Microsol II E plus Ver.07

DIFFERENTIAL TEMPERATURE CONTROLLER FOR SOLAR HEATING SYSTEMS WITH TWO BACKUP STAGES

Full Gauge® CONTROLS

⚠ Have this manual to hands when using the **FG Finder** application.

Protection against freezing | Protection against superheating | Temperature differential | Functions lock | Control Functions Shutdown | Serial programming | IP 65 FRONT Degree of protection | Sitrad Supervisory system

1. DESCRIPTION

The **MICROSOL II E plus** is a differential temperature controller for solar heating systems, that simplifies water temperature management in thermal tanks and swimming pools, using solar power effectively. It has functions that avoid water from overheating or freezing within the piping. It controls the water circulation pump based on the differential temperatures between the solar panels and the thermal tank or swimming pool. It has two outputs for backup heating, that can be electric, gas, diesel-fuelled, or to program the filtering of the swimming pool. The output AUX2 can also be used to program pool filtration or as a thermostat for water circulation in the keg so the hot water takes less time to reach the consumption point, thus wasting less water. In addition, it has a real time scheduling feature that allows the programming. If a weekly schedule with up to eight daily events. It has RS-485 serial communication port for Sitrad monitoring and management.

What do auxiliary systems mean (or backup systems)?
They function as backups for the solar heating system on rainy and cold days. They are usually gas burners, electric heaters, or heat exchangers (heat pump). If the solar heating system is not enough to heat the water (thermal tank and swimming pool), the auxiliary systems start to operate to heat the water. Sensor 3 is responsible for the activation of the auxiliary equipment (backup systems).

2. SAFETY RECOMMENDATIONS

- Read this manual before installing and using the controller;
- The installation procedures should be performed by a qualified technician;
- Wear adequate personal protective equipment (PPE);
- Make sure the power supply is switched off and will not be switched on during the installation of the controller;
- Make sure the controller is properly fastened;
- For application in location subject of water spills, install the vinyl protection provided with the controller;
- For protection under more critical conditions, we recommend the Ecase cover, available as an option (sold separately);

3. APLICATIONS

• Pumped solar heating systems
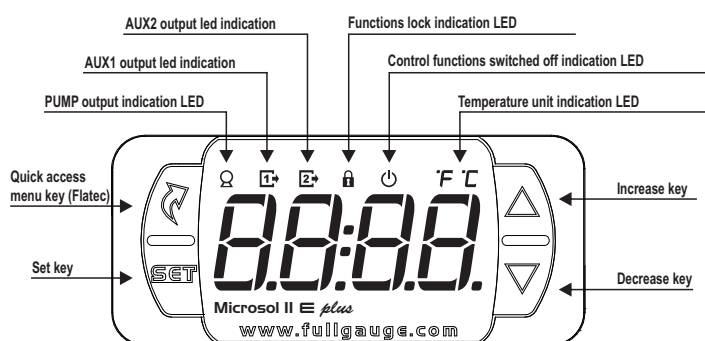
4. TECHNICAL SPECIFICATIONS

Power Supply	**Microsol II E plus:** 115 or 230 Vac ±10%* (50/60 Hz) **Microsol II EL plus:** 12 or 24 Vdc or Vac +10%*
Approximate consumption	0.5 VA
Temperature range (**)	**Sensor 1** - Panels (or solar collector): White cable - Silicon: -50 to 200°C / -58 to 392°F **Sensor 2** - Swimming pool (or thermal tank): Black cable - PVC: -50 to 105°C / -58 to 221°F **Sensor 3** - Auxiliary equipment activation (backup systems): Black cable - PVC: -50 to 105°C / -58 to 221°F
Operating temperature	0 to 50 ºC / 32 to 122°F
Operating humidity	10 to 90% UR (no condensation)
Maximum current per output	**PUMP:** 12(8)A / 240Vac 1HP **AUX 1:** 10A / 240Vac 2400W **AUX 2:** 5(3)A / 240Vac
Degree of protection	IP 65 (frontal)
Dimensions (mm)	76 x 34 x 77 mm (WxHxD)
Cutout dimensions (mm)	X = 71±0,5 Y = 29±0,5 (see Image V)

(*) Acceptable variation in relation to the rated voltage.
(**) This device can measure and control temperatures of up to 200°C/392°F, when used in conjunction with a SB59 model silicon sensor cable (sold separately).
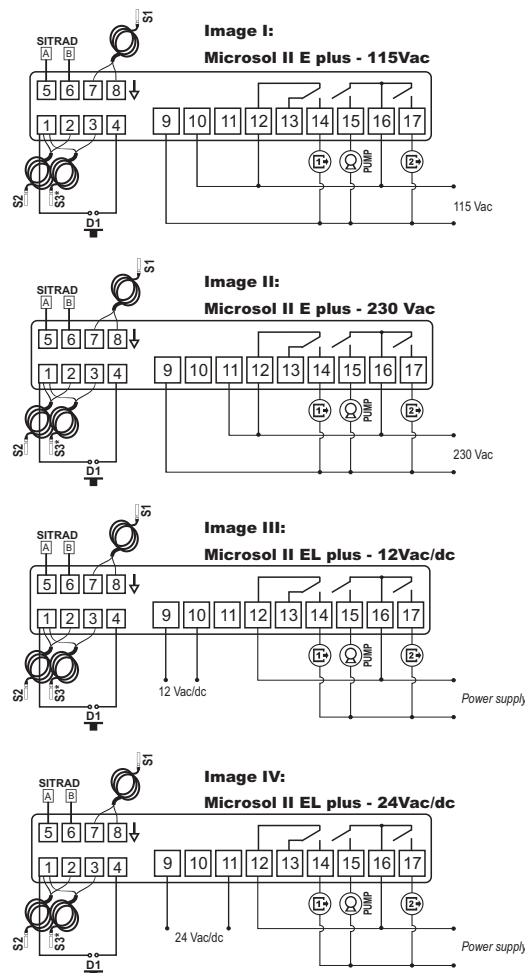⚠ **IMPORTANT:** Only sensors 1 and 2 are included with the product. Sensor 3 may be purchased separately.

5. INDICATIONS AND KEYS

AUX2 output led indication
AUX1 output led indication
PUMP output indication LED
Functions lock indication LED
Control functions switched off indication LED
Temperature unit indication LED

Quick access menu key (Flatec)
Increase key
Set key
Decrease key

Microsol II E plus
www.fullgauge.com

6. CONNECTION DIAGRAM

6.1. Electric connections (see images I to IV)

Image I:
Microsol II E plus - 115Vac
115 Vac

Image II:
Microsol II E plus - 230 Vac
230 Vac

Image III:
Microsol II EL plus - 12Vac/dc
12 Vac/dc
Power supply

Image IV:
Microsol II EL plus - 24Vac/dc
24 Vac/dc
Power supply

CAPTION:
⤓ To the terminal ⤓ of the connection block

SENSOR IDENTIFICATION:
S1: Solar panels
S2: Tank / swimming pool
S3*: Surface

⚠ **IMPORTANT**
EVOLUTION LINE INSTRUMENTS HAVE TWO DIFFERENT TERMINAL SIZES, BUT BOTH ARE COMPATIBLE WITH THE 2.0 mm SCREWDRIVER. USE APPROPRIATE TOOLS DURING INSTALLATION AND ENSURE A LONGER LIFE AND THE PROPER OPERATION OF THE PRODUCTS.

Electric noise suppressor filter (sold separately)

Diagram showing the connection of suppressors in contactors
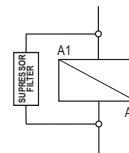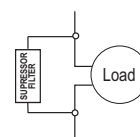A1 and A2 are the terminals of the contactor's coil.

Diagram showing the connection of suppressors in direct drive loads
For the direct drive, consider the specified maximum current.

6.2. Temperature sensor connection

- Connect the wires of **Sensor S1** to terminals "7 and 8" / **Sensor S2** to terminals "1 and 2": the polarity is indifferent and if **Sensor S3** is used, it must be connected to terminals "1 and 3".
- Sensors cables lenght can be extended up to 200 meters using a PP 2 x 24 AWG cable.
- For water immersion use a thermowell (image VI-item 15), available from the Full Gauge Controls product line (sold separately).

6.3. Controller power supply

Use the terminals according to the table below, depending on the version of the controller:

Bornes	Microsol II E plus	Microsol II EL plus
9 e 10	115 Vac	12 Vac/dc
9 e 11	230 Vac	24 Vac/dc

6.4. NBR5410 and IEC60364 standard recommendations

a) Install voltage overload protection in the power supply line of the controller.

b) Install surge protectors-suppressor filter (RC type) - in the circuit to improves instruments performance. See instructions on how to connect the filter on the previous page.

c) Sensor cables may run together, but not through the same mains where the electricity supplies of the controller and / or loads pass.

7. FASTENING PROCEDURE

a) Cut out sheet metal of the panel (image V - item 15) where the controller will be fastened, with the dimensions X = 71 ± 0.5 mm and Y = 29 ± 0.5 mm;

b) Remove the side locks (image VII - item 15): to do that, press the central elliptical part (with Full Gauge Controls Logo) and move the latches backwards;

c) Insert the controller in the notch made on the panel, inwords;

d) Place the locks and move them until they are pressed against the panel, fastening the controller into the housing (see the indication of the arrow on image VII - item 15);

e) Perform the electric installation as described in item 6;

f) Adjust the parameters as described in item 8.

⚠️**WARNING: for installations that require liquid tightness, the opening to install the controller must be 70.5 x 29 mm maximum. The side locks must be fixed in order to press the sealing gasket to prevent infiltration between the opening and the controller.**

Vinyl protection - Image VIII (item 15)

It protects the controller when it is installed in locations subjected to splashes of water, such as refrigerated display counters.

This vinyl protection is included with the instrument.

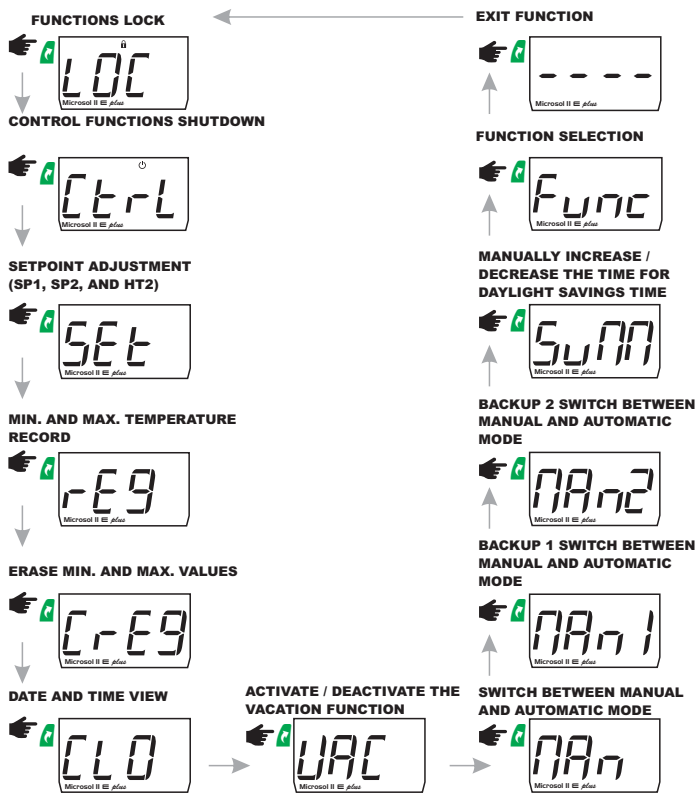⚠️ **IMPORTANT: Apply only after finishing the electric connections.**

a) Push the side locks backward (Image VII - item 15);

b) Remove the protective film from the adhesive face of the vinyl;

c) Apply the vinyl on the entire upper part, bending the tabs as indicated by the arrows - image VIII (item 15);

d) Reattach the locks.

NOTE: The vinyl is transparent, allowing the instrument's electric diagram to be seen.

8. ADJUSTING THE DESIRED TEMPERATURE AND PARAMETERS

8.1. Quick Access Menu Chart

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). For more details, see chapter 8.3; below is the map of functions:

FUNCTIONS LOCK — `LOC`

CONTROL FUNCTIONS SHUTDOWN — `CtrL`

SETPOINT ADJUSTMENT (SP1, SP2, AND HT2) — `SEt`

MIN. AND MAX. TEMPERATURE RECORD — `rE9`

ERASE MIN. AND MAX. VALUES — `CrE9`

DATE AND TIME VIEW — `CLO`

ACTIVATE / DEACTIVATE THE VACATION FUNCTION — `UAC`

SWITCH BETWEEN MANUAL AND AUTOMATIC MODE — `MAn`

EXIT FUNCTION — `----`

FUNCTION SELECTION — `Func`

MANUALLY INCREASE / DECREASE THE TIME FOR DAYLIGHT SAVINGS TIME — `SuMM`

BACKUP 2 SWITCH BETWEEN MANUAL AND AUTOMATIC MODE — `MAn2`

BACKUP 1 SWITCH BETWEEN MANUAL AND AUTOMATIC MODE — `MAn1`

8.2. Quick access keys map

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

SET	**Quick touch: the current day, month, year, day of the week, hour, and minute/temperature will be shown in sequence on the display.**
SET	**Held down for 2 seconds: Setpoint adjustments (SP1, SP2, AND HT2).**
SET	**Held down for 5 seconds: switch between manual and automatic pump activation mode.**
▲	**Quick touch: display of the maximum and minimum measurements recorded.**
▲	**Held down for 2 seconds: clear history when records are being displayed.**
▲	**Held down for 5 seconds: backup 2 switch between manual and automatic activation mode.**
▼	**Quick touch: momentarily switches the temperature view.**
▼	**Held down for 5 seconds: backup 1 switch between manual and automatic activation mode.**

🔁	**Quick touch: enter the quick access menu.**
🔁	**Held down for 5 seconds: control functions shutdown.**
▲▼	**Held down simultaneously: access to the function selection.**

9. BASIC OPERATIONS

9.1 Backup operating temperature adjustment (SETPOINTS)

Pressing SET for 2 seconds you can adjust the operating temperature of Backup 1 and Backup 2, as well as the superheating temperature of sensor 2 (tank / swimming pool). The message `SP1`, will be displayed; adjust the operating temperature of Backup 1 using the ▲ or ▼ key, press SET to confirm. Then the message `SP2`, will be displayed; adjust the operating temperature of Backup 2 as described above. After pressing the SET key the message `Ht2` will be displayed for the adjustment of the superheating temperature of sensor 2. Again, use the ▲ or ▼ keys to change the value and press SET to confirm. Finally the indication `----` is signaled concluding the configuration. The setpoints may also be adjusted in the quick access menu.

9.2 Viewing other temperatures

To switch between the temperature views for sensor 1, sensor 2, sensor 3 (if enabled) and temperature difference, press ▼ until the desired temperature is displayed.

`t-1`	Sensor 1 temperature
`t-2`	Sensor 2 temperature
`t-3`	Sensor 2 temperature
`d,F`	Temperature differential (T1-T2)

The selected temperature will be displayed for 15 seconds and then the default indication will return (as per `F01` parameter setting).

9.3 Minimum and maximum temperature record

By pressing the ▲ key or also through the quick access menu (see item 6), the message `rE9` will be displayed and then message `t-1` indicating the temperature of sensor 1 and the maximum and minimum recorded temperatures immediately after, then the temperature of sensor 2 `t-2`, sensor 3 `t-3` (if enabled), and differential `d,F`, will be displayed. To erase the current minimum and maximum values, press the 🔁 key (quick touch) until the message `CrE9` is displayed. Press SET to confirm.

Note: If the ▲ key is pressed while the records are being displayed the values will be reset and the message `rSt` will be displayed.

9.4 View current date and time

Quickly pressing the SET key makes possible to view the current date and time set in the controller. The display will show sequentially the current day (`--d`), mouth (`--M`), year (`--y`), weekday (`dAY-`) hour and minute (`00:00`) and if the preferred view set in `F01` or `Hour`, the temperature is also displayed. It is also possible to view the date and time through the quick access menu in the option `CLO`.

9.5 Manual pump activation

The pump is manually activated by pressing the SET key for 5 seconds.

When the manual mode is selected, the pump remains on for 6 hours (fixed time) and then the controller assumes the automatic mode. If you want to return to the automatic mode before the 6 hours have elapsed, press the SET key again for 5 seconds to deactivate the manual mode; the message `AUto` will be displayed.

The message `MAn` is displayed upon manual activation, this message alternates with the display of the default indication `F01`. It is also possible to choose the mode through the quick access menu `MAn`.

NOTE: It is not possible to activate the manual pump mode when the control shutdown is active.

NOTE: Manual pump mode can be activated even with one or more sensor errors.

9.6 Manual activation of backup 1

Backup 1 is manually activated by holding the ▼ key down for 5 seconds.

When the manual mode is selected, backup 1 keeps regulating the temperature regardless of the event schedule for the time defined in `F20`, after the controller assumes automatic mode. If you want to return to the automatic mode before this time has elapsed, hold the ▼ key down again for 5 seconds to deactivate the manual mode; the message `AUto` will be displayed.

The message `MAn1` is displayed upon manual activation, this message alternates with the display of the default indication `F01`. It is also possible to choose the mode through the quick access menu `MAn1`.

9.7 Manual activation of backup 2

The backup 2 is manually activated by pressing the ▲ key for 5 seconds.

When the manual mode is selected, backup 2 keeps regulating the temperature regardless of the event schedule for the time defined in `F26`, after the controller assumes automatic mode. If you want to return to the automatic mode before this time has elapsed, hold the ▲ key down again for 5 seconds to deactivate the manual mode; the message `AUto` will be displayed.

The message `MAn2` is displayed upon manual activation, this message alternates with the display of the default indication `F01`.

It is also possible to choose the mode through the quick access menu `MAn2`.

NOTE: If the controller's control functions are disabled or if vacation mode is enabled, manual activation of the backups will not be allowed.

9.8 Vacation Mode

Vacation mode can be activated using the quick access menu (🔁), option `UAc` and pressing SET to confirm.

When active:

* The event schedule is disregarded and the backup outputs are switched off, resulting in a reduction in power consumption.

* Carries out the cooling of the tank as programmed in `F30` - Temperature to switch off the cooling in vacation mode (S3).

The Vacation function is used to switch the backup systems off and to allow cooling of the tank through the solar panel when its temperature is below the tank temperature, for example: during the night. During periods with low or no hot water consumption and high solar intensity, for example vacations, extended holidays, or for the residence's off seasons, the tank will reach the maximum temperature limit and the solar heating system will be subject to a high thermal load. Upon activating vacation mode, the message $\boxed{UAC}$ is displayed, and this message is alternated with the display of the preferred indication $\boxed{FD1}$.

9.9 Functions lock

The use of the functions lock brings greater security to the operation of the instrument. When it is activated, the setpoint and other parameters can be visible to the user when activated, but they are protected against undue changes $\boxed{F41}$ = 2 or you can block changes to the control functions and leave the adjustment of the setpoints enabled $\boxed{F41}$=1.
Using the ⏻ key (quick touch), access the function $\boxed{LOC}$ in the quick access menu, confirm by pressing ⏻ (quick touch), then the message $\boxed{no}$,will be displayed. Keep the ▼ key pressed for the time configured for the functions lock $\boxed{tLOC}$, until $\boxed{LOC}$ is displayed. The message $\boxed{On}$ will be displayed indicating the functions lock is activated upon releasing the key.

↓

LOC
Microsol II E plus

To unlock, turn the controller off and then turn it on again with the ▼ key pressed. Keep the key pressed until $\boxed{LOC}$ is displayed. Keep the key pressed for 10 seconds and, upon releasing the key, the message $\boxed{OFF}$ will be displayed indicating the functions lock is deactivated.

9.10 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 not by the control functions shutdown function $\boxed{F43}$.
When enabled, the control and alarms functions are turned off ($\boxed{Ctrl}$ $\boxed{OFF}$) or on ($\boxed{Ctrl}$ $\boxed{On}$) through the quick access menu in the option $\boxed{Ctrl}$. When the control functions are off the message $\boxed{OFF}$ will then be displayed alternately with the temperature and the other messages. Except when $\boxed{F43}$ is equal to 3 or 4, in which case the display is switched off, keeping only the ⏻ icon on.
NOTE: It is also possible to switch the control functions on / off by pressing the ⏻ key for five seconds.

↓

Ctrl
Microsol II E plus

9.11 Manually increase/decrease the time for daylight saving time

Using the option $\boxed{SuПП}$ on the quick access menu it is possible to increment or decrement one hour to adjust the clock for daylight savings time.
When this function is accessed you need to enter the access code $\boxed{123}$ to allow you to make the adjustment.
Use the ▲ or ▼ keys to choose between increase $\boxed{Inc}$ or decrease $\boxed{dEc}$ the time, and press ⏻ to confirm.

9.12 Unit Selection (ºC / ºF)

To select the units that the system will use to operate, press ▲ and ▼ simultaneously as the temperature/hour is being displayed, enter the option $\boxed{CodE}$ using the access code $\boxed{231}$ and then press ⏻. Then select the desired unit $\boxed{oC}$ or $\boxed{oF}$ using the ▲ ▼ keys and press ⏻ to confirm.
NOTE: Whenever the units are changed, the functions' configuration assumes the factory default, so they need to be configured again.

10. ADVANCED OPERATIONS

10.1 Access to the main menu

The main menu can be accessed through the quick access menu (⏻), option $\boxed{Func}$ or by pressing ▲ and ▼ simultaneously while the temperature is being displayed.
The following options will be displayed:
$\boxed{CodE}$ Entry to the access code
$\boxed{Func}$ Change the advanced parameters
$\boxed{ПodE}$ Event schedule operation mode
$\boxed{Pro9}$ Event schedule programming
$\boxed{CLO}$ Adjustment or display of the date and time

Select the desired function using the ▲ or ▼ keys. Press ⏻ (quick touch) after selecting the function to view its value. Use ▲ or ▼ to change the value and press ⏻ when ready to save the configured value and return to the functions menu. To leave the menu and return to the normal operating mode (temperature indication), hold down ⏻ (long touch) until $\boxed{----}$ appears.
Note: If the functions lock is active, the controller will show the message $\boxed{LOC}$, in the display upon pressing ▲ or ▼ and will not allow the adjustment of the parameters.

10.2 Access Code

To change the parameters or adjust the clock, select the $\boxed{CodE}$ option by pressing ⏻ (quick touch) and entering the access code 123 (one hundred and twenty-three) using the ▲ ou ▼ keys, and confirm with ⏻ .

10.3 Date and time adjustment

When the $\boxed{CLO}$ menu is selected, if the access code $\boxed{123}$ has been entered, the controller will enter the date and time adjustment mode. Use ▲ or ▼ to change the value and press ⏻ when ready to save the configured value. If the date entered is invalid, the message $\boxed{ECLO}$ will be shown on the display.

Example 1 (correct access code entered):
$\boxed{00d}$ - day $\boxed{00П}$ - mouth $\boxed{004}$ - year $\boxed{00:00}$

time ↓ ↓ minute
flashing

⚠ **IMPORTANT:**
The controller has an auxiliary internal power supply to keep the clock running for at least 72 hours in case of power failure. If the controller remains off for a long period of time, the message $\boxed{ECLO}$, may be displayed to indicate that the clock is not programmed. In this case, the date and time must be adjusted and the controller must be kept on for 10 hours to fully recharge the auxiliary power supply.
NOTE: If the controller's clock is not programmed (message $\boxed{ECLO}$) it is possible to adjust the time even when the functions are locked (message $\boxed{LOC}$). Under these conditions the clock adjustment is enabled and the other functions remain locked. After the clock is adjusted the adjustment function is locked again.

10.4 Event schedule operation mode

In the main menu (after entering the code 123) select the option $\boxed{ПodE}$ and then the desired function using the ▲ and ▼ keys. The factory default for the controller is $\boxed{It7}$ - Daily Programming. To leave the menu and return to the normal operating mode (temperature indication), hold down ⏻ (long touch) until $\boxed{----}$ appears.

$\boxed{Ib1}$ - **Weekly Programming:** In this mode the instrument can configure up to 8 events for each day of the week.
$\boxed{2t6}$ - **Weekdays Programming:** In this mode, the instrument keeps the same events from weekdays (Monday to Friday) and allows you to program different events for Saturday and Sunday.
$\boxed{It7}$ - **Daily Programming:** In this mode, the instrument keeps the same events for all days of the week.

10.5 Event schedule programming

This option allows entering the values of the time intervals for each event. Data input depends on the configured operation mode. Up to eight events may be configured for each day. The start time and end time of each event is set using options $\boxed{On1}$ to $\boxed{On8}$ $\boxed{OFF8}$, where:
$\boxed{On1}$ - Start time of the 1st event.
$\boxed{OFF1}$ - End time of the 1st event.
.
.
.
$\boxed{On8}$ - Start time of the 8th event.
$\boxed{OFF8}$ - End time of the 8th event.

To configure the event schedule on menu $\boxed{Pro9}$:
a) Press ▲ and ▼ (quick touch) simultaneously, the option $\boxed{CodE}$, will be displayed to request the access code.
b) Press ⏻ and enter the access code 123 using the ▲ or ▼ keys, confirming with ⏻ . The option $\boxed{CodE}$ will appear again.
c) Browse the menu using the ▲ or ▼ key until the option $\boxed{Pro9}$ appears, and then press ⏻ .
The following programming options may be displayed depending on the operation mode:

$\boxed{ПodE}$

$\boxed{Ib1}$ - Weekly programming		**Events programmable by day**
$\boxed{P1}$ - Sunday	→	$\boxed{On1}$ - Start time of the 1st event
$\boxed{P2}$ - Monday		$\boxed{OFF1}$ - End time of the 1st event
$\boxed{P3}$ - Tuesday		.
$\boxed{P4}$ - Wednesday		.
$\boxed{P5}$ - Thursday		.
$\boxed{P6}$ - Friday		$\boxed{On8}$ - Start time of the 1st event
$\boxed{P7}$ - Saturday		$\boxed{OFF8}$ - End time of the 1st event
$\boxed{2t6}$ - **Weekdays programming**		
$\boxed{P26}$ - Monday to Friday		
$\boxed{P7}$ - Saturday		
$\boxed{P1}$ - Sunday		
$\boxed{It7}$ - **Daily programming**		
$\boxed{P17}$ - Everyday		

If it is not necessary to use all the eight events then they may be configured in the disabled mode by increasing the switch off time ($\boxed{OFF1}$ for instance) until $\boxed{OFF}$ is displayed. It is also possible to configure an event to cross midnight by incrementing the switch off time until the option $\boxed{Cro}$ is displayed and adjusting an event for the following day starting at 12: 00 AM.

d) The time configured for the chosen event will be displayed. Use the ▲ or ▼ key to change the time and press ⏻ again to return to the event programming menu.
e) To leave the event programming menu and return to the home screen, press ⏻ until the message $\boxed{----}$ is displayed.

NOTE: By default the event schedule comes with all events disabled.
NOTE 2: When the event schedule operation mode is changed all events return to the default, i.e. disabled.

10.6 Parameter Table

Fun	Description	CELSIUS (°C)				FAHRENHEIT (°F)			
		Mín	Máx	Unit	Standard	Mín	Máx	Unit	Standard
F01	Preferred indication	t1	hour	-	t2	t1	hour	-	t2
F02	Differential to switch the water circulation pump on	1.0	40.0	°C	8.0	1	72	°F	15
F03	Differential to switch the water circulation pump off	1.0	40.0	°C	4.0	1	72	°F	8
F04	Minimum temperature in S1 to activate the pump	-50(off)	200	°C	-50(off)	-58(off)	392	°F	-58(off)
F05	Instrument energization delay	0(no)	999	seg.	0(no)	0(no)	999	seg.	0(no)
F06	Negative differential (T1-T2) to switch the pump on to dissipate heat	-40.0	0.0(off)	°C	0.0(off)	-72	0(off)	°F	0(off)
F07	Minimum temperature at S2 to allow heat dissipation activation	0.0	200.1(off)	°C	200.1(off)	32	392(off)	°F	392(off)
F08	Antifreeze temperature (S1) to switch* the pump on	-18(off)	10.0	°C	8.0	0(off)	50	°F	46
F09	Antifreeze hysteresis	0.1	20.0	°C	2.0	1	36	°F	4
F10	Minimum antifreeze time	0	999	seg.	180	0	999	seg.	180
F11	Superheating temperature (S1) to switch* the pump off - Ht1	0.0	200	°C	90.0	32	392	°F	194
F12	Superheating temperature hysteresis * (S1) to restart the pump	0.1	20.0	°C	1.0	1	36	°F	2
F13	Superheating temperature (S2) to switch* the pump off - Ht2	0.0	200	°C	70	32	392	°F	158
F14	Superheating temperature hysteresis * (S2) to restart the pump	0.1	20.0	°C	1.0	1	36	°F	2
F15	Backup 1 operating mode	0	1	-	0	0	1	-	0
F16	Backup 1 temperature setpoint	-50.00	200	°C	35.00	-58	392	°F	95
F17	Backup 1 operation hysteresis	0.1	20.0	°C	1.0	1	36	°F	2
F18	Min. setpoint allowed to the end user (backup 1)	-50.00	200	°C	-50.00	-58	392	°F	-58
F19	Max. setpoint allowed to the end user (backup 1)	-50.00	200	°C	200	-58	392	°F	392
F20	Backup 1 manual activation time	0(no)	999	min.	0(no)	0(no)	999	min.	0(no)
F21	Backup 2 operating mode	0	9	-	1	0	9	-	1
F22	Backup 2 temperature setpoint	-50.00	200	°C	30.00	-58	221	°F	86
F23	Backup 2 operation hysteresis	0.1	20.0	°C	1.0	0.1	36	°F	2
F24	Min. setpoint allowed to the end user (backup 2)	-50.00	200	°C	-50.00	-58	392	°F	-58
F25	Max. setpoint allowed to the end user (backup 2)	-50.00	200	°C	200	-58	392	°F	392
F26	Backup 2 manual activation time	0(no)	999	min.	0(no)	0(no)	999	min.	0(no)
F27	Cyclical timer on time / Scan Time* (Recirculation)	0(no)	999	min.	1	0(no)	999	min.	1
F28	Cyclical timer off time / Interval* between scans	0(no)	999	min.	1	0(no)	999	min.	1
F29	Event schedule linking mode	0	7	-	0	0	7	-	0
F30	Temperature to switch off the cooling in* vacation mode (S3)	-50.00	200	°C	50	-58	392	°F	122
F31	Output of backup 1 associated to the antifreeze (S1)	0ff	0n	-	0ff	0ff	0n	-	0ff
F32	Indication offset for sensor 1	-5.0	5.0	°C	0.0	-9	9	°F	0
F33	Indication offset for sensor 2	-5.0	5.0	°C	0.0	-9	9	°F	0
F34	Indication offset for sensor 3	-5.0	5.1(off)	°C	0.0	-9	10(off)	°F	0
F35	Linking of sensor S3 to the pump automatic* mode	no	yes	-	no	no	yes	-	no
F36	Maximum time the backup 1 output remains on without* reaching the setpoint	0(no)	999	min.	0(no)	0(no)	999	min.	0(no)
F37	Thermostat output off time in state of alarm for not reaching the setpoint	1	999	min.	1	1	999	min.	1
F38	Digital input operating mode	0(off)	8	-	0(off)	0(off)	8	-	0(off)
F39	Pump output enable	0ff	0n	-	0n	0ff	0n	-	0n
F40	Backup on only when the pump is off	0(no)	3	-	0(no)	0(no)	3	-	0(no)
F41	Functions lock mode	0	2	-	0	0	2	-	0
F42	Time for functions lock	15	60	seg.	15	15	60	seg.	15
F43	Control functions shutdown	0(no)	4	-	0(no)	0(no)	4	-	0(no)
F44	Address of the instrument in the RS-485 network	1	247	-	1	1	247	-	1

10.7 Description of the Parameters

F01 - Preferred indication:
This function allows configuring the default temperature indication.
The options are:
- t-1 Displays the temperature of sensor 1
- t-2 Displays the temperature of sensor 2
- t-3 Displays the temperature of sensor 3
- d.F Displays the differential temperature (T1-T2)
- Hour Displays the time

F02 - Differential (T1-T2) to switch the pump on:
As the solar panels receive energy, the temperature in sensor 1 increases. When this temperature is at an ascertainable value above the temperature of sensor 2, the pump is switched on and circulates the heated water down, storing it in the tank for example.

F03 - Differential (T1-T2) to switch the pump off:
Allows configuring the temperature difference in degrees between sensor 1 and sensor 2 for MICROSOL II E plus to switch on the water circulation pump.
Exemple:
F02 = 8.0
F03 = 4.0

When sensor 1 (panel) is at 35° C and sensor 2 (tank or pool) is at 23° C, the difference will be 12° C. Thus the circulation pump will be on (35-23 = 12 greater than 8). With the pump on, the warm water circulates down and the cold water circulates up. Thus the temperature difference between 1 and 2 decreases. Thus, when the difference between sensor 1 and sensor 2 reaches 4° C (function F02), the circulation pump will be switched off (35-31 = 4).

⚠ **IMPORTANT:** The value adjusted in function F02 must be higher than the value adjusted in function F03. Therefore **MICROSOL II E plus** does not allow making invalid adjustments in order to ensure its perfect operation.

Ex.: Current configuration:
F02 : 10.0°C
F03 : 5.0°C

You want to change it to:
F02 : 4.0°C
F03 : 2.0°C

First adjust F03 to 2.0°C and then adjust F02 to 4.0°C.

F04 - Minimum temperature in S1 to activate the pump:
Prevents the pump from being turned on when the temperature of the panel (collector) is below the desired temperature, thus preventing warm or cold water from circulating through the system, which would cause higher power consumption.

Exemple: If the panels are at 27°C and the pool is at 28°C the circulation pump does not need to be activated. This function can be disabled by adjusting it to the minimum value OFF.

NOTE: This function has priority over the other pump activation functions except for the manual activation.

F05 - Instrument energization delay:
With this function enabled, when the instrument is energized, it only works as a temperature indicator remaining with all the outputs off during the defined time. In installations with several units of equipment, configuring different values for the start-up delay time of each instrument, it is possible to avoid demand peaks by activating the loads at different times. This function can be switched off by setting it at the minimum value 0 no.

F06 - Negative differential (T1-T2) to switch the pump on to dissipate heat:
If the temperature in the tank or swimming pool is too high, switch the circulation pump on (even if the water in the panels is cool) to cool the consumption water a little (swimming pool or thermal tank). This function can be disabled by adjusting it to the maximum value OFF.

F07 - Minimum temperature at S2 to allow heat dissipation activation:
This function allows temperature configuration in sensor 2, for safety reasons, to dissipate heat.
This function will be considered to switch the pump on and / or Backup 2, if it is configured for dissipation (F21=6).
This function can be disabled by adjusting it to the maximum value OFF.

F08 - Antifreeze temperature (S1) to switch the pump on:
When the temperature at the panels (sensor 1) is too low (e.g. winter nighttime), the water circulation pump is switched on at regular intervals to prevent the water from freezing and damaging the pipes. While the pump is switched on due to the antifreeze, message ICE is alternated with the default temperature indication. This function can be disabled by adjusting it to the minimum value OFF.

F09 - Antifreeze hysteresis:
It is the temperature difference in sensor 1 (panel) for the antifreeze to be switched off.
Exemple:
F08 = 5,0 °C
F09 = 1,0 °C
When the temperature in sensor 1 falls to 5°C, the circulation pump is activated so that a little of the warm water of the swimming pool or thermal tank flows through the solar panels. Thus, when the temperature rises by 1°C and reaches 6°C in sensor 1 (5+1=6), the pump will be switched off.

F10 - Minimum antifreeze time:
It is the minimum time the circulation pump will remain on to ensure (for safety reasons) that the water will circulate through all panels. This function is frequently used in large installations due to the number of panels required.

F11 - Superheating temperature (S1) to switch the pump off - HT1:
When the temperature at the collectors (sensor 1) is higher than an adjustable value, the pump is switched off to prevent the superheated water from circulating through the pipes and damaging them (if PVC pipes are used). When superheating is detected in sensor 1, message Ht1 is alternated with the default temperature indication.

F12 - Superheating temperature hysteresis (Sensor 1) to restart the pump:
Temperature difference to restart the circulation pump.
Exemple:
F11 = 80,0 °C
F12 = 10,0 °C
When sensor 1 temperature reaches 80° C, the circulation pump is switched off, and when the temperature falls to 70° C, the circulation pump starts again (80 - 10 = 70).

F13 - Superheating temperature (S2) to switch the pump off - HT2:
This is the maximum desired temperature in the tank, above which the circulation pump will not function. This is a safety measure to protect the hydraulic installation in case of superheating. This function is used in swimming pool heating systems without the third sensor. When superheating is detected in sensor 2, message Ht2 is alternated with the default temperature indication.

F14 - Superheating temperature hysteresis (Sensor 2) to restart the pump:
If the pump is off due to superheating in sensor 2 this function can define a temperature range within which the pump will remain off.
Exemple:
F13 = 28,0 °C
F14 = 1,0°C
The swimming pool will be heated until sensor 2 temperature reaches 28° C. When this value is reached, the circulation pump is turned off. When the temperature drops to 27° C, the swimming pool is heated again (28 - 1 = 27).

F15 - Backup 1 operating mode:
   `0` Backup 1 working independently from backup 2.
   `1` Backup 1 disabled when backup 2 is active.

NOTE: Programmed in 1, if the two backup systems are in condition to be switched on, backup 1 is switched off and the controller displays the message `AA2`, except when backup 1 is with manual activation or when backup 1 is operating in the antifreeze (F31).

F16 - Backup 1 temperature setpoint:
Temperature to switch off backup 1.

F17 - Backup 1 operation hysteresis:
Temperature to switch backup 1 on again.
Exemple:
`F16` = 30,0 °C
`F17` = 1,0°C
Backup 1 switches off at 30° C and switches on again at 29° C (30-1=29).

⚠ **IMPORTANT:** Backup 1 is linked to an event schedule (acts in accordance with user-defined times up to eight daily events). That is why the times must be programmed for this backup system to work properly. If the clock of the controller is not programmed (message `ECLO`), **MICROSOL II E** *plus* assumes a momentary disconnection until the clock is reprogrammed.

F18 - Minimum setpoint allowed to the end user (backup 1):
Avoids regulation of excessively low setpoint temperatures by mistake.

F19 - Maximum setpoint allowed to the end user (backup 1):
Avoids regulation of excessively high setpoint temperatures by mistake.

F20 - Backup 1 manual activation time:
Time for which **MICROSOL II E** *plus* will remain independent from the event schedule if the user activates backup 1 manually. After this time, backup 1 returns to automatic mode.

F21 - Backup 2 operating mode:
   `0` Refrigeration thermostat.
   `1` Heating thermostat.
   `2` Refrigeration thermostat linked to the event schedule.
   `3` Heating thermostat linked to the event schedule.
   `4` Cyclical timer with initial state on.
   `5` Cyclical timer with initial state on and linked to the event schedule.
   `6` Refrigeration thermostat for dissipation of excess temperature in the water tank.
   `7` Heating thermostat of the keg with recirculation.
   `8` Heating thermostat of the keg with recirculation linked to the event schedule.
   `9` Event output independent from thermostats.

When the thermostat mode is selected for the keg heating, the backup systems are controlled by different sensors. Backup 2 is controlled by sensor 3 while backup 1 is controlled by sensor 3. For this, sensor 3 must be enabled in function `F34`.
In the other thermostat functions, both backup systems are controlled by the same sensor. If sensor 3 is disabled (F34=OFF), both backup systems are controlled by sensor 2 or otherwise controlled by sensor 3, if it is enabled.

NOTE: If the controller's clock is not programmed (message `ECLO`) and the operating mode of backup 2 is linked to the event schedule, **MICROSOL II E** *plus* assumes a momentary disconnection until the clock is reprogrammed.
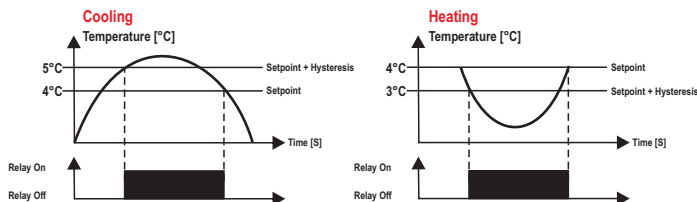
F22 - Backup 2 temperature setpoint:
This is the maximum desired temperature in the swimming pool (or thermal tank), as well as in function `F13`.

F23 - Backup 2 operation hysteresis:
It is the temperature difference (hysteresis) between switching the heating (or refrigeration) of the thermostat ON and OFF of backup 2.
Exemple: One wants to control the temperature at 4.0 °C with a differential of 1.0 °C. Therefore, the cooling is switched off at 4.0 °C and switched back on at 5.0 °C (4.0 + 1.0), in the heating mode the output is switched off at 3° C and is switched on again at 4.0° (1.0 - 4), as per the charts below:

F24 - Minimum setpoint allowed to the end user (backup 2):
Avoids regulation of excessively low setpoint temperatures by mistake.

F25 - Maximum setpoint allowed to the end user (backup 2):
Avoids regulation of excessively high setpoint temperatures by mistake.

F26 - Backup 2 manual activation time:
Time for which **MICROSOL II E** *plus* will remain independent from the event schedule if the user activates backup 2 manually. After this time, backup 1 returns to automatic mode.

F27 - Cyclical timer on time / Recirculation* (Scan Time):
It allows the adjustment of the time for which the controller will remain with output AUX 2 on when backup 2 is configured in cyclical timer mode (F21 = 4 or 5).
If the operating mode of backup 2 is heating thermostat of the keg with recirculation (F21 = 7 or 8), this is the time for which the controller will keep the water circulation active to regulate the temperature of the water in the keg.

Note: The recirculation can be disabled by adjusting it with the minimum value 0 `no`, On the other hand, the minimum on time for the cyclic timer is 1 minute.

F28 - Cyclical timer off time / Intervals* between scans:
It allows the adjustment of the time for which the controller will remain with output AUX 2 off when backup 2 is configured in cyclical timer mode (F21 = 4 or 5).
Functions F27 and F28 are used when the user configures backup 2 to filter the swimming pool. In this case, backup 2 will cycle in accordance with the times programmed in F27 (on time) and F28 (off time). If the operating mode of backup 2 is heating thermostat of the keg with recirculation, this is the time interval between the last and the next temperature scan. If the temperature to switch on the backup is reached the scan cycle is restarted.
Note: The interval between scans can be disabled by adjusting it with the minimum value 0 `no`. On the other hand, the minimum off time for the cyclical timer is 1 minute.

F29 - Event schedule linking mode:
This function allows the user to configure whether backup 2 must work in conjunction with backup 1 or not. If backup 2 is programmed as linked to the schedule of (F21=2, 3, 5, or 8), this function will serve to inform the events (times) for which the backup systems will be activated.

   `0` Aux 1 linked to events 1,2,3,4,5,6,7 e 8.
      Aux 2 linked to events 1,2,3,4,5,6,7 e 8.
   `1` Aux 1 linked to event 1.
      Aux 2 linked to events 2,3,4,5,6,7 e 8.
   `2` Aux 1 linked to events 1,2.
      Aux 2 linked to events 3,4,5,6,7e 8.
   `3` Aux 1 linked to events 1,2,3.
      Aux 2 linked to events 4,5,6,7e 8.
   `4` Aux 1 linked to events 1,2,3,4.
      Aux 2 linked to events 5,6,7e 8.
   `5` Aux 1 linked to events 1,2,3,4,5.
      Aux 2 linked to events 6,7e 8.
   `6` Aux 1 linked to events 1,2,3,4,5,6.
      Aux 2 linked to events 7e 8.
   `7` Aux 1 linked to events 1,2,3,4,5,6,7.
      Aux 2 linked to event 8.

F30 - Temperature to switch off the cooling in* vacation mode (S3):
This aims to cool the thermal tank during the night when Vacation mode is active, whenever the sensor 3 temperature is higher than the value adjusted in this parameter and the temperature difference between the solar panel (S1) and the tank (S2) reaches -4.0°C (fixed). Then the pump is switched on using the solar panel as a radiator to cool the water in the swimming pool. When the differential (T1-T2) drops below -2.0°C (fixed) or the backup temperature (S3) drops below the temperature of this parameter, the pump is switched off. The hysteresis of this control is fixed and defined as 2.0°C.

F31 - Output of backup 1 associated to the antifreeze (S1):
When enabled it aims to ensure a minimum temperature in the thermal tank for when the antifreeze function (`F08`) is required.
The output of backup 1 is activated whenever the backup's temperature is below the adjustment of `F08` (antifreeze temperature) + `F09` (antifreeze hysteresis). The hysteresis of this control is fixed and defined as 2.0°C. For example, if adjusted `F08` = `8,0` and `F09` = `20,0`, the output of backup 1 will switch on when sensor 3 temperature is below 28.0°C and switch off when it is above 30.0°C.
Note: This function switches the backup output on independently of backup 1 mode, vacation mode, or event schedule.

F32 - Sensor 1 indication offset:
It allows for the compensation of possible deviations in the temperature reading caused by the replacement of the sensor or changes in the cable length.

F33 - Sensor 2 indication offset:
It allows the compensation of possible deviations in the temperature reading caused by the replacement of the sensor or changes in the cable length.

F34 - Sensor 3 indication offset:
It allows for the compensation of possible deviations in the temperature reading caused by the replacement of the sensor or changes in the cable length. Sensor 3 may be disabled by adjusting this function to the maximum value `OFF`. After sensor 3 is disabled, backup systems 1 and 2 will be controlled by sensor 2 (tank / swimming pool).

F35 - Linking of sensor S3 to the automatic mode (If sensor 3 is enabled):
`no` Circulation pump operating in automatic mode and not linked to sensor 3. With this mode the pump is activated only by the temperature differential (S1-S2).
`YES` Circulation pump operating in automatic mode and linked to sensor 3. With this mode the pump is activated by the temperature differential and when the temperature at sensor 1 is higher than that at sensor 3.
NOTE: When the value of this function is `YES` it will return to [no] when sensor 3 is disabled `no`.

F36 - Maximum time the backup 1 output remains on without reaching the setpoint:
Is the maximum time the output of backup 1 will remain on without reaching the setpoint. When this time is exceeded the visual alarm `9A5` is activated and the thermostat output remains off according to the time defined in F37. Functions F36 and F37 serves as protections for the gas-fired backup so that in case of system failure (flame out for instance), the water circulation is interrupted and the heater is switched off to protect it. This function can be disabled by adjusting it to the minimum value 0 `no`.

F37 - Backup 1 output off time in state of alarm for not reaching the setpoint:
It allows adjusting the time for which the controller will keep the backup 1 output off while in state of alarm for not reaching the setpoint. If the setpoint is reached during this time the alarm is switched off. If the setpoint is not reached after this time has elapsed, new checks are performed during the time defined in F36.

F38 - Digital input operating mode:
`OFF` Off
   `1` Activate / deactivate manual pump operation (NO switch)
   `2` Activate / deactivate manual pump operation (NF switch)
   `3` Activate / deactivate manual backup 1 operation (NO switch)
   `4` Activate / deactivate manual backup 1 operation (NF switch)
   `5` Activate / deactivate manual backup 2 operation (NO switch)
   `6` Activate / deactivate manual backup 2 operation (NF switch)
   `7` Activate / deactivate vacation mode (NO switch)
   `8` Activate / deactivate vacation mode (NF switch)

F39 - Pump output enable:

`OFF` Off
`On` On

It allows the switching on / off of the circulation pump control. If the pump control is switched off, only the backup systems are enabled and the controller disregards the functions related to the circulation pump.

F40 - Backup on only when the pump is off:

It allows the choice of which backup will be linked to the activation of the pump:

`no` No backup
`1` Backup 1
`2` Backup 2
`3` Backup 1 and backup 2

The backup selected in this function will only switch on when the circulation pump is off, preventing the pump from operating at the same time as the backup systems, except when the backup is manually activated.

NOTE: The manual activations have priority over F40.

F41 - Functions lock mode:

It allows and configures the functions lock.

`0` Do not allow the functions lock.
`1` It allows a partial lock where the control functions will be locked but the adjustment of the setpoint, date views, and maximum and minimum record views are allowed.
`2` It allows the full lock, enabling only the date views and maximum and minimum record views.

F42 - Time for functions lock:

Allows lock of control functions (see item 9.9).

`15` - `60` - Defines the time in seconds for the controller to activate.

F43 - Control functions shutdown:

Allows the turning off the control functions (see item 9.10).

`0` Disables the control functions shutdown.
`1` Enables activation/deactivation of the control functions only if the functions are unlocked.
`2` Enables activation/deactivation of the control functions even if the functions are locked.
`3` It enables the activation/deactivation of the control functions only if the functions are unlocked, switching off the display.
`4` Enables activation/deactivation of the control functions even if the functions are locked, switching off the display.

NOTE: In options 3 and 4 the display is switched off if no keys are pressed and switched on when any key is pressed, remaining on for five seconds.

F44 - Address of the instrument in the RS-485 network:

Equipment's network address for communicating with Sitrad® software.

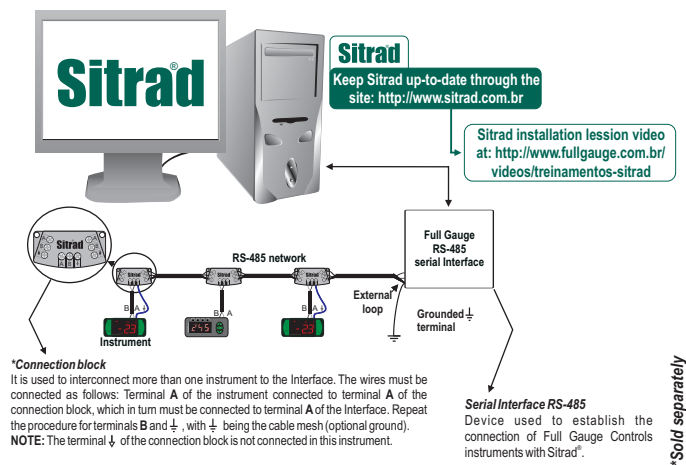**Note:** One network must not have different equipment with the same address.

11. DISPLAY SIGNALINGS

`Err1`	Sensor 1 disconnected or damaged.
`Err2`	Sensor 2 disconnected or damaged.
`Err3`	Sensor 3 disconnected or damaged.
`ICE`	Antifreeze in sensor 1.
`Ht1`	Sensor 1 superheating.
`Ht2`	Sensor 2 superheating.
`gAS`	Reached the maximum on time of backup 1 output without reaching the setpoint.
`MAn`	Pump manually activated.
`MAn1`	Backup 1 manually activated.
`MAn2`	Backup 2 manually activated.
`UAC`	Controller in vacation mode.
`AA2`	Backup 2 activation alarm.
`LOC` `On`	Functions lock.
`LOC` `OFF`	Unlocking of functions.
`OFF`	Control functions off
`ECLo`	Invalid date and/or time (adjust the clock).
`ECAL`	Contact Full Gauge Controls.
`PPPP`	Reconfigure the values of the functions.

12. GLOSSARY OF ABBREVIATIONS

- **°C:** *Temperature in degrees Celsius.*
- **°F:** *Temperature in degrees Fahrenheit.*
- **Auto**: *Automatic.*
- **LOC:** *Blocked.*
- **No:** *No.*
- **OFF:** *Switched off / deactivated.*
- **ON:** *Switched on / activated.*
- **SET (Setting)"** *(adjustment or configuration).*
- **Vac:** *Electric voltage (volts) in alternating current.*
- **Vdc:** *Electric voltage (volts) in direct current.*
- **Yes:** *Yes.*

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

Sitrad
Keep Sitrad up-to-date through the site: http://www.sitrad.com.br

Sitrad installation lession video at: http://www.fullgauge.com.br/videos/treinamentos-sitrad

RS-485 network

Full Gauge RS-485 serial Interface

External loop

Grounded terminal

Instrument

*Sold separately

Connection block
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 ⏚ , with ⏚ being the cable mesh (optional ground).
NOTE: The terminal ⏚ of the connection block is not connected in this instrument.

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

14. OPTIONAL ITEMS – Sold Separately

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.

ECASE PROTECTIVE CASE
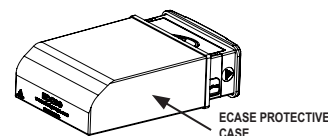
Extension Frame

It allows the installation of controllers with dimensions of 76 x 34 x 77 mm in several situations, because it does not require precision of the opening to embed the instrument.
The frame has two built-in 10-Amp switches that can be used to drive the internal light, air curtain, fan, and others.
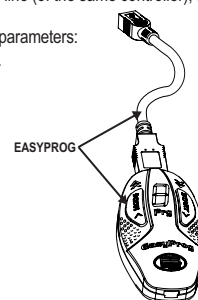

CONTROLLER

EXTENDED FRAME

SWITCHES
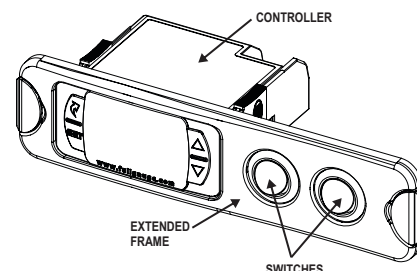
EasyProg - version 2 or later

It is an accessory which has the main function of storing the controller parameters. At any time you can load new parameters of a controller and 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

EASYPROG

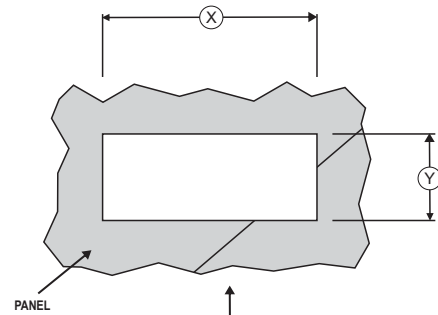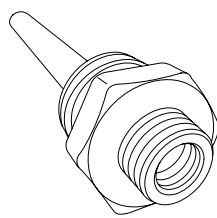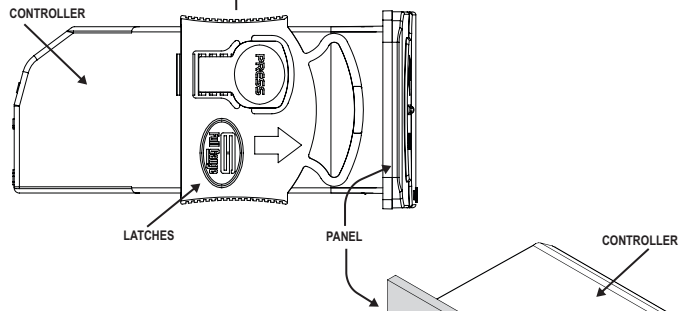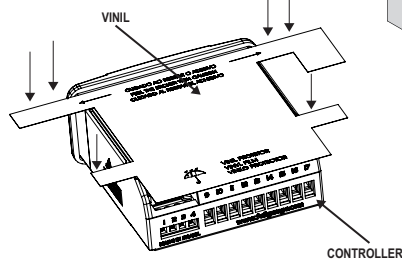| IMPORTANT |
|---|
| ⚠ IN ORDER TO BE ABLE TO COMMUNICATE WITH EASYPROG THE CONTROLLER MUST NOT BE COMMUNICATE WITH SITRAD. |

ANNEXES - Reference Images

Image V

PANEL

Image VI

Image VII

CONTROLLER

PRESS

LATCHES

PANEL

CONTROLLER

Image VIII

VINIL

CONTROLLER

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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