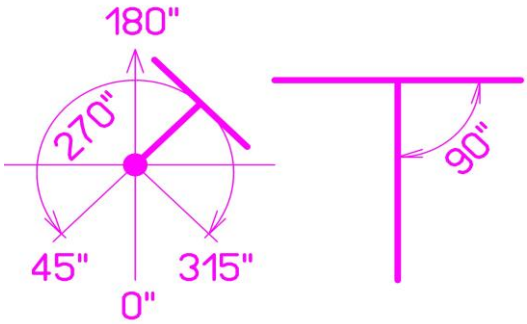
SOLARSAN

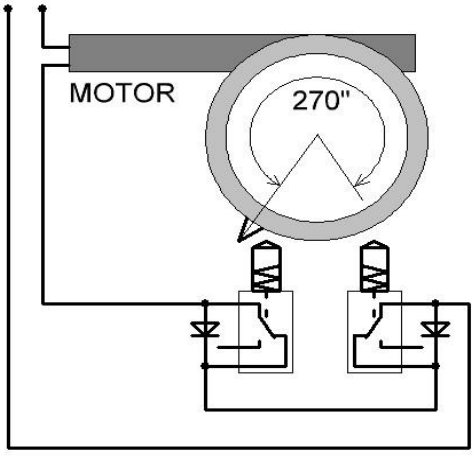
SOLARSAN is the sun tracking complex based on the calculation of data received from the GPS receiver. This system consists of a basic module SOLARSAN-M (MASTER), which can work in standalone mode, and module SOLARSAN-S (SLAVE) working only as an actuator. SOLARSAN can be used to position solar concentrators, collectors or panels at right angles to sunlight. Controlling is carried out with the help of actuators or rotary drives, in two planes and with accuracy of one degree. The module has a set of inputs, i.e. the anemometer connection input for protection against strong wind, the weather vane input for determining the wind direction, the hail and snow sensor input, and photo sensor input for operation in sleep mode during low solar activity. The WiFi module allows configuring the tracker via a web-page or a local network. The built-in MQTT broker allows managing and receiving data via the Internet from around the world. The unit's power supply requirement ranges from 12 V to 30 V (plus the HV version of 12 V to 55 V). The complex features an integrated autonomous power supply module, current protection function, short circuit protection function, built-in radio modem 433.92 (315.00) MHz, 100 mW, for data transmission within a range of up to 100 meters to SOLARSAN-S modules. The complex can work both along one axis and two axes. The IP66 housing allows installing a solar tracker out of doors.

Mechanical requirements

- The axis of rotation should not be inclined, as this adds declination and causes serious errors in extreme positions from 180 degrees (south).



- The correct operation of the control module requires to properly install the drives to ensure the fulfillment of necessary conditions. Movement along azimuth should be in the range or 120 - 370 degrees.
- The initial elevation angle should be in the range of 0 - 20 degrees, where 0 is the position where the panel is perpendicular to the ground.
- The final elevation angle should always be 90 degrees. This is the position where the solar panels are parallel to the ground.
- Movement should be limited not mechanically, but by limit switches installed in the gearbox or on the moving parts of the drives.
- There should be no obstacles within the entire range of movement.
- The feedback sensor installed in the gearbox should close the circuit. This may be a reed switch or a hall sensor SS449A.
- The maximum number of feedback pulses should not exceed the value set by the GR parameter (see **Configuration**).



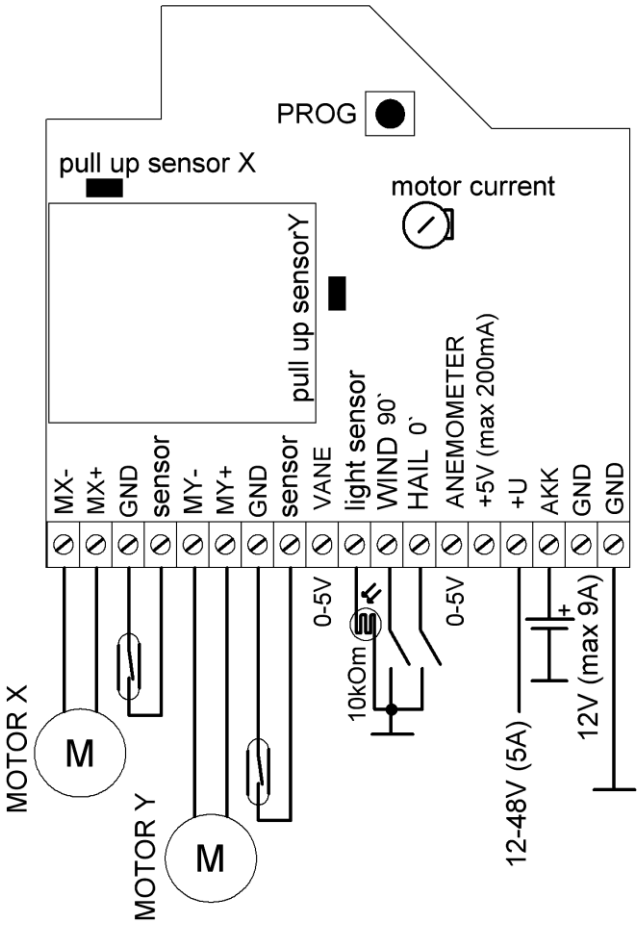
- Power cables of the drives should not be contact with any moving parts.

The result, especially for parabolic concentrators, depends on the correct installation.

Electrical requirements

- The module should be installed within the GPS reception area.
- When using three-phase or single-phase AC motors with 110 V or 220 V power supply, a relay should be installed. However, the motor current will not be monitored. To ensure such monitoring, you must install an additional current protection unit.
- The control system is designed for DC motors. The motors installed in the drives should have the same supply voltage. The load current of the drives on both axes should have close values.
- The power supply of the module should be ensured from a separate source with galvanic isolation!

- The sensor wires should not be located near power supply lines.
- It is recommended to use shielded wires, or twisted pair cables, for connecting drives and sensors.
- The power supply should not exceed the supply voltage range. The power supply should range within 12 V – 30 V (plus the HV version with power range of 12 V – 55 V).
- When using SOLARSAN-S, check for reliable radio signal transmission. Also check the operation of SOLARSAN-S at a double distance. To increase the range, stretch the helix antenna of the receiver and transmitter.
- At the moment of drive movement, set the current threshold so that there is no overload signal.
- Install the light sensor in a place where there is no shadow. It is recommended to use a photo-resistor of 10 kOhm as a light sensor,.
- When using the module indoors, in an iron box or under a canopy, install an external GPS antenna.
- Use the anemometer with an analog output. Also, use a converter to connect an anemometer with a frequency output.
- The computer can only be connected to the module when the power is off.



Drive scanning

The Train button is used to scan drives and save coordinates.

The button is available only when the GPS has determined the coordinates and there is no movement of the drives. When you press the knob, a short confirmation tone will sound.

After the "PROG" button is pressed, SOLARSAN will retain the coordinates and start scanning the drives. The procedure is fully automatic and may take, depending on the type of gear, up to 42*4 minutes. The procedure can be stopped only by turning off the power. After scanning, the module will save the values to non-volatile memory and will retain the parameters even after the power has been turned off. As confirmation of the end of the scanning procedure two beeps will sound and the module will reboot.

After training, SOLARSAN switches to automatic control mode and requires no monitoring.

Principle of operation

After switching on, SOLARSAN will sound two beeps to confirm the actuation of power supply. Then the motor for azimuth (axis X) counterclockwise movement is turned on to rotate the pane to dawn. If the motor stops earlier, this means that the feedback signal has disappeared or is missing. The same procedure is repeated for the height axis (Y axis): the motor will start to set the panel perpendicular to the ground. This is the start position. After determining the satellite data, as indicated by the flashing LED, SOLARSAN will set the panel perpendicular to the sun rays. Each time the sun's calculated position changes by one degree, panels will be adjusted to achieve the maximum positioning accuracy. This is especially important for parabolic concentrators. Every minute, data on all calculations and positions are put out to the port and transferred by the transmitter to SOLARSAN-SLAVE.

At the end of the day, when the sun is beyond the horizon and the wind sensor or hail protection is not activated, the module will reboot and the panels will be set to the initial position. This is done to prevent snow from sticking to the warm panels.
If the wind sensor should actuate at night, the panels will be set to a position parallel to the ground and remain in that position until dawn.

Setting the current protection threshold

The SOLARSAN module features several types of protection. The actuators have limit switches and an electronic current sensor. The threshold of the current sensor can be set by the adjustable resistor "MOTOR CURRENT". For convenience of setting, 10% before shutdown, the control module will give a warning buzz. The current threshold is set at the time of movement and is valid for both drives. Therefore, we recommend using drives of the same power.

Setting wind speed: ANM" input

The wind speed can be determined using any anemometer of factory or homemade type, which issues voltage proportional to the wind speed. The threshold can be configured. This input is used to determine if the specified wind threshold is exceeded. The average wind speed during three minutes should not exceed the set value. Otherwise, the controller will set the Y-axis drive to the 90" position (parallel to the ground), which could save the large solar panel from destruction. The return to the working position is possible if the average wind speed during three minutes is five times less than the specified value.

The Calibration parameter is intended to calibrate the wind speed readings. Using a calibrated anemometer, you can set the value at which the wind speed corresponds to the actual value. After calibrating the anemometer, it is necessary to set the wind threshold at which the protection against destruction will actuate.
E.g. If you set the value of 10 m/s, when the arithmetic average wind speed during three minutes exceeds this value, the Y-axis will be set to 90"; the return to the operating mode is possible when the arithmetic wind speed during 3 minutes remains below 2 m/s.

Weather vane input

This input is intended to control the direction of wind via a web interface or via the Internet.

WIND input

This input is intended for setting the tracker parallel to the ground.
As long as this input is closed to GND, the tracker will be in the wind protection mode. When the input is opened, the tracker will be set to the calculated angle. The WIND input is under the priority of the HAIL input and the MQTT control.

Connecting hail sensor

The input is logical, so if it is closed to GND, the Y axis will be set to 0" (perpendicular to the ground). The hail sensor input has priority over the wind sensor.

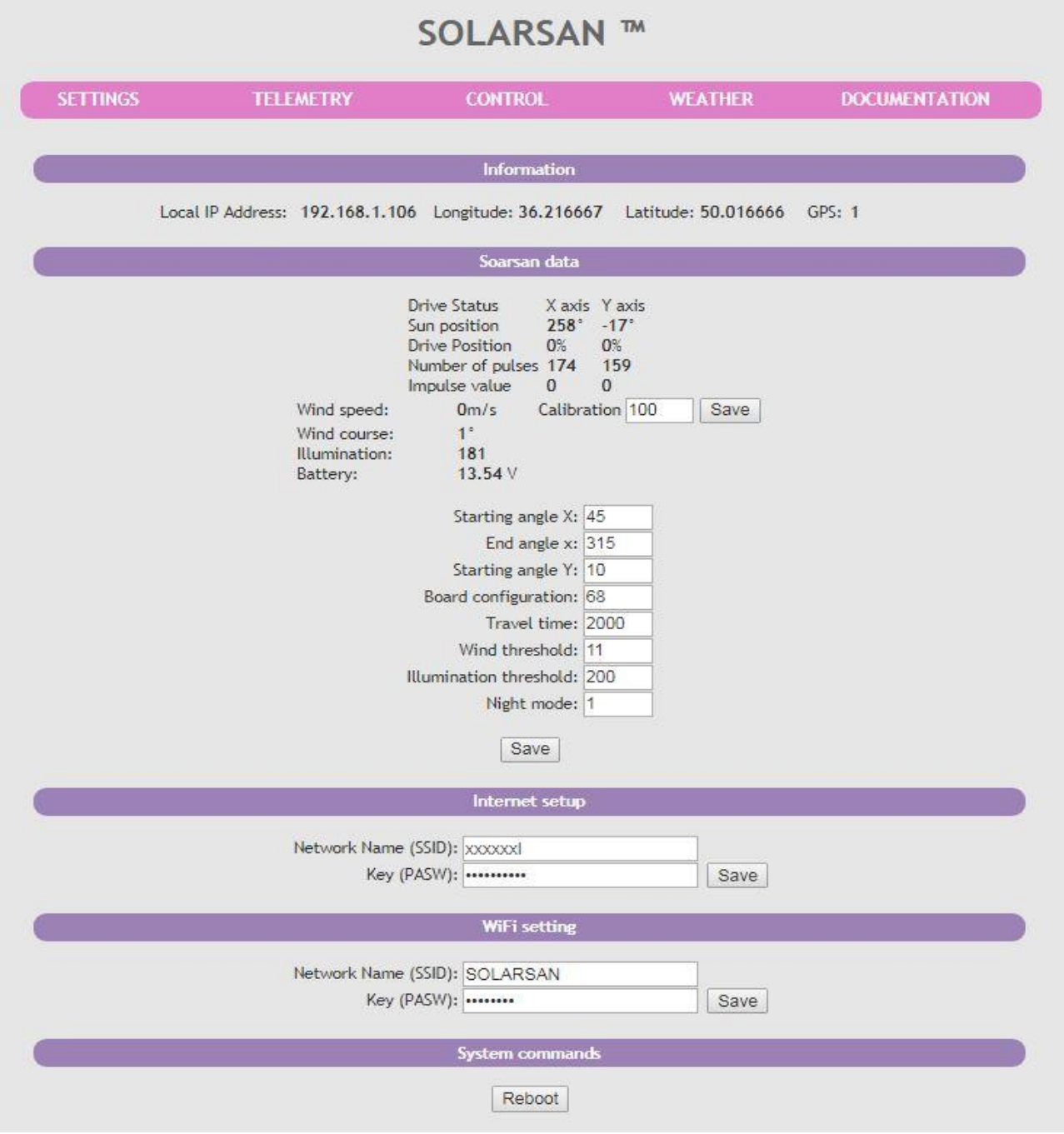
Master-Slave

The SOLARSAN-M module (MASTER) is the Master. It features a radio transmitter providing for communication with the SOLARSAN-S (SLAVE) modules. The communication radius depends on transmitter model. By default, the range is about 50 meters, but you can increase it to 1000 meters by installing a more powerful transmitter. SOLARSAN-S has no sensors of hail, snow, light, or wind, or the GPS module. Its task is to receive the finished signal and repeat the position. SOLARSAN-S has the same requirements to installation and setting the current threshold value. The number of SOLARSAN-S modules connected to one SOLARSAN-M is unlimited. The encryption method provides for reliable protection against intrusion or interference.

Light sensor

We recommend using this function, as it should reduce the management costs in low light. Install the light resistor in a place where there is no shadow. The procedure is best done at sunset or sunrise:

- Wait until the illumination value appears in the data line.
- Set the illumination threshold value from the range of 3 - 255.
- The illumination threshold value is compared with actual illumination value.
- If the illumination level value is greater than (>) the illumination threshold value, SOLARSAN switches to sleep mode.



Configuration

- In the WiFi environment, find the SOLARSAN access point.
- Log in using the password 12345678.
- Go to IP 192.168.4.1

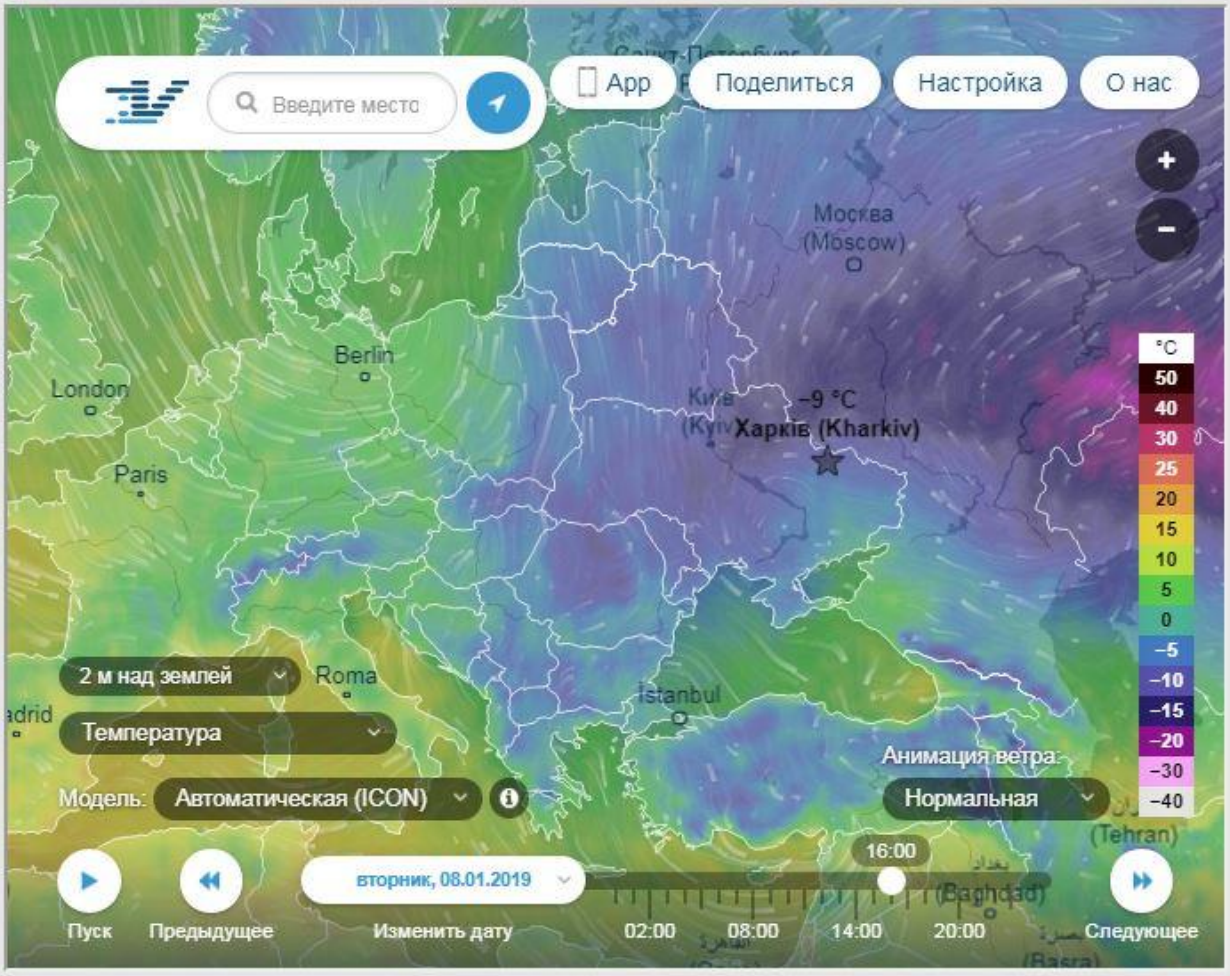
The IP 192.168.1.106 indicates the address in the local network; by going to this address you can also access the configuration page.

We recommend changing the password to the SOLARSAN network to ensure protection against unauthorized access.
After the new parameters have been accepted, the module restart signal will be issued, and the data will take effect. Check the data after refreshing the page. If the data matches the format, the module will save them.
SOLARSAN-M refreshes data every 60 seconds.
After changing the password or SSID a reboot will be required.

SOLARSAN ™

SETTINGS | TELEMETRY | CONTROL | WEATHER | DOCUMENTATION

Weather online



Auto mode solarsan/gps

MQTT Telemetry

To set up remote control and telemetry you need to connect to the MQTT server. E.g. https://cloudmqtt.com.
Application for ANDROID and IOS.

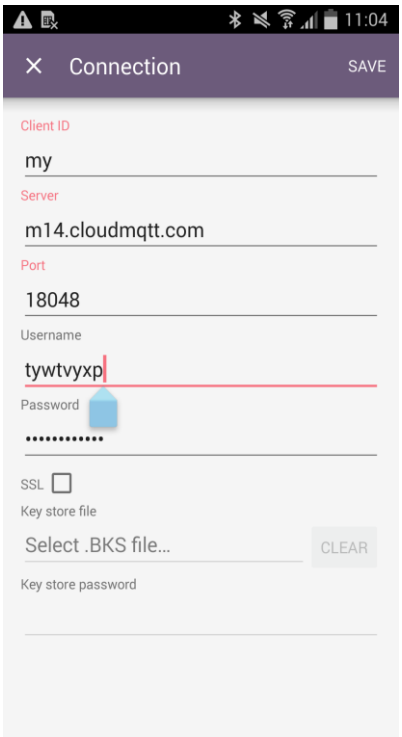
To do this, you need to register and get the data for SERVER, LOGIN, PASSWORD, and PORT.

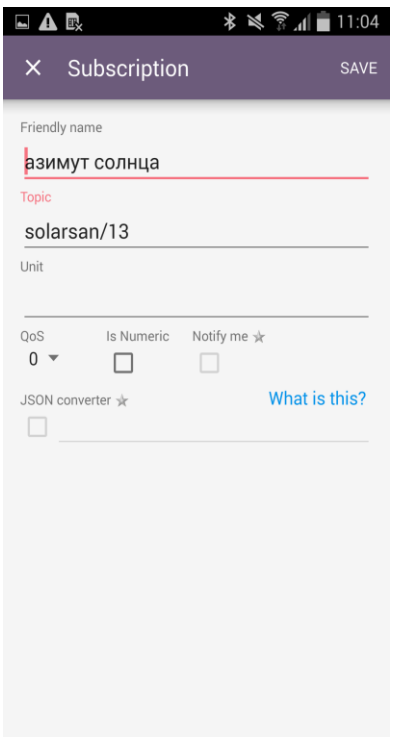
- Enter these data into the appropriate fields.
- Install the client MQTT application and enter the same data.
- Add TOPIC of data needed for control.
- To control the solar tracker remotely, add the TOPIC control for solarsan/y height adjustment and solarsan/x azimuth adjustment. The control values must be within range of the set parameters. E.g. solarsan/x values can range from 45 to 315 degrees. And the value of solarsan / y - from 10 to 90.

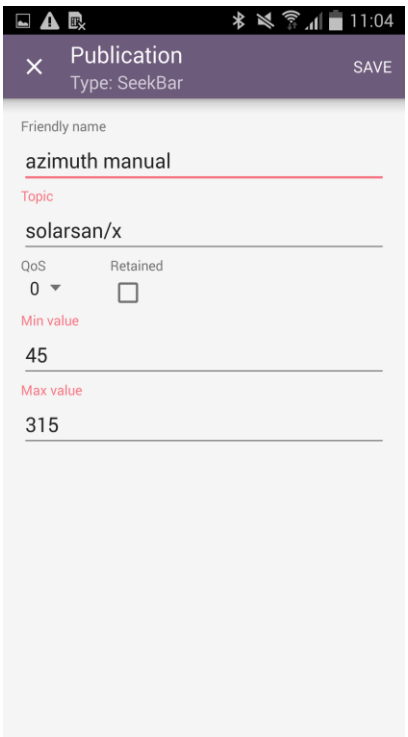
Exit from manual control of TOPIC solarsan/gps is possible at value 0.

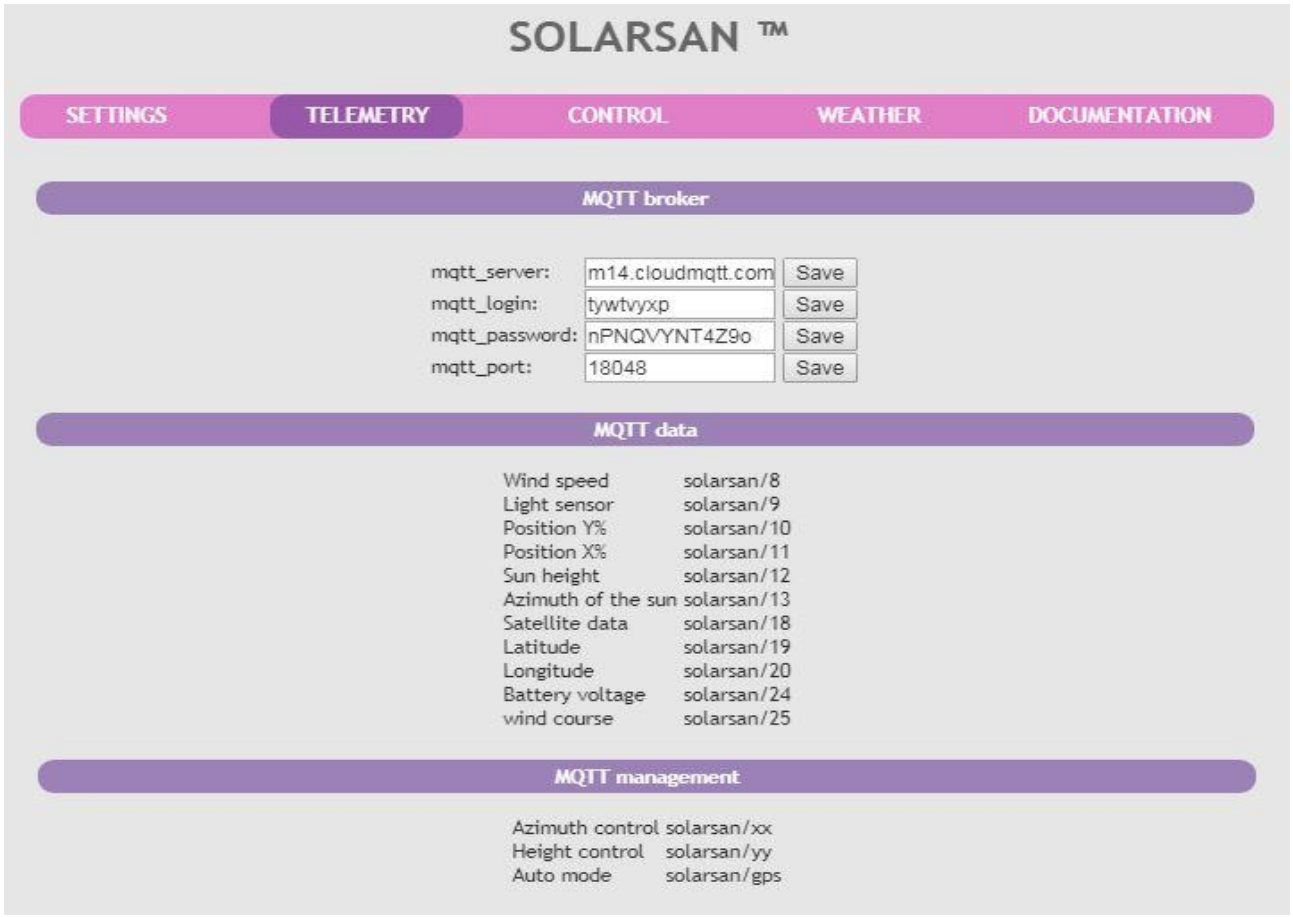
Caution! In case remote controlling, all sensors are disabled and SOLARSAN switches to manual control mode!

The SOLARSAN-S module connected to MQTT does not transmit data on the value of wind, light and coordinates.









Controlling SOLARSAN via local network

Offline mode

The SOLARSAN module features a battery charge controller to provide for offline operation. When the main power is cut out, the module switches to offline mode. This provides for controlling the wind and hail without the main power. When the battery voltage falls down to 12.0 V, SOLARSAN goes into sleep mode. You can monitor battery voltage locally or online.

Software update