset:
It allows compensation for possible deviations in the S3 sensor temperature reading caused by the replacement of the sensor or changes in the cable length. Sensor S3 can be switched off by adjusting the function of the digital input 1 / Sensor S3 (F57) with the value OFF (0) or making it to operate as a digital input.

F61 - Intensity of the digital filter applied to sensor 1 (0 - deactivated):
This filter aims at simulating an increase of thermal mass on the sensor, thus increasing its response time (thermal inertia). The higher the value adjusted in this function, the longer the response time of the sensor.

F62 - Function lock:
It allows and configures the function lock (see item 6.3.8).
0 - Do not allow the function lock.
1 - Allow a partial lock where the control functions will be locked but the adjustment of the setpoint is allowed.
2 - Allow full locking.
NOTE: The defrost and view of the minimum and maximum temperature records will always be allowed.

F63 - Time for functions lockdown:
It configures the time in seconds for the command to activate the function lock.
15 - 60 Time in seconds for the command to activate the lock.

F64 - Control functions shutdown:
Authorizes switching off the control functions (see item 6.3.9).
no Disables the control functions shutdown.
1 Enables activation/deactivation of the control functions only if the functions are unlocked.
2 Enables activation/deactivation of the control functions even if the functions are locked.
3 Enables activation/deactivation of the control functions only if the functions are unlocked.*
4 Enables activation/deactivation of the control functions even if the functions are locked.*
* When F64 is configured as 3 or 4 and the control functions shutdown is activated, the controller will turn off the display, keeping only the indication light on. If any key is touched the display turns on by 5 seconds, turning off again until a new key is touched.

F65 - Operating mode of the room temperature alarms (S1):
Determines whether the values configured for the high room temperature (F07) and low room temperature (F06) alarms are relative to the setpoint or absolute values.
0 - The room temperature alarms F06 and F07 represent values relative to the setpoint.
Example:
Desired temperature SP : - 5ºC
Low temperature alarm $F06$: 2ºC
High temperature alarm $F07$: 2ºC
Limits: (SP - $F06$ and SP + $F07$).
The low temperature alarm will be signaled at -7°C (-5-2) and the high temperature alarm at -3°C (-5+2).
1 - the room temperature alarms F06 and F07 are absolute values.
Example:
Low temperature alarm $F06$: -30ºC
High temperature alarm $F07$: 15ºC
The low temperature alarm will be signaled at -30 °C and the high temperature alarm at 15 °C.

F66 - Maximum operating time of the COMP output for maintenance:
Whenever the COMP output is activated the controller will count its operating time. When the counted time is equal or longer than the one set in this function, the display will show the message $ANAi$, and the audible warning will be activated if it is enabled (F56), meaning that the compressor must be serviced.
NOTE: The value adjusted in this parameter will be multiplied by ten.
Example: Value adjusted = 1, then 1*10 = 10 hours for the next service.

F67 - Time to confirm a low evaporator (S2 / S3) temperature to start defrosting (if F45=1):
When the evaporator temperature drops and then reaches the value set in F47, the controller starts counting the confirmation time to start defrosting. After the counting finishes, if the temperature is still below the value configured in F47 the defrost is started. If the temperature is above the value configured in F47 during the counting, the system continues at the refrigeration stage and the count is reset to zero.

F68 - High pressure event validation time:
It is the minimum time that the pressure switch connected to the discharge line must remain activated in order to be validated this event. This time is used to avoid unnecessary triggering due to the pressure oscillation.

F69 - Low pressure event validation time:
It is the minimum time that the pressure switch connected to the suction line must remain on for validated this event. This time is used to avoid unnecessary triggering due to oscillation of pressure.

**F70 - Time to inhibit the reading of the low pressure when initializing:**
Delay time that the suction line pressure switch takes to be within its ideal initialize the controller, avoiding unwanted alarms.

F71 - Time to wait for control return after high pressure event:
After the high pressure event, the controller uses this timeout to then regain control.

F72 - Delay time to return to control after a low pressure event:
After the low pressure event, the controller uses this timeout to then regain control.
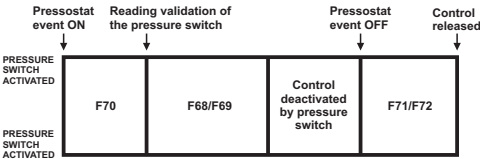
NOTE 1: For safety reasons, if controller registers 3 high pressure or 3 low pressure events in one hour period, three outputs of controller will be turned OFF: Compressor, Defrost & Fan display on controller will show alarm message $APHi$ - High pressure alarm or $APLo$ - Low pressure alarm. To reset $APHi$ and $APLo$ alarms a manual intervention is required. To manually reset: short press key on controller to navigate $HPLP$ option, short press key, select the option ON and press key.
NOTE 2: The values set in F57 and F58 must be properly configured for digital inputs of high/low pressure switches.
NOTE 3: The F71 and F72 times are independents of the time set in F10 - Minimum compressor time ON.

F73 - Enable second defrost output:
With this function activated, you can make the output FAN operate as a second defrost output. This output is activated during the execution of the pre-defrost, defrost and drainage.
NOTE: With these configurations, all the Fan features are disregarded, including the Fan Delay process.

F74 - Enable preset SP2:
F75 - Enable preset SP3:
F76 - Enable preset SP4:
F77 - Enable preset SP5:
The purpose of this functions is enable the presets SP2, SP3, SP4 or SP5.

F78 - Normal setpoint SP2:
F79 - Normal setpoint SP3:
F80 - Normal setpoint SP4:
F81 - Normal setpoint SP5:
It is the desired room temperature. It is the reference value for the temperature control of the presets SP2, SP3, SP4 or SP5.

F82 - Economic setpoint (SPE2):
F83 - Economic setpoint (SPE3):
F84 - Economic setpoint (SPE4):
F85 - Economic setpoint (SPE5):
It is the desired room temperature when the instrument is operating in economy mode of the presets SP2, SP3, SP4 or SP5.

6.6 Log Menu
The menu Log contains the configuration functions of the internal datalogger.

Fun	Description	CELSIUS (°C)				FAHRENHEIT (°F)			
		Min	Max	Unit	Default	Min	Max	Unit	Default
$F86$	Datalogger operating mode	0	2	-	2	0	2	-	2
$F87$	Sampling time (time between records in the memory)	1	999	sec.	30	1	999	sec.	30
$F88$	Minimum room temperature variation (S1) to force writing data to the memory	0(NO)	10	°C	0(NO)	0(NO)	18	°F	0(NO)
$F89$	Variation of the digital input or the outputs to force data writing	NO	YES	-	NO	NO	YES	-	NO
$F90$	Overwrite old records when the memory is full?	NO	YES	-	YES	NO	YES	-	YES

F86 - Datalogger operating mode:
It allows choosing one of the following datalogger operating modes:
0 - Always off
1 - Always on
2 - Manual operation

F87 - Sampling time (time between records in the memory):
It is the time in seconds for which the controller records samples of the temperature information, state of the outputs, door status, and alarm status.

F88 - Minimum room temperature variation (S1) to force writing data to the memory:
The room temperature difference (S1) in relation to the last piece of data written in the datalogger for the data to be recorded in the memory regardless of the sampling time set in F69. To deactivate this function, just decrement the value until the message no is displayed.

F89 - Variation of the digital input or the outputs to force data writing:
It indicates whether changes in the digital input or in the control outputs will force data to be written in the memory regardless of the sampling time set in F69.
no - Off
YES - On

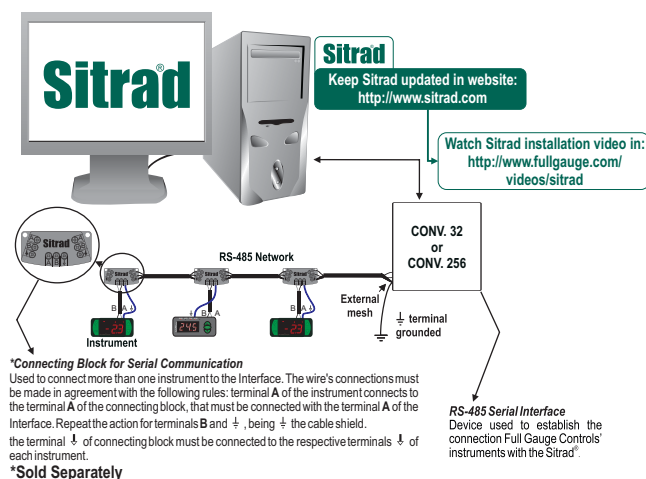**F90 - Overwrite old records when the memory is full?:**
This function indicates whether the controller should start writing new data at the beginning of the datalogger memory when the memory is full. This function prevents the last data calculated by the equipment from being lost. If set to zero, when the datalogger memory is full the controller and Sitrad will signal full memory.

7. SIGNALS

Signal	Description
$Err1$	Ambient sensor disconnected or out of range.
$Err2$	Evaporator sensor disconnected or out of range.
$Err3$	Sensor 3 disconnected or out of range.
$ALrE$	External alarm (digital input).
ECO	Operating with economic setpoint.
$OPEn$	Open door indication.
$ADPn$	Open door alarm indication.
$AthI$	High ambient temperature alarm (sensor1).
$AtLo$	Low ambient temperature alarm (sensor1).
$AtC1$	High temperature in condenser alarm (level 1).
$AtC2$	High temperature in condenser alarm (level 2).
$AMAI$	Indicates maintenance the compressor.
$ALrC$	Compressor reached the maximum time on without reaching the SP.
OFF	Control routines off.
$\ \ \ \ .$	It indicates that the temperature for end of defrost has not been reached.
$AdFL$	Datalogger memory full.
$HiPr$	High pressure event.
$LoPr$	Low pressure event.
$APLo$	Low pressure alarm (manual reset required).
$APHi$	High pressure alarm (manual reset required).
$EMEM$	Please contact Full Gauge Controls.
$ECLO$	Invalid date and/or time (adjust the clock).
$ECAL$	Please contact Full Gauge Controls.
$PPPP$	Reconfigure the values of the functions.

8. INTEGRATING CONTROLLERS, RS-485 SERIAL INTERFACE AND COMPUTER

Sitrad

Keep Sitrad updated in website:
http://www.sitrad.com

Watch Sitrad installation video in:
http://www.fullgauge.com/videos/sitrad

RS-485 Network

CONV. 32 or CONV. 256

External mesh

terminal grounded

Instrument

Connecting Block for Serial Communication
Used to connect more than one instrument to the Interface. The wire's connections must be made in agreement with the following rules: terminal **A** of the instrument connects to the terminal **A** of the connecting block, that must be connected with the terminal **A** of the Interface. Repeat the action for terminals **B** and ⏚ , being ⏚ the cable shield.
the terminal ⏚ of connecting block must be connected to the respective terminals ⏚ of each instrument.
Sold Separately

RS-485 Serial Interface
Device used to establish the connection Full Gauge Controls' instruments with the Sitrad®.

9. OPTIONAL ITEMS - Sold Separately

EasyProg - version 2 or higher
It is an accessory that has as its main function to store the parameters of the controllers. At any time, you can load new parameters of a controller and download them on a production line (of the same controller), for example. It has three types of connections to load or unload the parameters:

- **Serial RS-485:** It connects via RS-485 network to the controller (only for controllers that have RS-485).
- **USB:** it can be connected to the computer via the USB port, using Sitrad's Recipe Editor.
- **Serial TTL:** The controller can be connected directly to **EasyProg** by the TTL Serial connection.
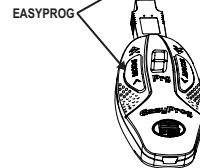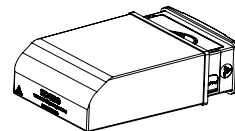

EASYPROG

IMPORTANT

⚠ TO PERFORM THE COMMUNICATION WITH EASYPROG THIS EQUIPMENT MUST NOT BE COMMUNICATING WITH SITRAD SOFTWARE.

Ecase protective cover
It is recommended for the Evolution line, keeps water from entering the back part of the instrument. It also protects the product when the installation site is washed.

Extended frame
It allows the installation of Evolution line controllers with sizes 76 x 34 x 77 mm in various situations, since it does not require precision in the notch of the instrument fitting panel.
The frame integrates two switches of 10 Amperes that may be used to actuate interior light, air curtain, fan, and others.
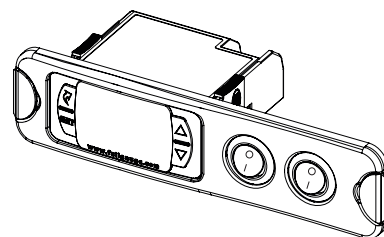
ENVIRONMENTAL INFORMATION
Packaging:
The materials used in the packaging of Full Gauge products are 100% recyclable. Try to perform disposal through specialized recyclers.

Product:
The components used in Full Gauge controllers can be recycled and reused if disassembled by specialized companies.

Disposal:
Do not incinerate or dispose the controllers that have reached the end of their service as household garbage. Observe the laws in your area regarding disposal of electronic waste. If in doubt, please contact Full Gauge Controls.