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MT-526 *plus* Ver.01

CONTROLLER FOR HEAT PUMPS AND
RESIDENTIAL HEATING SYSTEMS



Heating



Filtering



Auxiliary
Output



Ventilation



Buzzer



Defrost



Events
Schedule



Function
Lock



Programming
in Series



Degree
of Protection



Monitoring
System



MT526PLUSV01-02T-19634

BEFORE INSTALLING THE CONTROLLER, WE RECOMMEND THAT YOU READ THE ENTIRE INSTRUCTION MANUAL, IN ORDER TO AVOID DAMAGING THE PRODUCT.

IN ORDER TO BE ABLE TO PROVIDE CONTINUOUS DEVELOPMENT, FULL GAUGE CONTROLS RESERVES THE RIGHT TO AMEND THE INFORMATION IN THIS MANUAL AT ANY TIME, WITHOUT NOTICE.

1. DESCRIPTION

The **MT-526 plus** is a controller for automating heat pumps and home heating. It controls the heating of thermal reservoirs (bath mode) and swimming pools (scan mode) automatically through a series of configurable conditional events. There are a total of 16 events that can be set, including heating, heating in ECO mode and pool filtering. There is quick access to the heating and filter operating modes, allowing you to choose between automatic, manual and off modes, as well as the weekend heating mode. It has 3 digital inputs that allow you to monitor the flow switch, the compressor's high and low pressure and the option of an auxiliary input for an external alarm when sensor 3 is not used, as well as a *True RMS voltage monitor that prevents the system from operating outside the configured voltage range. The controller communicates with the SITRAD software for remote monitoring and control of the system.

2. APPLICATION

- Heat pumps

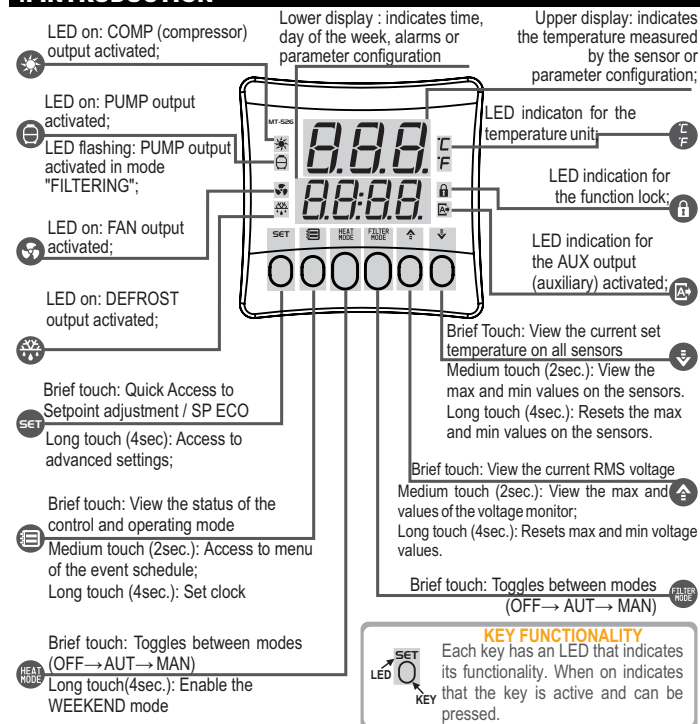
3. TECHNICAL SPECIFICATIONS

Power Source	85~240Vca (50-60Hz)
Average consumption	10VA
Working temperature	0 to 55°C (0 to 131°F)
Control temperature**	-20 to 200°C (-4 to 392°F)
Temperature sensors	S1: Water sensor S2: Defrost sensor S3: Reservoir sensor (Optional)*
Resolution	0.1°C / 1°F
Digital inputs	E1: Low pressure alarm E2: High pressure alarm E3: Flow Switch E4: External alarm auxiliary input*
Relay outputs COMP / PUMP / FAN / DEFROST / AUX	240Vac 1/8HP (Inductive) 120Vac 1/10HP (inductive) 120-240Vac 5A (Resistive) 120-240Vac 5W (E-ballast)
Degree of protection	IP 65 (front)
Maximum dimensions	75mm x 75mm x 100mm / 2,95" x 2,95" x 3,93" (WxHxD)
Bay size	67,2mm x 67,2mm / 2,64" x 2,64" (WxH)
Working Humidity	10 to 90% UR (without condensation)

* Can be configured as a digital input when not using the temperature sensor 3.

**For temperature readings above 105°C it is necessary to use a silicone SB59 sensor (sold separately).

4. INTRODUCTION



5. BASIC OPERATION

5.1 Setpoint adjustment (SET key)

To set the temperature (Setpoint), press the **SET** key briefly. Use the $\uparrow$ or $\downarrow$ keys to set the parameter value. To move forward, press the **SET** key again briefly.

SP
35.0

ECO
30.0

ECO will then be displayed. Use the $\uparrow$ or $\downarrow$ keys to adjust and/or stop adjusting the parameter value.

5.2 Heat mode

By pressing the **HEAT MODE** key, the user can switch between the following control operating modes: OFF, AUTOMATIC or MANUAL. In addition to these 3 modes, there is also a weekend mode which is activated by holding down the **HEAT MODE** key for 4 seconds until the message **WEEK** appears on display. The operation of each of these modes is described below:

OFF - Turned Off

OFF
Ctrl

In this mode, temperature control and monitoring is turned off, while waiting for the user to activate a new mode.

AUT - Automatic

AUT
HEAT

In this mode, temperature control is linked to the event schedule. Thus, the controller will only monitor heating processes within the range configured for each event, and will keep the control off when it is outside the range of the configured events. The schedule allows a total of 16 different events to be configured. For more details see item 8 Event schedule.

MAN - Manual

MAN
HEAT

In manual heating mode, the temperature monitoring and control process will be carried out in accordance with the time interval set in function **F05** Manual Temperature Control Activation Time. When the user activates manual mode using the **HEAT MODE** key, the monitoring and heating process starts until the time set in the function has elapsed **F05**.



Note: Once finished, the operating mode will return to AUTO mode and remain there until the user interacts again.

WEEKEND

WEEK

This mode is similar to manual heating, but allows you to select an interval in days (from 1 to 7), allowing the user to set a longer period for the temperature control process. This interval is configured in function **F07** Weekend Activation Interval, and is activated by holding down the **HEAT MODE** key for 4 seconds until **WEEK** appears on the display.



Note: After the interval of days set in function **F07** has elapsed, the operating mode will return to AUTO mode and remain there until the user interacts again.

5.3 Filter mode

When the controller is set to pool mode **[F01] = [POOL]** the **FILTER MODE** key will be available for the user to activate or deactivate the controller's filtering functions. The **FILTER MODE** key toggles the operating mode of the pump/filter control with each press, taking on the following options: OFF, AUTO and MANUAL, where:

OFF
FILT

In this mode, filtering will not be carried out directly, only indirectly when the temperature control triggers the pump to circulate the water for heat exchange;

AUT
FILT

When set to automatic, filtering will be controlled according to the events programmed in the schedule, i.e. it will filter indirectly when the temperature control activates the pump or if specific filtering events are programmed;

MAN
FILT

In this mode, the controller performs manual filtering according to the value set in function **F26** **Filtering time (manual)**. In this way, manual filtering can be carried out when there is no event on the schedule or at intervals when the heating is stopped because it has reached the Setpoint.



Note: If the bath mode **[F01] = [BATH]** is set, the operation of the pump output is controlled directly by the temperature control, and no manual activation of the pump output or user interaction with the **FILTER MODE** key is possible.

5.4 Control operating modes

5.4.1 Pool Mode

Pool
Pool

Operation via SCAN. When temperature control is active, either by event or in manual mode, the pump output will first be actuated to start the scan process, which consists of circulating the pool water to [F09] Scan Time, the controller will assess the need to activate the heating. If the temperature read from sensor 1 is below the value of the selected setpoint minus the value of the control differential (temp. $S1 \leq (SP - [F05])$), the heating process will start, activating the ventilation output and after the time set in function [F11] Compressor Start Delay Time has elapsed, the heating output will be activated until the temperature reaches the Setpoint value. When the temperature of sensor 1 is equal to the Setpoint value, all outputs will be switched off and the controller will wait until the time set in function [F10] Interval Between Scans has elapsed, and only then it will start a new scan and assess the need for a new heating cycle. At the end of this scan, if the sensor temperature is below the setpoint minus the defined hysteresis, heating will resume again, respecting the time set in function [F12] Minimum Compressor Off Time before activating the compressor output again. If it is not necessary to resume heating after the scan, the timer starts the Interval Between Scans [F10] to evaluate again after the next scan has finished.

5.4.2 Bath mode

Bath
Home

In this mode, it operates based on a traditional thermostat, i.e. once the temperature control is activated via event or manual mode, the controller is always ready to heat the water in the tank according to the selected setpoint. In this mode, sensor 3 is the default for the desired temperature reference, and if sensor 3 is not used, sensor 1 is automatically used as the default. When the temperature read from the reference sensor is below the value minus the value of the control differential (temp. $S1 \leq (SP - [F05])$), the heating process will start, activating the pump and ventilation outputs and after the time set in function [F11] Compressor Start Delay Time has elapsed, the output will remain activated until the temperature reaches the Setpoint value, thus switching off all the outputs. When the temperature of the reference sensor falls below the setpoint value minus the defined hysteresis, heating will resume again, respecting the time set in function [F12] Minimum Compressor Off Time before activating the compressor output again.

5.5 Control activation mode

The [T02] Temperature Control Activation Mode function in Pool mode allows you to configure the temperature control drive mode with the following options:

Temperature: This is the controller's default mode, and will allow you to select between pool [P00L] or bath [H0NÉ] in the function [T01] Operating Mode. It can be used via the event schedule, manual mode or weekend mode for temperature control.

Flow switch operation: Temperature control is carried out by another external device that drives the pump to circulate the water in the pool and changes the state of the flow switch's digital input, activating the heating output. For more information on this mode, see section 5.5.2 Temperature control and flow switch activation.

Activation via auxiliary input (dig. 4): The temperature control is carried out by another external device which actuates the control by changing the state of the auxiliary input (digital input 4). For more information on this mode, see section 5.5.1 Temperature control and digital input triggering.

The digital input [dIn4] and flow switch [FL0] actuating modes have specific application characteristics, for example, in both modes the temperature control is carried out by another external device. In other words, another thermostat reads the temperature and other parameters such as setpoint and control differential, and it assesses whether or not to activate the heating output. In these two activation modes, the event schedule and the manual or weekend heating modes are ignored, depending only on the activation of the external thermostat. The other features are explained below:

5.5.1 Activation via auxiliary input

In this mode, the external controller changes the state of the auxiliary digital input, informing the **MT-526 plus** that the heating output should be activated. The controller will first activate the pump output for circulating the water in the pool and the ventilation output. To activate the heating output, the controller will respect the values configured in functions [F11] Compressor Start Delay Time and [F12] Minimum Compressor Off Time, maintaining these compressor protection parameters. However, the **MT-526 plus** controller controls the defrost parameters via sensor 2, respecting the values set in the functions related to defrosting processes, such as [F17] Defrost Type, [F18] Defrost Start Temperature and [F20] Pre-defrost Time.

5.5.2 Activation via flow switch

In this other mode, an external controller activates an external pump which, when it starts pumping the system, changes the logic state of the flow switch on digital input 3, informing the **MT-526 plus** that the heating output should be activated. The controller will activate the ventilation output and before activating the heating output it will comply with the values configured in functions [F11] Compressor Start Delay Time and [F12] Minimum Compressor Off Time, maintaining these compressor protection parameters. However, control of the defrost parameters is carried out by the **MT-526 plus** controller via sensor 2, respecting the values configured in the functions related to defrosting processes, such as [F17] Defrost Type, [F18] Defrost Start Temperature and [F20] Pre-defrost Time. This mode can only be used in function [T01] = [P00L]

 **Note:** In these two control methods, the water temperature is controlled by another device and sensor 1 is not required.

5.6 Preferred display indication

The [F43] Preferred Indication function selects the main display of the upper (3-digit) display, according to the options below:

[E-51] Displays temperature measured by sensor 1;

[E-52] Displays temperature measured by sensor 2;

[E-53] Displays temperature measured by sensor 3;

[SP] Displays the value of the selected setpoint;

Display of temperature values: In addition to this preferred display, it is possible to view for a few moments both the measured values of all the sensors and the maximum and minimum values recorded, as follows:

5.6.1 Displaying the temperatures of all sensors

A brief touch in the  key displays the current temperature of each sensor, as follows: It displays the legend [S05] and its temperature, then the legend [S052] with its temperature and if sensor 3 is enabled, it will display the legend [S053] with its temperature.

5.6.2 Displaying the maximum and minimum values recorded

Pressing the  key for 2 seconds display the message [FEL] [FENP] with the maximum and minimum temperature values recorded for each sensor, in the following sequence: It displays the legend [INF] with the minimum temperature recorded on sensor 1, then it displays the legend [SUP1] with the maximum temperature recorded, and sequentially from each of the sensors [INF2] [SUP2] and if sensor 3 is enabled, [INF3] [SUP3].

To reset the maximum and minimum temperature records, simply press the  key for 4 seconds until the message [DEL] [FEL] appears, informing that the temperature records have been deleted.

5.7 FUNCTION LOCK

LOC
On

To enable/disable the function lock, press and hold the  and  keys for the time set in parameter [F45] Function Lock Time. With this setting activated, the parameters cannot be changed, however they can be viewed. The parameters that will be available for adjustment when the lock is activated are defined by parameter [F44] Function Lock Mode. The  indicates the status of the lock; if lit, this indicates that the function

lock is active.

5.8 SETTING THE CLOCK (RTC)

To access the clock setting menu, press the  key for 4 seconds until the message [CL0] [Edt] is displayed. In date and time setting mode, use the  or  keys to change the value and, when ready, press the **SET** key to save the set value and continue to the next parameter to be set. The sequence for setting the RTC is as follows:

[dd] day of the month, [nn] month, [yy] year and [EL0] where the hour is set first and then the minutes.

6. INSTALLATION SETTINGS

Fnc
Ed It

Access the installation settings menu by pressing the **SET** key for 4 seconds until [Func] appears. Next [Ed] will appear and then press the **SET** key again. Use the  or  keys to enter the value of **access code 231**, and when ready press the **SET** key (brief touch).

Use the  or  keys to select the desired function. With a short touch of the **SET** key, you can edit its value.

Use the  or  keys to change the value, and when ready, give the **SET** key a short touch to save the set value and return to the functions menu. To exit the configuration menu and return to normal operation (temperature display) press the **SET** key (long touch) until [---].

6.1 Installation configuration table

FUN	FUNCTION	DESCRIPTION	MIN.	MAX.	DEFAULT
[T01]	Operating mode	Selects the operating mode: [P00L] = Pool [H0NÉ] = Bath See 5.4 Control operating modes.	0 [P00L]	1 [H0NÉ]	0 [P00L]
[T02]	Temperature control activation mode	Allows you to select how the Temperature Control Mode is activated: [FENP] - Actuation defined by scan (temperature S1) or event schedule; [FL0] - Actuation via flow switch - This mode does not use event schedules. [dIn4] - Actuation via digital input 4 - This mode does not use event schedules.	0 [FENP]	2 [dIn4]	0 [FENP]
[T03]	S3 input operating mode	Allows you to configure how the S3 input works: [OFF] - Input will not be used; [S053] - Input configured as temperature sensor 3 [dIn4] - Digital input 4, used for remote temperature control; [ALIn] - Alarm input, used to interrupt the control process when activated;	0 [OFF]	3 [ALIn]	0 [OFF]
[T04]	Auxiliary output (AUX) operation mode	Allows you to configure how the auxiliary output works [OFF] = Output disabled; [FHP2] = Output configured as second compressor; [ALAr] = Output configured as alarm	0 [OFF]	2 [ALAr]	0 [OFF]
[T05]	Internal buzzer volume	Allows you to select the sound intensity of the internal buzzer. [OFF] = volume off; [1n] = low volume; [HEd] = medium volume; [H6H] = high volume;	0 [OFF]	3 [H6H]	2 [HEd]
[T06]	Digital input 1 signal type (low pressure switch)	Selects the status of digital input 1: [n0] = normally open contact (NO) [n1] = normally closed contact (NC)	0 [n0]	1 [n1]	0 [n0]
[T07]	Digital input 2 signal type (high pressure switch)	Selects the status of digital input 2: [n0] = normally open contact (NO) [n1] = normally closed contact (NC)	0 [n0]	1 [n1]	0 [n0]
[T08]	Digital input 3 signal type (flow switch)	Selects the status of digital input 3: [n0] = normally open contact (NO) [n1] = normally closed contact (NC)	0 [n0]	1 [n1]	0 [n0]
[T09]	Digital input 4 signal type (if [T01] = [dIn4])	Selects the status of digital input 4: [n0] = normally open contact (NO) [n1] = normally closed contact (NC)	0 [n0]	1 [n1]	0 [n0]
[T10]	Temperature unit	Selects the desired temperature unit: [C] - Celsius degrees; [F] - Fahrenheit degrees;	0 ([0C])	1 ([0F])	0 ([0C])

7. ADVANCED OPERATIONS

7.1 Changing controller parameters



Access the advanced settings menu by pressing the **SET** key for 4 seconds until **[F u n c]** appears. Then **[E d i t]** will appear and then press the key again (brief touch). Use the **▲** or **▼** keys to enter the value of the **access code 123**, and when ready, press the **SET** (brief touch).

Use the **▲** or **▼** keys to select the desired function. By short touching the **SET** key it is possible to edit its value. Use the **▲** or **▼** keys to change the value, and when ready, briefly touch the **SET** key to memorize the set value and return to the function menu.

To exit the menu and return to the normal operation (temperature and time indication) press the **SET** key (long touch) until **[- - -]**.

7.2 Table of parameters

FUN	FUNCTION	DESCRIPTION	MIN	MAX	UN.	DEF
[E d i t]	Access code	By entering the access code (123), the controller allows the user to change the values of the other parameters.	0	9999	-	0
[F 0 1]	Minimum setpoint allowed to the end user	Lower control temperature limit allowed by the user	-20 (-4)	[F 0 2]	°C (°F)	-20 (-4)
[F 0 2]	Maximum setpoint allowed to the end user	Upper control temperature limit allowed by the user	[F 0 1]	[F 0 2]	°C (°F)	200 (392)
[F 0 3]	Control Temp. (Setpoint)	This is the desired control temperature for the water (Operating setpoint).	[F 0 1]	[F 0 2]	°C (°F)	35,0 (95)
[F 0 4]	Control temperature in economic mode (Setpoint Eco)	This is the desired control temperature for the water in economic mode (Setpoint Eco).	[F 0 1]	[F 0 2]	°C (°F)	30,0 (86)
[F 0 5]	Control differential (hysteresis)	Determines the temperature between the actuation and the compressor shutdown. If the temperature of the sensor is below the setpoint value minus the value set in this function, the compressor is On. When the temperature reaches the setpoint, the compressor is turned off.	0,1 (1)	20 (36)	°C (°F)	2,0 (2)
[F 0 6]	Manual temperature control activation time	Determines the time that controller will perform the heating when manual mode is activated. This mode respects the setpoint conditions and of the selected hysteresis.	1	99	hours	4
[F 0 7]	Manual activation time for temperature control (weekend)	Determines how many days the controller will perform heating after activating the mode weekend manual. This mode respects the specific conditions of selected setpoint and hysteresis.	1	7	days	3
[F 0 8]	Startup control delay time	Allows to set the time the controller will wait after power-up before initializing the control. Enabling this function avoids that energy demand peaks take place after the return of electrical power. To disable this function, move the setting to the minimum until [0 F F F] appears on the display.	0 [0 F F F]	9999	sec.	0 [0 F F F]
[F 0 9]	Scan time	This parameter allows to set the running time of the circulation pump and temperature sweep in the pool/reservoir. During this process, the circulation of the water between the heat pump and the pool/reservoir will determine whether or not turn on the compressor (heating system).	1	9999	min.	3
[F 1 0]	Interval between scans	This parameter allows to adjust the time between two temperature scans.	1	9999	min.	60
[F 1 1]	Compressor start delay time	Whenever the compressor needs to be turned on, the controller will first activate the fan output, and then wait until the time configured in this function has elapsed, to then activate the compressor output.	0 [0 F F F]	9999	sec.	30
[F 1 2]	Minimum compressor off time	Allows to set a minimum time for the COMP output will be switched off before it is activated again.	0 [0 F F F]	9999	min.	3
[F 1 3]	Compressor 2 control differential (hysteresis)	When [0 0 4] – Auxiliary Output Operation Mode is set to [C A P 2] , this function is used as heating hysteresis to activate the AUX output. If the sensor temperature is below the value of setpoint minus the value set in this function, the compressor is On. When the temperature reaches the setpoint value the compressor is turned off.	[F 0 5]	20 (36)	°C (°F)	4,0 (7)
[F 1 4]	Delay between compressors activations	When using two compressors ([0 0 4] = [C A P 2]) a delay time can be set between the drive of the first and second compressor, if required simultaneously.	1	9999	sec.	30
[F 1 5]	Minimum temperature differential (S3-S1)	When sensor 3 is enabled, use this parameter to set the minimum temperature differential between sensors 3 and 1. Below this value is assumed: If S3 and S1 are low: the heat pump may not be heating. If S3 and S1 are high: the heat pump and the reservoir are heated.	0 [0 F F F]	30,0 (54)	°C (°F)	0 [0 F F F]
[F 1 6]	Maximum temperature differential (S3-S1)	When sensor 3 is enabled, this parameter allows to set the maximum differential between sensors 3 and 1. Above this value is assumed that the circulation of water between the heat pump and the reservoir is insufficient. The pump may be locked or the filter obstructed.	0 [0 F F F]	30,0 (54)	°C (°F)	0 [0 F F F]

FUN	FUNCTIONS	DESCRIPTIONS	MIN	MAX	UN.	DEF
[F 1 7]	Defrost type	0 = [0 F F] - Defrost disabled 1 = [C A E] - The DEFROST output is not activated, natural defrosting is carried out by the stopping compressor; 2 = [E L E E] - Electric defrost by resistors, where only the DEFROST output is activated; 3 = [C A S] - Hot gas defrost, where the COMP and DEFROST outputs will be actuated to activate the cycle inversion valve;	0 [0 F F]	3 [C A S]	-	1 [C A E]
[F 1 8]	Defrost start temperature	When the S2 temperature is less than or equal to the value set in this function, start the timer according to the value set in the function [F 1 9] - Low Temperature Confirmation Time to Start Defrost so that after this time has elapsed, the pre-defrost (if configured) and defrost cycle begins.	-15 (5)	30,0 (86)	°C (°F)	-8,0 (18)
[F 1 9]	Low temperature confirmation time to start Defrost	When the S2 temperature is less than or equal to as configured in function [F 1 8] - Defrost Start Temperature, the count starts before to start the pre-defrost process (if configured) and defrost. This time is used to prevent temperature fluctuations from generate unwanted defrosts.	0 [0 F F F]	9999	sec.	60
[F 2 0]	Pre-defrost time	Allows to set a time for the outputs to be turned off to carry out a pre-defrost before the defrost interval. At the end of this time, the control evaluates whether the S2 temperature is still lower than the value configured in the function [F 2 1] - Defrost End Temperature and then starts defrost.	0 [0 F F F]	9999	sec.	120
[F 2 1]	Defrost end temperature	When the S2 temperature is higher than temperature set in this function, the controller ends the defrost cycle.	-20 (-4)	200 (392)	°C (°F)	5,0 (41)
[F 2 2]	Maximum defrost duration	Allow to configure the maximum duration of the defrost process. If at the end of this period the defrosting is not completed by temperature, the process will be terminated after this time has elapsed.	0 [0 F F F]	9999	min.	30
[F 2 3]	Maximum time without defrost	When the controller is in the state of heating for longer than the time set in this function, defrost will start regardless of the evaporator temperature. This function serves as protection in the event of defrost sensor failure and prevents the controller from remain constantly in heating mode without defrost.	0 [0 F F F]	99	hours	24
[F 2 4]	Fan operating mode during defrost	Defines how the Fan output will be activated during the defrost process: [0 F F] - Fan output turned off during the pre-defrost and defrost; [P r E] - Fan output turned on only during the pre-defrost interval; [d E F] - Fan output turned on only during the defrost interval; [b o t H] - Fan output turned on during the both pre-defrost and defrost interval;	0 [0 F F F]	3 [b o t H]	-	3 [b o t H]
[F 2 5]	Pump output operation mode during defrost	Defines the way in which the PUMP output will act during the defrost process: [0 F F] - Pump output turned off during the pre-defrost and defrost; [P r E] - Pump output turned on only during pre-defrost interval; [d E F] - Pump output turned on only during defrost interval; [b o t H] - Pump output turned on during the both pre-defrost and defrost interval;	0 [0 F F F]	3 [b o t H]	-	0 [0 F F F]
[F 2 6]	Filtering time (manual)	Determines the time the pump (filter) will be kept running when activated manually using the FILTER MODE key.	1	99	hours	6
[F 2 7]	Minimum operating voltage	Lower RMS voltage limit allowed for equipment operation.	85	265	V	85
[F 2 8]	Maximum operating voltage	Upper RMS voltage limit allowed for equipment operation. To disable the operation of the voltage monitor just adjust the upper range value [F 2 8] below the lower range value [F 2 7] .	85	265	V	265
[F 2 9]	Voltage alarm validation time	Defines the time the controller waits to validate the out-of-range voltage reading. When the mains voltage is outside the adjusted limits, this time starts counting and after the configured time has elapsed, the controller will turn off the control outputs.	1	60	sec.	10
[F 3 0]	Voltage indication offset	Allows compensating for any deviations in the voltage reading.	-20	20	V	0
[F 3 1]	Time for confirmation of High Pressure Alarm [H H , P]	Defines the time required for the digital input to validate the High Pressure Alarm [H H , P] . This time serves to prevent any oscillations cause unwanted alarms in the system.	0 [0 F F F]	9999	sec.	5
[F 3 2]	Time for confirmation of Low Pressure Alarm [H L o P]	Defines the time required for the digital input to validate the Low Pressure Alarm [H L o P] . This time serves to prevent any oscillations cause unwanted alarms in the system.	0 [0 F F F]	9999	sec.	5

FUN	FUNCTIONS	DESCRIPTIONS	MIN	MAX	UN.	DEF
[F33]	Flow Switch Confirmation Time [RFLD]	Defines the time required for the digital input to validate the lack-of-flow alarm [RFLD]. This time serves to prevent any oscillations cause unwanted alarms in the system.	0 [OFF]	9999	sec.	120
[F34]	Pump operation mode in case of lack of flow alarm	Determines the action that will be taken when a lack-of-flow alarm detected: [ND] = Disregards flow switch alarms, not interrupting the control process; [PHE] = Turn off the outputs except the pump output, which will remain activated during the alarm while the time configured in function [F39] - Rearm Delay Time; [LLL] = Turn off all outputs;	0 [ND]	2 [LLL]	-	2 [LLL]
[F35]	Low temperature alarm S1	Defines an S1 temperature value so that an [LOS1] alarm occurs indicating that the temperature is below the desired value. This function has a fixed hysteresis of 1.0°C (2°F) to terminate the temperature alarm.	-21 (-5) [OFF]	200 (392)	°C (°F)	-21 (-5) [OFF]
[F36]	High temperature alarm S2	Defines an S2 temperature value so that an [HS2] alarm occurs indicating that the temperature is above the desired value. This function has a fixed hysteresis of 1.0°C (2°F) to terminate the temperature alarm.	-20 (-4)	201 (393) [OFF]	°C (°F)	201 (393) [OFF]
[F37]	Automatic rearm mode	Configures the controller rearm method when faults occur: [HAN] - Manual rearm only [DD1] - 1 automatic rearm allowed [DD2] - 2 automatic rearm allowed [DD3] - 3 automatic rearm allowed [DD4] - 4 automatic rearm allowed [DD5] - 5 automatic rearm allowed [DD6] - 6 automatic rearm allowed [DD7] - 7 automatic rearm allowed [DD8] - 8 automatic rearm allowed [DD9] - 9 automatic rearm allowed [D10] - 10 automatic rearm allowed [AUTO] - Automatic rearms	0 [HAN]	11 [AUTO]	-	11 [AUTO]
[F38]	Fault monitoring interval for disarm	When a limited number of allowed rearms are configured in function [F37], this function allows to configure the interval in which rearms can occur. After this time has elapsed, the respective occurrence is removed from rearm control.	1	24	hours	6
[F39]	Rearm delay time	This parameter allows configuring the time between the occurrence of an alarm and the next attempt of automatic rearming.	1	9999	min.	1
[F40]	S1 indication offset	Allows to compensate for any deviations in the reading of the S1 sensor, resulting from replacement or changes in the length of the S1 sensor.	-10 (-18)	10.0 (18)	°C (°F)	0.0 (0)
[F41]	S2 indication offset	Allows to compensate for any deviations in the reading of the S2 sensor, resulting from replacement or changes in the length of the S2 sensor.	-10 (-18)	10.0 (18)	°C (°F)	0.0 (0)
[F42]	S3 indication offset	Allows to compensate for any deviations in the reading of the S3 sensor, resulting from replacement or changes in the length of the S3 sensor.	-10 (-18)	10.0 (18)	°C (°F)	0.0 (0)
[F43]	Preferred Indicator	Configures the main display on the upper (3-digit) display: [E-S1] - Sensor 1 temperature [E-S2] - Sensor 2 temperature [E-S3] - Sensor 3 temperature [SP] - Selected setpoint value	0 [E-S1]	3 [SP]	-	0 [E-S1]
[F44]	Function lock mode	Sets the function lock mode: [OFF] = function lock disabled; [LFL1] = partial function lock 1 - prevents adjustment of advanced configuration parameters; [LFL2] = partial function lock 2 - prevents adjustment of controller parameters, allowing only change of operating mode; [FULL] = full function lock, does not allow any parameter adjustment;	0 [OFF]	3 [FULL]	-	0 [OFF]
[F45]	Function lock Time	Sets the time for locking/unlocking the functions. For more information, see setion 5.7 Function Lock.	1	30	sec.	10
[F46]	Address on the RS-485 network	Instrument address on the network for communication with SITRAD software. NOTE: In a network there cannot be more than one instrument with the same address.	1	247	-	1

8. EVENTS SCHEDULE

The **MT-526 plus** has a scheduling of up to 16 configurable events. To access the event schedule settings, just press the  key for 2 seconds until the message [Mod] [Event] is displayed. Use the  or  keys to switch between parameters and select the parameter to be edited by pressing the **SET** key. To adjust the parameter value, use the  or  keys and the **SET** key to confirm the setting with one touch.

The parameters available in the event schedule are as follows:

FUN	PARAMETERS	MIN.	MAX.	UNIT.	DEF.
[E01]	Type of event selected	[HEAT]	[EcoF]	-	[OFF]
[d01]	Day of the week	[LLL]	[Sun]	-	[LLL]
[S01]	Start time	[00:00]	[23:59]	hh:mm	[00:00]
[C01]	Finish time	[00:00]	[23:59]	hh:mm	[23:59]
[E02]	Type of event selected	[HEAT]	[EcoF]	-	[OFF]
[d02]	Day of the week	[LLL]	[Sun]	-	[LLL]
[S02]	Start time	[00:00]	[23:59]	hh:mm	[00:00]
[C02]	Finish time	[00:00]	[23:59]	hh:mm	[23:59]
:	:	:	:	:	:
:	:	:	:	:	:
[E16]	Type of event selected	[HEAT]	[EcoF]	-	[OFF]
[d16]	Day of the week	[LLL]	[Sun]	-	[LLL]
[S16]	Start time	[00:00]	[23:59]	hh:mm	[00:00]
[C16]	Finish time	[00:00]	[23:59]	hh:mm	[23:59]

[E01] .. [E16] - **Event type.** You can select from the following possible events:
[OFF] - Disabled event;
[HEAT] - Heating event;
[EcoH] - ECO heating event (Economic Setpoint);
[FLT] - Filtering event*;
[HE_F] - Heating and filtering event (when heating is switched off by setpoint)*;
[EcoF] - Economy heating and filtering event (when heating is switched off by setpoint)*;
*Filtration only available in pool mode ([D01] = [Pool])

[d01] .. [d16] - **Day of the week the event will occur:**
[LLL] - Event will occur every day of the week;
[Sun] - Event will only take place on Sunday;
[Mon] - Event will only take place on Monday;
[Tue] - Event will only take place on Tuesday;
[Wed] - Event will only take place on Wednesday;
[Thu] - Event will only take place on Thursday;
[Fri] - Event will only take place on Friday;
[Sat] - Event will only take place on Saturday;
[EoF] - Event will take place from Monday to Friday;
[EoS] - Event will take place from Friday to Sunday;

[S01] .. [S16] - **Time the event will start:**
[00:00] to [23:59];

[C01] .. [C16] - **Time the event will end:**
[00:00] to [23:59];

To configure an event that starts on one day and ends on the next, you need to use more than one event for the configuration, as shown in the example below:
Assuming an economic heating event that will take place every weekday from 21:30 to 03:00 the following day. For example, events 1 and 2 are configured for this situation:
Eco heating event [E01]=[EcoH], which will occur every day [d01]=[LLL], starting at [S01]=[21:30] and ending at [C01]=[23:59] and starting event 2, in which eco heating event [E02]=[EcoH], will occur every day [d02]=[LLL], starting at [S02]=[00:00] and ending at [C02]=[03:00] .

9. ADVANCED FEATURES

9.1 True RMS voltage monitor

The controller has a True RMS voltage monitor which monitors the electrical network to ensure that the equipment operates within the limits set by the user. Using the [F27] Minimum Operating Voltage and [F28] Maximum Operating Voltage functions, it is possible to determine the device's operating range. When a voltage outside the configured range is detected, this measurement is validated according to the value configured in function [F29] Voltage Alarm Validation Time, and if after this time the voltage is still outside the range, the control is interrupted by deactivating all the outputs, triggering the alarm (buzzer) and displaying the reason for the failure, whether due to a high voltage alarm [RH.V] or a low voltage alarm [RL.V]. The high and low voltage alarms are accounted for in the rearm control, and the automatic rearm will be carried out according to the settings made by the user. For more information on rearms, see section 9.3 Rearm modes.

The function [F30] Voltage Indication Offset allows adjustments to be made to the voltage value due to possible fluctuations or attenuation of the mains signal.

 **Note:** To disable the voltage monitor, simply set the upper range value [F28] below the lower range value [F27].

To display the RMS voltage in real time, a short touch on the  key will display the value. Pressing the  key for 2 seconds will display the message [F27] [UOLt] and then the minimum [INF] and maximum [SUP] values recorded during operation. If you wish to reset these values, simply press and hold the  key for 4 seconds until the message [DEL] [UREG] is displayed, informing you that the records have been deleted.

9.2 Digital inputs

The MT-526plus controller has 3 unique digital inputs and an auxiliary input that can be used if sensor 3 is not enabled. The inputs have the following functions:

Low pressure digital input

Input dedicated to monitoring low pressure in the compressor. When a change in the logic state of this input is detected, the timer starts according to the value configured in the function [F32] Low Pressure Alarm Confirmation Time, and after this time has elapsed, the controller will enter low pressure alarm mode.

High pressure digital input

Input dedicated to monitoring high pressure in the compressor. When a change in the logic state of this input is detected, the timer starts according to the value set in function [F31] High Pressure Alarm Confirmation Time, and after this time has elapsed, the controller will enter high pressure alarm mode.

Flow switch digital input

Input dedicated to monitoring the water flow switch in the unit. If it is necessary to monitor this input, the function [F34] Pump Operation Mode in Case of Lack of Flow Alarm must be set, so that when a change in the logic state of this input is detected, the timer will start according to the value set in the function [F33] Flow Switch Confirmation Time alarm, and after this time has elapsed, the controller will enter the lack of flow alarm mode, deactivating the outputs according to the option selected in the function [F34].

Auxiliary digital input (S3)

Auxiliary input that can be used in the following ways:

- [0FF] Input will not be used;
- [5n53] Analog input from the temperature sensor 3;
- [d1n4] Digital input 4: used for remote activation of the temperature control. For more information, check item 5.5;
- [RLIn] Alarm input: used to interrupt the control process when activated. In this operating mode, when a change in the logic state of this input is detected, a fixed 1-second timer starts and after this time has elapsed, the controller will enter auxiliary alarm mode.

9.3 Alarms and rearm modes

The controller has a fault monitoring system to interrupt the control process when operating errors occur, which can be of the following types: Low or high compressor pressure input alarms, flow switch, auxiliary alarm input (if enabled), and from the RMS voltage monitor above or below the configured range. Firstly, the rearm mode must be configured using the function [F37] Automatic Rearm Mode, which can be configured to allow up to 10 rearms (1 to 10), unlimited automatic rearms [RUEd] or manual rearms only [RRn]. When a maximum number of rearms is configured, you must also configure function [F38] Fault Monitoring Interval for Disarm, so that a maximum number of faults can occur in this interval, as shown in the example: Assuming that function [F37] = 5 rearms and [F38] = 4 Hours.

Assuming the above situation, if the first fault occurs, the control is interrupted until the time in function [F39] Rearm Delay Time has elapsed, resuming control and counting the first rearm. After control is resumed, a counter is triggered to monitor the number of rearms within the interval set in function [F37], and if more faults occur than the number of automatic rearms allowed within the set interval, the system displays the message [FEB] [CSL], indicating that the system must be rearm manually or remotely (via SITRAD). However, if no further faults occur within this interval, after the set time has elapsed, the first recorded fault is erased from memory.

9.3.1 Manual rearm

When the controller is set to manual [RRn] in the function [F37] Automatic Rearm Mode or when the automatic rearm attempts have ended, you must manually reactivate the control. To do this, press the SET key for 2 seconds until [RRn] [CSL] appears on the display.

9.3.2 Inhibiting the buzzer

When an alarm occurs, the controller's internal buzzer will be activated (and the auxiliary output if [0V4] = [RLRC] is configured as an external alarm) and will remain active for as long as the alarm is occurring or until the user silences the buzzer. To silence the buzzer, simply press any key during the alarm or remotely (via SITRAD) and the message [buc] [0FF] will be displayed informing you that the buzzer has been deactivated.

9.4 Auxiliary output (AUX)

The controller has an auxiliary output which can be configured in function [r04] Auxiliary Output (AUX) Operation Mode with the following options:

- [0FF] Output disabled;
 - [RPP2] Output configured as a second compressor: In this operating mode, the controller will carry out the heating processes using the output as an auxiliary compressor. Thus, when the temperature read from sensor 1 (or 3 if used when configured in bath mode [HAPF]) is below the selected setpoint value minus the value configured in function [F13] Compressor 2 Control Differential (sensor temp. $\leq$ (SP - [F13])), the auxiliary compressor will be activated, but maintaining the waiting time configured in function [F14] Delay Between Compressor Activations, to prevent both compressors from being activated at the same time. When the temperature of the reference sensor is equal to the selected setpoint, the auxiliary output will be switched off along with the other outputs.
 - [RLRC] = Output configured as an alarm: The output can be used to trigger an external alarm, and will be activated whenever any type of alarm or controller operating error is occurring.
- For more information on errors, check item 10.4 and on alarms, item 10.3.

9.5 DEFOREST

9.5.1 Defrost types

When the controller is in automatic mode with an active event or in manual heating mode, it monitors the temperature of sensor 2 to assess the need for a defrost. The function [F17] Defrost Type allows you to select the type of defrost that will be carried out, as described below:

- [nRE] - Natural defrost by compressor stop, where the DEFOREST output is not activated;
- [ELEt] - Electric defrost by resistors activated by the DEFOREST output;
- [GAS] - Defrosting by hot gas, where the COMP and DEFOREST outputs are actuated to activate the cycle reversal valve;

If you don't want defrosting to occur in the unit, there is the option [0FF] Defrost disabled, to prevent the defrosting and pre-defrosting process.

When enabled, defrosting can be initiated by the temperature at sensor 2 or when the maximum defrost-free interval time is reached.

9.5.2 Temperature defrost

When the temperature on sensor 2 reaches the value set in function [F18] Defrost Start Temperature, the countdown begins to validate the temperature in accordance with function [F19] Low Temperature Confirmation Time to Start Defrost. Once this time has elapsed, the controller will enter the pre-defrost interval (if a value has been set in function [F20] Pre-defrost Time). At the end of the pre-defrost interval, the controller assesses whether the temperature at sensor 2 has reached the value set in function [F21] Defrost End Temperature, to avoid unnecessary defrosting, and if not, starts the defrosting process.

9.5.3 Defrost by time

When a new heating cycle starts, a counter is activated according to the value of the function [F23] Maximum Time Without Defrost. This function acts as a safety factor to ensure that the defrosting process takes place when the heating has been running for long periods but the temperature to start defrosting has not been reached, either due to an obstruction in the reading from sensor 2 or due to a fault in the equipment. This function can be disabled by setting this parameter to the lowest value available until [0FF] appears on the display.

After defrosting has started, it will be automatically terminated when the temperature of sensor 2 reaches the value set in function [F21] Defrost End Temperature or when the defrost duration reaches the value in function [F22] Maximum Defrost Duration, ensuring that defrosting can be terminated while maintaining a device safety factor.

 **Note:** The status of the fan (FAN) and pump (PUMP) outputs during the defrosting process can be set via parameters [F24] and [F25].

10. OPERATING SIGNALS AND MESSAGES

10.1 Operating status

You can check the current operating status of the controller at any time by pressing the  key briefly and the following information will be displayed:

CONTROL MODE

	Pool Mode		Bath Mode
	Control via Auxiliary Digital Input		Control via Flow Switch

OPERATING MODE

	Control Off		Waiting Event of Schedule		Automatic Filtering
	Weekend Mode		Automatic Heating		
	Manual Filtering		Manual Heating		

EVENTS SCHEDULE

	If the controller is in automatic mode and has an active event, the event number is displayed.
--	--

CONTROL PROCESS

	Performing Scan		Defrosting		Pre-defrosting
	Heating		Interval between Scans		In Initial Delay

HEATING TIME

	The total time that the controller has been heating up during the day is shown in the sequence.
--	---

FILTERING TIME

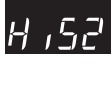
	Lastly, the total filtering time is displayed, i.e. the time the pump was running during the day.
--	---

 **Note:** The elapsed heating and filtering times will be reset every time a new day starts or when the controller is disconnected from the power supply.

10.2 Warnings

	Function Lock activated The parameter cannot be adjusted. To deactivate the function lock, see item 5.7 Function lock.
	Parameter adjustment denied Enter access code in parameter  to adjust parameter value.
	Receiving data via EasyProg* (programming key) Updating parameter table via EasyProg*. *Sold separately.
	Voltage error In the event of a voltage monitor reading failure, either due to values outside the operating range or damage to the equipment, the message  will appear on the controller's display, indicating that a voltage reading failure has been detected, and the monitor will be deactivated until it is normalized.
	Waiting for reset When an alarm has been terminated and the controller is waiting for the time set in function  to reset the system, the legend  will be displayed indicating that the time to activate the outputs again has not yet elapsed.

10.3 Alarms

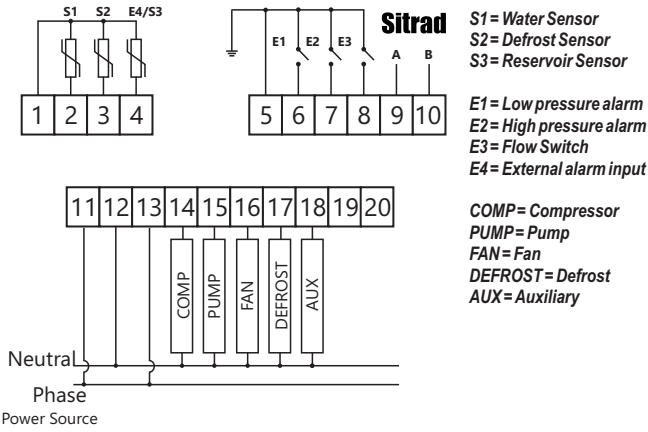
	Voltage above range alarm If a voltage alarm occurs, all outputs will be deactivated and control will only resume after the time set in function  has elapsed and when the voltage returns to the configured range;
	Voltage alarm below range If a voltage alarm occurs, all outputs will be deactivated and control will only resume after the time set in function  has elapsed and when the voltage returns to the configured range;
	High pressure alarm If a pressure alarm occurs, only the compressor output (and auxiliary compressor if configured) will be deactivated, and activated again after the time set in function  has elapsed;
	Low pressure alarm If a pressure alarm occurs, only the compressor output (and auxiliary compressor if configured) will be deactivated, and activated again after the time set in function  has elapsed;
	Lack-of-flow alarm If function  Pump Operation Mode in Case of Lack of Flow Alarm is set to  , the alarms will be ignored and control will not be interrupted. If the value  is set in this function, the pump output will remain activated and the others will be deactivated during the alarm. If the value set in the function is  , all outputs will be deactivated in the event of a no-flow alarm;
	External alarm (if  = ): External digital input alarm, If an external alarm occurs, all outputs will be deactivated and control will only resume after the time set in function  has elapsed and the alarm has been terminated (digital input returns to previous state);
	Low temperature in sensor 1 Through the function  Low Temperature Alarm S1 sets the value so that a warning occurs when the temperature of sensor 1 falls below the set value, with the message  on the display. This function has a fixed temperature differential of 1.0°C (2°F) to terminate this temperature warning. To deactivate this monitoring, simply set the setting to the lowest possible value until  appears on the display.
	High temperature at sensor 2 Through the function  High Temperature Alarm S2 function sets the value so that a warning occurs when the temperature of sensor 2 is above the set value, indicating the message  on the display. This function has a fixed temperature differential of 1.0°C (2°F) to terminate this temperature warning. To deactivate this monitoring, simply set the setting to the highest possible value until  appears on the display.
	Minimum temperature differential (S3-S1) When sensor 3 is enabled, you can set a minimum differential temperature value between sensor 3 and sensor 1 (S3-S1) using the function  Minimum Temperature Differential. Thus, when the temperature reaches a value below this configured differential, the message  will be shown on the display, where it is assumed that below this value the heat pump may not be heating properly. To deactivate this monitoring, simply set the setting to the lowest possible value until  appears on the display.
	Maximum temperature differential (S3-S1) When sensor 3 is enabled, you can set a maximum differential temperature value between sensor 3 and sensor 1 (S3-S1) using the function  Maximum Temperature Differential. Thus, when the temperature reaches a value above this set differential, the message  will appear on the display, assuming that there is insufficient water circulation between the heat pump and the tank. The pump may be locked or the filter may be blocked. To deactivate this monitoring, simply set the setting to the lowest possible value until  appears on the display.

10.4 Errors

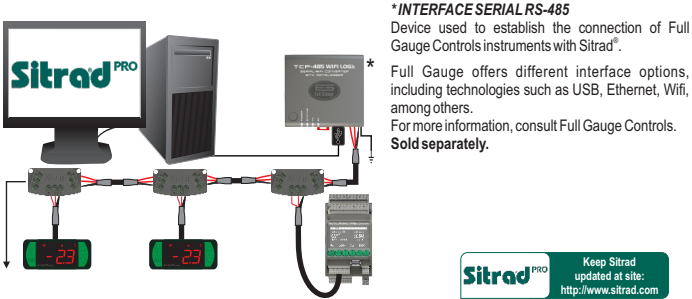
If the controller detects an error that interferes with the system's operation, the controller switches off the outputs, intermittently turns on the audible alarm and indicates the detected fault on the display. To exit error mode, the fault must be corrected.

	Action: Contact Full Gauge Controls.
	Action: Contact Full Gauge Controls.
	Reason: Temperature sensor 1 disconnected or outside the specified range. Action: Check sensor connections and operation
	Reason: Temperature sensor 2 disconnected or outside the specified range. Action: Check sensor connections and operation
	Reason: Temperature sensor 3 disconnected or outside the specified range. Action: Check sensor connections and operation
	Reason: Controller has reached the maximum number of rearm attempts. Action: Perform reset manually via SET key or remotely via SITRAD software.

11. ELECTRIC DIAGRAM

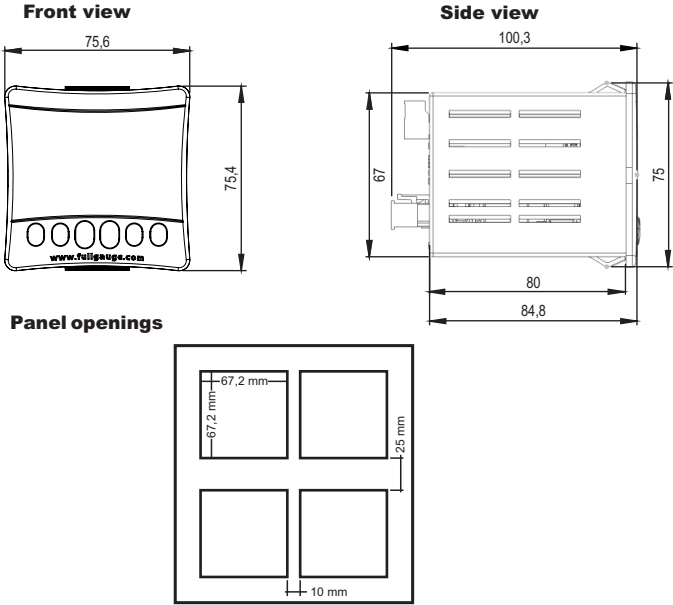


12. CONNECTING CONTROLLERS, RS-485 SERIAL INTERFACE AND COMPUTER



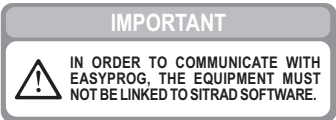
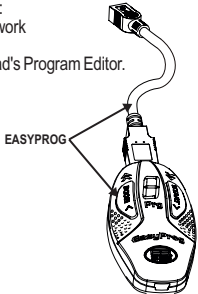
CONNECTION BLOCK
It is used to connect more than one controller to the Interface. The wire connections must be made as follows: Terminal **A** of the controller connect to terminal **A** of the connection block, which in turn, must be connected to terminal **A** of the Interface. Repeat the procedure for terminals **B** and $\pm$, being $\pm$ the cable screen. Do not splice the cables. Use the connection block to make connections to the controllers, in addition to facilitating the connection, the connection block has a protection function.

13. DIMENSIONS



14. OPTIONAL ITEMS - SOLD SEPARATELY

EasyProg - version 6 or higher
This is an accessory, whose main function is to store the parameters of the controllers. You can load new parameters from a controller at any time, and download them to a production line (from the same controller), for example.
It has three types of connection for loading or clearing parameters:
- **Serial RS-485:** Connect it to the controller using the RS-485 network (only controllers that can access RS-485).
- **USB:** If connected to the computer by a USB port, it can use Sitrad's Program Editor.
- **Serial TTL:** The controller can connect directly to **EasyProg** by a Serial TTL connection.



15. WARRANTY

ENVIRONMENTAL INFORMATION
Packaging:
Full Gauge products use packaging made from entirely recycled materials. Please dispose of it through specialized recyclers.

Product:
The components used in Full Gauge controllers can be recycled and reused if they are dismantled by specialists.

Disposal:
Do not burn or throw controllers in the domestic waste, once they have reached the end of their working life. Follow the current legislation applicable to your area in relation to disposing of electronic waste. If you have any questions, contact Full Gauge Controls.

WARRANTY - FULL GAUGE CONTROLS

Products manufactured by Full Gauge Controls, from May 2005, have a warranty period of 10 (ten) years direct from the factory and 01 (one) year from accredited retailers, starting from the consignment date on the sales invoice. After this year, the warranty will continue to be honored for purchases from retailers if the device is sent directly to Full Gauge Controls. This period is valid in Brazil. Other countries provide a guarantee for 2 years. The products are guaranteed in the event of a manufacturing fault that makes them unsuitable or inappropriate for the uses to which they were intended. The warranty is limited to the maintenance of devices manufactured by Full Gauge Controls, regardless of any other form of costs, such as any indemnity due to damage caused to other equipment.

WARRANTY EXCEPTIONS
The Warranty does not cover transport and / or insurance costs for sending products believed to have defects or to have malfunctioned to Technical Support. The following events are also not covered: natural wear of parts, external damage caused by falls or improper packing of products.

LOSS OF WARRANTY
The product will automatically no longer be covered if:
- The instructions for use and assembly contained in the technical description and installation procedures listed in the NBR5410 standard are not observed;
- It is subjected to conditions beyond the limits specified in its technical description;
- If it is opened up or repaired by a person who is not part of Full Gauge's technical team;
- The damage which has taken place was the result of a fall, blow or impact, water damage, electrical surge or atmospheric discharge.

USING THE WARRANTY
To take advantage of the warranty, the customer must send the product properly packed, together with the corresponding purchase invoice, to Full Gauge Controls. The delivery cost for the product is borne by the client. You will also need to send as much information as possible regarding the defect that has been detected, thus making it possible to streamline the analysis, testing and servicing.
These processes and any eventual maintenance of the product will only be carried out by Full Gauge Controls' Technical Support, at the Company's head office - Rua Julio de Castilhos, 250 - Zip Code 92120-030 - Canoas - Rio Grande do Sul - Brazil.

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