

SOLARIN

WEB

HI precision controller for hot water solar panels with integrated data logger

V 9.00



General Warning

Installation of this component has to be performed by specialized personnel.

Read carefully the instruction manual and warranty limitations. The controller's boards must always be mounted inside a protective box suitable for the environment where is intended to be used and never directly connected to mains, but only to low voltage (12V max) only by certified power adapters.

Every device connected to S0larin0 has to be equipped with all the necessary protections against overvoltage/overpressure/overheat/fault, the reliability/security/capabilities of safety features embedded in S0larin0 do not replace the electric/mechanical/hydraulically ones that have always to be in place and working and that must fit the plant where S0larin0 will eventually be used, moreover those devices, must allow a safe operation even in case of partial/total fault of S0larin0.

Warning: some parts of the controller may become hot.

Exclusion/Limitations

Producer is not liable for any damage caused or induced by this device that has to be employed only for teaching use under competent supervision, any other use is improper and therefore dangerous.

Warranty is considered extinct if the defect is due to improper use, maintenance, fix not made by the producer and/or if serial numbers are altered or not readable.

This warranty is the one and only supplied by the producer in case of defects and replaces any other that was indeed verbally, in written or by any other non mandatory regulation or in consequence of any illicit act.

Responsibility is limited to the value of the device itself, the producer will not be considered liable for damages originated by improper or unreasonable use, furthermore the producer will not be considered liable for every incident caused by lack or non conformity to security guidelines/laws of the grounding plant or any other security device, or generally of the electrical, hydraulic or thermal plant; the personnel which performs the installation is the sole responsible of the compliance of the plant and of S0larin0 with all the regulation that may apply and must possess all the necessary skills, competencies and certifications.

IF YOU DO NOT HAVE ALL THE SKILLS AND COMPETENCIES, OR SUSPECT THAT THE DEVICE COULD NOT BE COMPLIANT WITH REGULATORY, OR IF YOU DON'T AGREE WITH THE ABOVE TERMS DO NOT INSTALL IT AND RETURN THE DEVICE TO THE PRODUCER FOR A REFUND¹ !

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¹ Delivery expenses excluded, must be returned with all the original parts, restocking fees applies.

First Start

Connect all the probes and power up the device, during the startup all the digital probes, or the analog ones in case you're using the analog version, are polled. To speed up the process of assignment you're advised to mark/number the probes starting from 0. Please beware that the first startup creates the Database and can take up to 30 minutes.

To discriminate the probes warm them one at time and take note of the channel that is connected so to know exactly which probe is associated to which channel. Please note that a probe can be always reassigned to any channel, is also possible to assign one probe to multiple channels.

The controller creates an autonomous WIFI AP, connect with a WIFI capable device equipped with a browser that fully supports HTML 5:

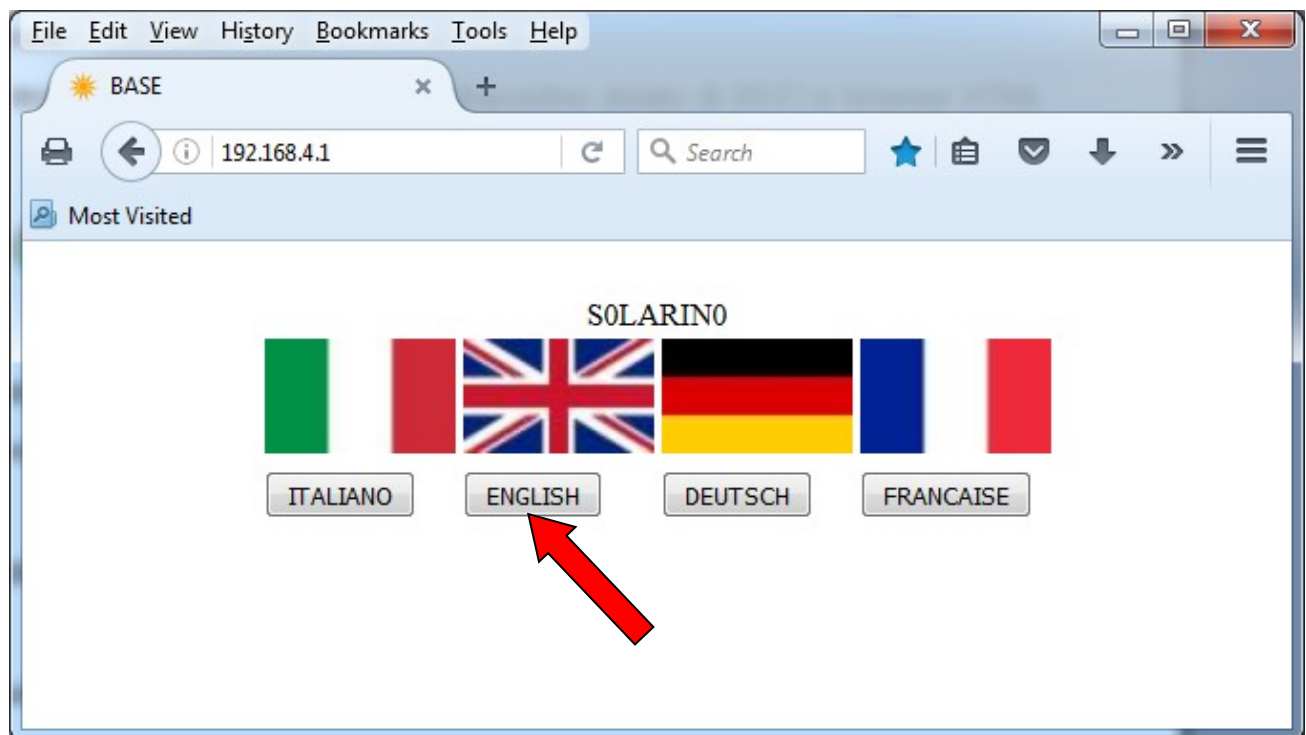


Search for new networks: connect to : **SOLARIN0WEB<xxxx>**

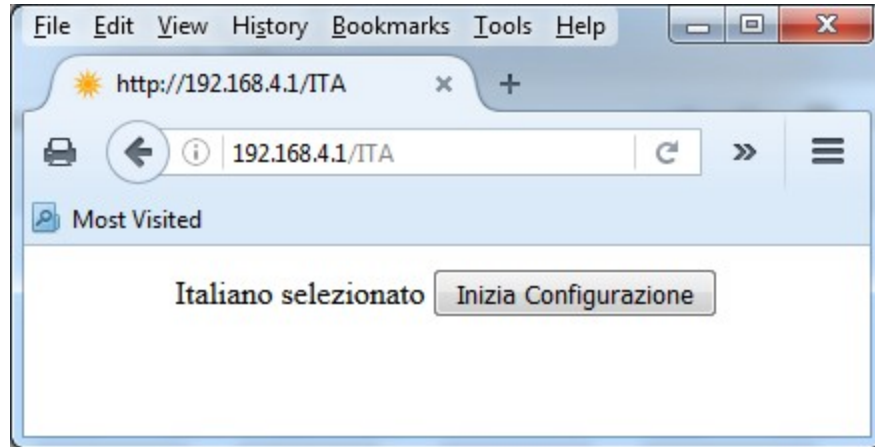
Insert password , **LOWERCASE** : **s0larinoweb0**

Note: <xxxx> is different for every device, password is the same.

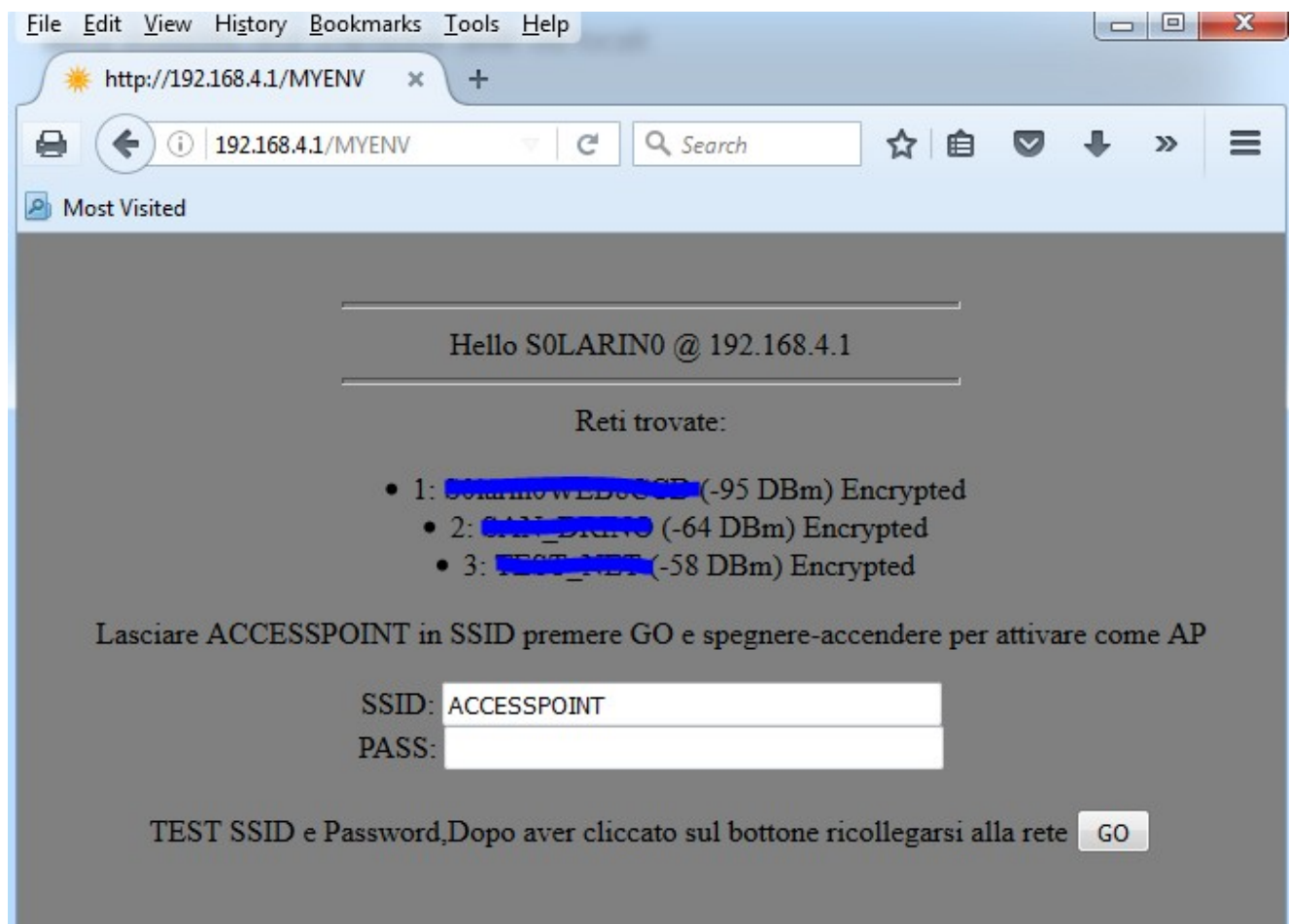
After the connection start a browser on: 192.168.4.1, then choose language:



You can now proceed with configuration, the displayed language will change according to the prior choice:



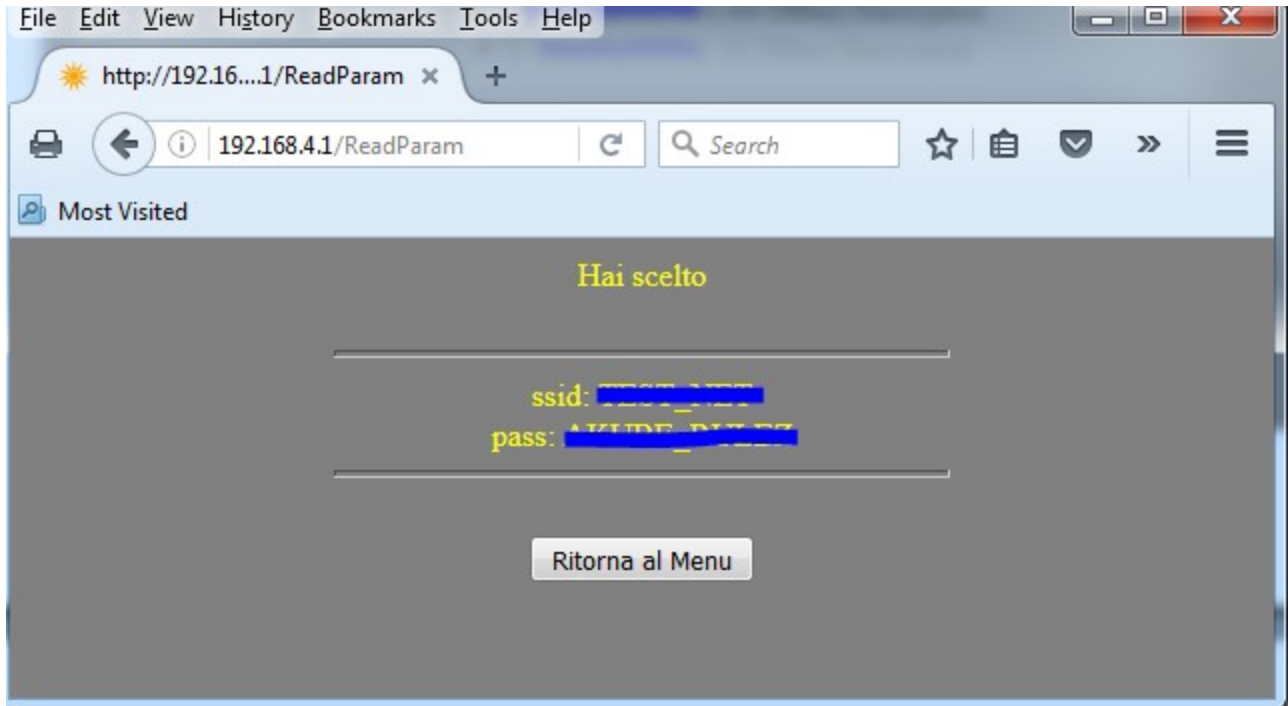
The neighbours network's scan result will be displayed :



Choose the wanted local network filling **SSID** and **PASS** fields, if "**ACCESSPOINT**" keyword is left in SSID then SOLARINO will default to AP and will not connect to any existing WIFI.

NOTE: The basic AP provided by the device will always be active

Now the system will check for connectivity; click on "Return to Menu" and connect to the local AP from 192.168.4.1



If it takes more than 15 Minutes to get to the main menu' please power off then on the unit.

If a local WIFI was chosen and the connection was successful then the next screenshot will show the connection parameters, IE 192.168.1.105. Since AP is always active his IP address will be displayed too, if ACCESSPOINT was chosen or connection to local WIFI is not working then 0.0.0.0 is displayed. Please note that the process can take up to 5 minutes, if unsuccessful cycle power. Logger cannot be used if NTP is not working.

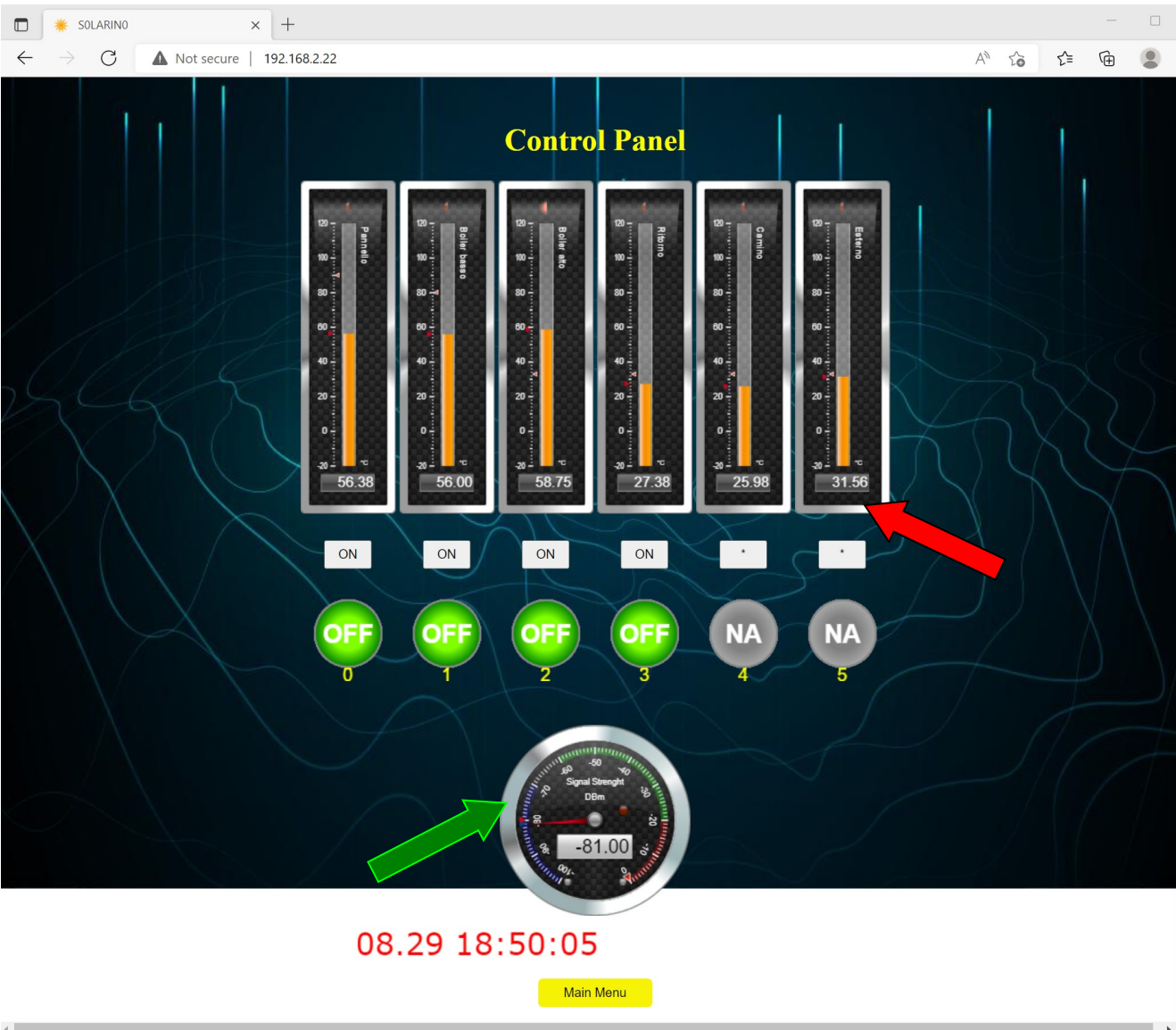
WIRELESS CLIENT DHCP IP -> 0.0.0.0 Network WIFI :

UTC Time: NTP OFF Timezone: 1

n page

At boot up the control panel is displayed, this page is reachable both via AP (WIFI NETWORK SOLarin0Web<xxx>, and by the local WIF if configured

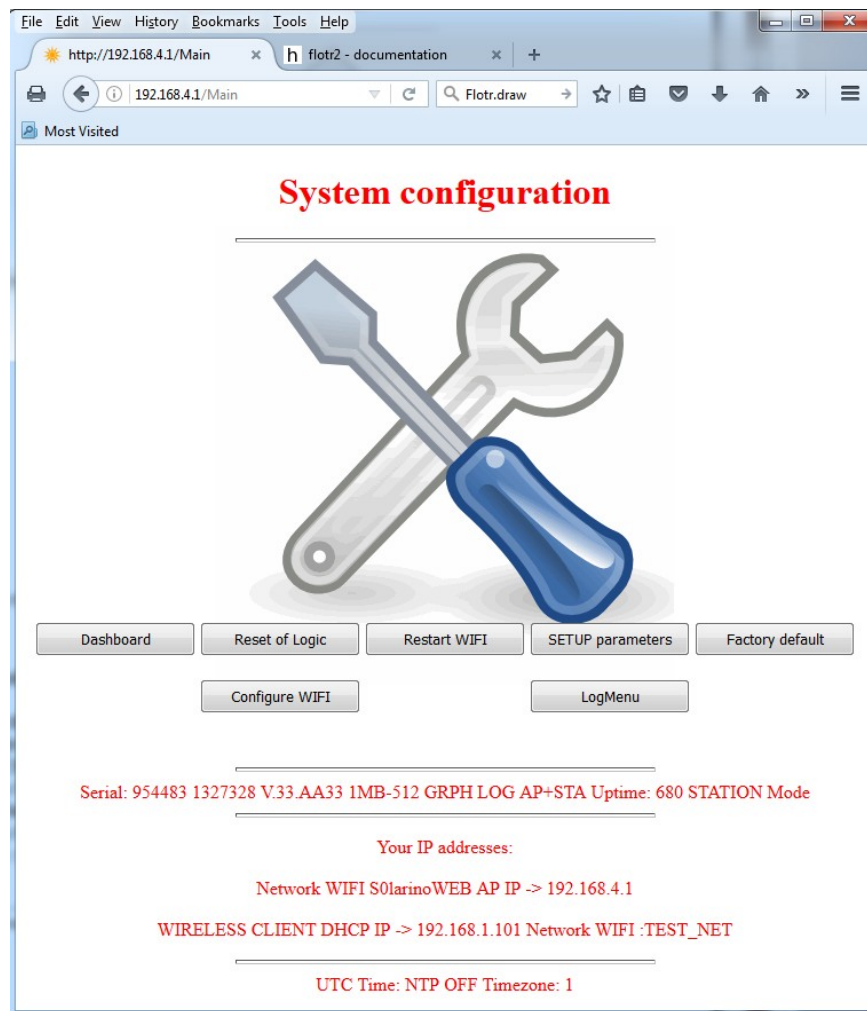
WIRELESS CLIENT DHCP IP -> x.y.z.w Network WIFI : zzzz



The readings (indicated by red arrow) changes if the connection to the controller is working, the green arrow displays the strength of signal while the scrolling text will display either the time or the latest error messages.

System configuration

Clicking on "configuration", will lead to the configuration page:



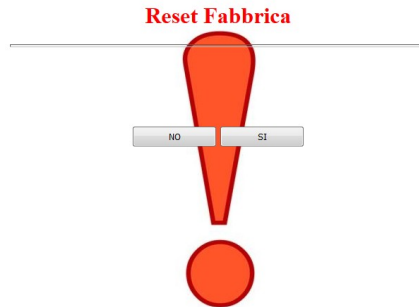
you're advised about taking note of network and IP, this is the address to which you'll have to choose in browser when connected through your WIFI.²

Options:

- Control panel: back home
- Reset logic: resets the controller responsible for power switching relays
- Reset WEB: resets the WEB server
- Configure Parameters: Operations controls
- Reset to factory: restarts power controller to factory defaults, does not affect WIFI
- Configure WIFI: configures WIFI
- LogMenu: log temperatures & graphics

² Note: if NTP is not connected logging will not be activated

Factory reset page



Please beware that the factory reset also creates the Database and can take up to 30 minutes.

Configuration page

Parameters management

T.Safety 0 (coll.1)	90	T.Safety 1 (Boil.1)	70	T.Safety 2 (Boil.2)	70	T.Safety 3 (coll.2)	95
T. ICE	10	Dynamic 0	1	Dynamic 1	1	Hysteresis 0	10
Hysteresis 1	10	Max Boiler 0	85	Max Boiler 1	85	T. Integration (min T2)	30
T. Ext. hinibit	35	Hysteresis 2	10	Resolution BIT	☐ 8 ☐ 10 ☒ 12	Language	English
Operation mode	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ 6	Check ICE	☐ NO ☒ YES	Check external Temp.	☒ NO ☐ YES	Channel 2 follows 3	☒ NO ☐ YES
Type NTC	☒ D ☐ M ☐ 10K ☐ 20K ☐ 50K ☐ 100K	Timezone	1	°F/°C	☒ F ☐ C		
Probe 0 map	0	Probe 1 map	1	Probe 2 map	2		
Probe 3 map	3	Probe 4 map	4	Probe 5 map	5		

Store Parameters

Back to menu

- T.Safety 0 (coll.1)= Temperature Safety on main collector (#1) [°C]
- T.Safety 1 (Boil.1)= Temperature Safety main boiler (#1) [°C]
- T.Safety 2 (Boil.2)= Temperature Safety secondary boiler (#2) [°C]
- T.Safety 3 (coll.2)= Temperature Safety on secondary collector (#2) [°C]
- T.ICE = Temperature of freezing [°C]
- REACTIVITY 0 = Reactivity CH 0
- REACTIVITY 1 = Reactivity CH #2 or #3, depending from configuration
- HYSTERESIS 0 = Delta T 0 [°C]
- HYSTERESIS 1 = Delta T 1 [°C]
- HYSTERESIS 2 = Delta T 2 [°C]
- Max Boiler 0= Temp. Max (Bolier 1) [°C]
- Max Boiler 1= Temp. Max (Bolier 2) [°C]
- T. integration (min T2) = Min. for T2 to activate integration heater [°C]
- T. Ext. Inhibit= Temperature ext. to activate integration heater [°C]
- RESOLUTION = Resolution of probes [BIT] -> from 0.5 to 0.1 [°C]
- Language=language menu

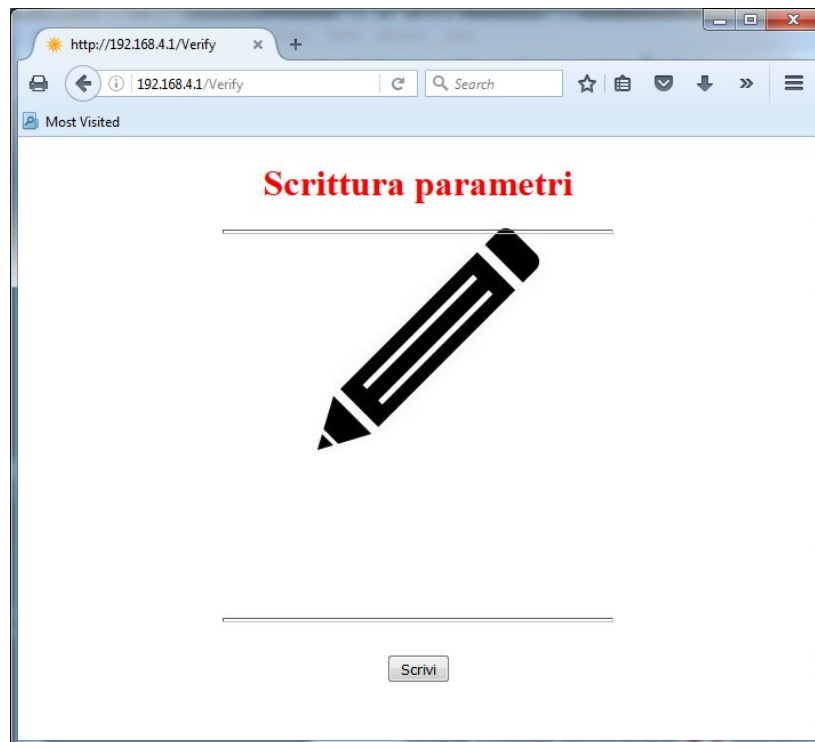
- Operation mode = type of plant 1-6
- Check ICE = Activates check of ICE T0 (& T4 if plant type. 5) [Y/N]
- Channel 2 follows 3 = CH2 can activate (ON) only if CH3 is ON [Y/N]
- Type NTC: for analog model only, not used in digital one modello digitale
- Timezone: NTP adjustment
- °F /°C Fahrenheit/Celsius
- Probe 0 on = mapping Channel 0
- Probe 1 on = mapping Channel 1
- Probe 2 on = mapping Channel 2
- Probe 3 on = mapping Channel 3
- Probe 4 on = mapping Channel 4
- Probe 5 on = mapping Channel 5

Please note that the parameters configuration is ALWAYS done in °C; in the CONTROL SCREEN the temperature will be -eventually- displayed in °F, all the other languages will use °C.

The mapping allows to assign a physical probe to a logic channel without re-cabling.

If "Type NTC" is used only for the model with analogue inputs and allows a choice between NTC: 10, 20, 50 or 100 K Ohm.

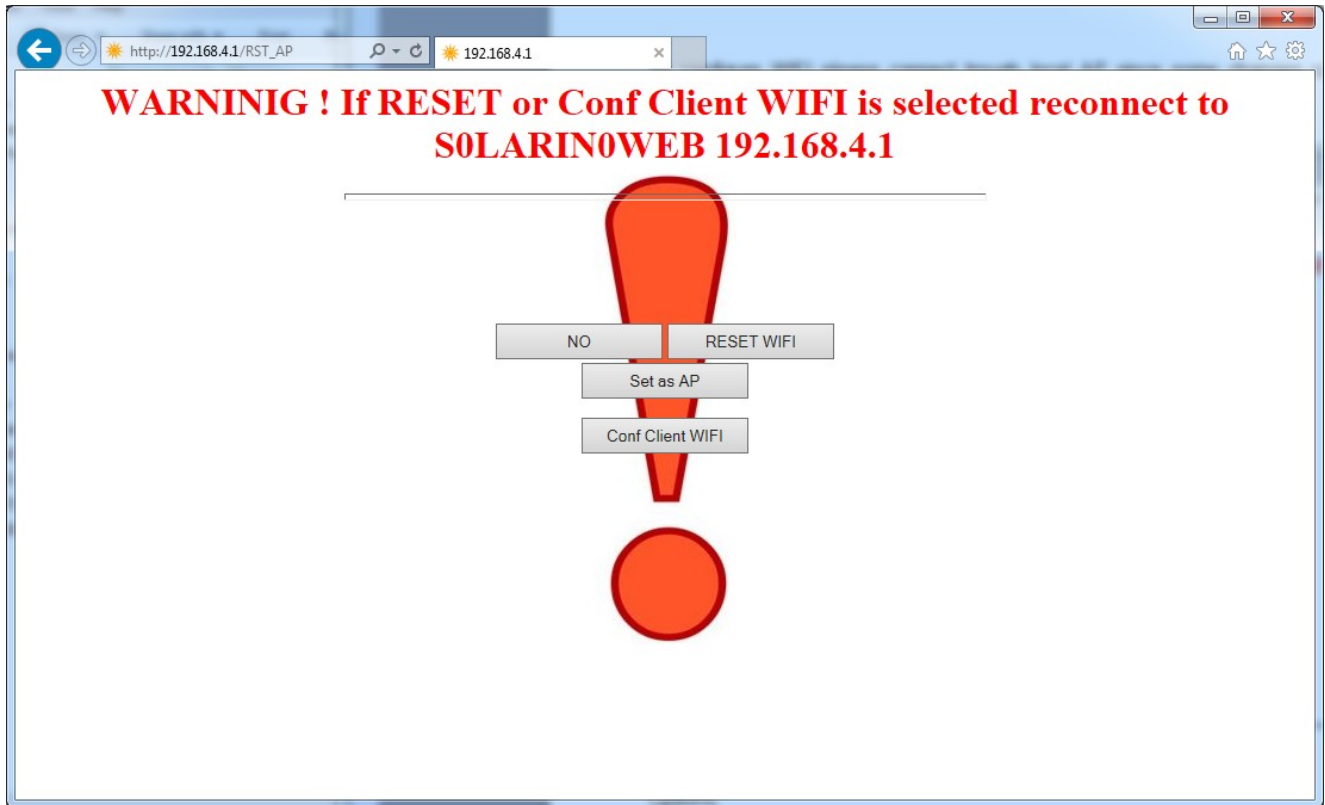
After the setup Click on "Store parameters":



And hit "Write" button.

Configure WIFI

To configure WIFI please connect trough local AP since some changes can lead to a disconnection from your local WIFI.



Options:

- NO: back to control panel
- Reset WIFI: Factory reset of WIFI, please cycle power
- Function as AP: AP only
- CFG Client WIFI: chooses WIFI

LOG Menu

Here the records can be accessed, either in graphical or table view.

A "round robin" system is used, so older data is overwritten by new, if logger is RESET the the system must be restarted by cycling power, please beware that to rebuild the Database it takes 10 Minutes, during this time the system will not be accessible.

Menu logger

Today Daily Monthly

Graphic

Today Daily Monthly

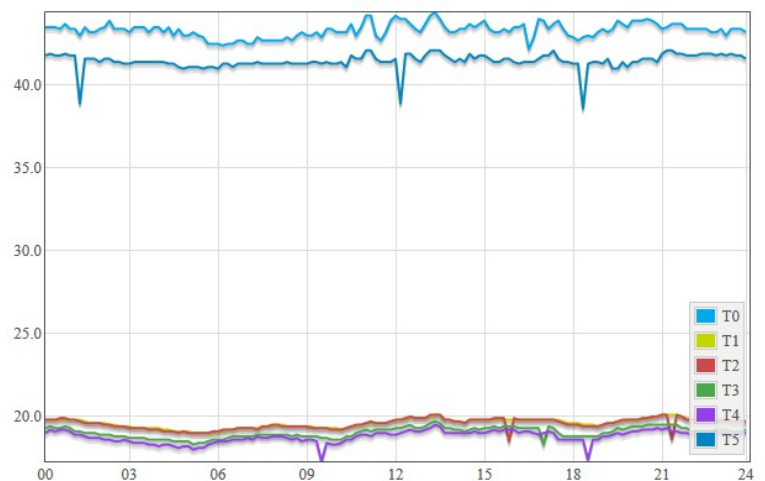
Back to menu

reset logger

Database Temperature

```
2017.01.07 0:07: T0:43.5 T1:19.8 T2:19.8 T3:19.3 T4:19.0 T5: 41.8
2017.01.07 0:16: T0:43.5 T1:19.8 T2:19.8 T3:19.4 T4:19.2 T5: 41.9
2017.01.07 0:24: T0:43.5 T1:19.8 T2:19.8 T3:19.3 T4:19.1 T5: 41.8
2017.01.07 0:34: T0:43.4 T1:19.8 T2:19.9 T3:19.3 T4:19.2 T5: 41.8
2017.01.07 0:42: T0:43.7 T1:19.8 T2:19.9 T3:19.4 T4:19.2 T5: 41.9
2017.01.07 0:52: T0:43.4 T1:19.8 T2:19.8 T3:19.3 T4:19.1 T5: 41.8
2017.01.07 1:09: T0:43.4 T1:19.8 T2:19.8 T3:19.1 T4:18.9 T5: 41.8
2017.01.07 1:18: T0:43.0 T1:19.8 T2:19.7 T3:19.1 T4:18.9 T5: 38.9
2017.01.07 1:27: T0:43.5 T1:19.7 T2:19.6 T3:19.0 T4:18.8 T5: 41.6
2017.01.07 1:35: T0:43.2 T1:19.6 T2:19.6 T3:19.0 T4:18.7 T5: 41.6
2017.01.07 1:44: T0:43.2 T1:19.6 T2:19.6 T3:19.0 T4:18.7 T5: 41.6
2017.01.07 1:54: T0:43.4 T1:19.6 T2:19.6 T3:18.9 T4:18.7 T5: 41.4
2017.01.07 2:03: T0:43.5 T1:19.6 T2:19.5 T3:18.9 T4:18.6 T5: 41.6
2017.01.07 2:11: T0:43.9 T1:19.5 T2:19.5 T3:18.9 T4:18.6 T5: 41.6
2017.01.07 2:30: T0:43.4 T1:19.5 T2:19.4 T3:18.8 T4:18.5 T5: 41.4
2017.01.07 2:38: T0:43.4 T1:19.4 T2:19.4 T3:18.8 T4:18.5 T5: 41.4
2017.01.07 2:47: T0:43.4 T1:19.4 T2:19.4 T3:18.8 T4:18.6 T5: 41.3
2017.01.07 2:56: T0:43.2 T1:19.4 T2:19.3 T3:18.7 T4:18.5 T5: 41.3
2017.01.07 3:06: T0:43.5 T1:19.3 T2:19.3 T3:18.7 T4:18.4 T5: 41.4
```

Grafico Andamento



Note

Power usage

To reduce power usage system goes on "power save" as soon as possible, therefore it could be necessary to reload pages; also some WEB browsers can be disconnected, so:

- Reload with key "F5".
- After any configuration change make sure the new parameters are written.
- Please beware that the first startup creates the Database and can take up to 30 minutes.

Security

If AP only is used there's no connection to the Internet, however the device itself is reachable within his own AP range, so take all the cautionary steps.

DHCP

IP Address may change in case of reboot, in this case to know the address connect to the default.

NTP server

An active NTP server is mandatory for the logger to be reachable.

Default

In case of fault connect to SOLarin0 with a WIFI device. Standing next to the controller look for the network "SOLARIN0WEB<xxxx>", password is solarinoweb0 , browse to 192.168.4.1.

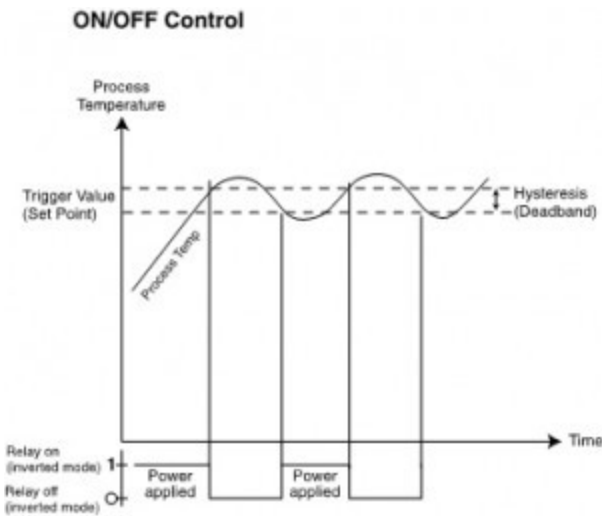
Hysteresis and Dynamics cannel-specific

Every configuration has a specific configuration for hysteresis and dynamics, in the example below Relays 0 has hysteresis set to IST 0 (hysteresis of channel 0), dynamics DIN 0 (dynamics of channel 0); relays 1 and relays 3 are not configurable (na):

EXAMPLE

R	IST	DIN
0	0	0
1	na	na
2	1	1
3	na	na

How Hysteresis works



Definition of symbols

T0 = Temperature Probe 0 [°C]

T1 = Temperature Probe 1 [°C]

T2 = Temperature Probe 2 [°C]

T3 = Temperature Probe 3 [°C]

T4 = Temperature Probe 4 [°C]*

T5 = Temperature Probe 5 [°C]*

R0 = Relay 0 [ON/OFF]

R1 = Relay 1 [ON/OFF]

R2 = Relay 2 [ON/OFF]

R3 = Relay 3 [ON/OFF]

SIC T0 = Temperature safe 0 [°C]

SIC T1 = Temperature safe 1 [°C]

SIC T2 = Temperature safe 2 [°C]

SIC T3 = Temperature safe 3 [°C]

MIN T2 = Temperature minimal 2 [°C]

HI T1 = Temp. Max to be reached (Boiler 1) [°C]

HI T2 = Temp. Max to be reached (Boiler 2) [°C]

ICE = Temperature of freezing of vector fluid [°C]

TenvTex = Temperature external minimal [°C]*

ICE CHECK = Activate check Temperature of freezing [ON/OFF]

CHECK T. Ext. = Activate check Temperature external minimal for integration [ON/OFF]*

HYSTERESIS 0 = Delta T of tolerance 0 [°C]

HYSTERESIS 1 = Delta T of tolerance 1 [°C]

REACTIVITY 0 = Reactivity on channel 0

REACTIVITY 1 = Reactivity on channel 2or3

HYSTERESIS 2 = Delta T of tolerance 2 [°C]*

RESOLUTION = Resolution of digital probes [BIT]

N.O. = Normally Open

N.C. = Normally Closed

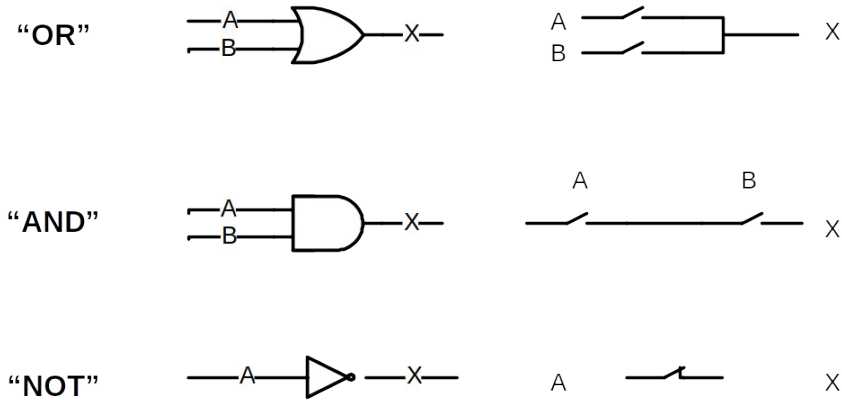
* Only model "SeiSonde"

*

*

System Logic's

Equivalences logical <-> electrical



Interpretation

If A is connected to "SicT2" and B to "SicT1" means that switch X is active (1) if the threshold of SicT2 is exceeded and if the threshold of SicT1 is exceeded.

- **"OR"** X is active if A or B are active (SicT2 or SicT1 exceeded)
- **"AND"** X is active if A and B are active (SicT2 and SicT1 exceeded)
- **"NOT"** X is active if A is not' active (SicT2 not exceeded)

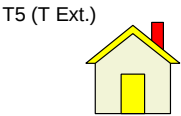
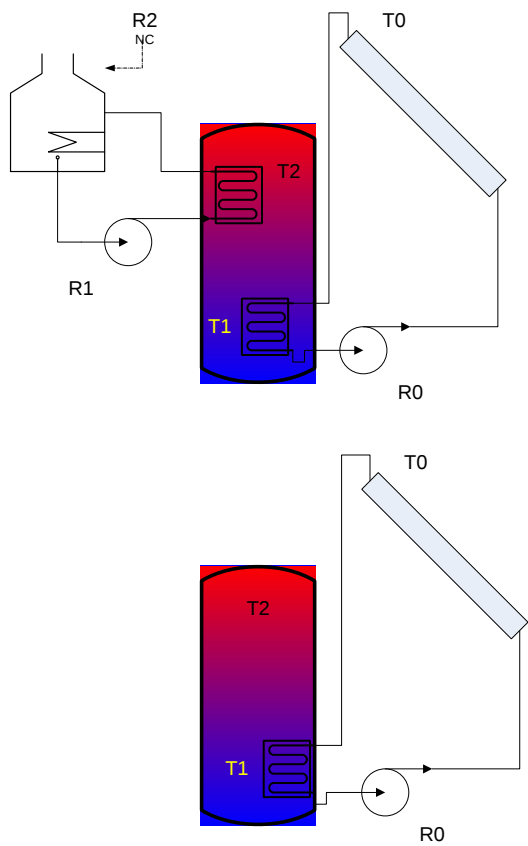
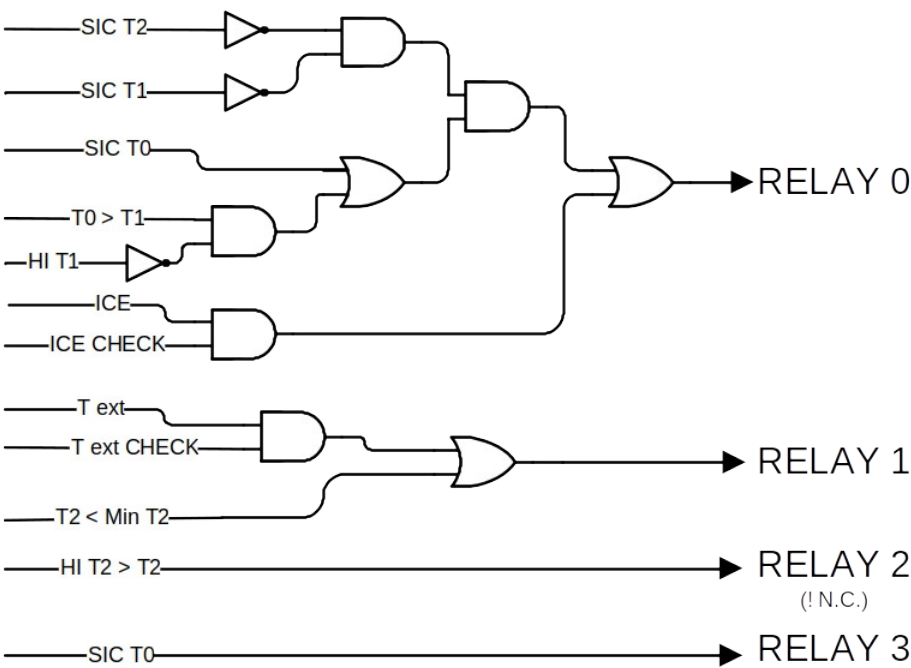
Note:

ICE and **T.ext** are active ("1") when temperature is BELOW threshold.

Configurations

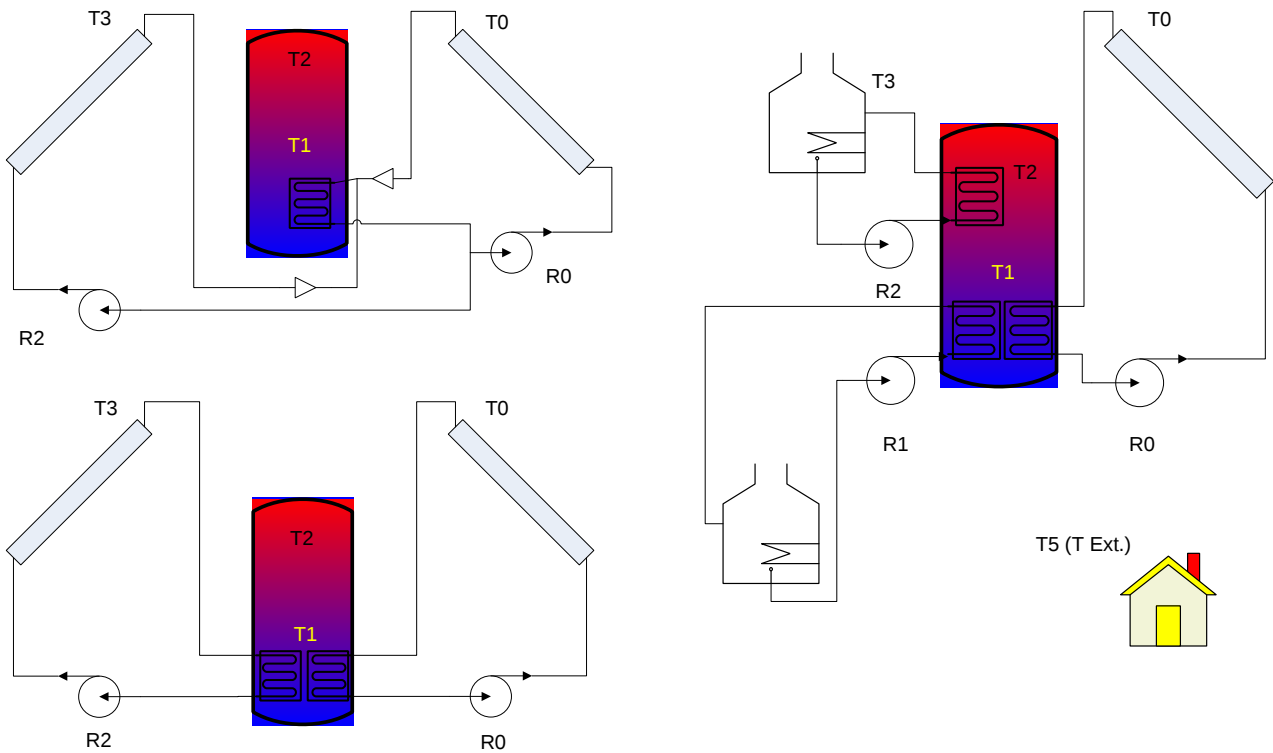
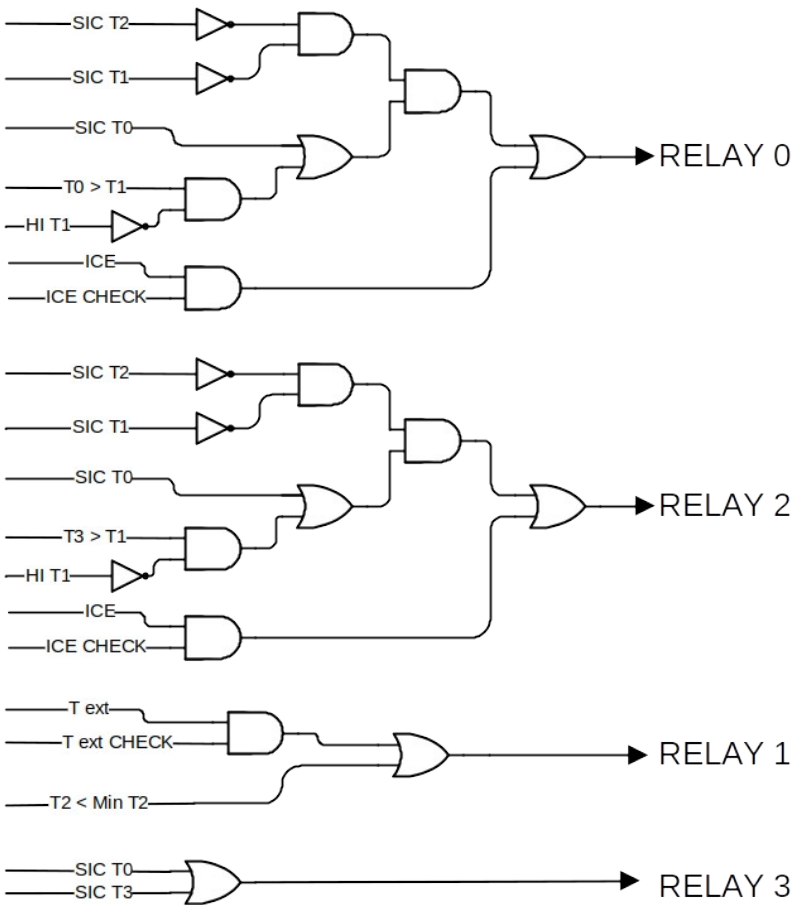
Config 0

R	IST	DIN
0	0	0
1	na	na
2	na	na
3	na	na



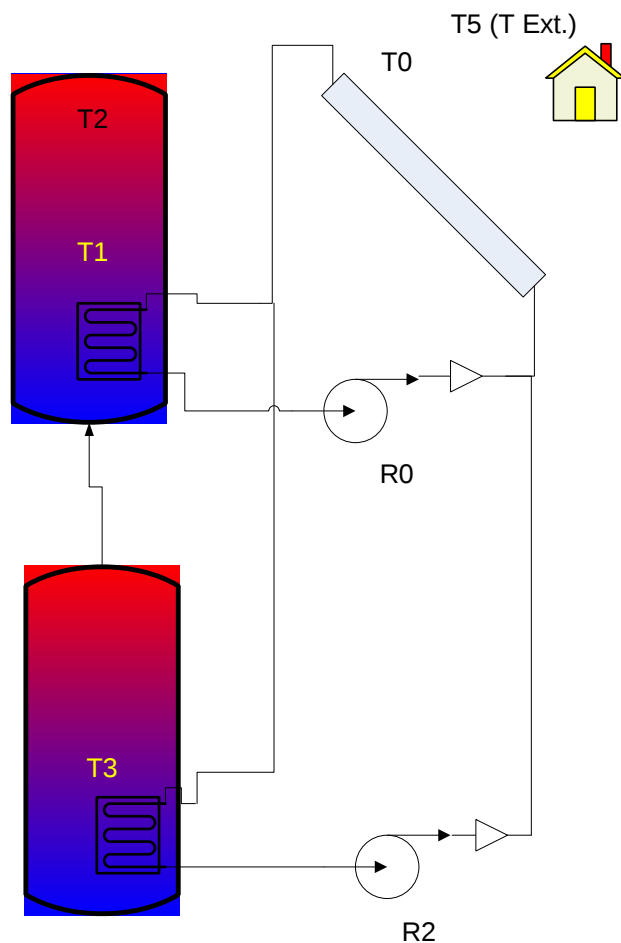
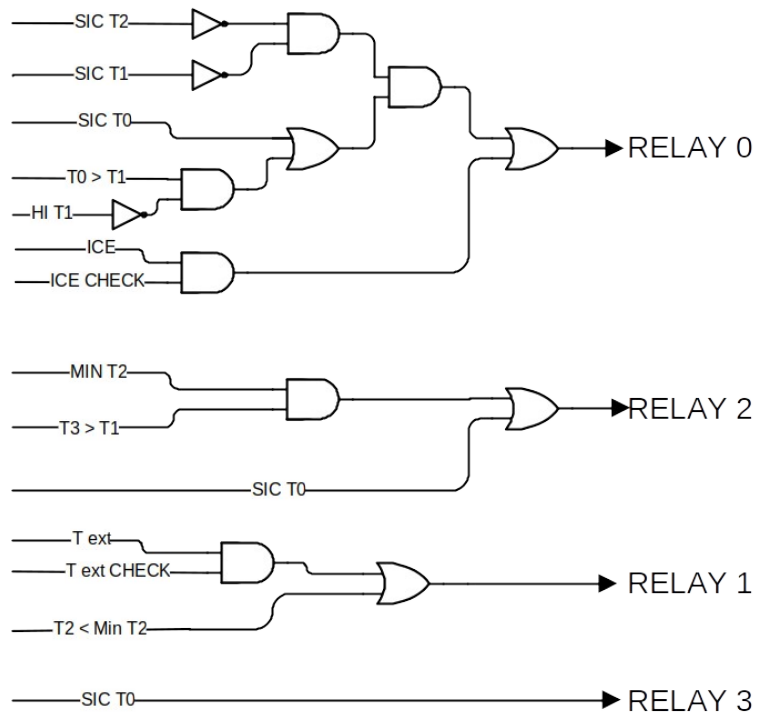
Config 1

R	IST	DIN
0	0	0
1	na	na
2	1	1
3	na	na



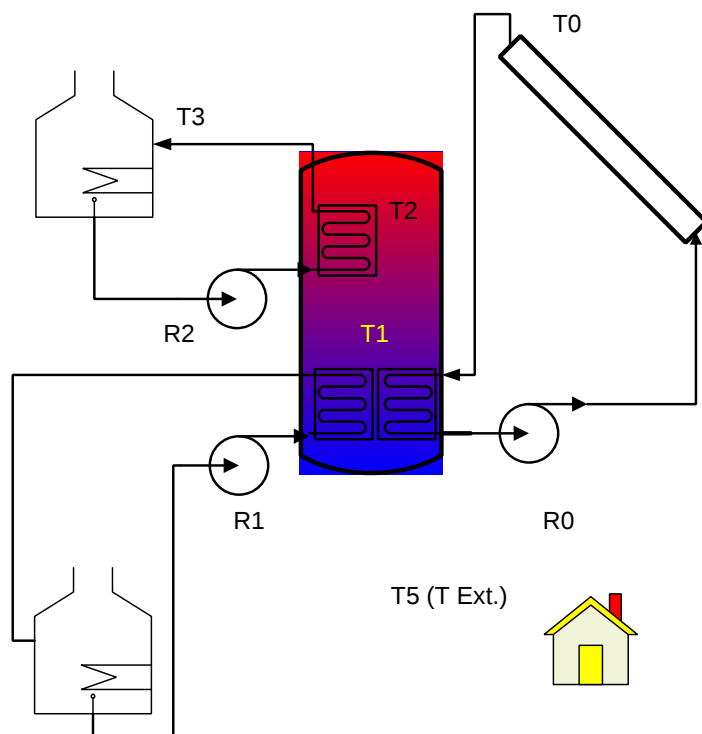
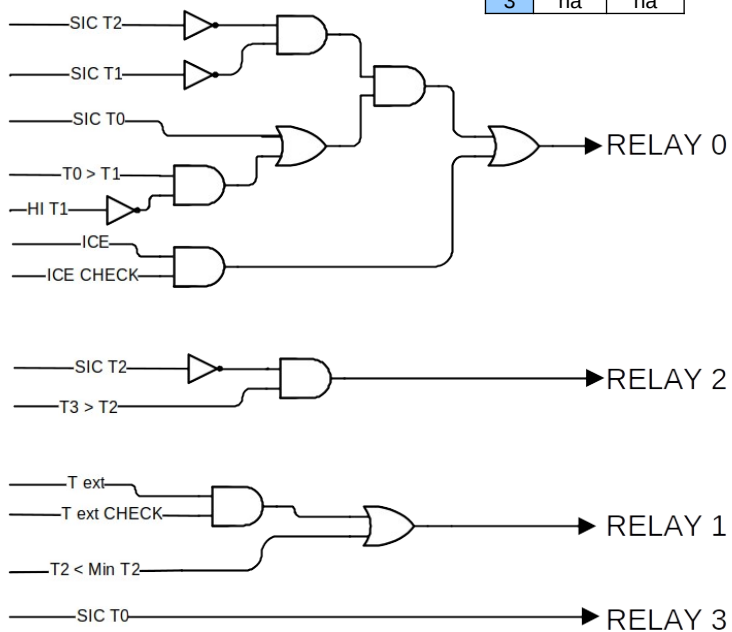
R	IST	DIN
0	0	0
1	na	na
2	1	1
3	na	na

Config 2



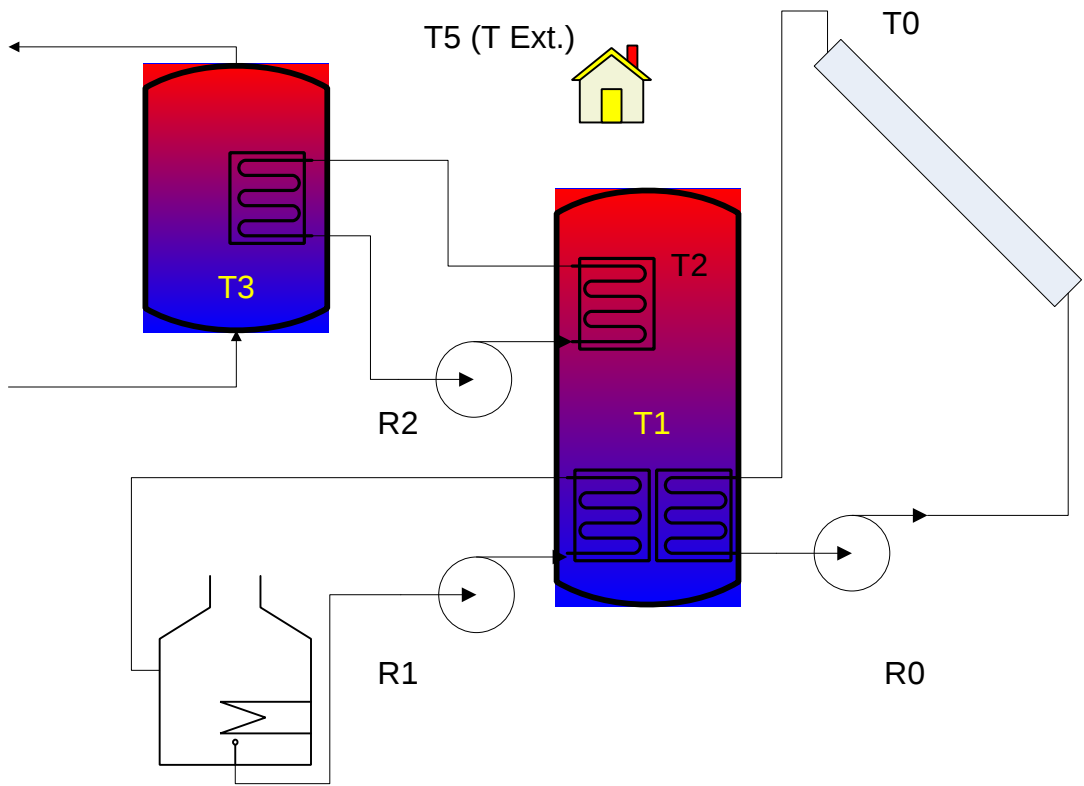
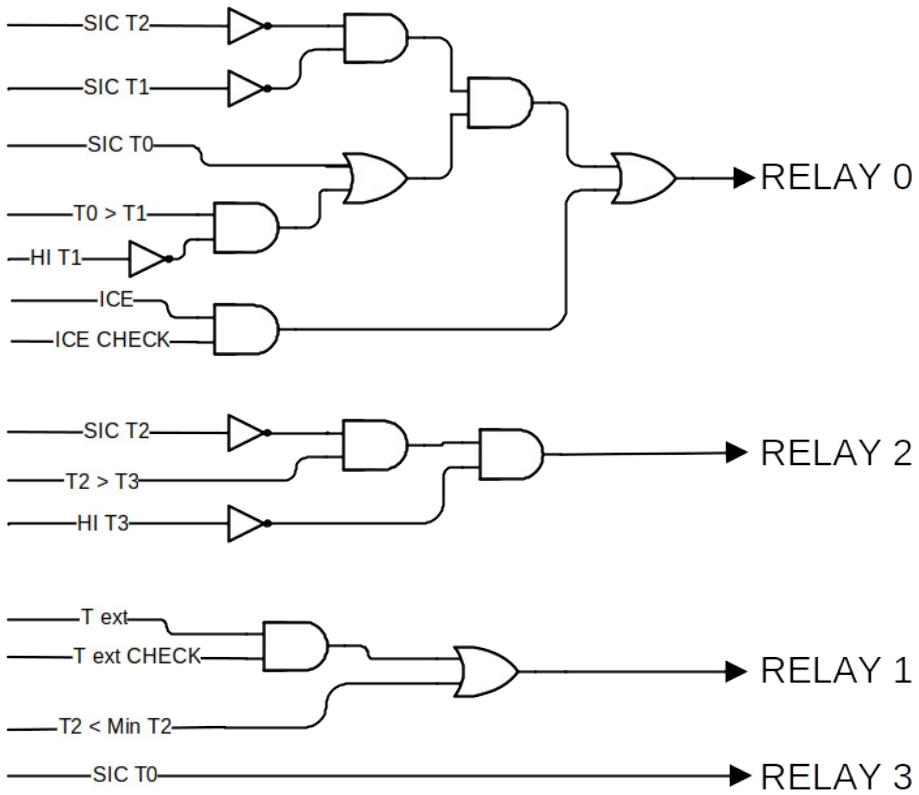
Config 3

R	IST	DIN
0	0	0
1	na	na
2	1	1
3	na	na



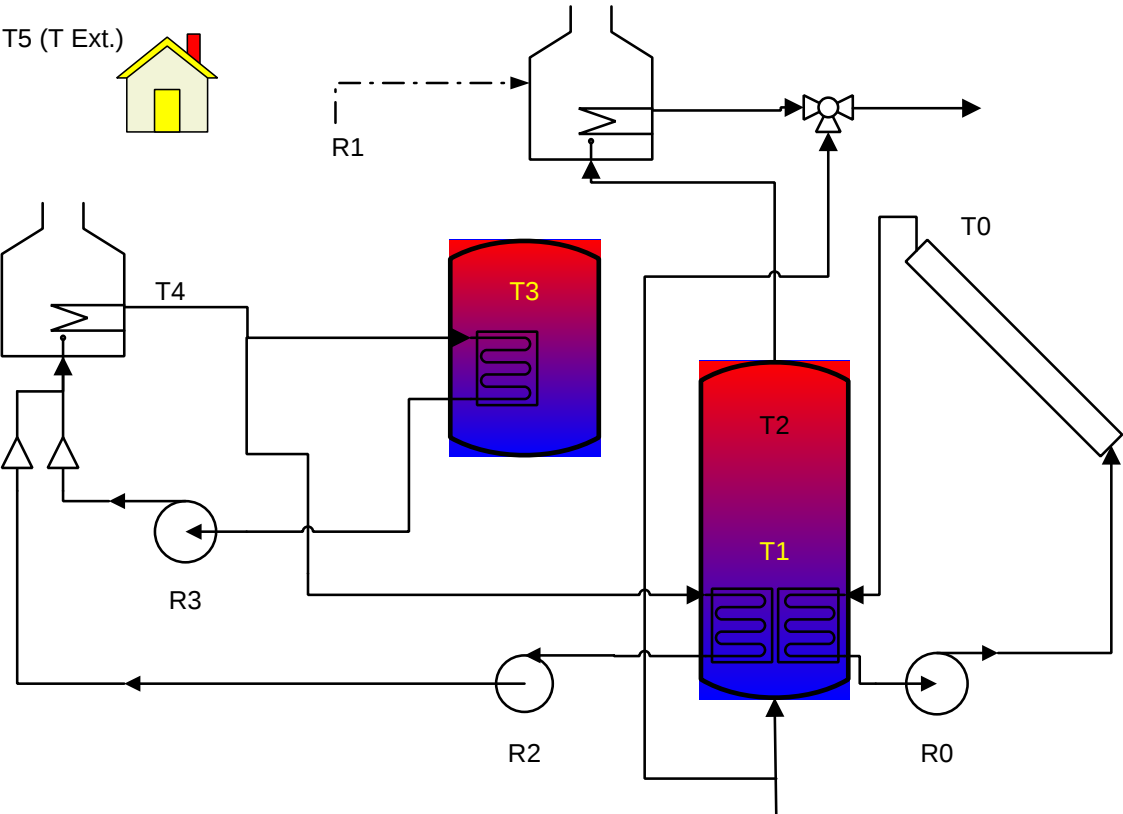
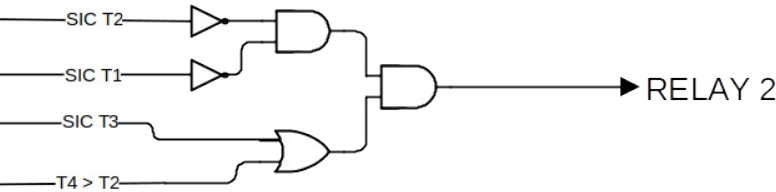
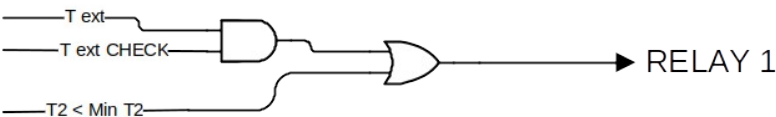
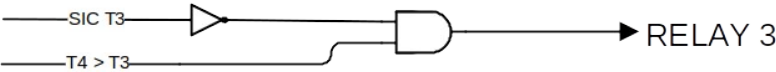
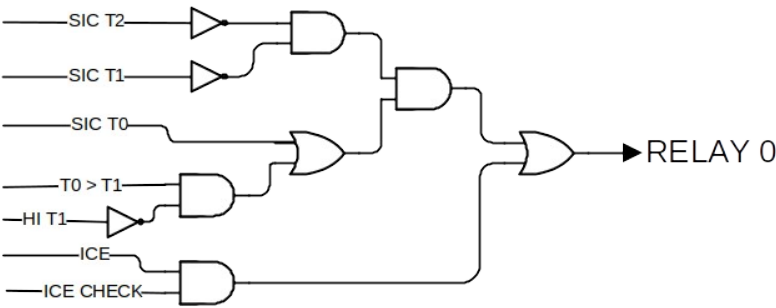
Config 4

R	IST	DIN
0	0	0
1	na	na
2	1	1
3	na	na



Config 5

R	IST	DIN
0	0	0
1	na	na
2	1	na
3	2	1



Operational notes

Verify parameters after every change

After waiting a couple of minutes please check the parameters are as intended.

Thresholds

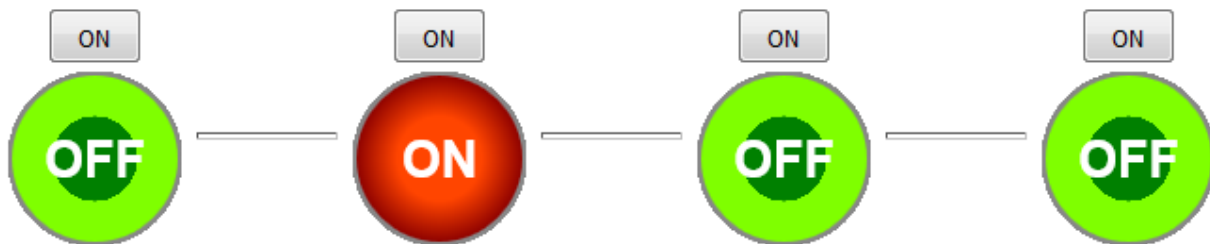
! Warning ! Interpretation of thresholds depends from the configuration, always check.

DHCP changes

Please beware that DHCP addresses may change in case of reboot of the device and/or of your network devices. In case of doubt connect using the local AP.

Test Relays-Pumps

From main menu click upon "ON", the corresponding relay will be activated for about 30 seconds.



Resolution change

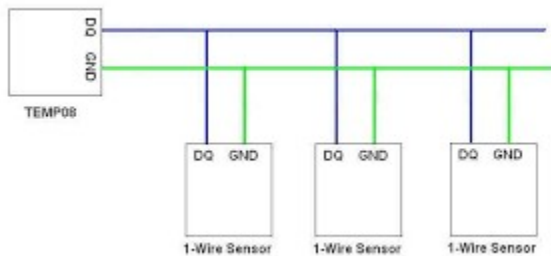
In case you change it please cycle power.

Digital Probes

Intelligent probes on a two wire bus are used in this device, max resolution is 12 BIT (about 0.1°C) and precision within the range -10°C +85°C is of $\pm 0.5^\circ\text{C}$; for the connection only a (CAT. 3) twisted pair cable must be employed and must be shorter than 15 meters overall.

NEVER mix cabling or use them in the same bay with power, alarm, telephony, TV or satellite cables.

Probes connections have to be in parallel with the due respect to polarity. **Yellow** (or **blue**) terminal have to be connected to “S” while **Red** and **BLACK** to “G”.



The length of cabling, differently from NTC probes, does not influence the performances.

In case of probe reading errors reduce resolution to 8 BIT, and then try increments. A power off/on cycle is required after each change.

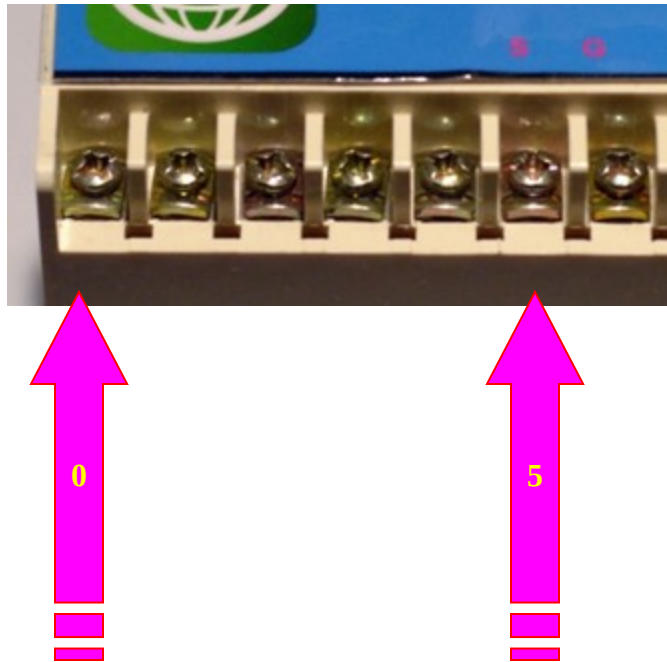
Note: All the probes, even if not used, have to be connected.

Environment

The controller must be installed in a dry and clean environment with temperature from 0 to 40°C.

Analogic probes with NTC sensor

The NTC probes have to be connected to the screw terminals from 0 to 5, every probe must be connected both to his own channel and to common. The common is "G":



Resolution is 8 BIT (about 0.5°C) and precision within the range -10°C +85°C is of $\pm 10^\circ\text{C}$; the NTC sensors give quite variable and non-linear reading that's also depending from the cable's length.

Since it is a DIFFERENTIAL controller if the probes are equal a reasonable precision is achieved.

Please beware: the type of probes will influence both range and precision, even substantially.

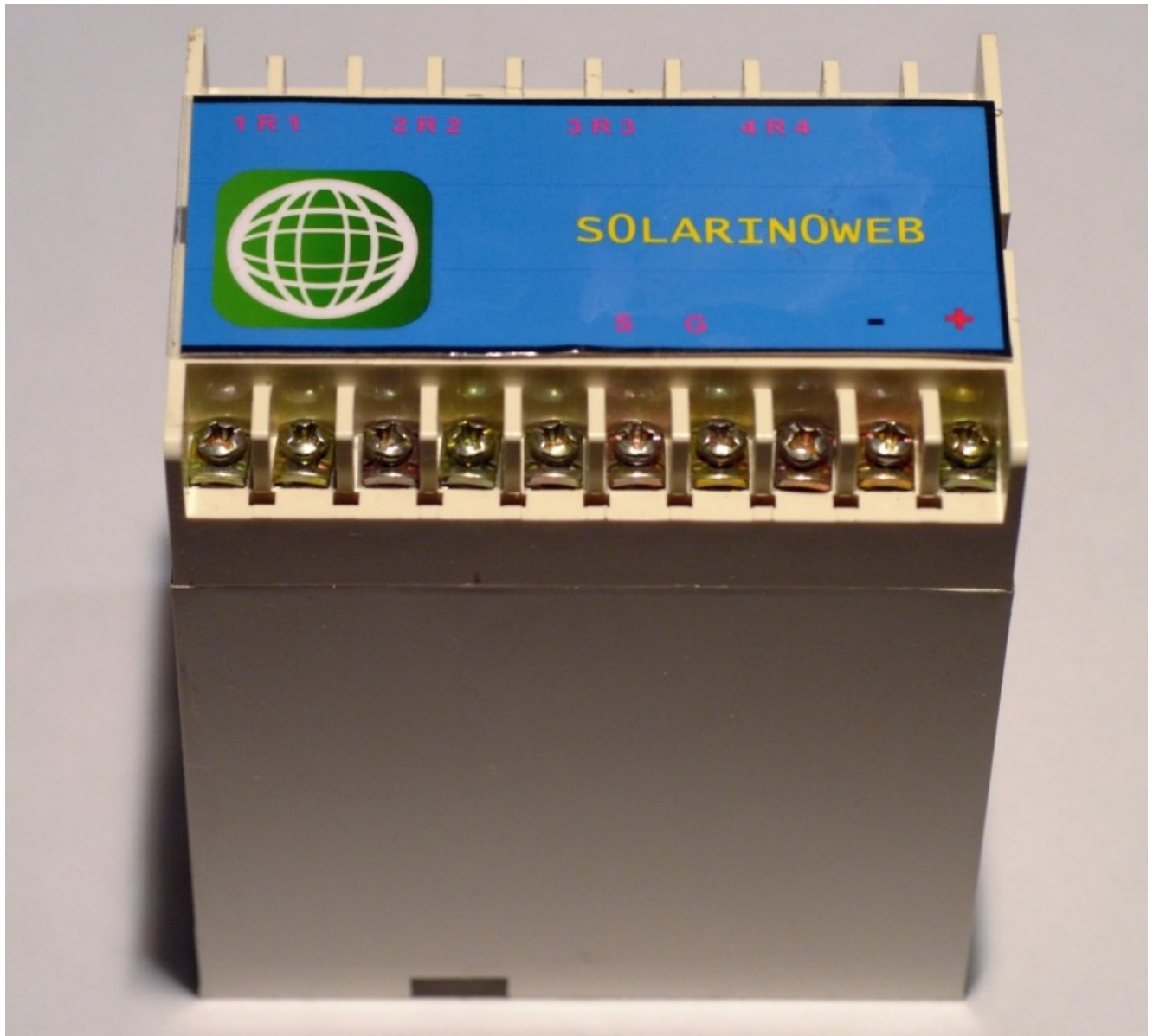
NEVER mix cabling or use them in the same bay with power, alarm, telephony, TV or satellite cables.

Note: All the probes, even if not used, have to be connected, if necessary use a dummy resistor to simulate the missing probe(s).

Assembled DIN RAIL enclosure

Power is feed trough an external adapter, not supplied, 9V cc 2A, max 18 W, the wiring has to be as depicted. The device does not tolerate polarity reversal that will damage the electronics.

In the assembled version only NO contacts are actually connected. to the screw connectors 1R1 trough 4R4.



Install your own backgrounds

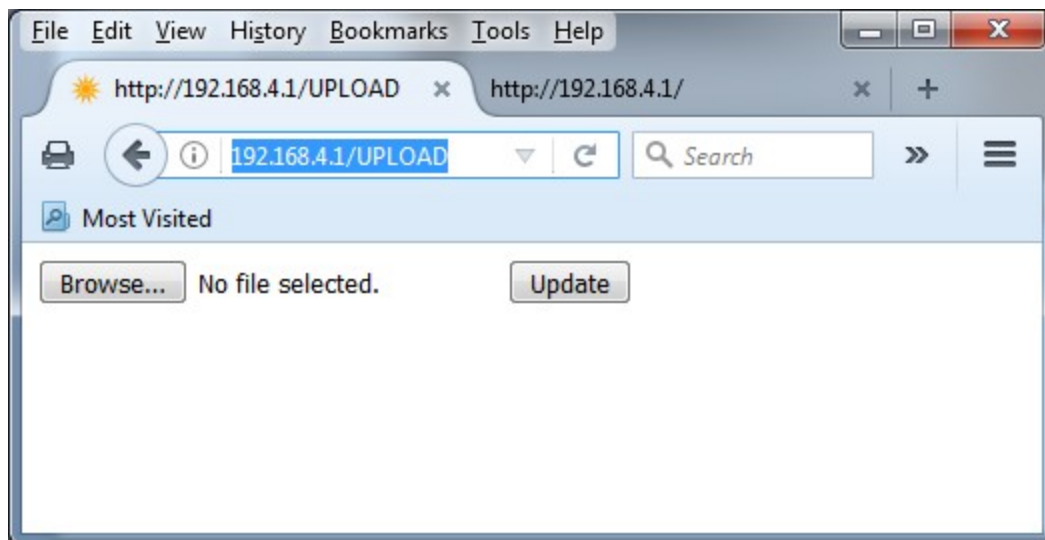
Exerting absolute care is possible to change the backgrounds, however since: **THE SYSTEM CANNOT CHECK SIZES NOR NAMES THIS OPTION IF EXERTED NULLIFIES ANY WARRANTY**, so be very careful about both the size, name, extension and capitalization of files.

FILES CANNOT BE DELETED BUT ONLY OVERWRITTEN !

The first step is to check the source code of the HTML page, this will report the exact name of all the files, for instance the background of home page is **home_background.jpg**:

```
<style>
  body {
    background-image: url("home_background.jpg");
    background-repeat: no-repeat ;
    background-attachment: fixed;
    background-position: center;
    background-size: cover;
  }
</style>
```

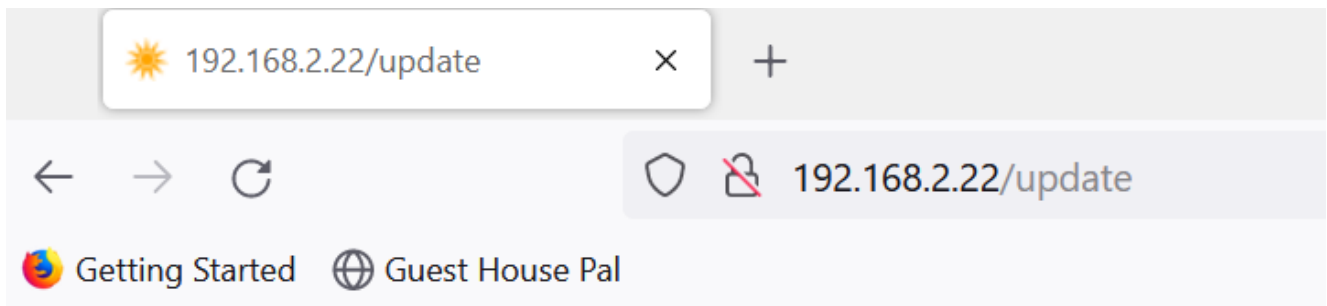
then go to page /UPLOAD:



To load an image select BROWSE, choose the file, then UPDATE.

Firmware update

After receiving the ne binary file simply go to page /update



Firmware:

[Browse...](#)

No file selected.

[Update Firmware](#)

List of current files

Size (Bytes)	NAME
6.096	ex.jpg
6.568	penci.jpg
14.099	Wrench.jpg
37.330	Tool_animated.gif
5.438	thermometer.jpg
48.796	home_background.jpg

Acknowledgements

Some Icon made by from www.flaticon.com
Graphics: <http://www.humblesoftware.com/flotr2/>
ARDUINO community

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