MT-543Ri LOG

THREE OUTPUT DIGITAL CONTROLLER WITH ALARM, CYCLICAL TIMER AND SERIAL COMMUNICATION

Ver. 02

MT543LOGV02-07T-12898

1 - DESCRIPTION

The **MT-543Ri LOG** controller has three stages that can be applied to refrigeration or heating: the first stage, together with the second stage, works in systems that require minimum ventilation; the second one works as a cyclical timer; the third one works as an alarm. The second and third stages work also in the following modes: refrigeration, heating, refrigeration (SP1), heating (SP1), refrigeration in rotation.

The **MT-543Ri LOG** accepts three types of sensors: NTC thermistor (-50 to 105 °C*), PT100 and PT1000 (-99 to 300 °C).

It also features a built-in audible alarm (buzzer), configurable digital filter and internal memory (datalogger), where the temperature value is stored in user-defined time periods, the temperature variation and the state of the outputs.

In addition, it has built-in rechargeable battery and clock to keep track of data even in case of power failure.

It complies with Anvisa Resolution RDC153 for hemotherapeutic procedures.

*It measures temperatures up to 200 °C using the SB59 (sold separately).

Product complies with NSF (United States).

2 - APPLICATION

- Blood banks
- Multistage temperature system
- Air conditioning
- Data centers

3 - TECHNICAL SPECIFICATIONS

- **Power Supply:** MT-543Ri LOG: 90 ~ 264Vac (50/60Hz)
  MT-543RiL LOG: 12/24 Vac/dc
- **Control Temperature:** NTC:-50 to 105°C(*) / -58 to 221°F(*)
  PT100: -99 to 300°C / -99 to 572°F
  PT1000: -99 to 300°C / -99 to 572°F
- **Dimensions:** 71 x 28 x 71 mm
- **Operating temperature:** 0 to 50 ºC / 32 to 122ºF
- **Operating humidity:** 10 to 90% RH (without condensation)
- **Maximum Load Current:** OUT 1, OUT 2 and OUT 3 (NO) - 5(3)A / 250 Vac 1/8HP per output
  OUT 3 (NC) - 3A/250Vac - Resistive load
- **Digital input:** Switch - input for detection of open door (dry contact type)

(*) The SB19 NTC sensor that comes with the device allows measuring and controlling temperatures up to 105 °C (221 °F). To measure and control temperatures up to 200 °C (392 °F), the NTC sensor must have silicon insulation (e.g.: SB59).

4 - CONFIGURATIONS

4.1 - Control temperature adjust, thus, it is the desired temperature for the controlled environment or the temperature for which the output will be switched off (SETPOINT)

- Press the SET for 2 seconds until appears [SEt], then release it. [SP1] will appear and the temperature will be adjusted for the first stage.
- Use ▼ or ▲ to change the value and then press SET when ready.
- Adjust in the same way [SP2] (2nd stage) and [SP3] (3rd stage).
- The adjustment [SP2] and [SP3] will only be displayed if F07 and F17 are configured with 0 or 1 values.
- If the 2nd stage is configured as a cyclic timer (F07 = "4") or minimum ventilation (F07 = "5") and F26 = "1" or "3", the adjustment of the time of the cyclic timer of the 2nd stage on ([ton]) and the time of the cyclic timer of the 2nd stage off ([toF]) will be allowed.
- If the 3rd stage is configured as an alarm (F17 = "4", "5" or "6") and F26 = "2" or "3", the adjustment of the alarm time on ([ton]) and off ([toF]) will be permitted.

4.2 - Parameters table

		NTC SENSOR								PT100 OR PT1000 SENSOR							
		CELSIUS				FAHRENHEIT				CELSIUS				FAHRENHEIT			
Fun	Descrição	Min	Max	Unit	Standard	Min	Max	Unit	Standard	Min	Max	Unit	Standard	Min	Max	Unit	Standard
F01	Offset indication	-5.0	5.0	°C	0.0	-9	9	°F	0	-20	20	°C	0	-36	36	°F	0
F02	Operation mode of first stage	0	1	-	1	0	1	-	1	0	1	-	1	0	1	-	1
F03	Minimum setpoint allowed to the end user (first stage)	-50	105*	°C	-50	-58	221*	°F	-58	-99	300	°C	-99	-99	572	°F	-99
F04	Maximum setpoint allowed to the end user (first stage)	-50	105*	°C	105	-58	221*	°F	221	-99	300	°C	300	-99	572	°F	572
F05	Control differential (hysteresis) of first stage	0.1	20	°C	1	1	36	°F	2	1	20	°C	1	1	36	°F	2
F06	Minimum delay to turn on the first stage output	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0
F07	Operation mode of second stage	0	6	-	0	0	6	-	0	0	6	-	0	0	6	-	0
F08	Minimum setpoint allowed to the end user (second stage)	-50	105*	°C	-50	-58	221*	°F	-58	-99	300	°C	-99	-99	572	°F	-99
F09	Maximum setpoint allowed to the end user (second stage)	-50	105*	°C	105	-58	221*	°F	221	-99	300	°C	300	-99	572	°F	572
F10	Control differential (hysteresis) of second stage	0.1	20	°C	1	1	36	°F	2	1	20	°C	1	1	36	°F	2
F11	Minimum delay to turn on the second stage output	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0
F12	Time base of second stage cyclical timer	0	1	-	0	0	1	-	0	0	1	-	0	0	1	-	0
F13	Activation time for second stage cyclical timer	0	999	sec.	5	0	999	sec.	5	0	999	sec.	5	0	999	sec.	5
F14	Cyclical timer on second stage - time ON	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0
F15	Cyclical timer on second stage - time OFF	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0	0	999	s/m	0
F16	Operation mode of cyclical timer	0	4	-	0	0	4	-	0	0	4	-	0	0	4	-	0
F17	Operation mode of third stage	0	7	-	5	0	7	-	5	0	7	-	5	0	7	-	5
F18	Minimum setpoint allowed to the end user (third stage)	-50	105*	°C	21	-58	221*	°F	70	-99	300	°C	21	-99	572	°F	70
F19	Maximum setpoint allowed to the end user (third stage)	-50	105*	°C	27	-58	221*	°F	81	-99	300	°C	27	-99	572	°F	81
F20	Control differential (hysteresis) of third stage	0.1	20	°C	1	1	36	°F	1	1	20	°C	1	1	36	°F	2
F21	Minimum delay to turn on the third stage	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0	0	999	sec.	0
F22	Delay to enable the alarm when the instrument is powered on	0	999	min.	0	0	999	min.	0	0	999	min.	0	0	999	min.	0
F23	Reactivation time of alarm when inhibited manually	[Aut]	999	min.	[Aut]	[Aut]	999	min.	[Aut]	[Aut]	999	min.	[Aut]	[Aut]	999	min.	[Aut]
F24	Alarm time (on cycle)	0	999	seg.	1	0	999	seg.	1	0	999	seg.	1	0	999	seg.	1
F25	Alarm time (off cycle)	0	999	seg.	1	0	999	seg.	1	0	999	seg.	1	0	999	seg.	1
F26	Selects functions of the easy access menu	0	3	-	2	0	3	-	2	0	3	-	2	0	3	-	2
F27	Operation mode of Buzzer	0	3	-	1	0	3	-	1	0	3	-	1	0	3	-	1
F28	Acting point of Buzzer (inferior limit)	-50	105*	°C	21	-58	221*	°F	70	-99	300	°C	21	-99	572	°F	70
F29	Acting point of Buzzer (superior limit)	-50	105*	°C	27	-58	221*	°F	81	-99	300	°C	27	-99	572	°F	81
F30	Buzzer time on	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1
F31	Buzzer time off	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1
F32	Inhibition time of Buzzer during electrical supply	0	999	min.	0	0	999	min.	0	0	999	min.	0	0	999	min.	0
F33	Reactivation time of Buzzer when inhibited manually	[Aut]	999	min.	[Aut]	[Aut]	999	min.	[Aut]	[Aut]	999	min.	[Aut]	[Aut]	999	min.	[Aut]
F34	Enables refrigeration in rotation	0	2	-	0	0	2	-	0	0	2	-	0	0	2	-	0
F35	Time for rotation operation	1	999	h	1	1	999	h	1	1	999	h	1	1	999	h	1
F36	Maximum time to add a new output	1	999	min.	12	1	999	min.	12	1	999	min.	12	1	999	min.	12
F37	Minimum time between activations of relays	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1	0	999	sec.	1
F38	Time base for the open door alarm	0	1	-	0	0	1	-	0	0	1	-	0	0	1	-	0
F39	Time for the open door alarm	[OFF]	999	s/m	5	[OFF]	999	s/m	5	[OFF]	999	s/m	5	[OFF]	999	s/m	5
F40	Digital input operation mode	0	1	-	0	0	1	-	0	0	1	-	0	0	1	-	0
F41	Datalogger operation mode	0	2	-	2	0	2	-	2	0	2	-	2	0	2	-	2
F42	Datalogger sampling interval	1	999	sec.	30	1	999	sec.	30	1	999	sec.	30	1	999	sec.	30
F43	Variation of the temperature to force data recording	[nOP]	10	°C	[nOP]	[nOP]	18	°F	[nOP]	[nOP]	10	°C	[nOP]	[nOP]	18	°F	[nOP]
F44	Variation of the digital input or outputs to force data recording	0	1	-	0	0	1	-	0	0	1	-	0	0	1	-	0
F45	Overwrite records in the memory when it is full?	0	1	-	1	0	1	-	1	0	1	-	1	0	1	-	1
F46	Intensity of the digital filter	0	9	-	0	0	9	-	0	0	9	-	0	0	9	-	0
F47	Controller's address in the RS-485 network	1	247	-	1	1	247	-	1	1	247	-	1	1	247	-	1

(*) This parameter allows adjustments up to 200ºC (392°F), but to work on these conditions it has to be used with silicone cable sensor (ex.: SB59).

5 - PARAMETERS DESCRIPTION

F01 - Offset indication
It allows to compensate eventual shunting lines in the reading of ambient temperature proceeding from the exchange of the sensor or cable lenght alteration.

F02 - Operation mode of first stage
0 - Refrigeration
1 - Heating

F03 - Minimum setpoint allowed to the end user (first stage)
Sets the minimum adjustment temperature for the setpoint.

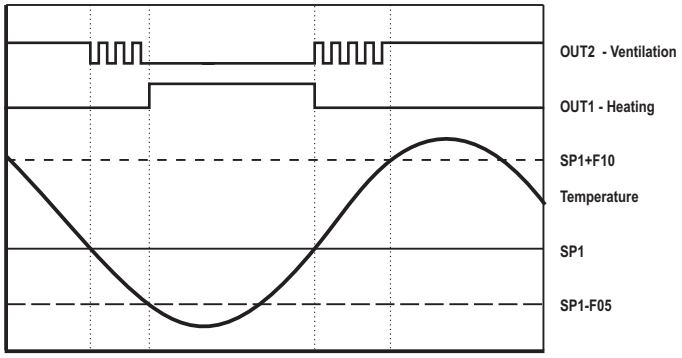
F04 - Maximum setpoint allowed to the end user (first stage)
Sets the maximum adjustment temperature for the setpoint.

F05 - Control differential (hysteresis) of first stage
It is the difference of temperature(hysteresis) between turn ON and turn OFF the OUT1 output.

F06 - Minimum delay to turn on the first stage output
It is the minimum time that OUT1 will keep turned off, it means, the amount of time between the last stop and the next start.

F07 - Operation mode of second stage
0 - Refrigeration (controlled by SP2)
1 - Heating (controlled by SP2)
2 - Refrigeration (controlled by SP1)
3 - Heating (controlled by SP1)
4 - Cyclical timer
5 - Minimum ventilation (controlled by SP1)*
6 -2nd stage of the refrigeration in rotation (controlled by SP1)

* With the first stage configured for heating (F01 = 1) and the second stage configured for minimum ventilation (F07 = 5), they work together in a sequence: heating, minimum ventilation and refrigeration or refrigeration, minimum ventilation and heating, as shown in Graphic 01.



Graphic 01 - Heating, Minimum Ventilation and Refrigeration.

F08 - Minimum setpoint allowed to the end user (second stage)

F09 - Maximum setpoint allowed to the end user (second stage)
Electronic limits whose purpose is prevent that too high or too low setpoint temperatures are regulated.

F10 - Control differential (hysteresis) of second stage
It is the difference of temperature(hysteresis) between turn ON and turn OFF the output OUT2.

F11 - Minimum delay to turn on the second stage output
It is the minimum time that the output OUT2 will remain turned off, in other words, the amount of time between the last startup and the next startup. Only if programmed in F07 = 0, 1, 2 or 3.

F12 -Time base of second stage cyclical timer
0 - Seconds
1 - Minutes

F13 - Activation time of second stage cyclical timer
This function depends of F16. Every time that the temperature reach the configured value in SP1, the configured time in this function is respected, to be activated the cyclical timer after. To activate the timer when SP1 is reached just set "0" in this function.

F14 - Cyclical timer on second stage - time ON
It is the time that the timer will be turned ON.
F15 - Cyclical timer on second stage - time OFF
It is the time that the timer will be turned OFF.

F16 - Operation mode of cyclical timer
0 - Independent cyclical timer
1 - Cyclical timer started by the first stage setpoint
2 - First stage linked with cyclical timer (Timer starts ON during electrical supply)
3 - First stage linked with cyclical timer (Timer starts OFF during electrical supply)
4 - Cyclical timer output turned on whenever the the first stage output is turned ON

F17 - Operation mode of third stage
0 - Refrigeration (controlled by SP3)
1 - Heating (controlled by SP3)
2 - Refrigeration (controlled by SP1)
3 - Heating (controlled by SP1)
4 - Intra range alarm (F18 and F19)
5 - Extra range alarm (F18 and F19)
6 - Extra range alarm relative to the 1st stage setpoint (SP1 - F18 and SP1 + F19), it is considered the absolute values of F18 and F19.
7 - 3rd stage of the refrigeration in rotation (controlled by SP1)

F18 - Minimum setpoint allowed to the end user (third stage)

F19 - Maximum setpoint allowed to the end user (third stage)
When the third stage is defined as alarm (F17 = 4, 5 or 6), the acting points are defined in F18 and F19.

F20 - Control differential (hysteresis) of third stage
It is the difference temperature (hysteresis) between turn ON and turn OFF the output OUT3.

F21 - Minimum delay to turn on the third stage output
It is the minimum time that the output OUT3 will remain turned off, in other words, the amount of time between the last startup and the next startup. Only if programmed in F07 = 0, 1, 2 or 3.

F22 - Delay to enable the alarm when the instrument is powered on
This function serves to inhibit the alarm during a certain period after the start up, because the system has not yet reached the working temperature (only if F17 = 4, 5 or 6).

F23 - Reactivation time of alarm when inhibited manually
This function allows three different settings (only if F17= 4,5 or 6):
AuE - The alarm will be inhibited until the temperature reaches the normal working condition and returns to the alarm condition again;
0 - The alarm can not be inhibited by easy access keys;
1 to 999 - The alarm will be inhibited during this period (in minutes), returning the call if the alarm condition persists;

F24 - Alarm time (on cycle)
It allows to adust the time that OUT3 output will keep turned on (only if F17= 4,5 or 6).

F25 - Alarm time (off cycle)
It allows to adust the time that OUT3 output will keep turned off (only if F17= 4,5 or 6). To keep the alarm always active set this function to "0".

F26 - Selection of functions of the easy access menu
Allows selecting the parameters that can be adjusted in the easy access menu along with the setpoints:
0 - Disables the access to the parameters of the cyclic timer of the 2nd stage (F14 and F15) and of the cyclic timer alarm (F24 and F25) via easy access menu.
1 - Only the parameters of the cyclic timer of the 2nd stage (F14 and F15).
2 - Only the parameters of the cyclic timer of the alarm (F24 and F25).
3 - Allows adjusting the parameters of the cyclic timer of the 2nd stage and parameters of the cyclic timer alarm.

F27 - Operation mode of Buzzer
0 - Intra-range alarm (F28 and F29).
1 - Extra-range alarm (F28 and F29).
2 - Extra-range alarm relative to the 1st stage setpoint (SP1 - F28 and SP1 + F29), it is considered the absolute values of F28 andF29).
3 - Rotation mode alarm (goes off when more than one output is activated).

F28 - Acting point of Buzzer (inferior limit)
It is the inferior value of temperature to the buzzer alarm act as the configured Operation Mode of Buzzer (F27).

F29 - Acting point of Buzzer (superior limit)
It is the superior value of temperature to the buzzer alarm act as the configured Operation Mode of Buzzer (F27).

F30 - Buzzer time on
It is the time that the Buzzer will be turned on (cycle on). To turn it off the sonore alarm (Buzzer) adjust the value "0" to this function.

F31 - Buzzer time off
It is the time that the buzzer will be turned off (cycle off). To turn it off the sonore alarm (Buzzer) adjust the value "0" to this function.

F32 - Inhibition time of Buzzer during electrical supply
It is the time were the Buzzer will kept turned off even if in alarm contitions for a certain period after startup, because the system has not yet reached working temperature.

F33 - Reactivation time of Buzzer when inhibited manually
This function allows three different settings:
AuE - The Buzzer is inhibited by an indefinite period or until the temperature range in normal working condition and return the alarm again;
0 - The Buzzer can not be inhibited by facilitating access keys;
1 to 999 - The Buzzer will be inhibited during this period (in minutes), returning the call if the alarm condition persists.

F34 - Enables refrigeration in rotation
The rotation mode switches the output used for refrigeration, making each machine work during a certain time and therefore makes all of them accumulate the same working time (item 12).
0 - Disables refrigeration in rotation
1 - Enables rotation for OUT1 and OUT2
2 - Enables rotation for OUT1, OUT2 and OUT3

F35 - Time for rotation operation
1 to 999 - Time in hours for the rotation

F36 - Maximum time to activate a new output
1 to 999 - Time in minutes to activate a new output. When the output of the first stage cannot reach the setpoint during this time another output is activated. If the rotation is enabled for the three outputs the time counting is restarted too.
If the established limit is exceeded again, without the temperature reaching the setpoint, the third output is activated.

F37 - Minimum time between activations of relays
0 - The relays will activate at the same time when required.
1 to 999 - Time in seconds between the activation of relays.
This configuration is disregarded when the output works as an alarm or cyclic timer.

F38 - Time base for the open alarm door
0 - Seconds
1 - Minutes

F39 - Time for the open door alarm
When the door open alarm is enabled, the buzzer will be triggered after the door has been left open for the programmed amount of time. The time the buzzer is on and off is set with F30 and F31. SIf disabled no alert will be indicated in Sitrad.
OFF - Disabled
0 to 999 - Minutes to activate the open door alarm

F40 - Digital input operation mode
This function allows to configure what status of digital input will indicate that the door is open:
0 - Closed contact indicates that the door is open
1 - Open contact indicates that the door is open

F41 - Datalogger operation mode
Allows to choose between the following operation modes of the datalogger:
[0] - Always OFF
[1] - Always ON
[2] - Manual operation

F42 - Datalogger sampling interval
Time period in seconds in which the controller will register a sample of the temperature and the control outputs status.

F43 - Variation of the temperature to force data recording
Temperature difference to forces the recording of data in the memory, independently of the sampling time configured at F42. To desable this function, just decrease the value until the [nOP] message appears in the display.

F44 - Variation of the digital input or outputs to force data recording
Indicates whether the change in the digital inputs or in the control outputs (configured as cooling or heating) will force the recording of data in memory regardless of the time of sampling set in F42. Data recording will also occur if the device enters or exits the alarm condition (for OUT3 and buzzer) and lack of and return electricity.
[0] - OFF
[1] - ON

F45 - Overwrite records in the memory when it is full?
This function indicates whether the controller should start writing the new data at the beginning of the datalogger's memory when it is full. This prevents that the latest data recorded from controller be erased first.
[0] - OFF
[1] - ON

F46 - Intensity of the digital filter
This filter aims at simulating an increase of the mass of sensor , thus increasing its response time (thermal inertia). The larger the value adjusted in this function, the longest the response time of sensor.
A typical application requiring this filter is the freezer for ice cream or frozen goods, because when the door is opened a hot air mass reaches the sensor directly, causing the indication of the measured temperature to rise quickly and the compressor to be activated unnecessarily.

F47 - Controller's address in the RS-485 network
Each controller connected to the RS-485 network must have its own address different from the others so that the computer will be able to identify it.
Attention: To avoid communication problems, make sure that there are no controllers with the same address.

6 - PARAMETERS ALTERATION

6.1 - To enter the function menu

Press ▼ and ▲ simultaneously for 2 seconds to display [SEL] and release the keys. When [Cod] is displayed, press SET (shortly), and enter the code 123 through the ▼ and ▲ keys. Press SET to confirm. Use the ▼ and ▲ keys to access the other functions and proceed the same way to adjust them. Press SET (long touch) until [---] is displayed to exit the menu and return to normal operation.

6.2 - Functions

[Cod] - To enter the access code
[Fun] - Advanced setting functions
[CLo] - Date and time setting

6.3 - Adjustment of the date and time

Inside the funcions menu, press the key ▲ until the message [CLo] appears in the visor.
Hit key SET. The settings will appear in the following order:

DAY ➨ MONTH ➨ YEAR ➨ HOURS ➨ MINUTES

Ex.: 17/03/2013 12h43min
[17d] - Day
[03M] - Month
[13Y] - Year
[12h] - Hours
[43'] - Minutes

7 - FUNCTIONS WITH FACILITATED ACCESS

7.1 - Register of minimum and maximum temperatures

Press ▲, appear the minimum registered temperatures. Soon will apears the the maximum registered temperature.
Note: To reset the registers, keep the key ▲ pressed during the visualization of minimum and maximum registers until [rSt] to be showed.

7.2 - Viewing current date and time

You can press the SET key shortly to view the date and time set in the controller.
The display shows the current day, month, year, hours and minutes, in this order.
Ex.: 17/03/2013 12h43min
[17d] - Day
[03M] - Month
[13Y] - Year
[12h] - Hours
[43'] - Minutes

7.3 - Manual datalogger activation

With F41 set to value 2 and the ▼ and ▲ keys pressed simultaneously for 10 seconds one can enable or disable the operation of data recording (datalogger). The [dEL] message will be shown, then [On] when the datalogger is activated and [OFF] when it is deactivated.
If F41 is set to 0 or 1 the messages [OFF] and [On] will be displayed respectively.

7.4 - Alarm and Buzzer inhibition

To inhibit the OUT3 press the ▲ and SET keys simultaneously.
To inhibit the Buzzer press the ▼ and SET keys simultaneously.
- The inhibition of alarm and buzzer can be configured by the functions F23 and F33, respectively.

7.5 - Operation time of the outputs in refrigeration and rotation

Pressing the key ▼ in the rotation mode the following will be shown:
[tt1] and then the total accumulated time for OUT1 (hours x 10)
[tt2] and then the total accumulated time for OUT2 (hours x 10)
[tt3] and then the total accumulated time for OUT3 (hours x 10)
[At1], [At2] or [At3], depending on the current output, and then the time remaining for the output change. If the time remaining is more than one hour it will be displayed in hours, otherwise it will be displayed in minutes. Example: for 1h30min remaining, [001] will be displayed, or for 45min remaining, [45'] will be displayed.

Resetting of the time for rotation and selection of the current output:
If during the time display the key ▼ is pressed and kept pressed, at the end of the display the counters will be reset. Once this is done, the message [CLr] will be displayed and then [rL1], [rL2] or [rL3], indicating which output will be the first to be activated. Each time the counters are reset, before completing the first hour, the operation passes to the next output. Resetting once it starts to operate in OUT1 ([rL1]), then resetting again it starts to operate in OUT2 ([rL2]). Repeating the process once again and the rotation is enabled for the three outputs, it starts to operate in OUT3 ([rL3]), otherwise it goes back to OUT1 ([rL1]).

8 - SIGNALING

OUT 1 - Output 1 turn on
OUT 2 - Output 2 turn on
OUT 3 - Output 3 turn on
BUZZ - Internal buzzer activated
[Err] - Detached temperature sensor or outside the specified range
[CLo] - Deprogram clock
[SPC] - Comunication with SITRAD® to adjust functions, the clock or download data from the datalogger
[OPn] - Open door
[dFL] - Alarm of datalogger memory full
[dEr] - Alarm of datalogger memory corrupted
[PPP] - Invalid parameters configuration
The outputs are turned off automatically in this situation.
Please check which parameters have invalid data configured and correct them to return to normal operation.
[bAt] - When displayed in the initialization, it indicates that the controller was operating with battery power.
[MEM] - When displayed in the initialization, it indicates that the controller is loading the memory of the datalogger and that the battery discharged while disconnected from the external power.

9 - SELECTION OF THE UNIT (ºC / ºF)

To define the temperature unit for the instrument to operate press ▼ and ▲ simultaneously for 2 seconds and enter the function [Cod]. Using the keys ▼ or ▲, go to code 231 and confirm with SET. After the indication [Uni], choose between [ºC] or [ºF] and confirm. After changing the unit [FAC] will be displayed indicating that the default configuration is restored. Thus, it is required to readjust the configuration of the functions whenever this operation is performed. To exit without confirming the change press SET for 2 seconds.

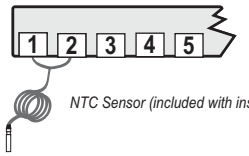
10 - SELECTION OF THE TYPE OF SENSOR

It is required when you want to change the type of sensor connected to the controller. You can choose the NTC thermistor, PT-100 or PT-1000.

To define the type of sensor for the instrument to operate press ▼ and ▲ simultaneously for 2 seconds and enter the function [Cod]. Using the keys ▼ or ▲, go to code 312 and confirm with SET. After the indication [SEn], select the required sensor among the options [ntc] (NTC thermistor), [Pt1] (PT-100 thermistor) and [P10] (PT-1000 thermistor). After changing the type of sensor [FAC] will be displayed indicating that the default configuration is restored. Thus, it is required to readjust the configuration of the functions whenever this operation is performed. To exit without confirming the change press SET for 2 seconds.

10.1 - SENSOR CONNECTION

It must be connected to terminals 1 and 2 according to the picture below:



NTC Sensor (included with instrument), PT-100 or PT-1000

Table of wire gauge / max distance for the two wire PT-100.

Diameter		Max. Dist.
(AWG)	(mm)	(meters)
14	1.63	18.1
16	1.29	11.4
18	1.02	7.2
20	0.81	3.0
22	0.64	1.9
24	0.51	1.8
26	0.40	1.1

11 - INTERNAL BATTERY

The **MT-543Ri LOG** has an internal rechargeable battery. This battery provides the power to operate the clock and record the data in the memory in the event of a power outage. The capacity of the fully charged battery is 24 hours, under the higher consumption condition (log every 1 sec).

11.1 - Clock

The battery must be charged to keep the built-in clock working during a power failure. If the battery is discharged before the power is re-established, the message [CLo] will be displayed when the device is switched on again to indicate that the date and time must be adjusted.

11.2 - Data recording in the event of a power outage

With the battery connected and the datalogger activated, the **MT-543Ri LOG** will record the temperature in the internal memory even in the event of a power outage. These records can be configured to be recorded at preset time intervals (F42), with the temperature variation (F43) and/or by the variation of the state of the digital input (F44). If the temperature variation data record is disabled, the device will read the temperature sensor only at the set time intervals, therefore using less energy. The use of the record for temperature variation provides more detailed records, but discharges the battery faster.

11.3 - Battery precautions

- Avoid unnecessarily draining the battery;
- If a greater time interval between each sample is set, the datalogger will use less battery power;
- If not required, disable the F44 function to avoid wasting the energy used in reading the temperature sensor;
- The instrument must be powered for at least 10 hours for a full recharge of the battery.

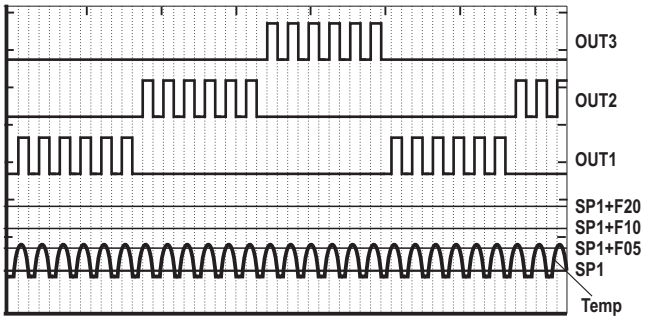
12 - REFRIGERATION IN ROTATION

The rotation mode switches the output used for refrigeration, making each machine work during a certain time and therefore makes all of them accumulate the same working time. It also enables a logic of stages that activates the outputs simultaneously when the setpoint is not reached in normal operation (1st stage). However, as the outputs alternate in the rotation, there is not a link between the order of stages and outputs. Thus, when entering the second stage one more output is activated, which can be

OUT1, OUT2 or OUT3.

Using the "Rotation" function requires setting F34 (enables rotation refrigeration) indicating which outputs it will operate. To enable the rotation, the operating mode of the 2nd stage (F07) is automatically forced to the rotation function. The same happens with the mode of operation of the 3rd stage if the rotation uses the three outputs (F34 = 2). But if it is set to work only with OUT1 and OUT2 (F34 = 1), the mode of operation of the 3rd stage (F17) is free to be configured with another function.

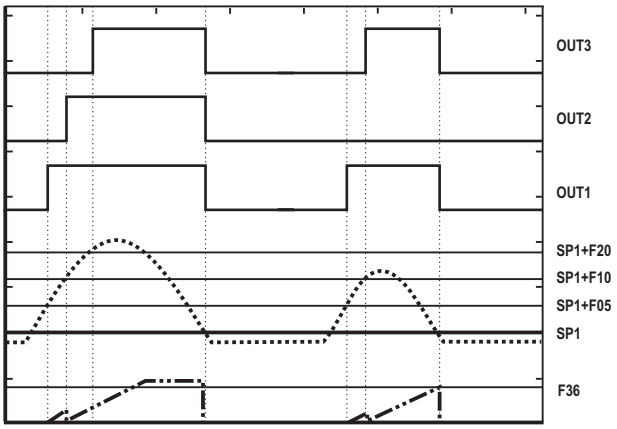
In normal operation, when the temperature exceeds the control differential of the 1st stage, the current output (OUT1, OUT2 or OUT3) is activated to perform the refrigeration. The time it remains switched on to reach the setpoint is counted and accumulated. When the accumulated value of the on time of the output exceeds a given number of hours, it gives way to the next output. This time during which the rotation will be performed is configured in hours in function F35 (time for rotation operation), the setpoint is set in the easy menu (SP1), and the control differential of the first stage is adjusted in F05.



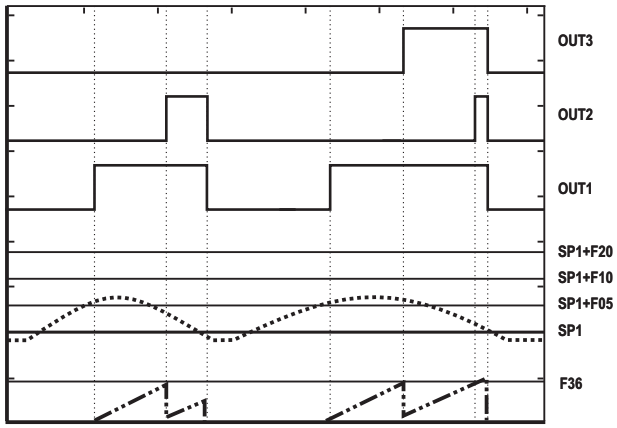
Graphic 02 - Output rotation with accumulated switched on time

When due to any faults the active output cannot reach the setpoint, the 2nd and 3rd stages act as backup. Two criteria are used to determine this operation for each stage, temperature differential and time. In the first case, new control outputs will be activated as the temperature deviates from the setpoint and exceeds the control differentials of each stage. In this way, all outputs may work together. The differentials to include a new output are defined in relation to the setpoint (SP1) and configured in F10, control differential of the 2nd stage, and in F20, control differential of the 3rd stage.

For the 2nd and 3rd stage to act by time, the time is counted from the activation of the current output of the 1st stage. If that time exceeds a certain limit (F36) without reaching the setpoint, the 2nd stage activates the output with less accumulated time. The time count is restarted and if that limit is exceeded again without reaching the setpoint, the 3rd stage activates the remaining output. The time to activate a new output is configured in minutes in F36.



Graphic 03 - Activation of a new output for exceeding the control differential

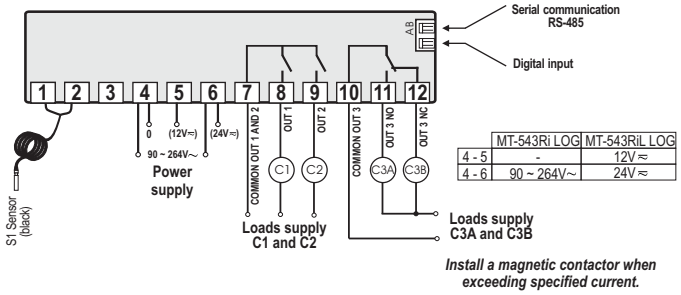


Graphic 04 - Activation of a new output for exceeding the maximum time to reach the setpoint

The buzzer may be activated when more than one output is activated simultaneously (2nd e 3rd stages). To do this, F27 (buzzer operation mode) must be defined as 3 - Error alarm in the rotation mode.

Also related to protection routines, it is possible to set the minimum time between the stage switch off the output and switch it on again, configured in F06, F11 and F21, minimum delay to switch on again the outputs of the 1st, 2nd and 3rd stages respectively. There is also a logic to prevent the outputs from switching on at the same time by forcing a time interval between activations, which is configured in F37.

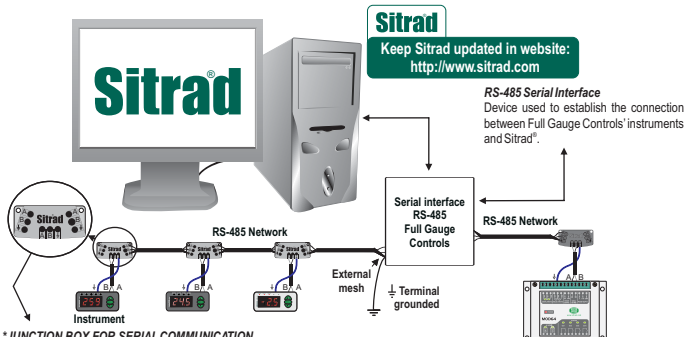
13 - WIRING DIAGRAM



	MT-543Ri LOG	MT-543RiL LOG
4 - 5	-	12V ≂
4 - 6	90 ~ 264V~	24V ≂

Install a magnetic contactor when exceeding specified current.

14 - INTEGRATING CONTROLLERS, RS-485 SERIAL INTERFACE AND COMPUTER

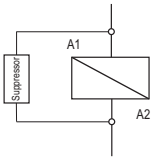


JUNCTION BOX FOR SERIAL COMMUNICATION
Used to connect more than one instrument to the Interface. The wire's connections must be made in agreement with the following rules: terminal **A** of the instrument connects to the terminal **A** of the junction box, that must be connected with the terminal **A** of the Interface. Repeat the action for terminals **B** and ⏚, being ⏚ the cable shield.
The terminal ⏚ of the junction box must be connected to the respective terminals ⏚ of each instrument.
***Sold Separately**

Note: The length of the sensor cable may be increased by the user up to 200 meters, using a PP 2 x 24 AWG cable. For immersion in water, use thermometric well.

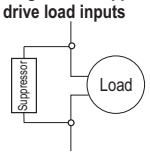
IMPORTANT
According to the chapters of norm IEC 60364:
1: Install protector against overvoltage on the power supply.
2: Sensor cables and signal cables of the computer may be joined, but not in the same electric conduit through which the electric input and the activation of the loads run.
3: Install transient suppressors (RC filters) parallel to the loads as to increase the product life of the relays.

Contact suppressor connection diagram



A1 and A2 are the contactor coils.

Diagram for suppressor installation for direct drive load inputs



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

ENVIRONMENTAL INFORMATION
Package:
The packages material are 100% recyclable. Just dispose it through specialized recyclers.

Products:
The electro components of Full Gauge Controls controllers can be recycled or reused if it is disassembled for specialized companies.

Disposal:
Do not burn or throw in domestic garbage the controllers which have reached the end-of-life. Observe the respectively law in your region concerning the environmental responsible manner of dispose its devices. In case of any doubts, contact Full Gauge Controls for assistance.

PROTECTIVE VINYL
This adhesive vinyl (included inside the packing) protects the instruments against water drippings, as in commercial refrigerators, for example. Do the application after finishing the electrical connections.
Remove the protective paper and apply the vinyl on the entire superior part of the device, folding the flaps as indicated by the arrows.