MT-514E Ver.03

DIGITAL CONTROLLER FOR HEATING OR COOLING WITH DEFROST AND CONFIGURABLE ALARM OUTPUT

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

Audible Alarm	Defrost	Function blocking	Control functions shutdown	Serial Programming	Protection level

IP 65 FRONT

NSF · c UL us · E251415

MT514EV03-02T-18524

WARNING

⚠ **BEFORE INSTALLING THE CONTROLLER, WE RECOMMEND READING THROUGH THE ENTIRE INSTRUCTION MANUAL IN ORDER TO AVOID POSSIBLE DAMAGE TO THE PRODUCT.**

PRECAUTIONS WHEN INSTALLING THE PRODUCT:
Before performing any procedure on this instrument, disconnect it from the mains;
Ensure that the instrument has adequate ventilation and avoid installation in panels containing devices that may cause it to operate outside the specified temperature limits;
Install the product away from sources that may generate electromagnetic disturbances such as: motors, contactors, relays, solenoid valves, etc;

AUTHORIZED SERVICE:
The installation or maintenance of the product must be performed by qualified professionals only;

ACCESSORIES:
Only use original Full Gauge Controls accessories.
If you have any questions, please contact technical support.

DUE TO YOUR CONSTANT EVOLUTION, THE FULL GAUGE CONTROLS RESERVES THE RIGHT TO CHANGE THE INFORMATION CONTAINED IN THIS MANUAL AT ANY TIME WITHOUT NOTICE.

1. DESCRIPTION

The **MT-514E** is a temperature controller for cooling or heating applications. It has an internal audible alarm (buzzer) and an output for alarm control that can also be configured for electric defrost, hot gas defrost, fan or as a second compressor that will act in parallel with the main one. The minimum and maximum temperature record is displayed at the touch of a single key ⟳ (Flatec). Another available feature is the shutdown of control functions, making it possible for the **MT-514E** to operate only as a temperature indicator. And through an intelligent function blocking system, it prevents unauthorized persons from changing the control parameters.
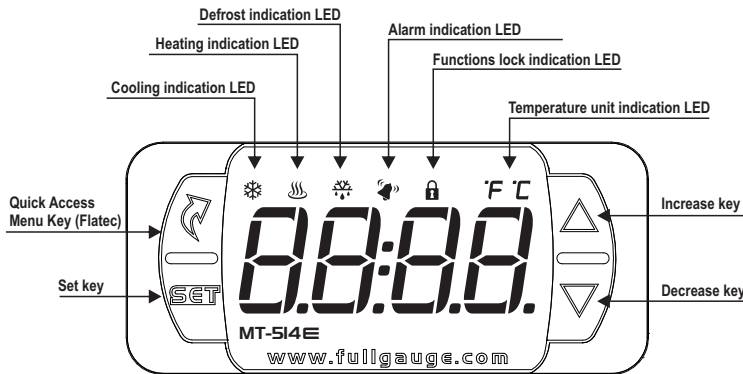Product is compliant with UL Inc. (United States and Canada).

2. APPLICATION

• Vaccine refrigerators
• Refrigerated counters
• Freezer rooms
• Hot counters

3. TECHNICAL SPECIFICATIONS

|	
Power supply	**MT-514 E:** 115 or 230 Vac ±10%(50/60 Hz) **MT-514 EL:** 12 or 24 Vac/dc +10%
Control temperature	-50 to 105ºC (-58 to 221°F)*
Operating temperature	0 to 50 ºC / 32 to 122°F
Load current (outputs)	**OUT1:** 16(12)A 250Vac 2HP **OUT2:** 10A / 240Vac 1/4HP
Operating humidity	10 to 90%RH (without condensation)
Dimensions (WxHxD)	76 x 34 x 77 mm
Dimensions of the clipping for fixing of the instrument	71 ± 0,5 x 29 ± 0,5 mm (see item 5)

(*) This instrument measures and controls temperatures of up to 200°C/392°F, using the silicone sensor cable SB59 (sold separately).
Note: The sensor cable lenght can be increased by the user up to 200 meters using PP 2 x 24 AWG cable.

4. INDICATIONS AND KEYS

- Defrost indication LED
- Heating indication LED
- Cooling indication LED
- Alarm indication LED
- Functions lock indication LED
- Temperature unit indication LED
- Quick Access Menu Key (Flatec)
- Set key
- Increase key
- Decrease key

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*Blinking led (when F26 = 7): Indicates that OUT1 has been activated and the compressor delay is ocurring before trigger OUT2
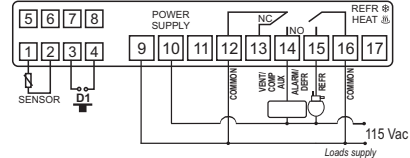
5. INSTALLATION - ASSEMBLING AND ELECTRICAL CONNECTIONS

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)
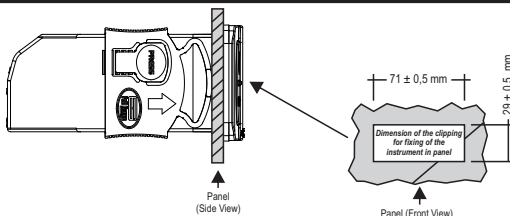
⚠ **ATTENTION**
FOR INSTALLATIONS WHERE A SEALING IS REQUIRED TO AVOID LIQUID CONTACT, THE CUT FOR THE CONTROLLER MUST BE OF 70,5X29mm MAXIMUM. THE SIDE LOCKS MUST BE FIXED SO IT PRESSES THE RUBBER SEALING AVOIDING INFILTRATION BETWEEN THE CUT AND THE CONTROLLER.
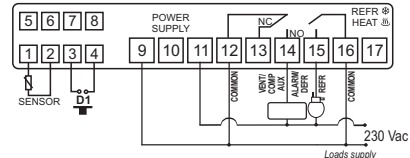
⚠ **IMPORTANT**
THE USE OF APPROPRIATE TOOLS IS ESSENTIAL TO AVOID DAMAGE IN THE CONNECTION AT INSTRUMENT TERMINALS:
⊖ SCREWDRIVER SLOT 3/32"(2.4mm) FOR ADJUSTMENTS IN THE SIGNAL TERMINALS;
⊕ SCREWDRIVER PHILLIPS #1 FOR ADJUSTMENTS IN THE POWER TERMINALS;
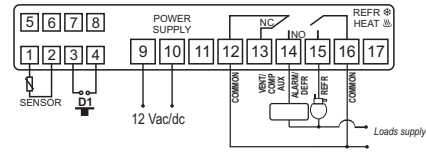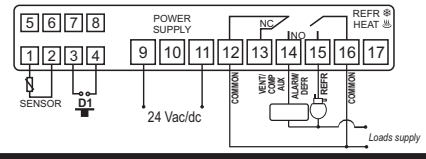
Connection 115 Vac
POWER SUPPLY · REFR ❄ HEAT
SENSOR · D1 · Loads supply · 115 Vac

Connection 230 Vac
POWER SUPPLY · REFR ❄ HEAT
SENSOR · D1 · Loads supply · 230 Vac

Connection 12 Vac/dc
POWER SUPPLY · REFR ❄ HEAT
SENSOR · D1 · 12 Vac/dc · Loads supply

Connection 24 Vac/dc
POWER SUPPLY · REFR ❄ HEAT
SENSOR · D1 · 24 Vac/dc · Loads supply

6. OPERATIONS

6.1. Quick Access Menu Map

To access or browse in the quick access menu, use the ⟳ key (quick touch) while the temperature is being displayed by the controller. Each touch displays the next function of the list; for confirming, use the ⊟ key (quick touch). For further details, refer to chapter 6.3.

DEFROST (ON/OFF) — dEFr

FUNCTIONS LOCKDOWN — LOC

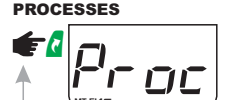**CONTROL FUNCTIONS (ON/OFF)** — CtrL

ADJUSTING DESIRED TEMPERATURE (SETPOINT) — SEt

MIN. AND MAX. TEMPERATURE RECORD — rE9

ERASE MIN. AND MAX. VALUES — CrE9

EXIT FUNCTION — - - - -

FUNCTION SELECTION — Func

VISUALIZATION OF PROCESSES — Proc

6.2. Quick access keys map

When controller is on temperature display mode, the following keys can be used as a shortcut for the following functions:

Key	Function
SET	Hold down for 2 seconds: setpoint adjustment.
▽	Quick touch: displayof current process and sensor temperature when F41 = 1 or 2.
▽	Hold down for 2 seconds: inhibit audible alarm (buzzer).
△	Quick touch: maximum and minimum temperature display.
⟳	Pressed for 5 seconds: turn on/turn off the control functions.

⬆ (green)	**Hold down for 4 seconds: carries out manual defrost.**
↻ (green)	**Quick touch: enters quick access menu.**
⬇⬆ (green)	**Hold down simultaneously: enters function selection.**

6.3. Basic operations

6.3.1. Adjusting desired temperature (setpoint)

If configured not to use recipes ($F03$ = no):
- Hold down the ⬛ key for 2 seconds until the message SEt is displayed;
- Then the message SP will be displayed and the setpoint may be adjusted;
- Use the ▼ or ▲ keys for changing the value, then press ⬛ to confirm.

If configured to use presets ($F03$ = YES):
Each preset may be set up to use different values for the Setpoint, Control differential (hysteresis) and Cooling time (interval between defrosts).

To select the preset:
- Hold down the ⬛ key for 2 seconds until the message SEt is displayed;
- Then the currently selected preset will appear $rc1$ or $rc2$.
- Use the ▼ or ▲ keys to select which of the 2 presets will be used.
- To confirm the selection, press ⬛.

Note: The values of functions Setpoint, Control differential (hysteresis) and Cooling time (interval between defrosts) for each preset are set up in the parameters menu.

6.3.2. Manual defrost ❄

Manual defrost can be carried out through the easy menu, decrement key or digital input.
Defrost using the easy menu: Press the key ↻ (short touch) until the message $dEFr$ (flashing ❄ led) appears, then press the ⬛ key (short touch) to select. Then the following message will be displayed $dEFr$ On (led ❄ access).
To switch off the defrost manualy, press the button ↻ (short touch) until the message $dEFr$ (flashing ❄ led). Press the ⬛ key (short press) to select. Then the message $dEFr$ OFF (led ❄ off).
Defrost using the ▲ key (increments): To activate / deactivate the defrost manually, just press the ▲ key for 4 seconds.
Defrost via digital input: If function $F35$ - Digital input operation mode is set to 7 - Digital input: Manual defrost, just touch the button (not supplied) connected to the digital input.

❄
dEFr
MT-514E

6.3.3. Functions lockdown 🔒

The use of the functions lockdown brings greater security to the operation of the instrument. When it is active, the setpoint and other parameters can be visible to the user, but are protected against undue changes ($F42$ =2) or you can block changes of control functions and leave the adjustment of the setpoint enabled ($F42$ =1).
Using the key ↻ (short touch), access the function LOC in the easy menu, confirm by pressing ⬛ (short touch), then the message no will be displayed. After that keep the key ▼ pressed for the time configured for the functions lockdown $F43$, until LOC is displayed. The message On will be displayed indicating the lockdown function is activated upon releasing the key.

🔒
LOC
MT-514E

To unlock, turn the controller off and then turn it on again with the key ▼ pressed. Keep the key pressed until LOC is displayed. Keep the key pressed for ten seconds and the message OFF will be shown on the display indicating the deactivation of the lockdown function when the key is released.

6.3.4. Shutdown of Control Functions

Turning off 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 not by the Shutdown of Control Functios feature $F44$. When enabled, the control and alarm functions are turned off ($Ctrl$ OFF) or turned on ($Ctrl$ On) through the menu provided in the option $Ctrl$. When the control functions are switched off, the message OFF will be displayed alternately with the temperature and other messages. Control functions can be switched off / on by pressing the key ↻ for 5 seconds or by setting the $F35$ function - Digital input operation mode to 8 - Digital input: To switch off the manual control, just touch the button (not supplied) connected to the digital input to activate or deactivate this functionality.
Note: When restarting the control functions, the times defined in the functions are counted, and these delay the powering up of the instrument and the alarm inhibition time when switching on the controller.

Ctrl
MT-514E

6.3.5. Visualization of Processes

To view the process and the time elapsed, press ▼ (quick touch) or by the ↻ (Flatec) key pressing it until the message $Proc$ appears. This way, the controller will display the current process status, and the following messages may appear on the display:
dEL - Initial delay (delay in the instrument start-up)
$rEFr$ - Cooling
Hot - Heating
$dEFr$ - Defrost
$drA i$ - Drainage
$----$ - Control functions off
Note: If the function $F41$ - Display indication has been set to $Cool$ or USE the message of the process in progress will be displayed, the time elapsed from this process and then the message $tEMP$ followed by the display of the measured temperature by the sensor, for a few seconds on the display.

6.3.6. Minimum and Maximum Temperature Record

Pressing down the ▲ key or also via the quick access menu (see chapter 6), will cause the message $rE9$ to be displayed, then the minimum and maximum temperatures recorded.
For erasing the current minimum and maximum values, hold down the ↻ key (quick touch) until the message $CrE9$ is displayed, then the message $CodE$ will appear; enter the value 123, then confirm with the ⬛ key. If the code is correctly entered, the message rSt will be displayed. rSt. This procedure keeps unauthorized users from erasing the minimum and maximum temperature records.
Note 1: The minimum and maximum temperature records shall only be performed after the elapsing of the alarm inhibition time when energizing the controller and after the delay in the instrument energizing $F32$ + $F19$.
Note 2: The minimum and maximum temperature records shall only be performed after the compressor reaches the active preset setpoint ; before that, the $----$ messages will be displayed for the records of minimum and $----$ for the records of maximum temperature.

6.3.7. Unit Selection

To select the temperature unit in which the instrument will operate enter the function $F01$ using the access code 231 then press the ⬛. key. Then, select the unit desired $ºC$ or $ºF$ using the ▲ keys; to confirm press ⬛. Every time the unit is changed, the functions settings return to the default value, thus, they must be set up again.

6.3.8. Buzzer inhibition

When activated, the buzzer can be inhibited by pressing the ▼ key for two seconds. The Buzzer will remain inhibited until a new alarm event takes place.

6.4. Advanced operations

The functions menu can be accessed through the quick access menu (according to chapter 6), option $Func$ or by pressing simultaneously ▼ and ▲ during the temperature display. To allow change of parameters, enter $F01$ by pressing ⬛ (quick touch) and using the ▼ or ▲ keys enter code 123 (one hundred and twenty-three), and then confirm with ⬛. For changing the other functions, browse the menu through the ▼ or ▲ keys and proceed the same way in order to adjust them. To exit the menu and return to the normal operation, press ⬛ (long touch) until $----$ is displayed.
OBS: If the functions lockdown is enabled, when pressing the ▼ or ▲ keys, the controller will display the message LOC and will not allow parameter adjustment.

6.5. Parameter table

Fun	Description	CELSIUS				FAHRENHEIT			
		Mín	Máx	Unit	Default	Mín	Máx	Unit	Default
$F01$	Access code: 123 (one hundred and twenty three)	-	-	-	-	-	-	-	-
$F02$	Sensor indication offset	-20,0	20,0	°C	0,0	-36	36	°F	0
$F03$	Using Presets	no	yes	-	no	no	yes	-	no
$F04$	Output operation mode (OUT1)	0-cool.	1-heat.	-	0-cool.	0-cool.	1-heat.	-	0-cool.
$F05$	Output setpoint (rc1)	-50,0	200,0	°C	4,0	-58	392	°F	39
$F06$	Output control differential (Hysteresis) (rc2)	0,1	20,0	°C	1,0	1	36	°F	1
$F07$	Cooling time (interval between defrosts) (rc1)	1	9999	min.	240	1	9999	min.	240
$F08$	Defrost duration time (rc1)	0(no)	999	min.	30	0(no)	999	min.	30
$F09$	Output setpoint (rc2)	-50,0	200,0	°C	0,0	-58	392	°F	32
$F10$	Output control differential (Hysteresis) (rc2)	0.1	20	°C	1	1	36	°F	1
$F11$	Cooling time (interval between defrosts) (rc2)	1	9999	min.	240	1	9999	min.	240
$F12$	Defrost duration time (rc2)	0(no)	999	min.	30	0(no)	999	min.	30
$F13$	Minimum setpoint allowed for end user	-50,0	200,0	°C	-50,0	-58	392	°F	-58
$F14$	Maximum setpoint allowed for end user	-50,0	200,0	°C	75,0	-58	392	°F	167
$F15$	Minimum OUT1 output time on	0(no)	999	sec.	20	0(no)	999	sec.	20
$F16$	Minimum OUT1 output time off	0(no)	999	sec.	20	0(no)	999	sec.	20
$F17$	Initial state when powering up the instrument	0-cool.	1-defr.	-	0-cool.	0-cool.	1-defr.	-	0-cool.
$F18$	Temperature indication locked during defrost	no	yes	-	no	no	yes	-	no
$F19$	Delay in powering up the instrument	0(no)	240	min.	0(no)	0(no)	240	min.	0(no)
$F20$	Compressor status with sensor disconnected	0	2	-	0	0	2	-	0
$F21$	Compressor on time with sensor disconnected	1	999	min.	15	1	999	min.	15
$F22$	Compressor off time with sensor disconnected	1	999	min.	15	1	999	min.	15
$F23$	Maximum compressor on without reaching setpoint	0(no)	9999	min.	0(no)	0(no)	9999	min.	0(no)
$F24$	Low temperature alarm	-50(no)	200,0	°C	-50(no)	-58	392	°F	-58
$F25$	High temperature alarm	-50(no)	200,0	°C	200(no)	-58	392	°F	392
$F26$	Output OUT2 operation mode	1	7	-	1	1	7	-	1
$F27$	Fan Operation Mode during cooling	0	2	-	0	0	2	-	0
$F28$	Fan On Time	1	99	min.	2	1	99	min.	2
$F29$	Fan Off Time	1	99	min.	2	1	99	min.	2
$F30$	Fan Delay	0(no)	999	min.	2	0(no)	999	min.	2
$F31$	Time delay between compressors activations	0(no)	99	sec.	15	0(no)	99	sec.	15
$F32$	Alarm inhibition time when powering up the controller	0(no)	999	min.	0(no)	0(no)	999	min.	0(no)
$F33$	Alarm inhibition time by room temperature	0(no)	999	min.	0(no)	0(no)	999	min.	0(no)
$F34$	Enable Buzzer (0-Disabled / 1-Enabled)	0(off)	1(on)	-	0(off)	0(off)	1(on)	-	0(off)
$F35$	Digital input operation mode	0(no)	8	-	0(no)	0(no)	8	-	0(no)
$F36$	Output on time in OUT2 alarm status	0	999	sec.	1	0	999	sec.	1
$F37$	Output off time in OUT2 alarm status	0	999	sec.	1	0	999	sec.	1
$F38$	Door open time to trigger alarm	0(no)	999	min.	0(no)	0(no)	999	min.	0(no)
$F39$	Sensor digital filter intensity	0	1	-	0	0	1	-	0
$F40$	Intensity of the digital filter applied to the sensors	0	20	sec.	0(no)	0	20	sec.	0(no)
$F41$	Display indication	0	2	-	0	0	2	-	0
$F42$	Functions lockdown	0	2	-	0	0	2	-	0
$F43$	Time for functions lockdown	15	60	sec.	15	15	60	sec.	15
$F44$	Control functions shutdown	0(no)	2	-	0(no)	0(no)	2	-	0(no)

6.5.1. Description of parameters

F01- Access code 123 (one hundred and twenty-three):
This is required when intending to change the configuration parameters. Entering of this code is not required if the intention is just visualizing the parameters adjusted.
It allows entering of the expected access codes:
`123` - Allows access for changing the table parameters.
`231` - Allows configuring of the unit of measurement `ºF` or `ºC`.
`231` - To select the unit in which the instrument will operate enter the function `F01` using the access code `231` then press the `set` key. Then, select the unit desired `ºC` or `ºF` using the ⬆ or ⬇ keys; to confirm press `set`.
Note: Every time the unit is changed, the parameters should be reset, since they assume the 'standard' values of the parameter's table.

F02 - Sensor indication displacement (offset):
Allows compensation for any temperature deviations from sensor replacement or change in the cable length.

F03 - Using Presets:
Allows configuration of the controller so as whether or not to use the presets:
`no` - **No:** If configured this way, the instrument will not use the preset values in the control routines. For this purpose, the setpoint `SP` will be used, adjusted via the quick access menu. The control differential to be used shall be the same as in preset `rc1`, `F06`- "OUT1 output control differential (`rc1`)". The cooling time to be used shall be the same as in preset `rc1`, `F07`- OUT1 output cooling time (`rc1`)". Defrost time to be used will be the same as in preset 1, `F08`- "OUT1 output defrost time (`rc1`)".
The value configured in `SP` may be adjusted between `F13`- "Minimum setpoint allowed to the end user" and `F14` - "Maximum setpoint allowed to the end user".
In this configuration, the controller will not indicate which preset is enabled.
`YES` - **Yes:** Selection of presets will be made through the quick access menu, in the same way as for adjusting the setpoint. In this configuration, the controller will indicate in the display which preset is enabled, `rc1` or `rc2`. If configured this way, in the control routines the instrument will use the values of setpoint, control differential, cooling time and defrost time configured in the parameters table.

F04 - Output operating mode OUT1:
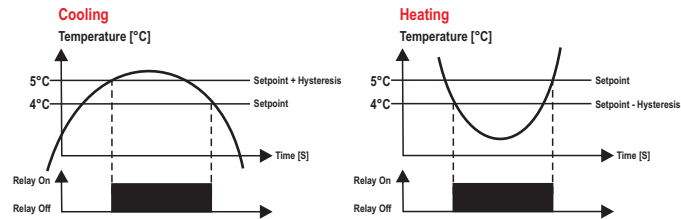Selects the out1 output operating mode:
`0` - Cooling
`1` - Heating

F05 - Operation setpoint (`rc1`):
It is the reference value for temperature control, that is, the temperature to be maintained in a controlled environment when preset (`rc1`) is used.

F06 - Control differential (Hysteresis) (`rc1`):
It is the difference in temperature (hysteresis) between TURNING ON and OFF the cooling (or heating) when recipe (`rc1`) is used.
Example: One wants to control the temperature at 4.0 °C with a differential of 1.0 °C. Therefore, the cooling is switched off at 4.0 °C and switched back on at 5.0 °C (4.0 + 1.0).

F07 - Cooling time (interval between defrosts) (`rc1`):
Corresponds to the time the controller will act on cooling when preset (`rc1`), is used; following this period, the controller enters the natural defrost process.

F08 - Defrost time (`rc1`):
It is the defrost duration time when preset (`rc1`) is used. Within this period, the relay will remain off; following this period, the controller will then return to the cooling state.

F09 - Operation setpoint (`rc2`):
It is the reference value for temperature control, that is, the temperature to be maintained in a controlled environment when preset (`rc2`) is used.

F10 - Control differential (Hysteresis) (`rc2`):
It is the difference in temperature (hysteresis) between TURNING ON and OFF the cooling (or heating) when preset (`rc2`) is used.
Example: One wants to control the temperature at 4.0 °C with a differential of 1.0 °C. Therefore, the cooling is switched off at 4.0 °C and switched back on at 5.0 °C (4.0 + 1.0).

F11 - Cooling time (interval between defrosts) (`rc2`):
Corresponds to the time the controller will act on cooling when recipe (`rc2`) is used; following this period, the controller enters the natural defrost process.

F12 - Defrost time (`rc2`):
It is the defrost duration time when preset (`rc2`) is used. Within this period, the relay will remain off; at the end of this period, the controller will return to the cooling state.

F13 - Minimum setpoint allowed to the end user:
Avoids regulation of excessively low setpoint temperatures by mistake.

F14 - Maximum setpoint allowed to the end user:
Avoids regulation of excessively high setpoint temperatures by mistake.

F15 -Minimum OUT1 output time on:
It is the minimum time the compressor will remain on, i.e. the time interval between the last start-up and the next stop.

F16 - Minimum OUT1 output time off:
It is the minimum time the compressor will remain off, i.e. the time interval between the last stop and the next start-up. It is used to relieve the discharge pressure and increase the service life of compressor.

F17 - Initial status when energizing the instrument:
It allows defrosting when controller is energized such as, for example, upon resuming of electric power (in the event of power outage).
`0` - Cooling
`1` - Defrost

F18 - Temperature indication locked during defrost:
If `F18` is enabled, the indication will only be released at the next cooling cycle after the temperature reaches the "locked" value again, or after 15 minutes in cooling (as a safety measure).

F19 - Instrument energization delay:
This function being enabled, when the instrument is energized it only works as temperature indicator remaining with the output off during the defrost time. In installations with several units of equipment, configuring different values for the delay time in the start-up of each instrument, it is possible to avoid peaks of demand by activating the loads at different times.
This delay may be of the compressor or of defrost (when defrost is configured at the start).
Note: At its end, the count of minimum time of output off is started, if there is any.

F20 - Compressor status with the sensor damaged:
If the sensor is in short-circuited, off or out of the measure range, the compressor assumes the set status in this function.
`0` - Compressor off
`1` - Compressor on
`2` - Cycling according to times defined in `F21` and `F22`
Note: If in the heating mode, and in error, the output will be switched off.

F21 - Compressor time on in case of error:
F22 - Compressor time off in case of error:
These determine the minimum time the compressor will remain on/off, respectively, if the sensor is off or out of the measure range.

F23 - Maximum Compressor on without reaching setpoint:
This is the maximum time the compressor may remain on without reaching the setpoint during the cooling process for safety reasons. If this time is surpassed, the output is switched off and also the visual alarm `ALrC` and the audible alarm (buzzer) will be activated. This function can be switched off by setting it at the minimum value 0 `no`.
Note 1: In this situation, the controller should be switched off and switched back on so as to continue with the operation.
Note 2: If the OUT2 output is set up to work differently from the alarm, this will also be switched off for safety reasons.

F24 - Low temperature alarm:
It is the temperature below that which the instrument will visually display the low temperature alarm `AtLo` as well as the audible alarm (Buzzer). The differential for switching off the alarm is fixed at 0.1°C / 1°F. This alarm considers the temperature shown on the display, thus being influenced by the temperature indication that was locked during the defrost `F18`. To disable this alarm, simply set this function to the minimum value until `no`.

F25 - High temperature alarm :
It is the temperature above that which the instrument will visually display the high temperature alarm `Athi` as well as the audible alarm (Buzzer). The differential for switching off the alarm is fixed at 0.1°C/1°F. This alarm considers the temperature shown on the display, thus being influenced by the temperature indication that was locked during the defrost `F18`. To disable this alarm, simply set this function to the maximum value until `no` is displayed.
Note: For safety, output OUT1 is switched `Athi` occurs, or if it is configured for cooling and a low temperature alarm `AtLo` occurs, therefore, you must set the alarm limits above (if heating) or below (if cooling) the desired temperature (setpoint of output OUT1).

F26 - Output OUT2 operation mode:
Select the operating mode of the OUT2 output.
`1` -**Extra alarm-absolute range:** It considers the values defined in `F24` and `F25` as minimum and maximum values to trigger the alarm output.
`2` -**Extra alarm-setpoint range:** It considers the active receipt setpoint `rc1` or `rc2` and the absolute values defined in `F24` and `F25`, that is, the positive value of these functions as minimum and maximum values to trigger the alarm output.
For example:
Desired temperature `SP` : -5ºC
Low temperature alarm `F24` : 2ºC
High temperature alarm `F25` : 2ºC
City Limits: (`SP` - `F24` and `SP` + `F25`).
The low temperature alarm will go off at -7°C (-5-2) and the high temperature alarm at -3°C (-5+2).
`3` -**Electric defrost (using resistances):** Where only the OUT2 output is activated during the defrost process.
`4` -**Hot gas defrost**: Where the compressor outputs OUT1 and OUT2 are activated during the defrost process.
`5` -**Output OUT2 as NF of output OUT1**: In this option, the OUT2 output is activated when the OUT1 output is deactivated, regardless of the state (cooling / heating or defrost), except when the sensor is in error `F20`.
`6` - **OUT2 output as ventilation:** In this mode, the output will be used to activate a fan that will remain on during the defrost interval. While the controller is cooling, the output will remain in operation according to the configuration selected in function `F27` - Fan Operation Mode during cooling.
`7` - **OUT2 output as an auxiliary compressor**: The output will be used to start a second compressor. Output OUT2 will be activated immediately after output OUT1 is activated, according to the value configured in function `F31` - Delay between the activation of compressors, and always switched off together with output OUT1.
Note 1: If the OUT2 output is configured to work different than an alarm, the absolute alarm indications are still visual (messages on the display) and audible (if the buzzer is enabled).
Note 2: If the OUT2 output is configured for defrost (electric or hot gas), after the defrost time has elapsed, a fixed time of 2 minutes is counted for drainage. This time is necessary for dripping, that is, for the last drops of water to drain from the evaporator. During this period, outputs OUT1 and OUT2 remain off.
Nota 3: If output OUT2 is configured for ventilation, and if a sensor error occurs, output OUT2 will be activated and deactivated together with output OUT1, that is, if OUT1 is activated OUT2 remains activated, and will continue to work together according to the configuration selected in function `F20` - Compressor status with the sensor disconnected.
Nota 4: If OUT2 output is configured as ventilation and function `F35` (Digital input operating mode) is configured as 1 or 2 (door open), OUT2 output will be turned off whenever the door is opened and turned back on when closing the door. If the door remains open for the time defined in `F38` (Door open time to issue alarm), the OUT1 and OUT2 outputs will remain off while the door is open.

F27 - Fan operation mode during cooling:
Selects the operating mode of the OUT2 output when $\boxed{F26}$ = 6.

$\boxed{0}$ - OUT2 output remains activated as long as OUT1 output (compressor) is activated. When the compressor is off by setpoint, the OUT2 output cycles according to the values configured in the functions $\boxed{F28}$ - Fan Time On and $\boxed{F29}$ - Fan Time Off;
$\boxed{1}$ - OUT2 output remains on regardless of output OUT1;
$\boxed{2}$ - OUT2 output remains on as long as OUT1 output on and off when OUT1 output is turned off.

F28 - Fan On Time:
F29 - Fan Off Time:
Define fan on time $\boxed{F28}$ and fan off time $\boxed{F29}$ during the off-cycle when $\boxed{F04}$ = 0, $\boxed{F26}$ =6 and $\boxed{F27}$ =0

F30 - Fan Delay:
Defines the time (delay) before activating the OUT2 output (if configured as fan $\boxed{F26}$ = 6) after the start of a new refrigeration cycle.

F31 - Delay between compressors being turned on:
Defines the time (delay) before activating the OUT2 output (if configured as auxiliary compressor $\boxed{F26}$ = 7). Every time the OUT1 output is activated, the time configured in this function will elapse before activating the OUT2 output.

32 - Alarm inhibition time when energizing the controller:
This is the time during which the alarm remains off even under conditions of alarm during the instrument start-up. This time will be counted after elapsing of the time configured in $\boxed{F19}$. This function can be switched off by setting it at the minimum value 0 $\boxed{no}$.

F33 - Alarm inhibition time by temperature:
With this configuration active, the temperature will need to remain in the alarm condition during the inhibition time set, for the alarm to be indicated. That way one can prevent alerts resulting from specific temperature variations, and after defrost.

F34 - Enable buzzer (0-Disabled/1-Enabled):
Allows enabling and disabling of the internal buzzer for alarm signaling.

F35 - Digital input operation mode
Select the operating mode of the digital input.
$\boxed{no}$ - Disabled
$\boxed{1}$ - Digital input: Door open (active when closing contact)
$\boxed{2}$ - Digital input: Door open (active when opening contact)
$\boxed{3}$ - Digital input: External alarm / power failure (active when closing contact)
$\boxed{4}$ - Digital input: External alarm / power failure (active when opening contact)
$\boxed{5}$ - Digital input: Door open and power failure (active when closing contact)
$\boxed{6}$ - Digital input: Door open and power failure (active when opening contact)
$\boxed{7}$ - Digital input: Push-button type switch (button) to manually start / stop defrost
$\boxed{8}$ - Digital input: Push-button type switch (button) to switch the control functions off or on

Examples of connection for detecting open door alarm:

This configuration may be used for the **MT-514⊟** to detect whether the door has been left open for a time above the value set up in "$\boxed{F33}$ - Time with open door to trigger alarm". In this configuration, the message $\boxed{AOPn}$ is displayed when an open door alarm is detected. To that end, the user may use the NO or NC pushbuttons (not supplied) connected to the digital input, as shown in examples below:
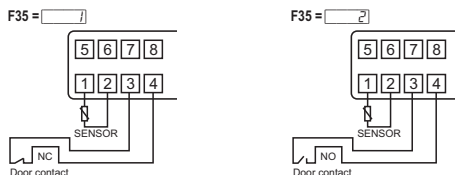
Examples of connection for power outage detection:

This configuration may be used when **MT-514⊟** is being energized by a 12/24 V DC battery (common in vaccine refrigerators) and one wants to detect when a power outage occurred (115/230 V AC). In this configuration, the message $\boxed{AUoL}$ is displayed when alarm is detected for power outage. To that end, the user may utilize a contactor or auxiliary contact (not supplied), where NC (F30=$\boxed{3}$) or NO (F30=$\boxed{4}$) contacts are connected to the digital input and contacts A1 and A2 (contactor coil) are connected to the power system, as shown in examples below:
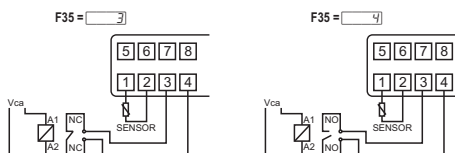

Example of connections for detecting open door and power outage:

This configuration may be used to detect power outage alarm (115/230 V AC) and also to detect that the door has been left open (either one event).
In those configurations, the messages $\boxed{AUoL}$ and $\boxed{AOPn}$ are displayed alternately when alarm event is detected (power outage or open door alarm).
For this purpose, the user may use the pushbuttons (not supplied) and a contactor or auxiliary contact (not supplied) connected in series or in parallel, as shown in examples below:
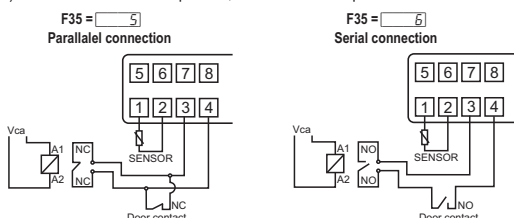
F36 - Output on time in OUT2 alarm status:
F37 - Output off time in OUT2 alarm status:
Selects the cycling time in seconds of the alarm output when it is active. If any of those functions are set with a value of $\boxed{0}$ the output will be permanently active.

F38 - Open door time for alarm:
If the door remains open for a time equal to, or greater than, the one configured in this parameter, the controller will set off a visual open door alarm $\boxed{AOPn}$ and the audible alarm (Buzzer).
The alarms are suspended upon the door closing. The audible alarm may be inhibited through the ▼ key (pressed for 2s). This function can be switched off by setting it at the minimum value 0 $\boxed{no}$.
Note 1: In order for the open door alarm to operate, the function "Digital input operating mode" $\boxed{F35}$ must be configured as open door contact.
The audible alarm is activated only if the buzzer is enabled in the function "Enable Buzzer (0-Disabled /1-Enabled)" $\boxed{F34}$.
Note 2: If the function "Digital input operating mode" $\boxed{F35}$ is configured as open door contact, the open door indication $\boxed{OPEn}$ will be displayed every time the door is open, except for the cases of alarm.

F39 - Operating mode of the digital filter:
$\boxed{0}$ - The filter acts both on the rise as on the decrease temperature.
$\boxed{1}$ - The filter acts only in the temperature rise ramp. When the temperature falls, your response will be immediate.

F40 -Digital filter intensity applied to the sensor:
This filter has the purpose of simulating increase in thermal mass at the sensor thereby increasing its response time (thermal inertia). The higher the value set in this function, the more time the sensor takes to respond.
This function can be switched off by setting it at the minimum value 0 $\boxed{no}$.

F41-Display indication:
Defines wheter the display will show the sensor temperature in real time or a static message on the display.
$\boxed{0}$ -Displays the sensor temperature in real time
$\boxed{1}$ -Does not display the temperature, only the message $\boxed{CooL}$ on the display
$\boxed{2}$ -Does not display the temperature, only the message $\boxed{USE}$ on the display
Note: If this function is configured as $\boxed{CooL}$ or $\boxed{USE}$ it is possible to view the temperature measured by the sensor at any time with a short touch on the ▼ key, where, firstly the message of the process in progress will be displayed as well as the elapsed time of this process and then the message $\boxed{tEmP}$ followed by the display of the temperature measured by the sensor, for a few seconds on the display.

F42 - Functions lockdown:
This allows and configures the functions lockdown.
$\boxed{0}$ - Do not allow the functions lockdown.
$\boxed{1}$ - Allow a partial lockdown where the control functions will be locked but the adjustment of the setpoint, manual defrost, and maximum and minimum record are allowed.
$\boxed{2}$ - Allow the full lockdown, enabling only the manual defrost and maximum and minimum record.

F43 - Time for functions lockdown:
Allow lockdown of control functions (see item 6.3.3).
$\boxed{15}$ - $\boxed{60}$ Defines the time in seconds for the controller to activate.

F44 - Control functions shutdown:
Allow control functions shutdown (see item 6.3.4).
$\boxed{no}$ Disables the control functions shutdown.
$\boxed{1}$ Enables activation/deactivation of the control functions only if the functions are unlocked.
$\boxed{2}$ Enables activation/deactivation of the control functions even if the functions are locked.

7. SIGNALS

|	
$\boxed{Err1}$	**Sensor disconnected or damaged.**
$\boxed{dEFr}$ $\boxed{On}$	**Manual activation of defrost process.**
$\boxed{dEFr}$ $\boxed{OFF}$	**Manual activation of end of defrost process.**
$\boxed{AtLo}$	**Low temperature alarm.**
$\boxed{Athi}$	**High temperature alarm.**
$\boxed{ALrC}$	**Compressor reached maximum time on limit without reaching SP.**
$\boxed{AUoL}$	**Power outage alarm indication.**
$\boxed{AOPn}$	**Open door alarm indication.**
$\boxed{OPEn}$	**Open door indication.**
$\boxed{inib}$	**Buzzer inhibited.**
$\boxed{LOC}$ $\boxed{On}$	**Functions lockdown.**
$\boxed{LOC}$ $\boxed{OFF}$	**Unlocking of functions.**
$\boxed{OFF}$	**Control functions off.**
$\boxed{ECAL}$	**Contact Full Gauge Controls.**
$\boxed{PPPP}$	**Reconfigure the values of the functions.**

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 unload 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
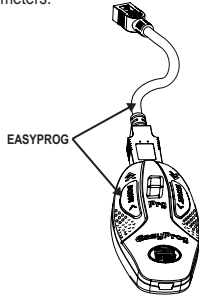
## Ecase

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.
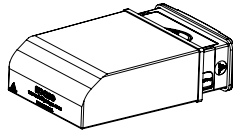
Extension Frame

The Full Gauge Controls extension frame allows the installation of Evolution / Ri line with measures 76x34x77 mm (dimensions of the clipping for fixing in the extension frame is 71x29mm) in varied situations, since it eliminates precision cut to embed the instrument. Allows customization via a sticker with the brand and the company contact, and accompany two 10A (250 Vac) switches that can trigger internal light, air curtain, on / off system or fan.
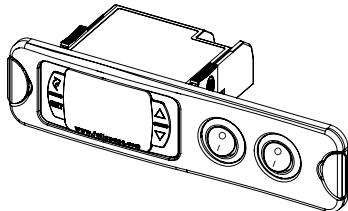
Electrical noise suppressing filter
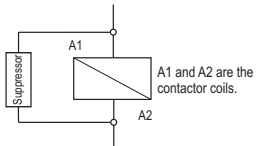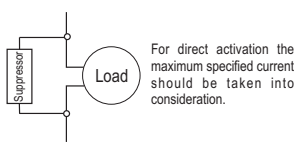
Contact suppressor connection diagram

RC FILTER

Suppressor

A1

A2

A1 and A2 are the contactor coils.

Diagram for suppressor installation for direct drive load inputs

Suppressor

Load

For direct activation the maximum specified current should be taken into consideration.

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.

WARRANTY - FULL GAUGE CONTROLS

Products manufactured by Full Gauge Controls, as of May 2005, have a two (02) year warranty, as of the date of the consigned sale, as stated on the invoice. They are guaranteed against manufacturing defects that make them unsuitable or inadequate for their intended use.

EXCEPTIONS TO WARRANTY
The Warranty does not cover expenses incurred for freight and/or insurance when sending products with signs of defect or faulty functioning to an authorized provider of technical support services. The following events are not covered either: natural wear and tear of parts; external damage caused by falls or inadequate packaging of products.

LOSS OF WARRANTY
Products will automatically lose its warranty in the following cases:
- The instructions for assembly and use found in the technical description and installation procedures in Standard IEC60364 are not obeyed;
- The product is submitted to conditions beyond the limits specified in its technical description;
- The product is violated or repaired by any person not a member of the technical team of Full Gauge Controls;
- Damage has been caused by a fall, blow and/or impact, infiltration of water, overload and/or atmospheric discharge.

USE OF WARRANTY
To make use of the warranty, customers must send the properly packaged product to Full Gauge Controls together with the invoice or receipt for the corresponding purchase. As much information as possible in relation to the issue detected must be sent to facilitate analysis, testing and execution of the service.
These procedures and any maintenance of the product may only be provided by Full Gauge Controls Technical Support services in the company's headquarters at Rua Júlio de Castilhos, 250 - CEP 92120-030 - Canoas - Rio Grande do Sul – Brasil

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