



MT-543E *plus* Ver.06

FOUR-STAGE DIGITAL CONTROLLER WITH ALARM, CYCLICAL TIMER, SOAK FUNCTION, AND SERIAL COMMUNICATION



MT543EPL USV06-02T-18595

Have this manual to hand using the FG Finder application.

- Audible alarm
- Cyclical timer
- Functions lock
- Control Functions Shutdown
- Serial programming
- Supervisory system
- Degree of protection

WARNING

- BEFORE INSTALLING THE CONTROLLER WE RECOMMEND READING THE INSTRUCTION MANUAL THOROUGHLY IN ORDER TO AVOID POSSIBLE DAMAGE TO THE PRODUCT.**
 - PRECAUTIONS WHEN INSTALLING THE PRODUCT:**
Before performing any procedure in this instrument, disconnect it from the mains; make sure the instrument has proper ventilation, avoiding installation in panels containing devices that may force it to work outside the specified temperature limits;
Install the product away from sources that can generate electromagnetic disturbances, such as: motors, contactors, relays, solenoid valves, etc;
 - AUTHORIZED SERVICES:**
The installation and maintenance of the product must only be performed by qualified personnel.
 - ACCESSORIES:**
Only use original accessories of Full Gauge Controls.
If you have any questions, please contact our technical support.
- DUE TO CONSTANT EVOLUTION, FULL GAUGE CONTROLS RESERVES THE RIGHT TO CHANGE THE INFORMATION CONTAINED IN THIS MANUAL.**

1. DESCRIPTION

It has four stages that can be applied to refrigeration or heating: the first stage, together with the third stage, works in systems that require minimum ventilation; the third one also works as a cyclical timer; the fourth one works as an alarm. The second, third and fourth stages work also in the following modes: Refrigeration, heating, refrigeration (Sp1), and heating (SP1). Stage 1 can be used in soak mode and allows configuring up to five different setpoints and the time each one will remain active. **MT-543E plus** accepts two types of sensor: NTC thermistor (-50 to 200 °C*), PT-100** (-99 to 300 °C). It has an intelligent functions lock system, a mode to switch off the control functions, an internal audible alarm (buzzer), and a configurable digital filter and serial interface for communications with Sitrad.

2. APPLICATIONS

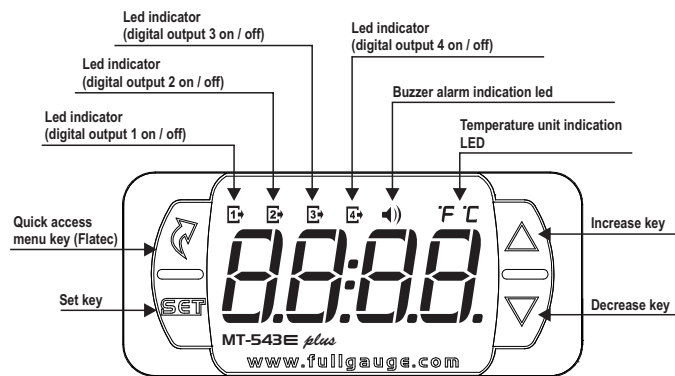
- Blood banks
- Vaccines
- Temperature multistage systems
- Beer brewing
- Air conditioners
- Datacenters

3. TECHNICAL SPECIFICATIONS

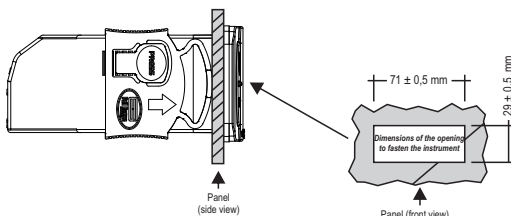
Power supply	MT-543E Plus: 115~230 Vac ±10% (50/60 Hz) MT-543EL Plus: 12 or 24 Vac/dc +10%
Approximate consumption	0,5 VA
Control temperature	*NTC: -50 to 200°C / -58 to 392°F **Pt100: -200 a 300°C / -328 a 572°F
Operating temperature	0 to 50°C / 32 to 122°F
Maximum output current	OUT1, OUT2, OUT3, OUT4: 5(3)A / 250 Vac / 1/8HP
Operating humidity	10 a 90% UR (no condensation)
Dimensions (mm)	76 x 34 x 77 mm (WxHxP)
Dimensions of the clip for fixing the instrument	71 ± 0,5 x 29 ± 0,5 mm (see item 5)

Note: Sensor cable length can be increased to up to 200 meters by the user by using a PP 2 x 24 AWG cable.
*It measures temperatures up to 200 °C using the SB59 (sold separately).
**Sensors sold separately

4. INDICATIONS AND KEYS



5. INSTALLATION - PANEL AND ELECTRIC CONNECTIONS



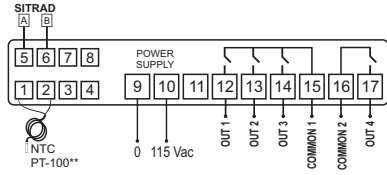
WARNING

FOR INSTALLATIONS THAT REQUIRE WATER TIGHTNESS, THE OPENING TO INSTALL THE CONTROLLER MUST BE 70.5 x 29 mm MAXIMUM. THE SIDE LATCHES MUST BE FIXED IN ORDER TO PRESS THE SEALING GASKET TO PREVENT INFILTRATION BETWEEN THE OPENING AND THE CONTROLLER.

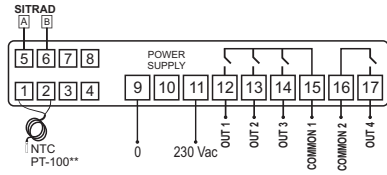
IMPORTANT

IT IS ESSENTIAL TO USE PROPER TOOLS IN ORDER TO AVOID DAMAGES TO THE INSTRUMENT'S CONNECTION TERMINALS:
⊖ 3/32" (2.4 mm) SLOTTED SCREW DRIVER FOR ADJUSTMENTS IN THE SIGNAL TERMINALS;
⊕ #1 PHILLIPS SCREW DRIVER FOR ADJUSTMENTS IN THE POWER TERMINALS.

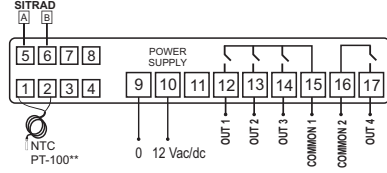
115 Vac connection



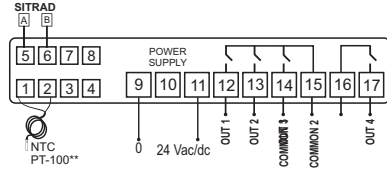
230 Vac connection



12 Vac/dc connection



24 Vac/dc connection

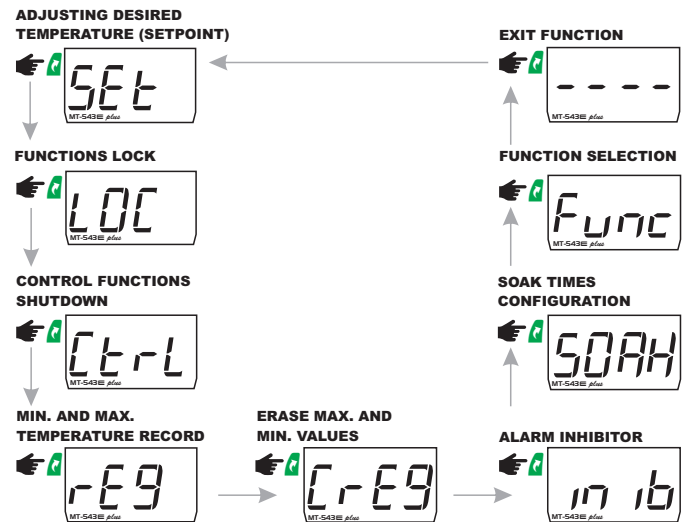


** This sensor is sold separately.

6. OPERATIONS

6.1. Quick Access Menu Map

To access or browse the quick access menu, use the key (quick touch) while the temperature is being displayed by the controller. With each touch the next function in the list is displayed. To confirm use the key (quick touch). See chapter 6.3 for more details. The map of functions is shown below:



6.2. Quick access keys map

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

	Hold down for 2 seconds: Setpoint adjustment.
	Hold down for 2 seconds: Inhibits the audible alarm and alarm output.
	Quick touch: Maximum and minimum temperature display.
	Hold down for 2 seconds: clear history when records are being displayed.
	Hold down for 2 seconds: Soak Menu.
	Held down simultaneously: Enters function selection.

6.3 Basic operations

6.3.1 Adjusting the desired temperature

To enter the setpoint adjustment menu, press \square for 2 seconds until $[5E1]$ is displayed or use the easy access key (item 6.1). The message $[5P1]$ and then the value to adjust the setpoint of stage 1 will be displayed in sequence. Use the \blacktriangle or \blacktriangledown keys to change the value and press \square to confirm.

- If stage 2 is configured to operate as refrigeration controlled by SP2 (F08=0) or heating controlled by SP2 (F08=1), the message $[5P2]$ will be displayed afterwards. Use the \blacktriangle or \blacktriangledown keys again to change the value and press \square to confirm.

- If stage 3 is configured to operate as refrigeration controlled by SP3 (F13=0) or heating controlled by SP3 (F13=1), the message $[5P3]$ will be displayed afterwards. Use the \blacktriangle or \blacktriangledown keys again to change the value and press \square to confirm.

- If stage 4 is configured to operate as refrigeration controlled by SP4 (F30=0) or heating controlled by SP4 (F30=1), the message $[5P4]$ will be displayed afterwards. Use the \blacktriangle or \blacktriangledown keys again to change the value and press \square to confirm.

If the 3rd stage is configured as a cyclical timer (F13 = 2) or minimum ventilation (F13 = 3), the adjustment of the time of the cyclical timer of the 3rd stage on $([E0n])$ and the time of the cyclical timer of the 3rd stage off $([E0FF])$ will be possible. The adjustment of alarm on $([E0n])$ and off $([E0FF])$ times will be allowed if stage 4 is configured as alarm (F30 = 2, 3, or 4).

Finally the indication $[- - -]$ is signaled concluding the configuration.

6.3.2 Functions Lock

The use of the functions lock brings greater security to the operation of the instrument. The setpoint and other parameters can be visible to the user when active, but they are protected against undue changes (F42=2) or only block changes to the control functions and leave the adjustment of the setpoint enabled (F42=1). To activate the functions lock, access $[L0L]$ in the quick access menu. The message $[n0]$ (lock must be enabled and deactivated) will be displayed. When the message is being display press and hold \blacktriangledown for the time configured in (F43) for the functions to be locked. The activation will be indicated by the message $[L0L] [0n]$. To enable the use of this function, F42 must be configured with 1 or 2.

When trying to change the parameters, the $[L0L]$ message shown in the display indicates that the functions lock is active, to deactivate it, turn the controller off and then turn it on again with the \blacktriangledown key held down. Keep the key held down until the $[L0L] [0FF]$ message indicates the unlocking (10 seconds).

6.3.3 Control Functions Shutdown

Turning the control functions off allows for the controller to operate just as an indicator of temperature, keeping the control outputs and the alarms disconnected. Use of this feature is enabled or disabled by the control functions shutdown (F44) function. When enabled, the control and alarms functions are turned off $([EEL] [0FF])$ or on $([EEL] [0n])$ through the quick access menu in the option $[EEL]$. When the control functions are off the message $[0FF]$ will then be displayed alternately with the temperature and the other messages.

6.3.4 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 \blacktriangle key. The minimum and maximum temperatures recorded will be displayed in sequence. To erase the minimum and maximum values recorded, keep the \blacktriangle key pressed for 2 seconds while the records are being displayed or use the option $[ELE9]$ in the quick access menu. The message $[ELE]$ indicates that the records were erased.

6.3.5 Selection of units

To select the units the system will use to operate, press \blacktriangle and \blacktriangledown simultaneously while the temperature is being displayed, enter the function $[F01]$ using the access code $[237]$ and then press \square . Then select the desired unit $[0L]$ or $[0F]$ using the \blacktriangle or \blacktriangledown keys, and press \square . Whenever the units are changed, the functions' configuration assumes the factory default, so they need to be configured again.

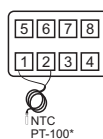
6.3.6 Selection of the type of sensor

It is required when you want to change the type of sensor connected to the controller. You can choose the NTC thermistor or PT-100.

To select the type of sensor that the system will use to operate, press \blacktriangle and \blacktriangledown simultaneously (quick touch) while the temperature is being displayed, enter the function $[F01]$ using the access code $[312]$ and then press \square . The message $[5En5]$ will be displayed, then select the desired sensor type $[nLc]$ (thermistor NTC) or $[PE01]$ (thermistor PT-100*) using the \blacktriangle or \blacktriangledown keys, and press \square to confirm. Whenever the type of sensor is changed, the configuration of the functions assumes the factory default, so they need to be configured again.

6.3.7 Sensor Connection

The NTC or PT100* sensors must be connected according to the picture below.



* This sensor is sold separately.

6.3.8 Audible alarm and alarm output inhibitor

To inhibit the alarm output OUT4 and / or the audible alarm (buzzer), when they are active, press \blacktriangledown for 2 seconds. In this case, if OUT4 and buzzer are active, they will both be inhibited.

It is also possible to inhibit the alarm or buzzer through the option $[vnb]$ in the quick access \blacktriangle , where it is possible to choose the individual alarm to be inhibited $([0vL4]$ or $[0v22])$ using the \blacktriangle or \blacktriangledown keys and pressing \square .

6.3.9 Stages

MT-543E plus controller has four stages.

Stages 1 and 2 work only as refrigeration or heating.

Besides operating as refrigeration or heating, Stage 3 can act as a cyclical timer or minimum ventilation. It has five operating modes when configured as cyclical timer:

- Independent (F22=0): the timer cycles are according to the times configured in F20 $([E0n])$ and F21 $([E0FF])$.

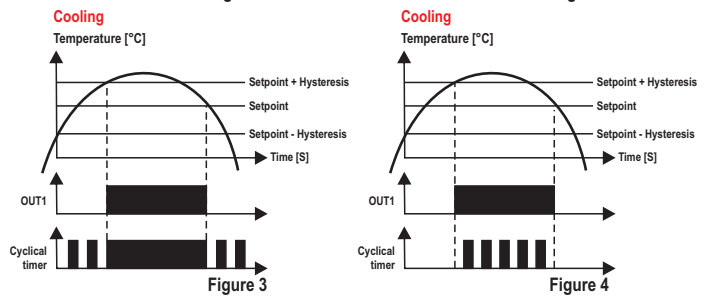
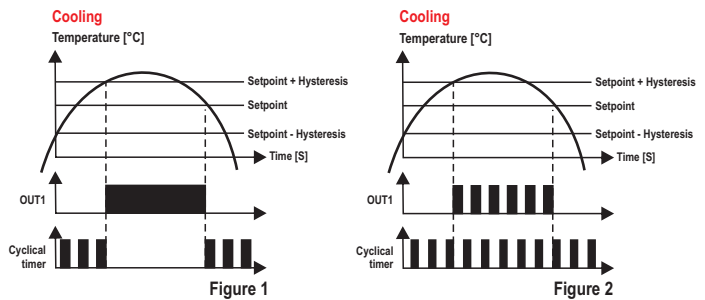
- Timer triggered by SP1 (F22=1): the timer is triggered whenever the temperature reaches the value configured for SP1. The timer switches off when the temperature reaches $SP1 + F06$ (if stage 1 is configured as refrigeration) or $SP1 - F06$ (if stage 1 is configured as heating), as shown in Figure 1.

- Stage 1 linked to the cyclical timer (timer switches on upon power up) (F22=2): in this configuration, the timer cycles according to the times configured in F20 $([E0n])$ and F21 $([E0FF])$. The Stage 1 starts to cycle when the temperature reaches $SP1 + F06$ (if stage 1 is configured as refrigeration) or $SP1 - F06$ (if stage 1 is configured as heating), as shown in Figure 1.

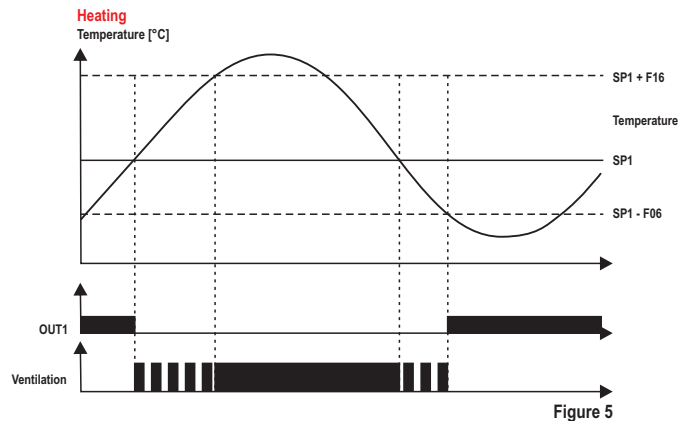
- Stage 1 linked to the cyclical timer (timer off upon power up) (F22=3): The operation is similar to the previous configuration. The difference in this configuration is that the timer starts off.

- Cyclical timer output is on whenever stage 1 output is on (F22=4): in this operating mode timer cycles according to the times configured in F20 $([E0n])$ and F21 $([E0FF])$ and stage 3 stops cycling and keeps the output switched on, whenever stage 1 output switches on, as shown in Figure 3.

- Cyclical timer output cycles whenever stage 1 output is on (F22=5): stage 3 will cycle only when stage 1 output is on, observing the times configured in F20 $([E0n])$ and F21 $([E0FF])$, as shown in Figure 4.



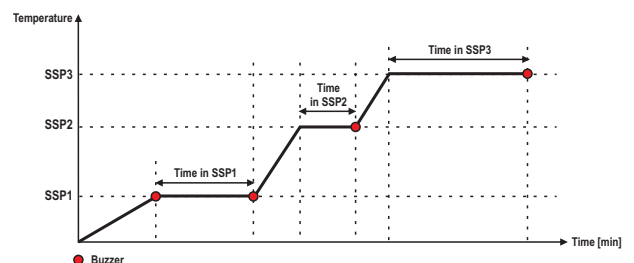
Stage 3 configured as minimum ventilation; it will act together with stage 1 (configured for heating) in systems that require minimum ventilation. Functioning as follows: when the temperature is between $SP1$ and $SP1-F06$ or between $SP1$ and $SP1+F16$, stage 3 will cycle according to the times configured in F20 $([E0n])$ e F21 $([E0FF])$. If the temperature is below $SP1-F06$, the ventilation is switched off, and if the temperature is higher than $SP1+F16$, the ventilation remains on, and stays in this condition until it reaches the setpoint again, as shown in Figure 5.



Like in the previous stages, stage 4 can also be configured as refrigeration or heating. It can also operate as an in-range alarm, relative out-of-range (F30 = 2, 3, and 4).

6.3.10 Soak Function

In the soak function mode (F45=1) up to five different setpoints can be configured to act for different times in output OUT1. The first desired setpoint (SSP1) is configured in function F46 and the time in minutes the controller must remain in this setpoint (F47), as well as the sequential setpoints (SSP2, SSP3, SSP4, and SSP5) in functions (F48, F50, F52 e F54), and respective permanence times (F49, F51, F53 e F55).



In the soak mode, the controller operates in the configured setpoint for the chosen permanence time. The permanence time count is only started when the temperature reaches the soak setpoint for the first time. Upon finishing the permanence time count, the controller will operate with the next soak setpoint. If this is the last soak setpoint, the controller switches off output OUT1 and waits for the process to be restarted through the menu [50RH] option [0n]. The stage operating mode (refrigeration or heating) must be selected in function F03, as well as the control differential (hysteresis) in F06.

6.3.10.1 Soak Menu

The soak control mode is off by default. Follow the steps below to start the process:

- Access the quick access (A), navigate through the menu pressing A until reaching the option [50RH] and press B, or press the A and B keys simultaneously to enter the menu [50RH].
- Use the A or B keys to navigate to the option [0n] and press B.
- Use the A or B keys to select the soak setpoint (SSP) 1, 2, 3, 4, or 5, in which the control will be started and press B. The message [50RH] [0n] will be displayed.

If required, follow the steps below to cancel the soak process:

- Access the quick access (A), navigate through the menu pressing A until reaching the option [50RH] and press B, or press the A and B keys simultaneously to enter the menu [50RH].
- Use the A or B keys to navigate to the option [0FF] and press B. The message [50RH] [0FF] will be displayed.

Follow the steps below to view the soak mode control information, such as functions configured for the current soak point (setpoint and permanence time):

- Access the quick access (A), navigate through the menu pressing A until reaching the option [50RH] and press B, or press the A and B keys simultaneously to enter the menu [50RH].
- Use the A or B keys to navigate to the option [nFo] and press B. Depending on the current soak point, the messages [55P1], [55P2], [55P3], [55P4] or [55P5] will be displayed in sequence, followed by the configured temperature and the permanence time [EtoE] [00:00] configured for this soak point.

To erase all the soak point configurations, i.e. reconfigure functions F46 to F55 with the default values, thus resetting the time of all soak points, follow the steps below:

- Access the quick access (A), navigate through the menu pressing A until reaching the option [50RH] and press B, or press the A and B keys simultaneously to enter the menu [50RH].
- Use the A or B keys to navigate to the option [55E] and press B.
- Use the A or B keys to select the option [4E5] and press B. The message [50RH] [55E] will be displayed indicating that all functions related to the soak control mode have been changed to the default values, i.e. temperatures changed to 23° C and permanence time to 0.

6.3.10.2 Messages

The following messages are displayed during the soak control mode:

After the soak control mode is started, the message [55P1], [55P2], [55P3], [55P4] or [55P5] will be displayed alternating with the temperature and other messages, indicating which soak point is active. The countdown timer [00:00] (hours : minutes) of the permanence time for the soak point will only be displayed after the controller reaches the temperature configured as the soak setpoint, i.e. the countdown timer is not displayed while the control is operating in the transition between temperatures (slope).

6.5 Parameter table

Fun	Description	NTC								PT-100							
		CELSIUS				FAHRENHEIT				CELSIUS				FAHRENHEIT			
		Min	Max	Unit	Standard	Min	Max	Unit	Standard	Min	Max	Unit	Standard	Min	Max	Unit	Standard
[F01]	Access code	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[F02]	Indication offset	-5	5	°C	0	-9	9	°F	0	-50	50	°C	0	-90	90	°F	0
[F03]	Stage 1 operating mode	0	1	-	1	0	1	-	1	0	1	-	1	0	1	-	1
[F04]	Minimum setpoint allowed (stage 1)	-50	200	°C	-50	-58	392	°F	-58	-200	300	°C	-200	-328	572	°F	-328
[F05]	Maximum setpoint (stage 1)	-50	200	°C	105	-58	392	°F	221	-200	300	°C	300	-328	572	°F	572
[F06]	Stage 1 control differential (hysteresis)	0.1	20	°C	1	1	36	°F	2	1	50	°C	2	2	90	°F	4
[F07]	Minimum delay to switch on stage 1 output again	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0
[F08]	Stage 2 operating mode	0	3	-	0	0	3	-	0	0	3	-	0	0	3	-	0
[F09]	Minimum setpoint allowed (stage 2)	-50	200	°C	-50	-58	392	°F	-58	-200	300	°C	-200	-328	572	°F	-328
[F10]	Maximum setpoint allowed (stage 2)	-50	200	°C	105	-58	392	°F	221	-200	300	°C	300	-328	572	°F	572
[F11]	Stage 2 control differential (hysteresis)	0.1	20	°C	1	1	36	°F	2	1	50	°C	2	2	90	°F	4
[F12]	Minimum delay to switch on stage 2 output again	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0
[F13]	Stage 3 operating mode	0	5	-	0	0	5	-	0	0	5	-	0	0	5	-	0
[F14]	Minimum setpoint allowed (stage 3)	-50	200	°C	-50	-58	392	°F	-58	-200	300	°C	-200	-328	572	°F	-328
[F15]	Maximum setpoint allowed (stage 3)	-50	200	°C	105	-58	392	°F	221	-200	300	°C	300	-328	572	°F	572
[F16]	Stage 3 control differential (hysteresis)	0.1	20	°C	1	1	36	°F	2	1	50	°C	2	2	90	°F	4
[F17]	Minimum delay to switch on stage 3 output again	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0
[F18]	Stage 3 cyclical timer time base	0	1	-	0	0	1	-	0	0	1	-	0	0	1	-	0
[F19]	Time to activate stage 3 cyclical timer	0	999	sec.	5	0	999	sec.	5	0	999	sec.	5	0	999	sec.	5
[F20]	Time of cyclical timer of stage 3 on	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0
[F21]	Time of cyclical timer of stage 3 off	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0
[F22]	Cyclical timer operating mode	0	5	-	0	0	5	-	0	0	5	-	0	0	5	-	0
[F23]	Buzzer operating mode	0	2	-	1	0	2	-	1	0	2	-	1	0	2	-	1
[F24]	Buzzer operating point (lower threshold)	-50	200	°C	-50	-58	392	°F	-58	-200	300	°C	-200	-328	572	°F	-328
[F25]	Buzzer operating point (upper threshold)	-50	200	°C	105	-58	392	°F	221	-200	300	°C	300	-328	572	°F	572
[F26]	Buzzer on time	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1
[F27]	Buzzer off time	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1
[F28]	Alarm inhibition time upon power up	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0
[F29]	Time to reactivate the buzzer when manually inhibited	Auto	999	Min.	Auto	Auto	999	Min.	Auto	Auto	999	Min.	Auto	Auto	999	Min.	Auto
[F30]	Stage 4 operating mode	0	6	-	3	0	6	-	3	0	6	-	3	0	6	-	3
[F31]	Minimum setpoint allowed (stage 4)	-50	200	°C	21	-58	392	°F	70	-200	300	°C	21	-328	572	°F	70
[F32]	Maximum setpoint allowed (stage 4)	-50	200	°C	27	-58	392	°F	81	-200	300	°C	27	-328	572	°F	81
[F33]	Stage 4 control differential (hysteresis)	0.1	20	°C	1	1	36	°F	2	1	50	°C	2	2	90	°F	4

6.3.10.3 Audible warnings

The following audible warnings will occur during the soak control mode:

- When the control reaches the temperature of the first soak point, i.e. at the moment that the permanence time count of the first soak point is started, an audible warning will occur, which will be a constant activation of the buzzer (internal alarm) for approximately 2 seconds.
- Whenever the control reaches the soak point permanence time and changes the setpoint to the next soak point, an audible warning will occur, with three consecutive activations of the buzzer (internal alarm).
- When the soak point operation is finished, i.e. when the permanence time of the last soak point is reached, an audible warning will occur with intermittent activations of the buzzer for 10 seconds.

NOTE: When not all five soak points are required, unused soak points must be configured with a permanence time of 0 (F49, F51, F53, or F55).

NOTE 2: When the controller is powered up in soak mode, output OUT1 will be off and the process will start only after being activated in menu [50RH] option [0n].

NOTE 3: When the controller is operating in soak mode, it is not possible to use the audible warning (buzzer) as temperature alarm (F23).

IMPORTANT: The controller has no influence on the time the system takes to go from one setpoint to the next. It controls only the permanence time in the setpoint (soak point). The slope time (incline) between soak points depends only on the capacity of the system, and not on the controller.

6.4 Advanced Operations

6.4.1 Access to the main menu

The main menu can be accessed through the quick access menu, option [FUN] or by pressing A and B simultaneously (quick touch) while the temperature is being displayed.

6.4.2 Access code

To allow the altering of parameters, enter the function [FD] by pressing B (quick touch), enter the access code 123 (one hundred and twenty-three) using the A or B keys, and confirm with B.

6.4.3 Changing the controller parameters

In the function menu, after entering the access code correctly in function [FD] select the desired option using the A or B keys. Press B (quick touch) after selecting the function to view its value. Use A or B to change the value and press B 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), hold down B (long touch) until [---] appears.

Fun	Description	NTC								PT-100							
		CELSIUS				FAHRENHEIT				CELSIUS				FAHRENHEIT			
		Min	Max	Unit	Standard	Min	Max	Unit	Standard	Min	Max	Unit	Standard	Min	Max	Unit	Standard
F34	Minimum delay to switch on stage 4 output again	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0
F35	Alarm inhibition time upon power up	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0
F36	Time to reactivate the alarm when manually inhibited	Auto	999	Min.	Auto	Auto	999	Min.	Auto	Auto	999	Min.	Auto	Auto	999	Min.	Auto
F37	Alarm on time	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1
F38	Alarm off time	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1
F39	Alarm inhibition time (delay)	0(NO)	999	Min.	0(NO)	0(NO)	999	Min.	0(NO)	0(NO)	999	Min.	0(NO)	0(NO)	999	Min.	0(NO)
F40	Digital filter operating mode	0	1	-	0	0	1	-	0	0	1	-	0	0	1	-	0
F41	Digital filter intensity applied to the sensor	0	20	sec.	0	0	20	sec.	0	0	20	sec.	0	0	20	sec.	0
F42	Functions lock	0	2	-	0	0	2	-	0	0	2	-	0	0	2	-	0
F43	Time for functions lock	15	60	sec.	15	15	60	sec.	15	15	60	sec.	15	15	60	sec.	15
F44	Control Functions Shutdown	0(NO)	2	-	0(NO)	0(NO)	2	-	0(NO)	0(NO)	2	-	0(NO)	0(NO)	2	-	0(NO)
F45	Enable the soak function feature in output Out1	0	1	-	0	0	1	-	0	0	1	-	0	0	1	-	0
F46	Temperature in the soak point (SSP1)	-50	200	°C	23	-58	392	°F	73	-200	300	°C	23	-328	572	°F	73
F47	Permanence time in the soak point	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0
F48	Temperature in the soak point2 (SSP2)	-50	200	°C	23	-58	392	°F	73	-200	300	°C	23	-328	572	°F	73
F49	Permanence time in the soak point2	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0
F50	Temperature in the soak point3 (SSP3)	-50	200	°C	23	-58	392	°F	73	-200	300	°C	23	-328	572	°F	73
F51	Permanence time in the soak point3	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0
F52	Temperature in the soak point4 (SSP4)	-50	200	°C	23	-58	392	°F	73	-200	300	°C	23	-328	572	°F	73
F53	Permanence time in the soak point4	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0
F54	Temperature in the soak point5 (SSP5)	-50	200	°C	23	-58	392	°F	73	-200	300	°C	23	-328	572	°F	73
F55	Permanence time in the soak point5	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0	0	999	Min.	0
F56	RS-485 network address	1	247	-	1	1	247	-	1	1	247	-	1	1	247	-	1

Caption: = no
 = automatic

6.5.1 Description of parameters

F01 - Access code (123):

Required when you want to change configuration parameters. This code is not required for viewing the parameters.

F02 - Indication offset:

Allows for the compensation of possible deviations in the temperature reading caused by the replacement of the sensor or changes in the cable length.

F03 - Stage 1 operating mode:

- Refrigeration
 - Heating

F04 - Minimum setpoint allowed to the end user (1st stage):

Electronic backstop aimed to prevent an exceedingly low temperature being inadvertently adjusted in the setpoint.

F05 - Maximum setpoint allowed to the end user (1st stage):

Electronic backstop aimed to prevent an exceedingly high temperature being inadvertently adjusted in the setpoint.

F06 - Stage 1 control differential (hysteresis):

It is the temperature difference (hysteresis) between switching output OUT1 ON and OFF.

F07 - Minimum delay to switch on stage 1 output again:

It is the minimum time the OUT1 output will remain off, i.e. the length of time between the last stop and the next start up.

F08 - Stage 2 operating mode:

- Refrigeration (controlled by SP2)
 - Heating (controlled by SP2)
 - Refrigeration (controlled by SP1)
 - Heating (controlled by SP1)

F09 - Minimum setpoint allowed to the end user (2nd stage):

F10 - Maximum setpoint allowed to the end user (2nd stage):

Electronic backstop to prevent exceedingly low or high temperatures being inadvertently adjusted in the setpoint.

F11 - Stage 2 control differential (hysteresis):

It is the temperature difference (hysteresis) between switching output OUT2 ON and OFF.

F12 - Minimum delay to switch on stage 2 output again:

It is the minimum time the OUT2 output will remain off, i.e. the length of time between the last stop and the next start up.

F13 - Stage 3 operating mode:

- Refrigeration (controlled by SP3)
 - Heating (controlled by SP3)
 - Cyclical Timer
 - Minimum ventilation
 - Refrigeration (controlled by SP1)
 - Heating (controlled by SP1)

NOTE: The operation of the minimum ventilation is described on item 6.3.9.

F14 - Minimum setpoint allowed to the end user (3rd stage):

F15 - Maximum setpoint allowed to the end user (3rd stage):

Electronic backstop aimed to prevent exceedingly low or high temperatures being inadvertently adjusted in the setpoint.

F16 - Stage 3 control differential (hysteresis):

It is the temperature difference (hysteresis) between switching output OUT3 ON and OFF.

F17 - Minimum delay to switch on stage 3 output again:

It is the minimum time the OUT3 output will remain off, i.e. the length of time between the last stop and the next start up. Programmed only if F13=0, 1, 4, or 5.

F18 - Stage 3 cyclical timer time base:

- Seconds
 - Minutes

F19 - Time to activate stage 3 cyclical timer:

Whenever the temperature reaches the value configured in , the time configured in this function is observed before activating the cyclical timer. To activate the timer at the moment is reached, configure this function with 0. Only if F22=1.

F20 - Time of cyclical timer of stage 3 on ():

Time for which the cyclical timer will remain active.

F21 - Time of cyclical timer of stage 3 off ():

Time for which the cyclical timer will remain inactive.

F22 - Cyclical timer operating mode:

- Independent cyclical timer
 - Cyclical timer triggered by the stage 1 setpoint (SP1)
 - Stage 1 linked to the cyclical timer (timer on upon power up)
 - Stage 1 linked to the cyclical timer (timer off upon power up)
 - Cyclical timer output on whenever stage 1 output is on
 - Cyclical timer output cycling whenever stage 1 output is on

F23 - Audible alarm (buzzer) operating mode:

- In-range alarm (F24 and F25)
 - Out-range alarm (F24 and F25)
 - Out-of-range alarm related to the stage 1 setpoint (-F24 and +F25), the absolute values of F24 and F25 are considered.

F24 - Buzzer operating point (lower threshold):

It is the lower temperature value for the buzzer alarm to activate according to F23.

F25 - Buzzer operating point (upper threshold):

It is the higher temperature value for the buzzer alarm to activate according to F23.

F26 - Buzzer on time:

It is the time the buzzer will remain on (active cycle). To disable the audible alarm (buzzer), configure this function with 0.

F27 - Buzzer off time:

It is the time the buzzer will remain off (inactive cycle). To disable the audible alarm (buzzer), configure this function with 0.

F28 - Alarm inhibition time upon power up:

It is the time for which the buzzer will remain off, even in alarm conditions, for a certain period after initialization, since the system has not yet reached the working temperature.

F29 - Time to reactivate the buzzer when manually inhibited:

This function allows for three different configurations:
 - The buzzer will be inhibited until the temperature reaches the normal working condition and returns to the alarm condition again.
 - Buzzer cannot be inhibited by the easy access keys.
 - Buzzer will be inhibited during this period (in minutes), switching on again if the alarm condition persists.

F30 - Stage 4 operating mode:

- Refrigeration (controlled by SP4)
 - Heating (controlled by SP4)
 - In-range alarm (F31 and F32)
 - Out-range alarm (F31 and F32)
 - Out-of-range alarm related (-F31 and +F32), the absolute values of F31 and F32 are considered.
 - Refrigeration (controlled by SP1)
 - Heating (controlled by SP1)

F31 - Minimum setpoint allowed to the end user (4th stage):

F32 - Minimum setpoint allowed to the end user (4th stage):

Electronic backstop aimed to prevent exceedingly low or high temperatures being inadvertently adjusted in the setpoint.

NOTE: When stage 4 is defined as alarm (F30=2, 3, or 4), the activation points are defined in F31 and F32.

F33 - Stage 4 control differential (hysteresis):

It is the temperature difference (hysteresis) between switching output OUT4 ON and OFF.

F34 - Minimum delay to switch on stage 4 output again:

It is the minimum time the OUT4 output will remain off, i.e. the length of time between the last stop and the next start up. Programmed only if F30=0, 1, 5, or 6.

F35 - Alarm inhibition time upon power up:

This function serves to inhibit the alarm for a certain period after the start up, because the system has not yet reached the working temperature (only if F30=2, 3 or 4).

F36 - Time to reactivate the alarm when manually inhibited:

This function allows for three different configurations (only if F30=2, 3, or 4)

[P u E a] - The alarm will be inhibited until the temperature reaches the normal working condition and returns to the alarm condition again.

[] [] - Alarm cannot be inhibited by the easy access keys.

[] [] to **[9 9 9]** - Alarm will be inhibited during this period (in minutes), switching on again if the alarm condition persists.

F37 - Alarm on time ([E D n]):

To adjust the time output OUT4 will remain active (only if F30=2, 3, or 4).

F38 - Alarm off time ([E D F F]):

To adjust the time output OUT4 will remain inactive (only if F30=2, 3, or 4). To always keep the alarm active configure this function with 0.

F39 - Time to inhibit the alarms (delay):

When this configuration is active, the temperature must remain in the alarm condition for the defined inhibit time before the alarm is indicated. This allows avoiding warnings originating from punctual temperature variations. This configuration is used in the alarm output and in the audible alarm (buzzer).

F40 - Digital filter operating mode:

[] [] - The filter operates both when the temperature rises and when it falls.

[] [] - The filter operates only on the ascending slope of the temperature. When the temperature falls the response is immediate.

F41 - Digital filter intensity:

The value adjusted in this function represents the time (in seconds) for the temperature to change by 0.1° C. This function can be switched off by setting it at the minimum value 0.

F42 - Functions lock:

It allows and configures the functions lock (see item 6.3.2).

[] [] - Do not allow the functions lock.

[] [] - 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 view of the minimum and maximum temperature records will always be allowed.

F43 - Time for functions lock:

It configures the time in seconds for the command to activate the functions lock:

[] [1 5] to **[] [6 0]** - Time in seconds for the command to activate the lock.

F44 - Control functions shutdown:

Authorizes switching off the control functions (see item 6.3.3).

[] [] [] - Disables the control functions shutdown.

[] [] [] - 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.

F45 - Enable the soak function feature in output Out1.

[] [] [] - Disable soak point.

[] [] [] - Enable soak point in output OUT1.

NOTE: The operation of the control in the soak mode is described in item 6.3.10 of this manual.

F46 - Soak Setpoint 1 Temperature (SSP1):

Desired temperature during Soak Point 1.

F47 - Permanence time in the soak point1:

Configures the time in minutes the controller will remain in Soak Point 1.

F48 - Soak Setpoint 2 Temperature (SSP2):

Desired temperature during Soak Point 2.

F49 - Permanence time in the soak point2:

Configures the time in minutes the controller will remain in Soak Point 2.

F50 - Soak Setpoint 3 Temperature (SSP3):

Desired temperature during Soak Point 3.

F51 - Permanence time in the soak point3:

Configures the time in minutes the controller will remain in Soak Point 3.

F52 - Soak Setpoint 4 Temperature (SSP4):

Desired temperature during Soak Point 4.

F53 - Permanence time in the soak point4:

Configures the time in minutes the controller will remain in Soak Point 4.

F54 - Soak Setpoint 5 Temperature (SSP5):

Desired temperature during Soak Point 5.

F55 - Permanence time in the soak point5:

Configures the time in minutes the controller will remain in Soak Point 5.

F56 - Instrument address in the RS-485 network:

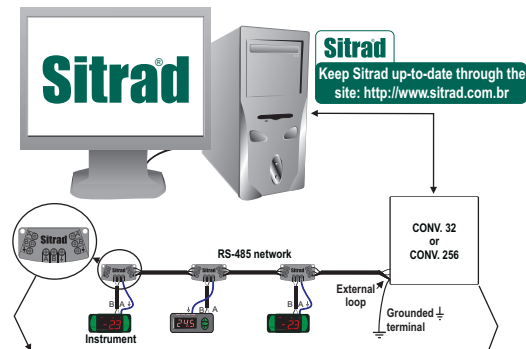
Equipment's network address for communicating with Sitrad software.

NOTE: One network must not have different equipment with the same address.

7. SIGNALS

[Err]	Sensor disconnected or temperature outside specified range.
[Ctrl On]	Control functions on.
[Ctrl Off]	Control functions off.
[Lck On]	Functions lock.
[Lck Off]	Unlocking of functions.
[E C R L]	Contact Full Gauge.
[P P P P]	Reconfigure the function values.

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



***CONNECTION BLOCK FOR SERIAL COMMUNICATION**
It is used to interconnect more than one instrument to the Interface. The wires must be connected as follows: Terminal A of the instrument connected to terminal A of the connection block, which in turn must be connected to terminal A of the Interface. Repeat the procedure for terminals B and \pm , with \pm being the cable mesh (optional ground). Terminal \downarrow of the connection block must be connected to the respective terminals \downarrow of each instrument.

***Sold Separately**

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

9. OPTIONAL ITEMS – Sold Separately

EasyProg - version 2 or later

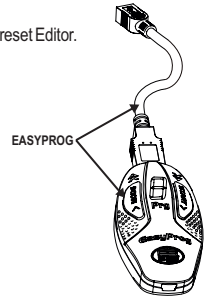
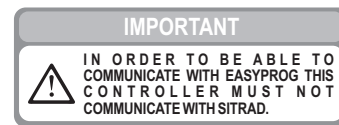
It is an accessory which has the main function of storing the controller parameters. At any time you can load new controller parameters unload them on a production line (of the same controller), for example. It is provided with three types of connections for loading or unloading the parameters:

- **Serial RS-485:** It is connected via RS-485 network to the controller (only for those controllers provided with RS-485).

- **USB:** It is connected to the computer via USB port, using the Sitrad Preset Editor.

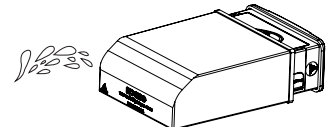
- **Serial TTL:** The controller may be connected directly to

EasyProg via Serial TTL connection.



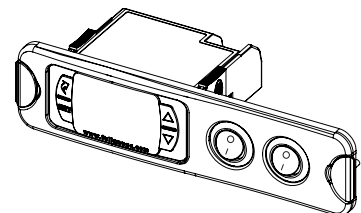
E-case

Recommended for the Evolution line, it prevents water from entering the back part of the instrument. It protects the product when the installation site thereof is washed.



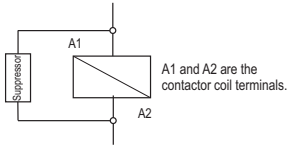
Extension Frame

To install controllers with maximum dimensions of 76 x 34 x 77 mm (opening dimensions of 71 x 29 mm for installation in the extended frame) in several situations, because it does not require precision of the opening to embed the instrument. It allows customization through a sticker with the brand and company contact, in addition to being accompanied by two 10 A (250 V AC) switches that can trigger internal light, air curtain, on/off system or fan.

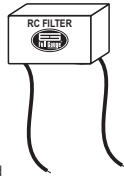
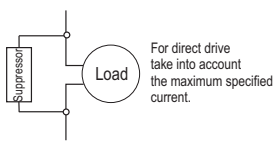


Electrical noise suppression filter

Wiring diagram of suppressors in contactors



Wiring diagram of suppressors in direct drive loads



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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