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IOT SCADA SOFTWARE INSTALLATION AND USER MANUAL


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1 Introduction

This manual is intended for installation, configuration and use of Alleantia's IOT SCADA Software (product codes ISS_YY) on hardware with Windows OS. If the system comes already pre-installed on IoT gateway hardware (appliance), go to Paragraph 4.4.

ISC web software is a monitoring system of operational parameters of plants, machines and industrial equipment, with additional functions as creation of alarms, synoptic, sending instant messages (email, sms) for alarms, data export to Excel, creation of graphs, etc.

In addition, if the system has optional plug-ins, it is able to send data to third party applications both on premise and on cloud is configured with: SQL, Rest API, IOT HUB AZURE, Dropbox, etc.

Finally, there are optional modules available:

- Energy Pack - application to monitor energy production in solar PV plants and energy usage from many meters;
- Machining Pack - application to control and account for the energy usage in production and operations of machine tools, combined with energy meter (Energy KIT).

For further details on these optional modules, please, refer to the user manuals, available at www.alleantia.com on Technical Documents page.

2 IOT SCADA software

2.1 General characteristics

The Alleantia ISC software license can be purchased and installed on a PC or a gateway with proper specifications on WINDOWS operating system, or it can be purchased already embedded on specific hardware (gateway DELL EG5000, Advantech UTX 3115, ISS Alleantia, etc.).

The last one is IOT Scada Server ISS (AL-ISS-XXX-YY products class).

There are different versions of software license depending on the following parameters:

1. Number of devices to connect to the software for monitoring and supervision;
2. Number of variables to read.

For example, the ISC 4 license (AL-ISC-4 product code) from the different connected devices allows to monitor up to 4 devices and 200 variables.

The variables are to be considered as the monitored values: speed, temperature, power, voltage, etc.

Recommended system requirements (hardware) to install the license:
- Windows 10 IoT 2016
- Processor 2 GB RAM
- Memory 32G SSD (4 GB suggested)

For the licenses that allow to monitor a large number of devices and variables (more than 15 devices and 1500 variables), it is recommended to increase the processor and memory capacity to improve the data processing capacity and system throughput.

The software works also on Windows 7 and Windows 10 but, in this case, the operating system requires more hardware resources.

2.2 Models

As mentioned in the previous paragraph, different versions are available, according to the variables and monitored devices.

Code	N°Variables	N°Devices
AL-ISC-60	3000	60
AL-ISC-45	2250	45
AL-ISC-30	1500	30
AL-ISC-15	750	15
AL-ISC-7	350	7
AL-ISC-4	200	4
AL-ISC-2	100	2
AL-ISC-1	50	1

The devices include energy meters, PLC, CNC, inverter, etc.

The variables are the monitored values as speed, temperature, power, voltage, state, both cumulative alarms and specific alarms, etc.

2.3 Software and Gateway

As mentioned in Paragraph 2.1, the software licence can be installed on industrial gateway, to be deployed in plant, electric cabinet or machines, with various architectures, depending on the plant topology, number of connected devices, networking requirements, etc.

On the market, there are diverse kinds of gateways with different configurations of the processors and disk memory, with additional connection type (Wi-Fi, 3G, LAN), ports and inputs/outputs.

At the moment, Alleantia Srl certifies ISC software on the following devices:

1. ISS Alleantia: appliance equipped with analog and digital I/O terminal block. The documents can be downloaded from Alleantia website.
2. DELL Edge Gateway 5000 (for further details, visit DELL site and see Annex A);
3. Advantech UTX 3115 (for further details, visit ADVANTECH site and see Annex B).

Before exploring installation and the functioning of the system, in the following section there are characteristics related to the physical world, which are useful for IoT Scada software use.

On the Alleantia web site the list of certified software is periodically updated.

3 Physical world and IoT

The software allows the user to immerse themselves into IoT world thanks to its various functionalities: connections with the “physical” world, represented by plants, devices, probes in the field and besides monitoring and managing the values, allows to connect the physical production systems and plants with different IT systems and applications, on premise and on cloud.

The measured values can be sent, for example, to OneDrive, Dropbox and in SQL, Modbus or REST API format vs. the most varied applications.

In this paragraph, there are some concepts and a short overview of the values, read by the system and related to the “physical” world.

3.1 Analog inputs

The analog inputs are available on the hardware with the installed software, or remote expansion I/O modules, connected through available ports, which are used for the acquisition of voltage signals (0-10 V) or current (up to 20 mA).

All probes and sensors data will be displayed from the system in individual channels.

See the technical data sheet and user manuals of the used hardware and/or I/O expansion, for the types of inputs and outputs, and connect only supported ones, to avoid damaging the hardware.

3.2 Digital inputs

Usually, in the gateways and the I/O expansions, DC voltage from the physical world is interpreted as a valid signal that activates the input.

See the technical data sheet and user manuals of the used hardware and I/O expansion, for the types of inputs and outputs, and connect only supported ones, otherwise the hardware can be damaged.

3.3 Ethernet ports

When one or more Ethernet ports are available, it is possible to integrate the gateway into a network architecture and make it “visible” to other systems, after assigning an IP by the network operator.

Furthermore, this port is also used for connection of machines/devices in the field (PLC, CNC, etc.). See on www.alleantia.com site the library of products supported by Alleantia, also the drivers can be found there.

All the gateways, certified by Alleantia, are equipped or can be equipped with dual LAN to address many diverse networking requirements.

3.4 RS232/485 port

When this kind of ports is available, it is possible to connect systems that use RS232 or RS485 communication protocols, usually Modbus protocols supported by the systems as inverters, energy meters, PLC, etc. See on www.alleantia.com site the library of products supported by Alleantia, also the drivers can be found there.

4 Access

4.1 First access to the software and related PC/gateway

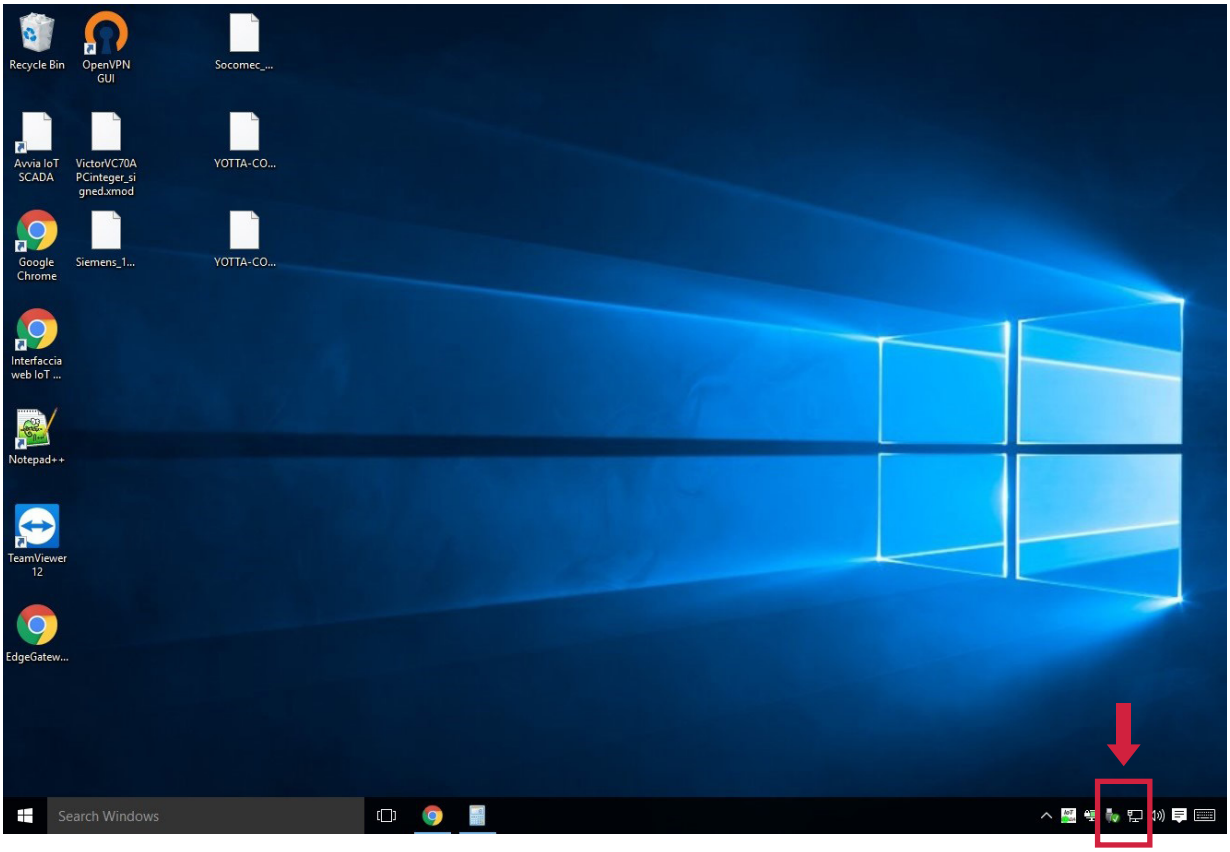
To access the software you must first do some gateway installation, such as suitable electrical connection and to connect mouse, keyboard and monitor.

When it is supplied with power (see gateway manual of the manufacturer and Annex), it can be switched on.

In the event that the device turns on automatically when supplied with power, it means that auto start and auto off functions were activated in the BIOS.

Proceed with the following the steps:

1. Connect the device to its electrical outlet (see gateway manual of the manufacturer and Annex), paying attention to electrical protection.
2. Connect the monitor to the video output port on the gateway (see manual).
3. Connect a keyboard to the USB port on the gateway (see manual).
4. Connect a mouse to the USB port on the gateway (see manual).
5. Access to the desktop of Windows operating system and in the bottom right corner of the screen right click on **"Network and Internet"**.



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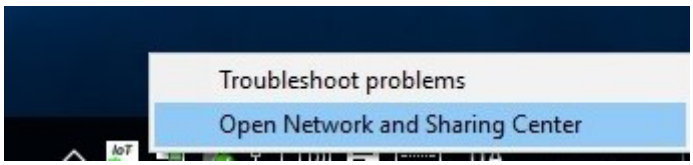
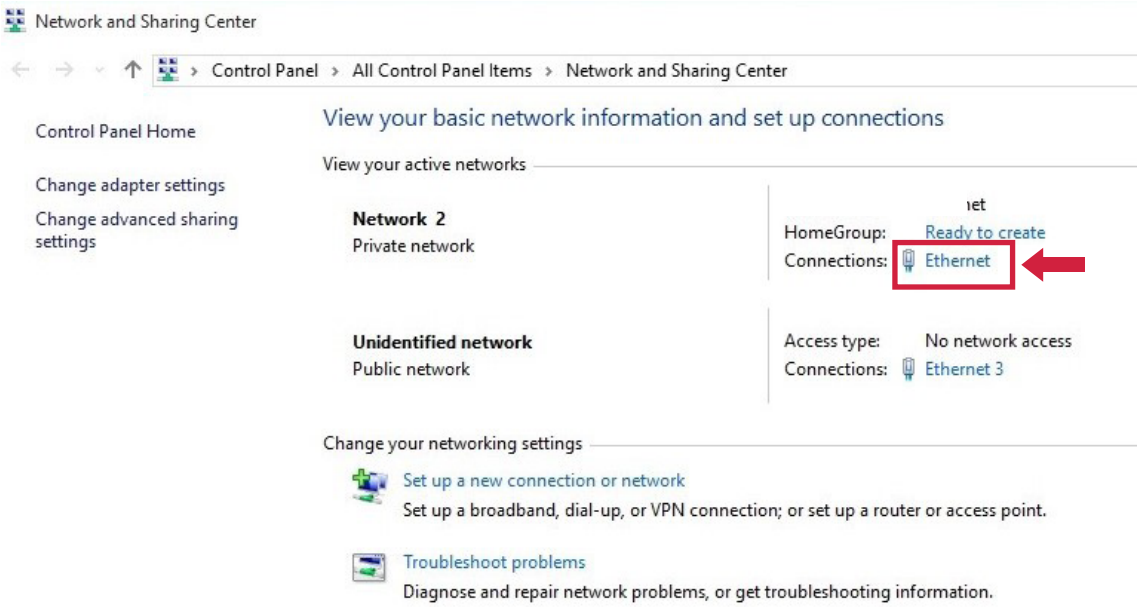
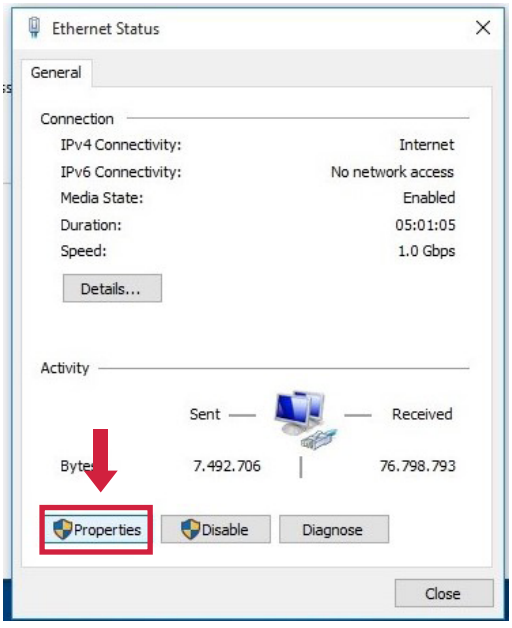
6. Select “Open Network and Sharing Center”.



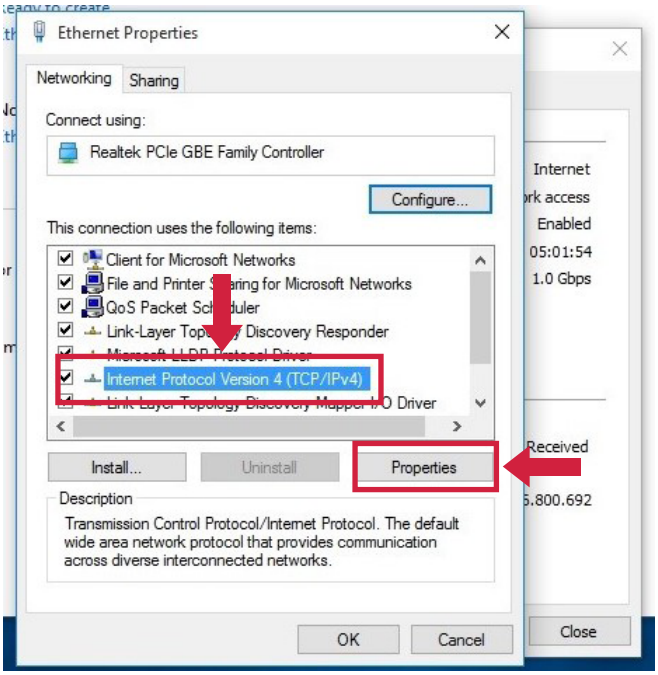
7. A window will open: click “Ethernet” at the top right of the window.



8. Click “Properties”.

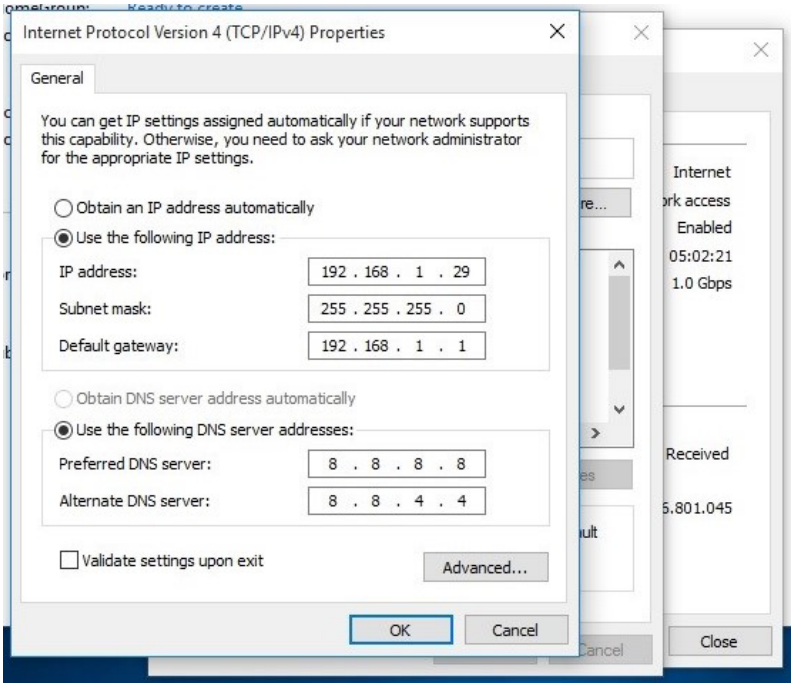


9. Select **“Internet Protocol Version 4 (TCP/IPv4)”**, then click **“Properties”**.



10. The window with IP addresses will open. Type here the static IP address you wish to give to your hardware gateway. If you don’t know which IP address to set, ask your network administrator.

    Fill in “Subnet mask”, “Default gateway”, “DNS” and other fields, to allow the device to access local networks, internet, etc.
    These addresses and parameters can be used, for example, to enable the system to send automatic email notifications (e.g. alarms, reports, etc.), to view the software on smartphone and tablet, or for the remote support.



11. Check **Use the following IP address**, click **Ok** and close the window.

When the correct IP address is assigned to the device, it can be displayed on the client's network.
The addresses from the figure above can be modified by the corporate network administrator, in order to assign correct addressing and network property, web access, etc.
In case of connection to multiple networks, make sure that the assigned IP addresses are compatible. For example, connecting the device on the office PCs network may conflict with the IP of monitored CNC/PLC. In such situation, assign a compatible IP also to the CNC or PLC, making choices both on the CNC and the gateway and PCs that need it.

CAUTION
setting a wrong IP address can result in equipment malfunctioning. If you're not sure about the IP address setup, ask your network administrator and/or verify the machine vendor user manual.

12. Click the **IoT WEB Scada** icon on your desktop to start the software.

13. Log in, using username and password from the from the software license coupon provided by your supplier. Now the system is ready and settings and configuration can be done.

Remote Desktop

As an alternative to points 1, 2, 3 and 4, there is the possibility to connect to the gateway via laptop or PC, using a remote desktop system. It can be useful in next steps (after first configuration, the user can install remote desktop software on the gateway, such as TeamViewer or others, downloading it for free from the web).

If purchased directly from Alleantia or its distribution channels, the hardware comes with the preloaded remote desktop software, so you can follow these steps:

1. Download TeamViewer on your PC or laptop and install it;
2. Start the program and connect the PC with the gateway;
3. Insert password **"alleantia"**;
4. Access the desktop of the gateway and follow with points 5,6,...,13.

1. Download and install on your PC **ULTRAVNC** from the official website: http://www.uvnc.com/downloads/ultravnc.html
2. Establish a direct connection point to point with a LAN cable from your PC to the gateway;
3. On your PC set a static IP similar to **192.168.1.XX** with two last numbers different from 29, following the procedures from n°6 to n°10 of the Section 4;
4. In the step n°10 do not set the **"Default gateway"**;
5. Start ULTRAVNCVIEWER on your PC and insert the IP address of the gateway **192.168.1.29** and password **"alleantia"** (without quotes) for the remote access from your PC to the gateway.

4 Access

In the next paragraph, we will see how to handle when the gateway is on-board machine and how to access monitoring IOT Scada Software from PC, tablet or smartphone.

4.2 Wi-Fi access

This option is available for gateways equipped with Wi-Fi and can be used in two cases:

1. Local/corporate Wi-Fi network: if you want to install the gateway in places with no wired network but Wi-Fi. In this case, connecting the gateway to the network you will be able to access the software from any PC, if this PC is connected to the same Wi-Fi network.

2. Connecting with your own device (laptop, tablet or smartphone) directly to the gateway, using not a local Wi-Fi network but access point function of the gateway. This function is available when the gateway has such characteristics, is correctly configured and is near enough to be able to connect.

4.2.1 Access with local/corporate Wi-Fi

Where there is a local/corporate Wi-Fi available, the gateway can be configured to connect to such Wi-Fi network. So you will be able to monitor without any additional cables.

To allow the gateway to use the Wi-Fi network, click the icon on your desktop and search for the available Wi-Fi networks.

Select the network and insert Wi-Fi security password. If you don't know the password, ask your network administrator.

The gateway will connect to the network and you will be able to access it from any PC, tablet or smartphone connected to the same Wi-Fi network.

See previous paragraph about settings of the IP address to the gateway.

Use your favourite browser (Google Chrome is recommended), type the assigned IP address in the address bar, for example

http://192.168.1.29

4.2.2 Wi-Fi Access Point Gateway

For the direct access to the system via Wi-Fi access point mode when near the gateway, using a PC, smartphone or tablet (IOS or Android), follow the steps below.

Set the gateway in Access Point mode when the operating system starts, as described in the operating system manual (**NOTE**: not all Windows systems allow this option). Make sure that the Access Point is not already active (after switching on the gateway and waiting for some minutes, check if IoT Scada wireless network is available, written below in bold).

4 Access

Once activation of the Access Point mode, as described in Windows operating system manual, and settings have been completed (for example, it might be useful to set auto-start of access point, every time the gateway starts), the system will automatically create a wireless network to assign the SSID parameters, security password and network address to. For example:

Wi-Fi (SSID) network name: IoT-SCADA

Password: IoTSCADAwifi

Connect to this network, generated by the gateway, using PC, tablet or smartphone with the same settings when you want to connect your device to a local Wi-Fi network.

Once connected, use your favourite browser (Google Chrome is recommended) and type the default address for the gateway in the address bar:

http://10.10.0.1

CAUTION: the Wi-Fi network allows direct connection to the web software IOT SCADA and display of its monitoring interface, but not to the hardware's operating system, managing its settings and other devices, connected to the IOT SCADA via LAN.

Obviously, activation and configuration of gateway's Access Point should be done connecting a monitor, keyboard and mouse to the gateway and making settings to the operating system.

4.3 Ethernet LAN access

4.3.1 Local/corporate LAN

In the case where the gateway is inserted in a LAN network and you want to access IOT SCADA for monitoring from a PC (smartphone or tablet).

LAN Ethernet default configuration of the IOT SCADA is shown below. After inserting the gateway into the LAN network (connecting the network cable to the device's LAN port), ping the device by the IP address, shown below, to check if it responds. Then, copy this IP address in your browser's address bar to access the system.

IP address: 192.168.1.29

Subnet mask: 255.255.255.0

Gateway: 192.168.1.1

DNS 1: 208.67.222.222

DNS 2: 208.67.220.220

If the device does not respond, check whether the default IP address is correct and coherent with the LAN network (the PC should have a static IP from the same family).

Otherwise assign a correct IP.

User can assign an address to insert the gateway into the LAN network.

In this case, the network parameters and assigned IP address settings, provided by the administrator, will enable Internet access (for the software updates or upgrade by Alleantia), as well as to display the software on PC, tablet or smartphone.

This function is supported as it is web based software and remote support by Alleantia or others (e.g. maintenance company).

NOTE: IP addresses and network

The IP address of the gateway should be compatible with the addresses of other devices, you want to connect with. Also user PC should have a compatible IP in order to make settings, configure and access the software via LAN. If the user's IP address does not have compatible characteristics (same network), assign a compatible IP address (the user can reset the original IP on their PC after gateway setup).

If you do not want to modify your IP settings, you can access via remote desktop (this function is available with a direct purchase from Alleantia).

In the same way, IP of the monitored devices, connected to the gateway, should have a compatible IP address.

Then, assign IP addresses, meeting these requirements (see previous paragraphs).

For this purpose the gateway also has Dual LAN, which can be configured.

Verify that the monitored CNC or PLC, connected to the gateway, have a compatible IP address, ID and LAN port, see the document for the technical requirements for installation of "Machine 4.0", which can be downloaded from the site www.alleantia.com.

For example, in the case of CNC, the communication should be enabled in its settings, and/or specific modules of the CNC's software for communication with third parties. Refer to the manufacturers of the devices you want to connect (which can be downloaded from the site www.alleantia.com). Firstly, it is recommended to control Alleantia libraries to check the compatibility of protocols and the presence of drivers.

4.3.2 Direct connection to a PC (LAN cable)

This procedure requires a direct link (point to point) to a PC via an Ethernet cable, **not necessarily twisted**. The network configuration of the PC connecting to the IOT SCADA SERVER must be:

- **192.168.1.nnn** Static IP (with n between 2 and 254, with the exception of 29, which is already used by IOT SCADA SERVER)
- subnet mask **255.255.255.0**

Otherwise, modify your PC configuration, following the indications in the next paragraphs.

Then, it will be possible to access the web interface of the IOT SCADA SERVER using the preferred internet browser and entering the following URL in the address bar:

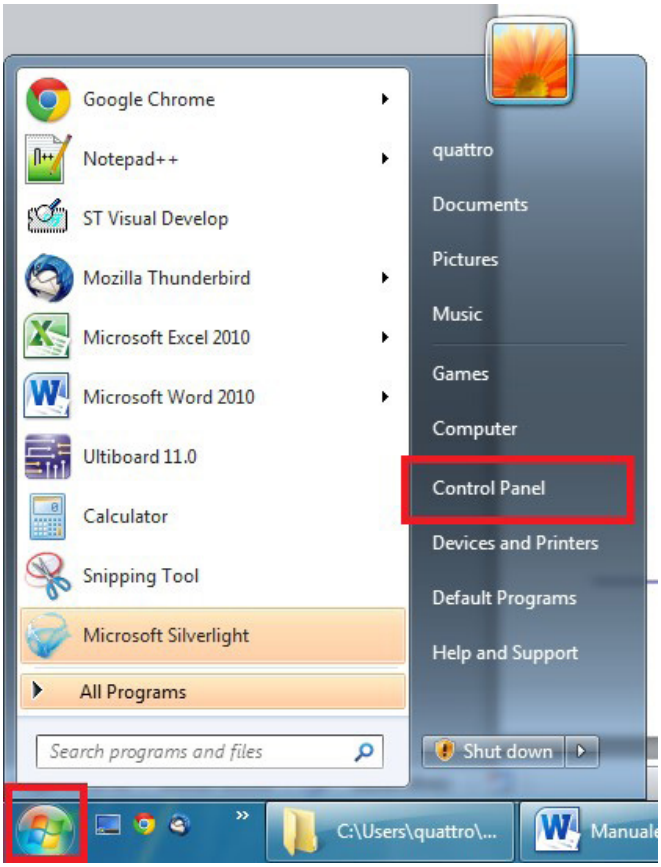
http://192.168.1.29

4.4 Setting up your operating system

The gateway or PC with the installed system, as mentioned in the previous paragraphs, can be configured and installed in a corporate network, connecting it to CNC or PLC with IP addresses, etc.

4.4.1 Windows 7

Access the **"Start"** menu and then click on **"Control panel"**



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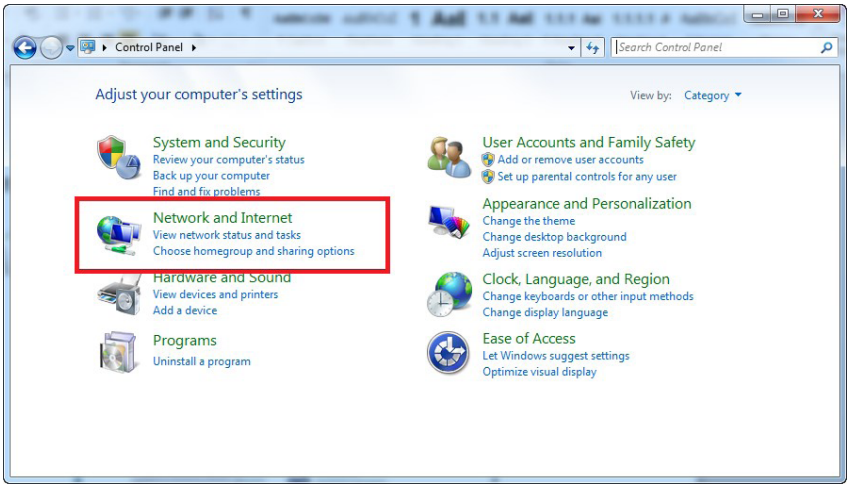
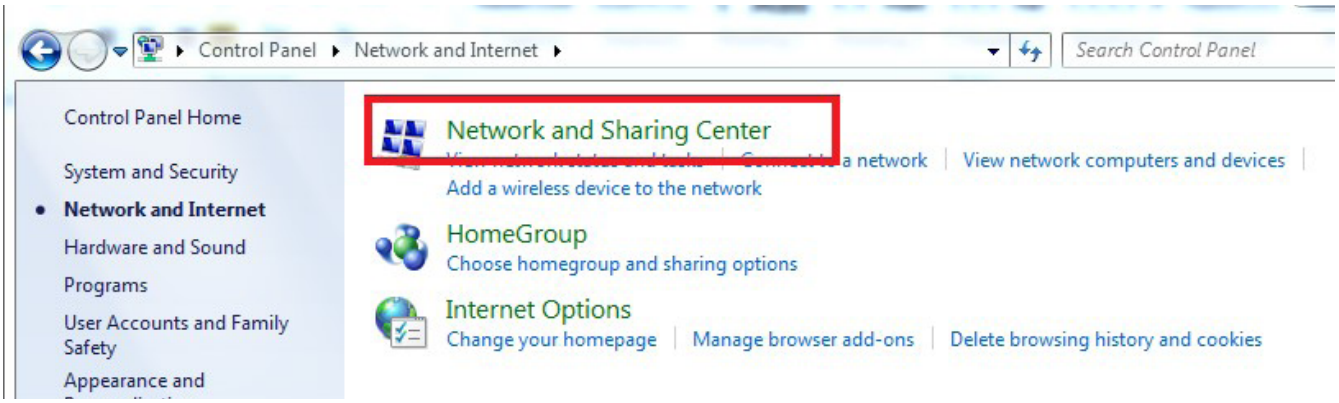
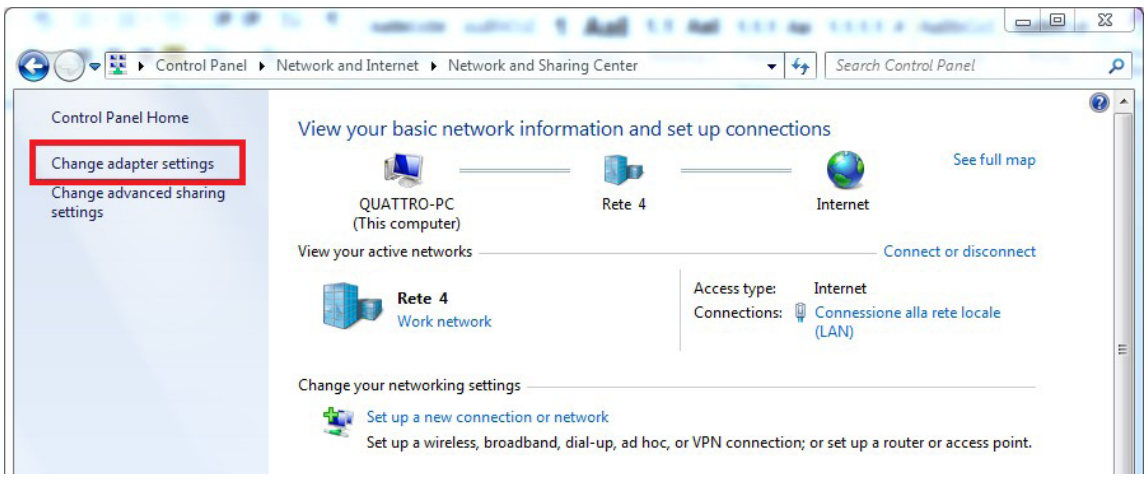
Click on **“Network and Internet”**



Click on **“Network and sharing center”**

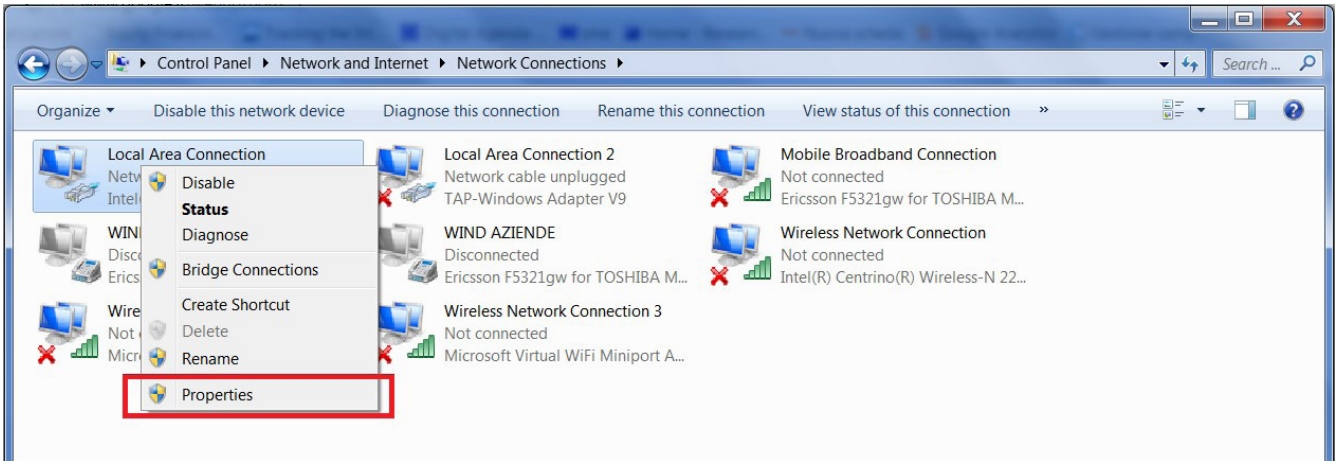


Click on **“Change adapter settings”**

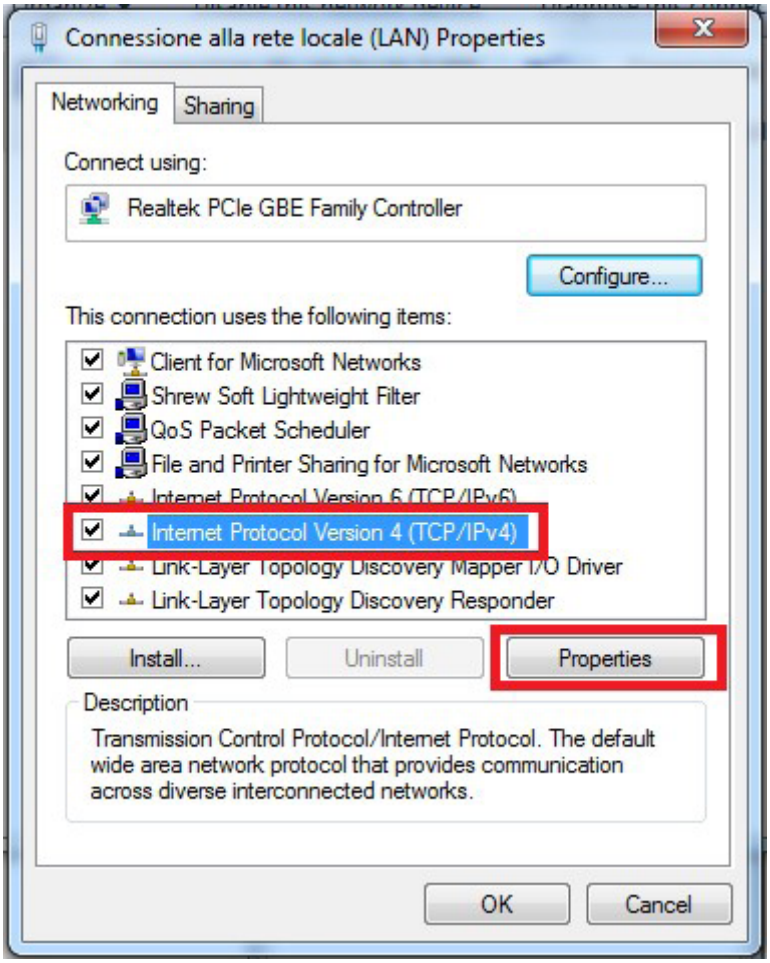


4 Access

Select the connection to be amended, usually **“Local area connection (LAN)”**. Click mouse right button and select **“Properties”**.

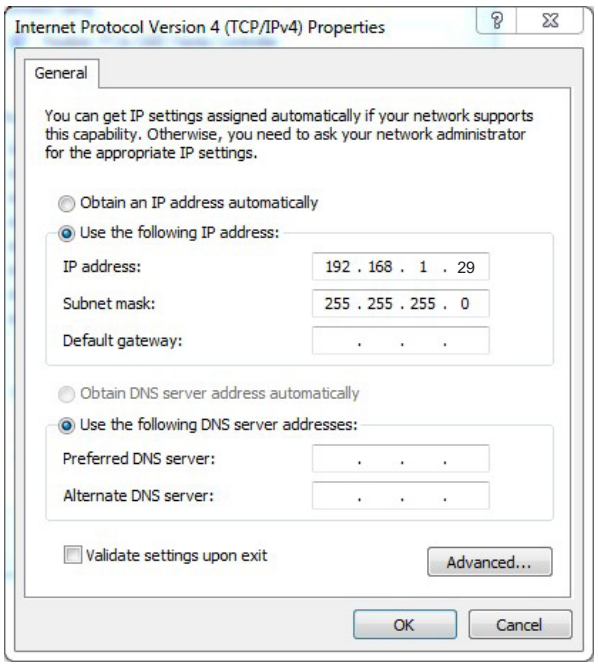


Select **“Internet protocol version 4 (TCP/IPv4)”** and click on **“Properties”.**



Set the network parameters as in the figure, namely:

IP address: 192.168.1.29
Subnet mask: 255.255.255.0



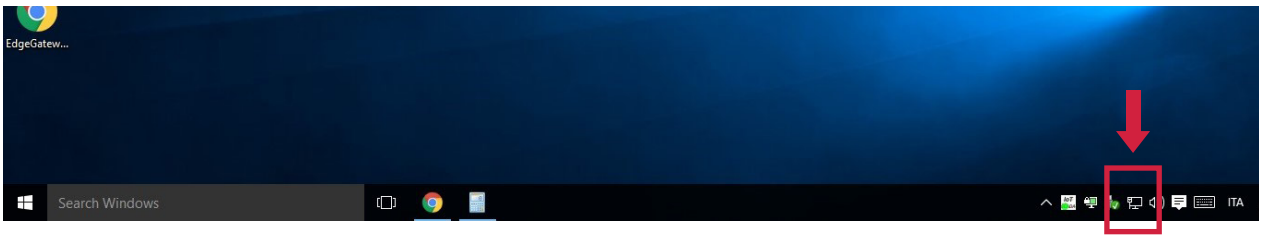
The addresses from the figure above can be modified by the corporate network administrator, in order to assign correct addressing and network property, web access, etc.

In case of connection to multiple networks, make sure that the assigned IP addresses are compatible.

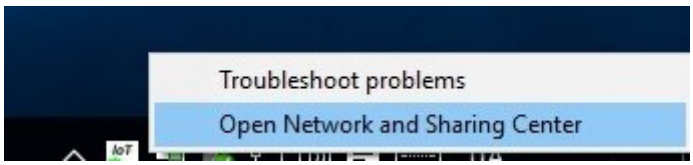
For example, connecting the device on the office PCs network may conflict with the IP of monitored CNC/ PLC. In such situation, assign a compatible IP also to the CNC or PLC, making choices both on the CNC and the gateway and PCs that need it.

4.4.2 Windows 10

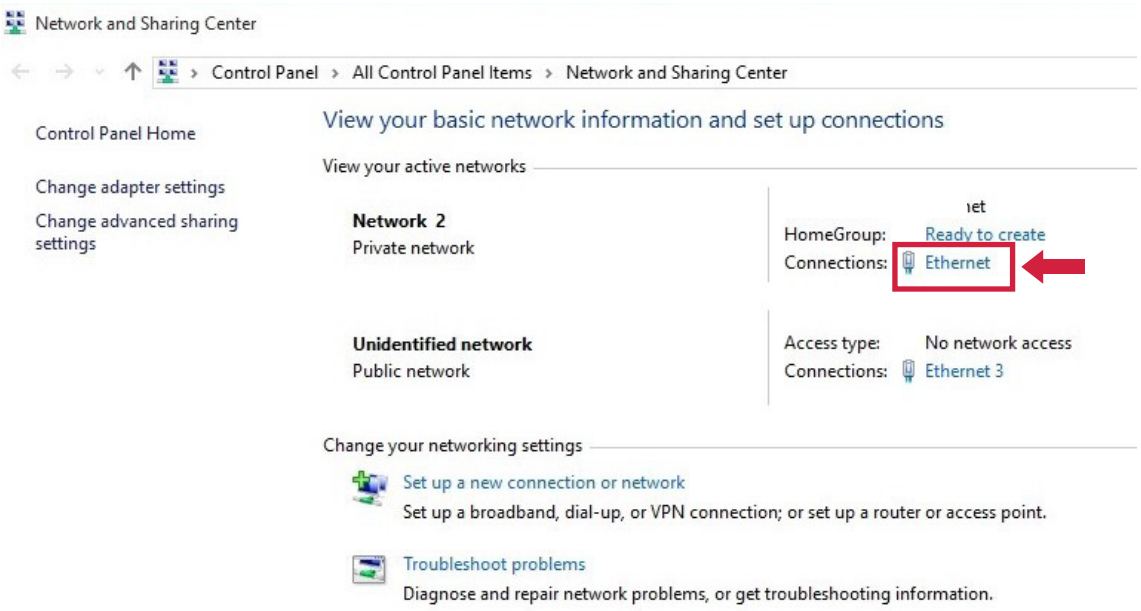
1. On the Windows OS desktop, in the bottom right corner right click on **“Network and Internet”** icon.



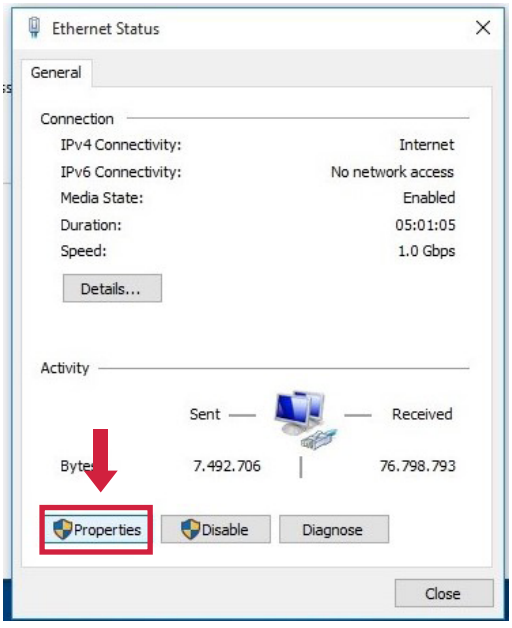
2. Select **“Open Network and Sharing Center”**.



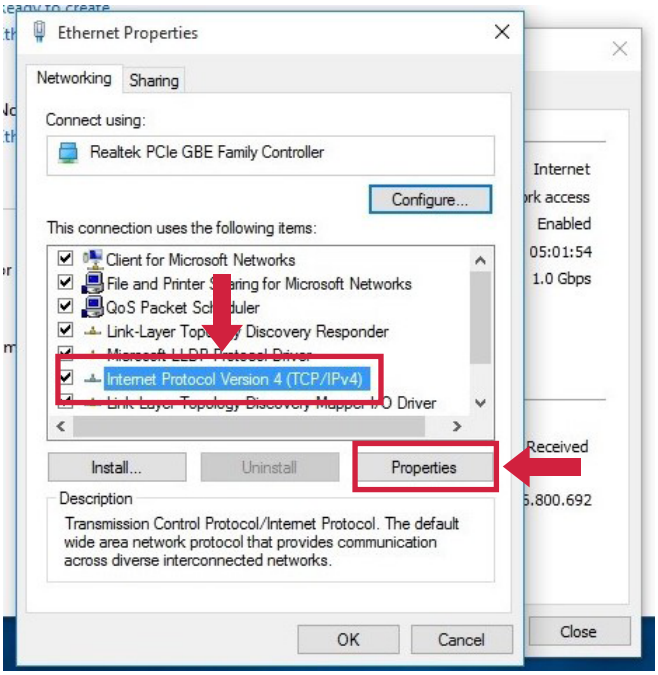
3. A window will open: click **“Ethernet”** at the top right of the window.



4. Click **“Properties”**.

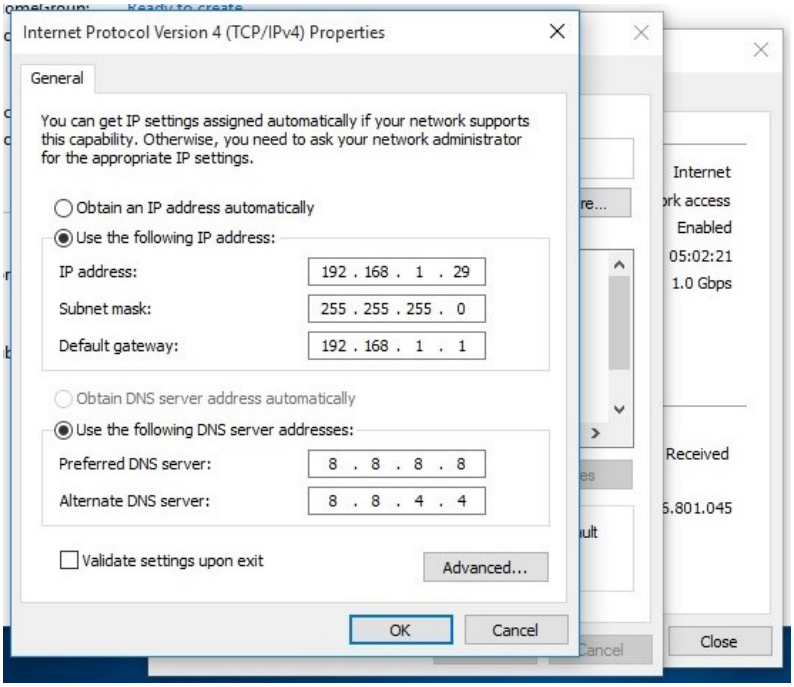


5. Select **“Internet Protocol Version 4 (TCP/IPv4)”**, then click **“Properties”**.



6. The window with IP addresses will open. Type here the static IP address you wish to give your device.

Fill in **“Subnet mask”**, **“Default gateway”**, **“DNS”** and other fields, to allow the device to access local networks, internet, etc.
These addresses and parameters can be used, for example, to enable the system to send automatic email notifications (e.g. alarms, reports, etc.), to view the software on smartphone and tablet, or for the remote support.



7. Check "**Use the following IP address"**, click **Ok** and close the window.

When the correct IP address is assigned to the device, it can be displayed on the client's network.

The addresses from the figure above can be modified by the corporate network administrator, in order to assign correct addressing and network property, web access, etc.

In case of connection to multiple networks, make sure that the assigned IP addresses are compatible.

For example, connecting the device on the office PCs network may conflict with the IP of monitored CNC/PLC. In such situation, assign a compatible IP also to the CNC or PLC, making choices both on the CNC and the gateway and PCs that need it.

4.4.3 Connection to an existing LAN network

As mentioned in previous paragraphs (**4.1**, **4.2**, **4.3** etc.), it is necessary that the default IP address of the purchased device is compatible with the devices in the existing network. If so, connect it directly to the switch/router, or modify the gateway network configuration. Follow the procedure described in Section 5.1.

The configuration of the network to assign to IOT SCADA SERVER cannot be determined beforehand. Please, contact your system administrator to obtain the necessary parameters.

Once you have obtained the network configuration for the IOT SCADA SERVER, modify it, accessing the web interface via one of the methods described in previous paragraphs, and then connect the IOT SCADA SERVER to the existing LAN.

If the LAN is equipped with a firewall to filter access to Internet, the following TCP and UDP ports used by IOT SCADA SERVER should be opened to outbound traffic, to ensure proper operation:

- 123 TCP (NTP) to synchronise the date and time
- 53 UDP (DNS) for domain names resolution, which is essential for the connection to the remote support VPN
- 443 TCP and 1194 UDP for the connection to the VPN of Alleantia remote support
- 21 TCP (FTP) for remote backup on FTP if enabled on a server not within the LAN network
- 25 TCP (SMTP) to send email notifications if enabled by a server not within the LAN network. Some SMTP servers may use a different TCP port. In this case open the specific port to traffic

If you want to remotely view the Web interface, enable the port to inbound traffic:
- 80 TCP (HTTP)

The configuration includes the setup of IOT SCADA SERVER communication, connection to devices through different available interfaces and GUI customization.

4.5 Software installation

If the IOT SCADA Server system is already installed on a device (PC, Gateway, etc.), to access and configure it, see **paragraph 4.1**.

Otherwise, if you need to install the software and license, follow these steps:

- Install the software;
- Activate license.

4.5.1 Provided files

The IOT SCADA is supplied as .exe file to install on Windows systems. It creates web server that you can access via browser at **http://localhost** (80 port can be modified during installation).

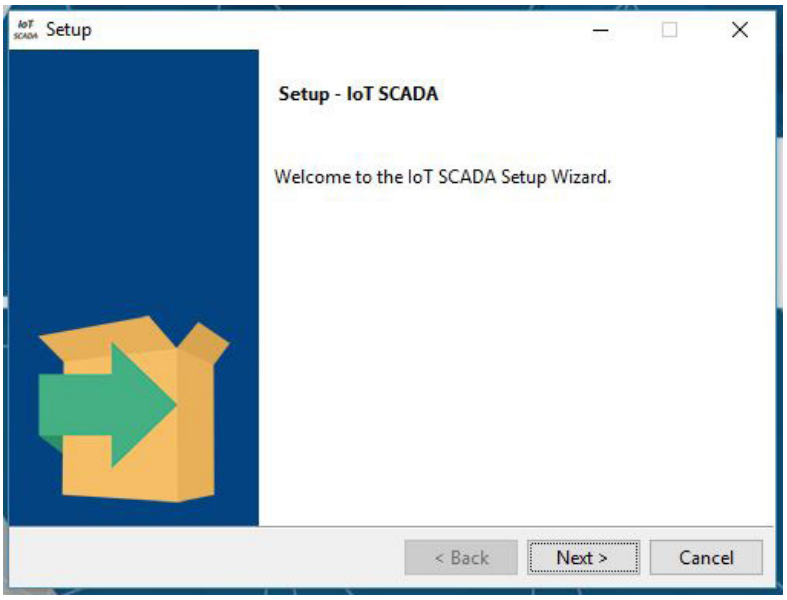
As regards the license, the provider sends a file with extension .lic that enables and activates the IOT SCADA.

4.5.2 Installation procedure

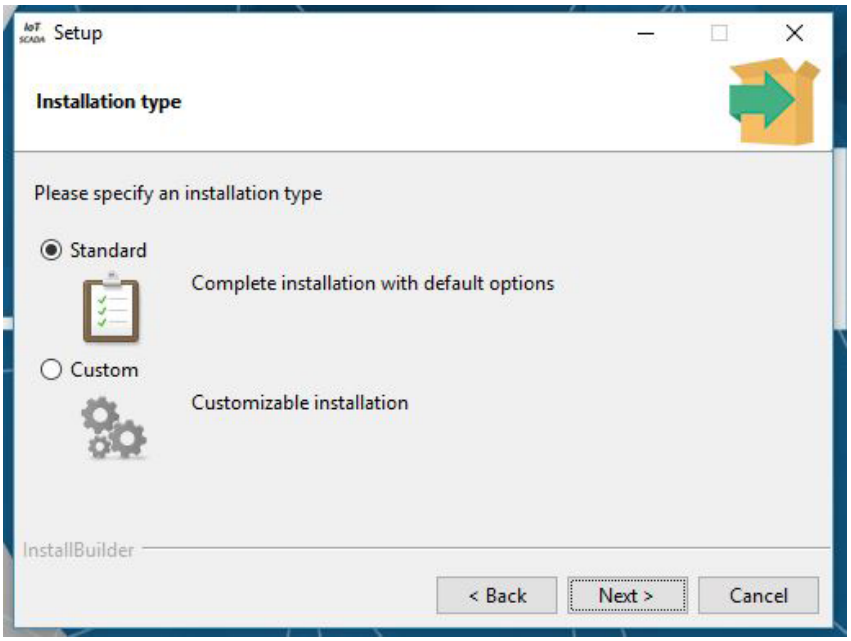
Copy the .exe file to the Windows system where you want to install the IOT SCADA and launch it.

Select the installation language.

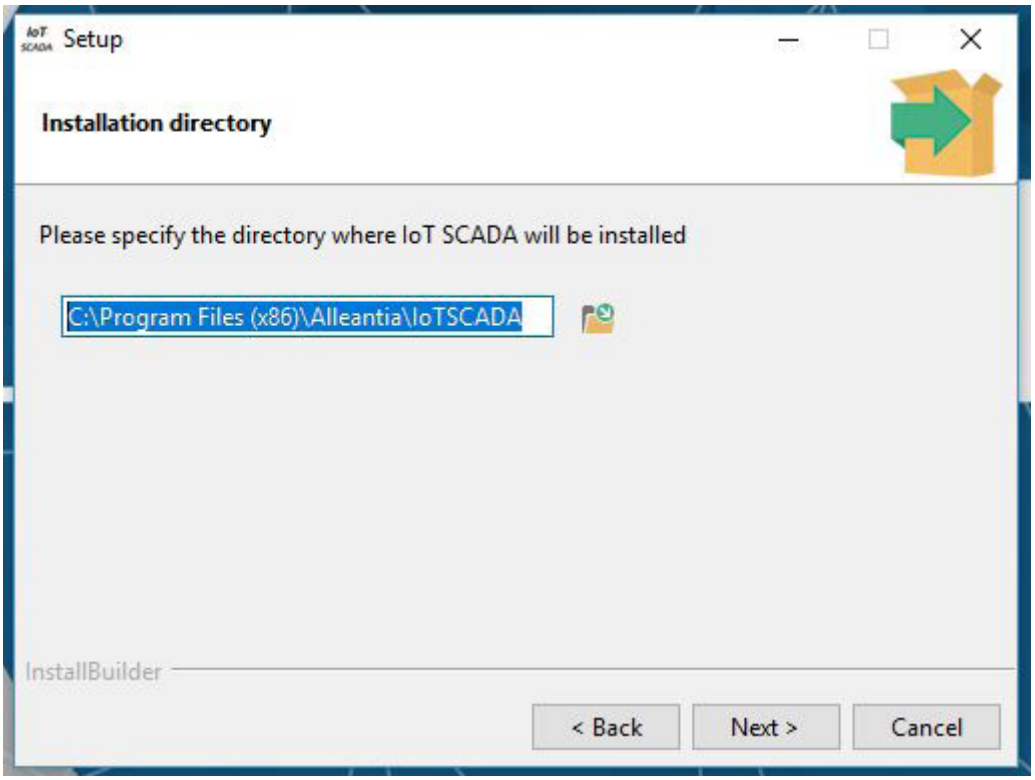
Click **"Next"**.



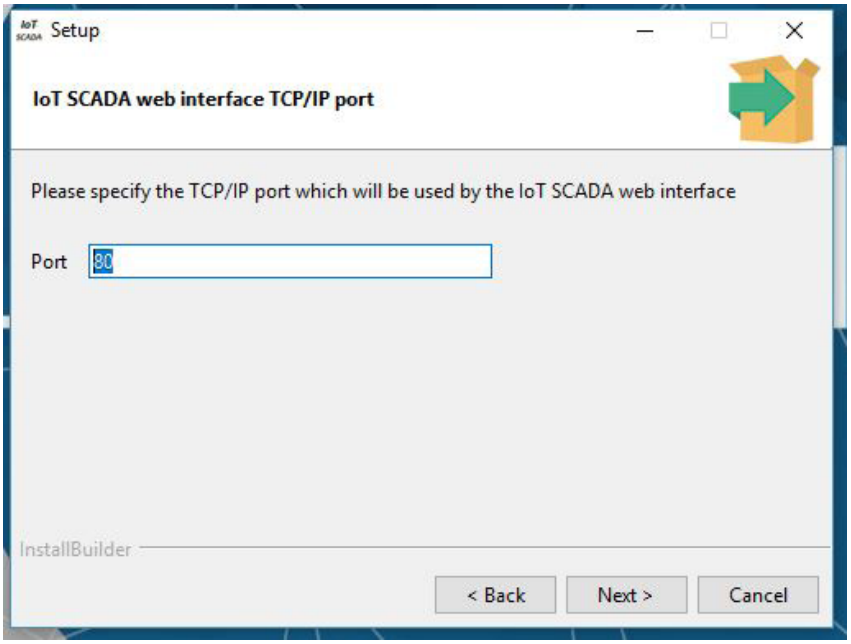
Specify an installation type:
- Standard: the files will be installed with default options (in **"Program files (x86)"** folder on Windows); the webserver port will be **:80** on the localhost.
- Custom: you can choose the installation directory and the webserver port.



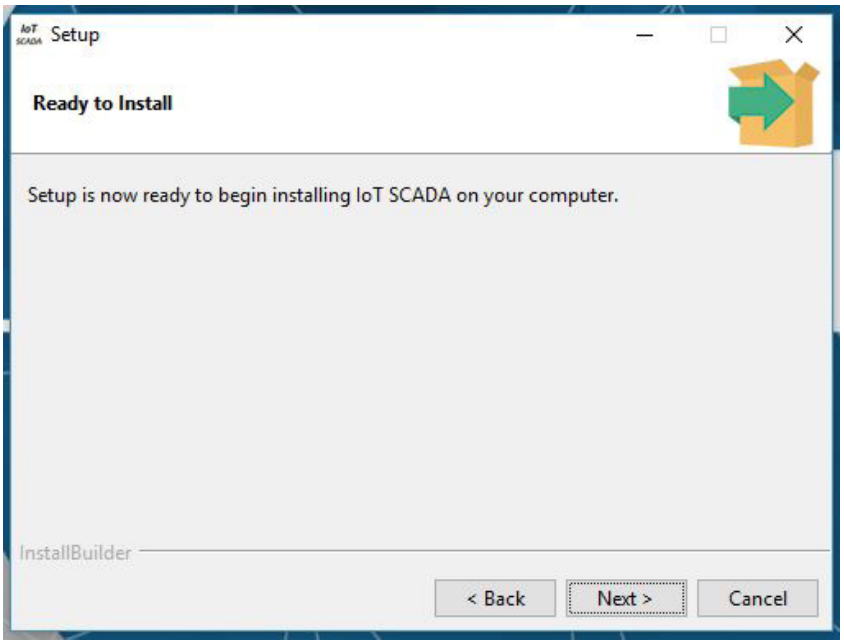
Two following windows appear only if custom installation is selected.



4 Access



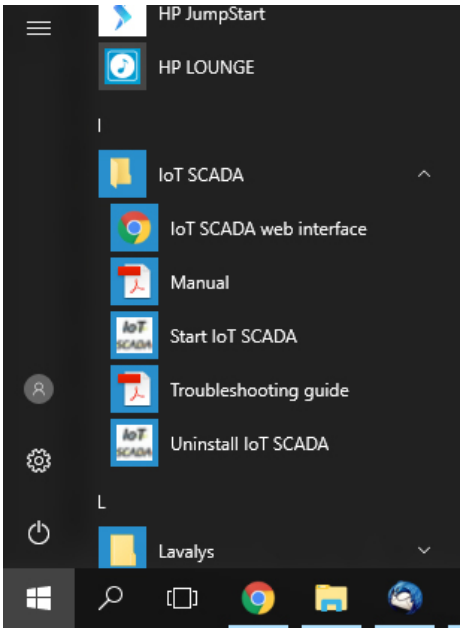
Click on **“Next”**.



In the end two icons will be created on the Desktop:

4 Access

To activate the webserver, double-click on **“Start IoT SCADA”.** To open the browser and access web, click **“IoT SCADA web interface”**. These commands can be found in Windows start menu.

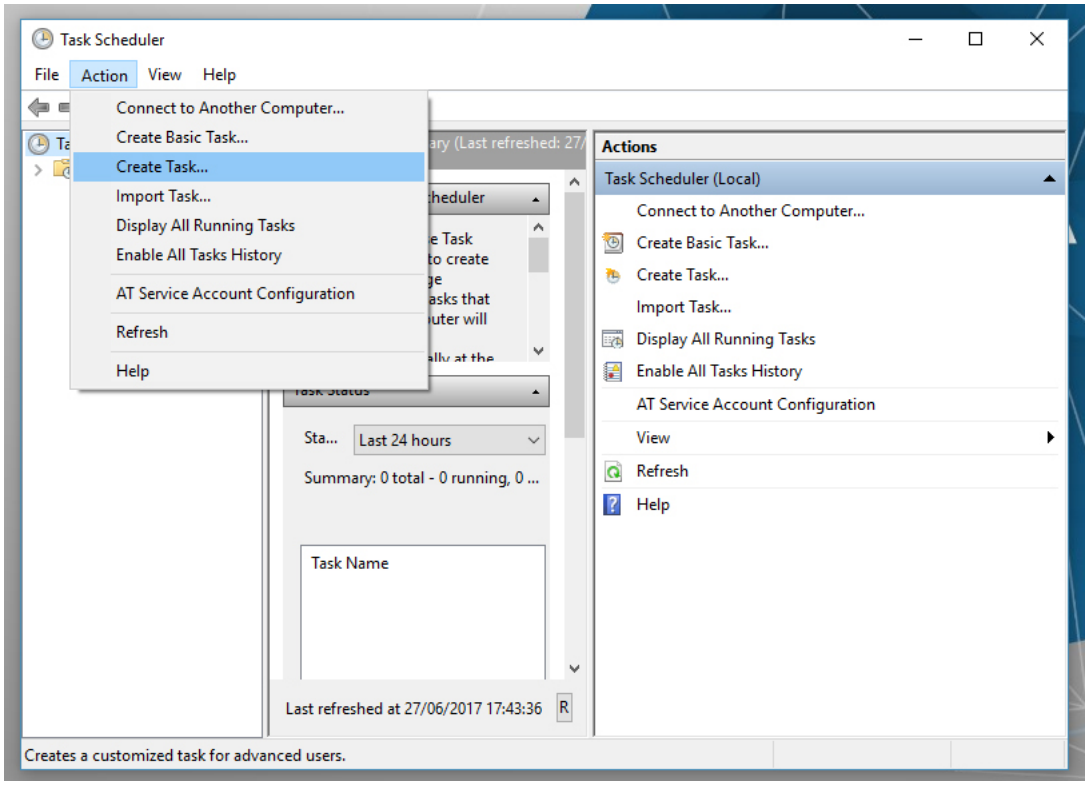


You can set the auto start of the webserver:

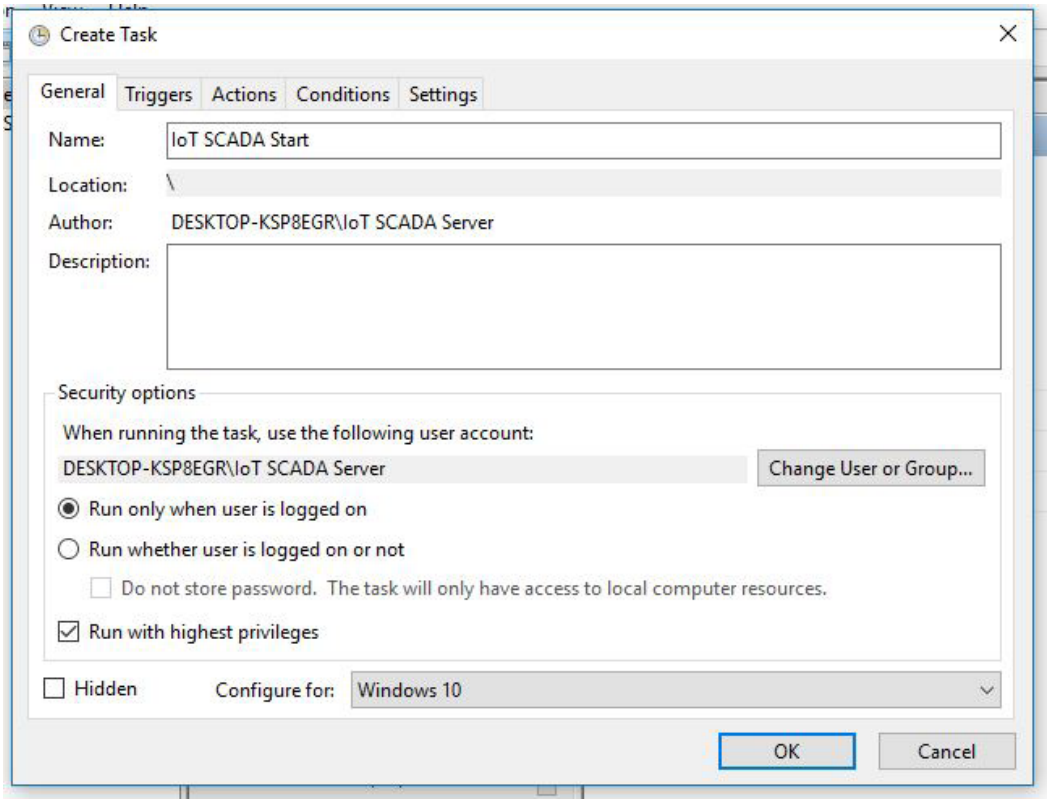
- **Windows 7 and Windows 8.1** - copying the **“Start IoT SCADA”** shortcut in Windows “Start-up” folder.

- **Windows 10**:

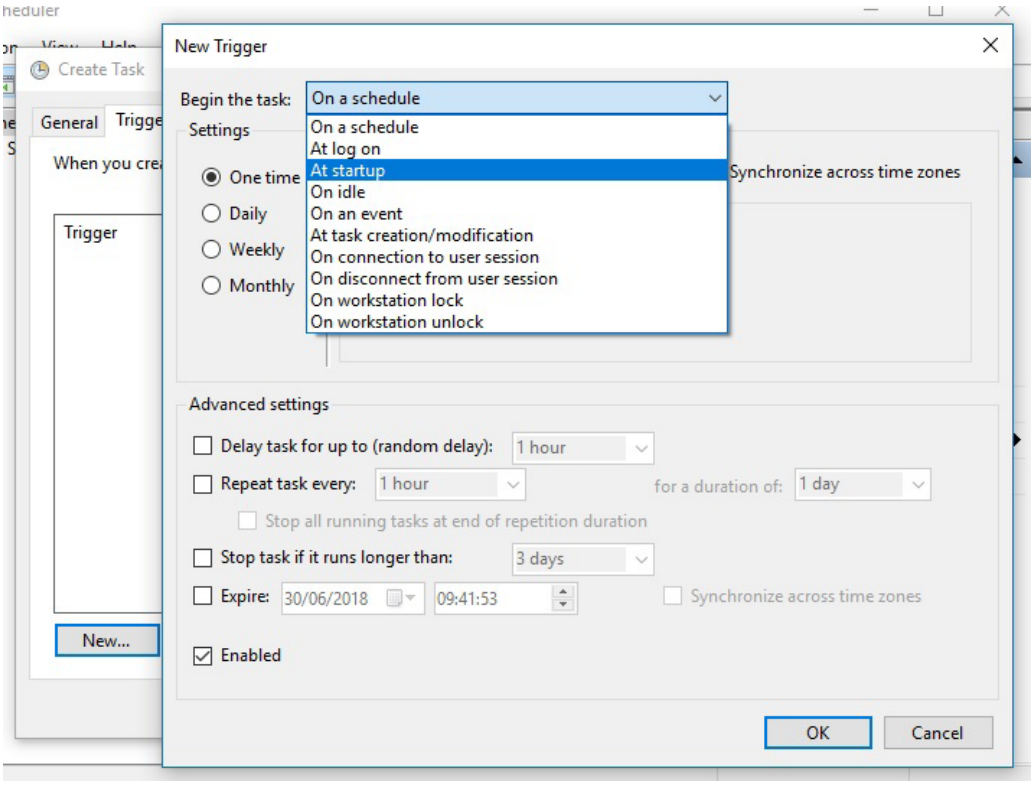
1. Open **Task Scheduler**, create new task.



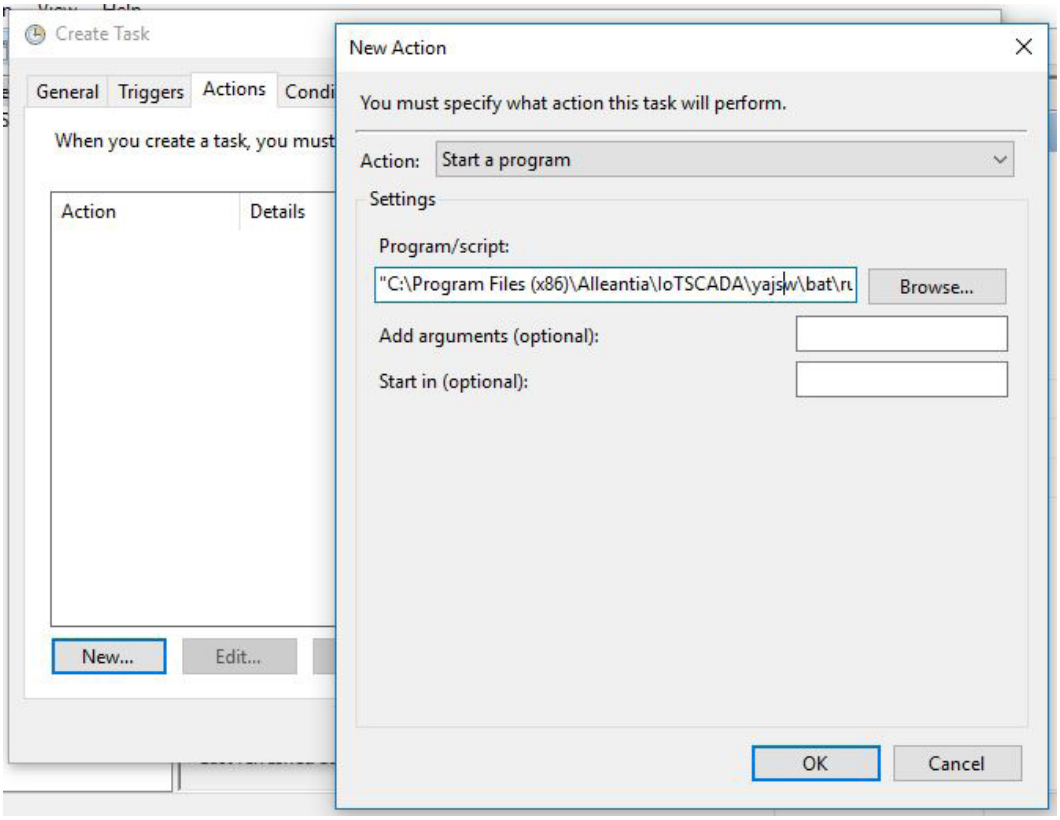
2. Setup as in the figure below: create a name, check **Run with highest privileges,** choose **Windows 10** from the dropdown list.



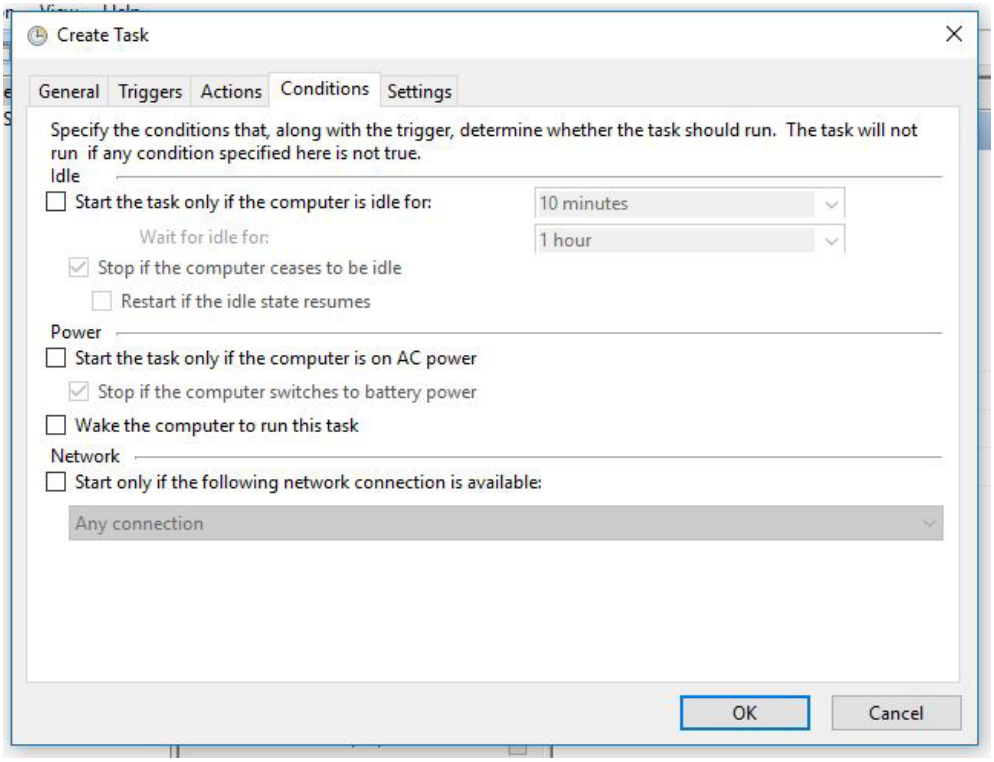
3. Go to **Trigger** tab. In the section “Begin the task” select **At startup.**



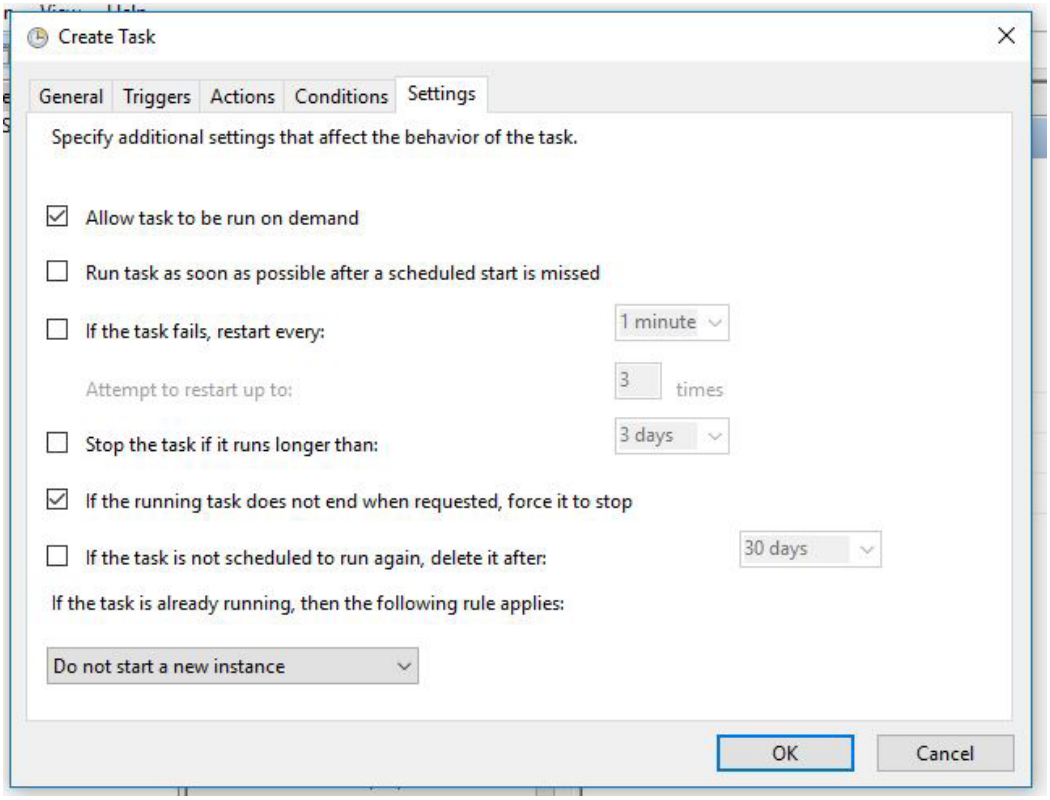
4. Go to **Actions** tab. Create new action.
Browse the file **C:\Program Files (x86)\Alleantia\IoTSCADA\yajsw\bat\runConsoleW.bat**



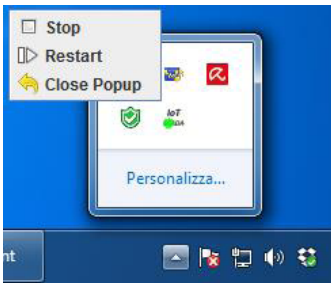
5. In the **Conditions** tab, in **Power** section, uncheck **Start the task only if the computer is on AC power**.



6. In the **Settings** tab, uncheck **Stop the task if it runs longer than:.**

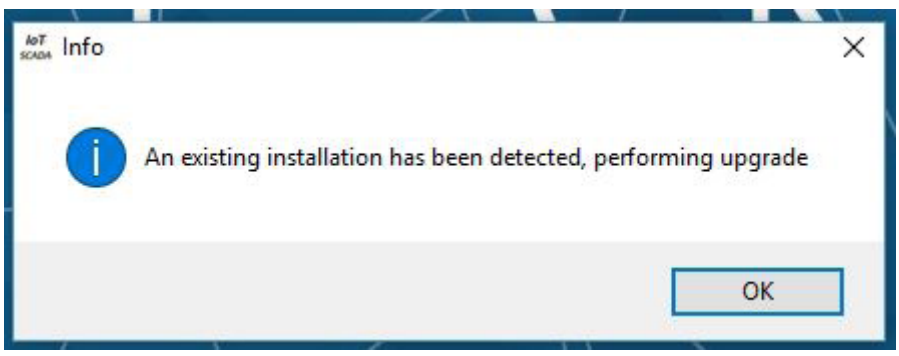


To stop/restart the active webserver, you can use **"IoT SCADA"** icon in Windows Task Bar.

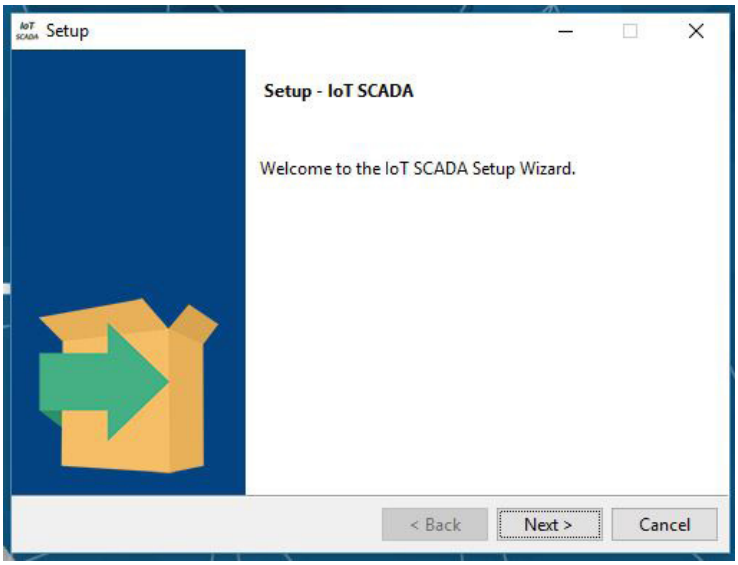


4.5.3 Update procedure

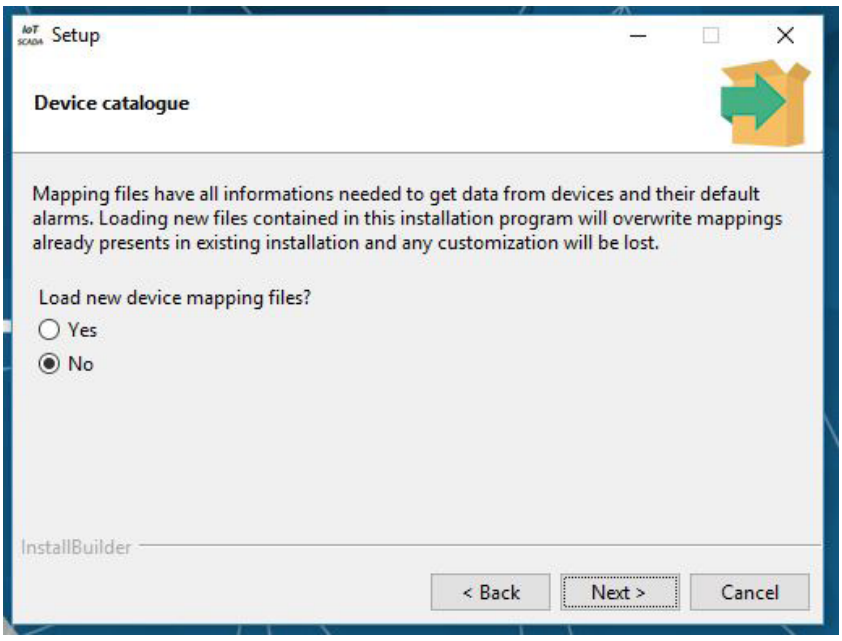
If the .exe file has been launched on the system where there is already an installed copy, it will be updated.



Click **“OK”,** then **“Next”**.



You will be asked to load new device mapping files, if in doub, select **“No”**.



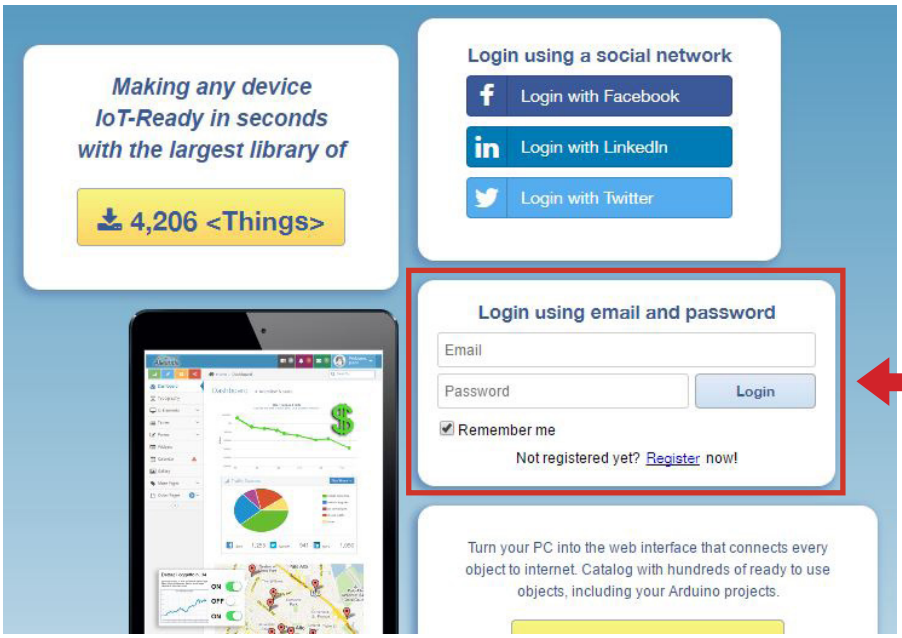
Click **“Next”** to start the update procedure.

4.5.4 License activation

Together with the product the activation code, consisting of xxxx numbers, is provided.

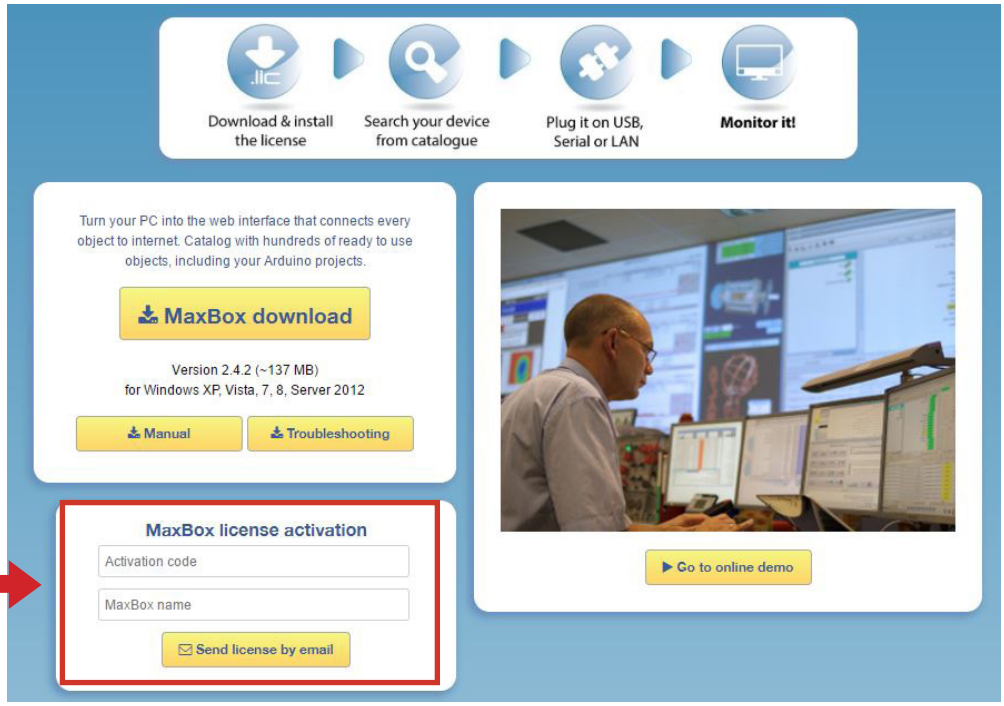
To activate the license, login to http://cloud.alleantia.com/login/login.zul

4 Access



Sign in with email or social networks. You will receive an email to confirm the registration.

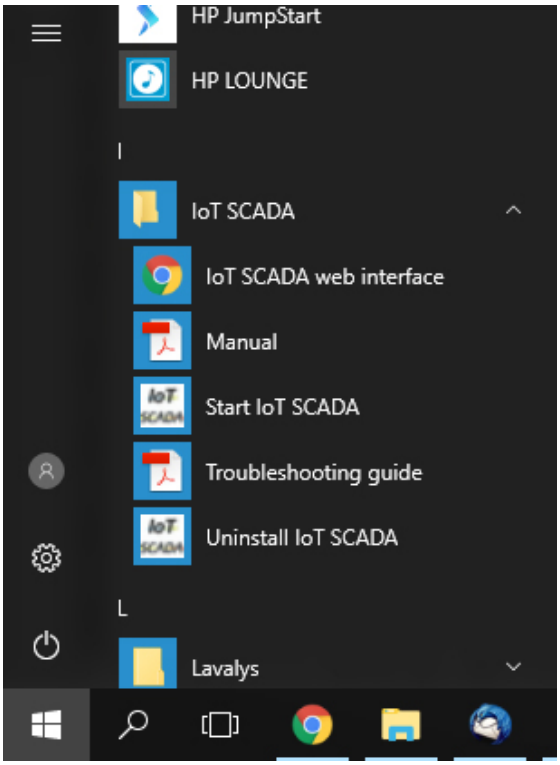
After you log in, the next screen will appear.



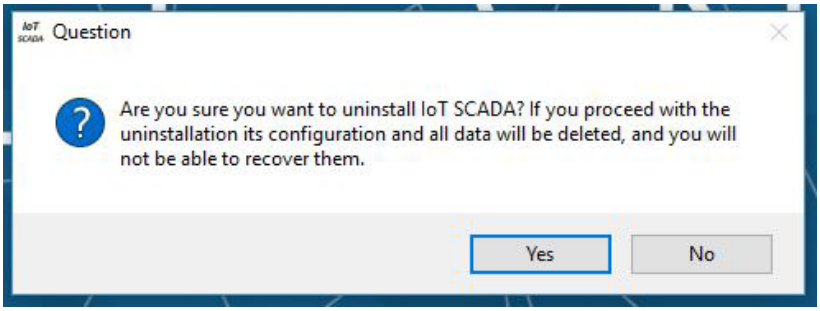
Insert your activation code in **“IOT SCADA license activation”** field.
File .lic will be automatically sent to your email for system activation.

4.5.5 Uninstallation process

To uninstall the program and delete the data, run **“Uninstall IoT SCADA”** from the Windows start menu.



CAUTION
All data will be deleted without the possibility to recover



In the end of uninstallation, desktop icons and shortcuts from Windows menu will be removed.

5 Configuration

Access the **“Configuration”** section from the main navigation bar and enter the following credentials:

Username: admin
Password: webloggerSU

A screen will appear as in Figure 1:

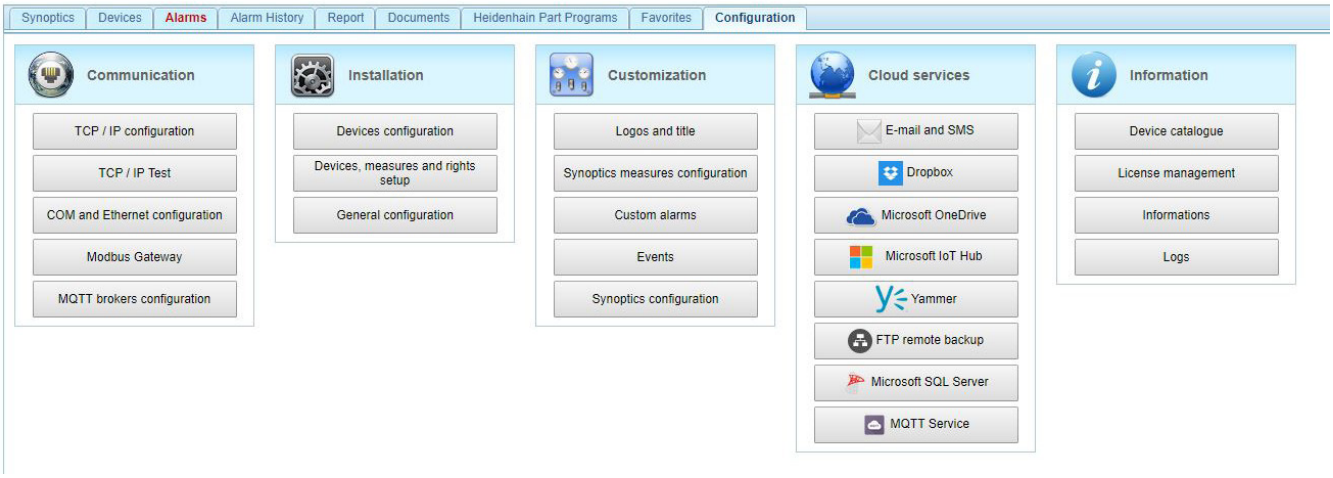


Figure 1. System configuration

5.1 Communication

5.1.1 TCP/IP Configuration

If the IOT SCADA SERVER is connected to a LAN network with other devices, its default settings could cause a conflict. If so, change the settings in the **“Communication” -> “TCP / IP Configuration”** section. A screen as shown in Figure 2 will be displayed:

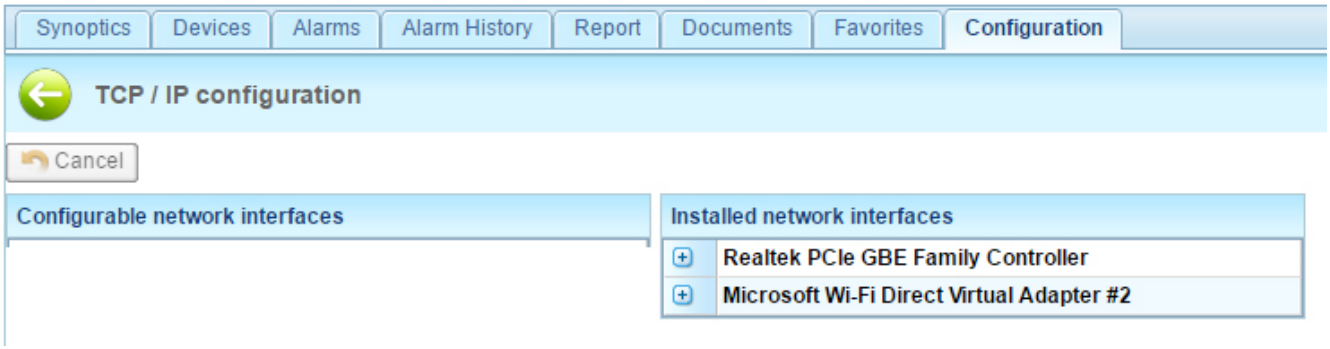


Figure 2. Network card data and setup of Ethernet and Wi-Fi

5 Configuration

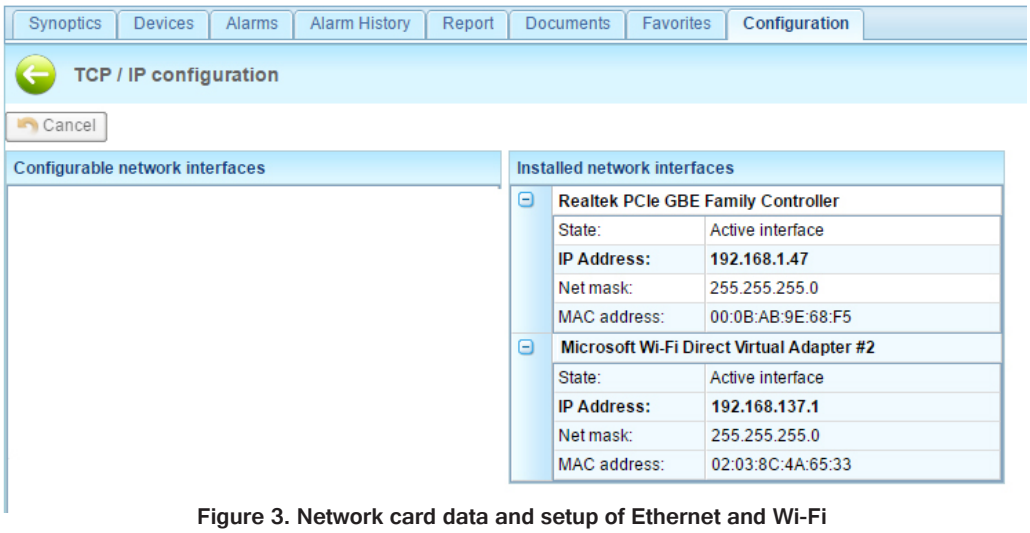
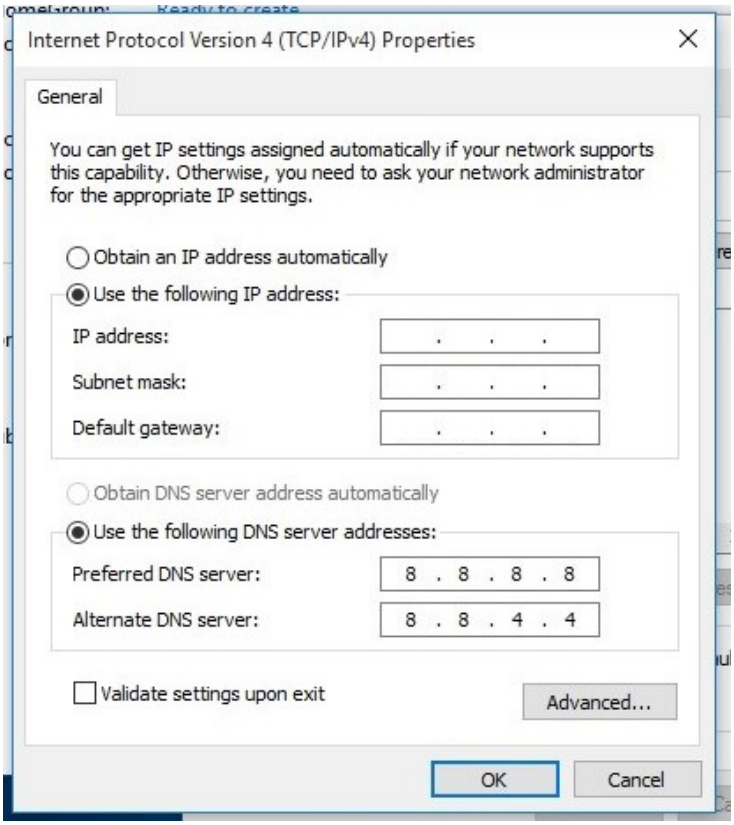


Figure 3. Network card data and setup of Ethernet and Wi-Fi

To modify the device's IP addresses on Windows 10 OS, see **paragraph 4.4.3.** For other Windows versions refer to **paragraphs 4.4.2** and **4.4.1.**

If there is a DHCP server in the LAN network to which the IOT SCADA SERVER is connected, you can check the **"Obtain an IP address automatically"** and click **Ok.**



The IOT SCADA SERVER will lease the IP configuration directly from the DHCP server.

If the DHCP server is not available or you prefer to set the IP address manually, check the **"Use the following IP address"** and enter all the **"IP Parameters"** including the IP addresses of the DNS servers that may coincide with that of the gateway in simple network configuration.

The right area **“Network Interface”** displays the current network configuration for both the wired interface (LAN) as well as the Alleantia VPN (Virtual Private Network) through which the IOT SCADA SERVER communicates with any centralised server (optional service) and the remote support, where available.

If the network to which you are connected has internet access, refer to paragraph 5.1.3 to verify the correctness of the LAN configuration set.

5.1.2 Connection to an existing Wi-Fi network

If there is a Wi-Fi, you can easily connect the gateway in order to monitor without laying additional cables.

To connect to Wi-Fi, click the desktop icon and search for available networks.

Select the network and insert the password.

The device will connect to the network and it will be possible to query it from any device, connected to the same Wi-Fi.

To connect to the device, open the browser and insert the static IP, assigned to the gateway, for example

http://192.168.1.29

Refer to previous paragraphs for the assigning IP to the gateway.

5.1.3 Internet communication test

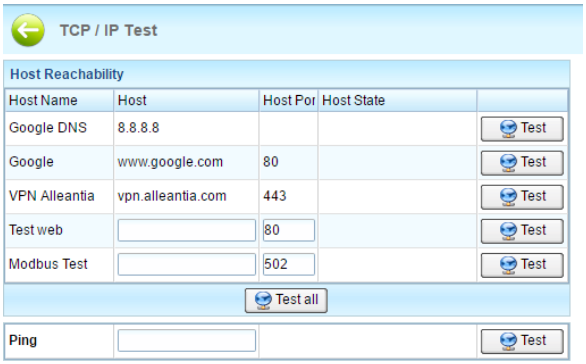


Figure 4. Internet communication test

In the **“Communication” - > “TCP / IP test”** section you can test the reachability of some default hosts and others of your choice.

By pressing the **"Test"** button next to each host or **"Test all"**, the reachability of these hosts can be verified and the result of the test will be shown in the **"Host state"** column. In the event that the host cannot be reached, check the configuration of the network, the network wiring or contact your network administrator.

5.1.4 Port and communication parameters configuration

To connect devices or machinery to the device's serial ports with installed IOT SCADA SERVER, make the following settings.

The default configuration of the ports is carried out in the section **"Communication" -> "COM and Ethernet configuration"** and is illustrated in Figure 5.

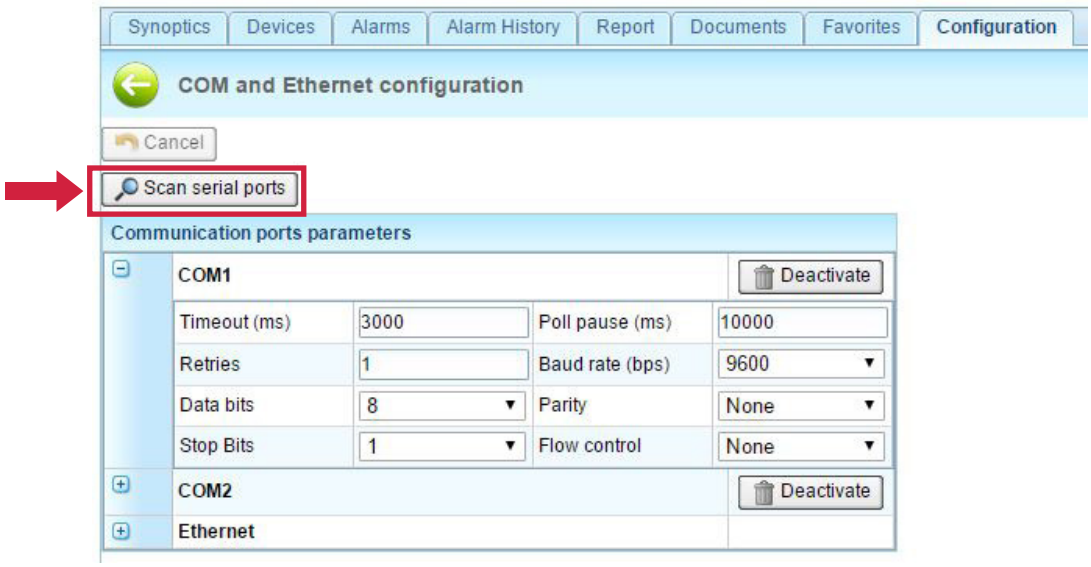


Figure 5. Communication ports configuration

First, click **Scan serial ports**.

The system will automatically find the serial connections of the gateway.

When connecting a device to one of the gateway's ports (PLC, energy meters, CNC, etc.), setup the port parameters.

Setup every port (for example, baud rate, parity, stop bit, data bit) according to the characteristics of the connected devices, referring to their installation manuals. The Ethernet port is associated to the RJ45 connector of the IOT SCADA SERVER.

To create the COM ports click **"Scan serial ports"** (**NOTE**: the converters should be physically connected to the IOT SCADA SERVER). When scanning is complete, new found ports are displayed on green background. Remember to save new configuration before leaving the page.

The system provides for the polling of all devices on each communication line, inserting a pause between one cycle and the next equal to the **"Poll pause (ms)"** value (can be set in web interface).

In the event that the polling of a device is not successful within the **"Timeout (ms)"**, the system performs a number of attempts equal to **"Retries"** before highlighting a communication error and moving on to the next device.

In the event of communication problems, increase this value by up to a few seconds in order to avoid under-performing electronic systems being overloaded by repeated polling.

The non-functioning device will be called up in each scan cycle. Click **"Save"** to apply changes when the configuration is complete.

5.1.5 Modbus Gateway

The Modbus gateway feature makes the system data accessible to external software via the Modbus protocol enabling, for example, the integration with SCADA systems, regardless of the protocol used by devices to which the IOT SCADA SERVER is connected upstream.

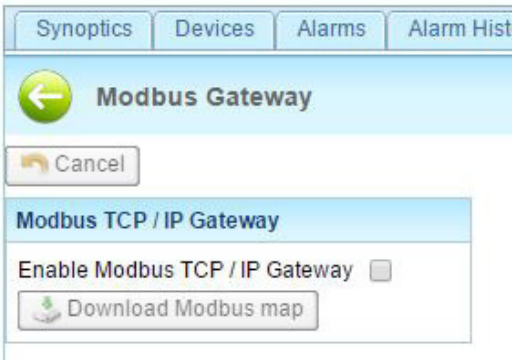


Figure 6. Modbus Gateway

To create automatically the Modbus map with information and download it in Excel format, including the configured information set, click the **Download Modbus map (Excel. XLSX)** button, which is enabled when the gateway is enabled.

5.1.5.1 Rules of automatic mapping

The mapping of the measures of the devices on the Modbus gateway follows the following rules:

- For each IO SCADA SERVER serial port where devices are connected and configured, a TCP Modbus slave is created on a different TCP port:
    - o COM1 -> TCP 502 port
    - o COM2 -> TCP 503 port
    - o COM3 -> TCP 504 port
    - o COM4 -> TCP 505 port
    - o COM5 -> TCP 506 port
    - o Ethernet -> TCP 565 port
- Within each Modbus slave the devices keep the address configured on the physical device. If, however, this address is greater than 247, the maximum permitted by the Modbus protocol, it will be arbitrarily reassigned.
- The Modbus devices maintain the same identical mapping of the original device, both in respect of the areas as well as the addresses, data types etc. Byte and word swaps will not be considered.
- Non-Modbus devices will show the Boolean types in the coil area and numeric types both in Holding as well as in Input. The number will be in 2-word float format. The register address will be calculated arbitrarily.

- The bits within a word of the gateway are in Big-Endian format (More Significant Byte First) and the word in data types in 32 or 64 bits are in Little Endian format (Less Significant Word First).
- If a physical device goes offline, it will not respond when contacted through the gateway and the request will time out.
- If the value of a register containing a measure not read by IOT SCADA SERVER (see **paragraph 5.2.3**), is requested, the gateway responds with a default value of 0 for numeric data types and false for Boolean
- If the value of a non-existent Modbus register is requested, the gateway responds with the exception code "2", that is "Illegal Data Address".
- The gateway does not support writing, so if these are carried out by an external Modbus master, the Modbus register values are immediately restored to the value prior to the writing.

5.1.6 MQTT brokers configuration

In **"MQTT brokers configuration"** section, enter the connection parameters of MQTT brokers, where the data from MQTT Service will be forwarded (see Section 5.4.7).

Click **"Add Broker"**, then insert necessary parameters to establish a connection with the broker.

Figure 7. Brokers MQTT configuration

First, create a name for the selected broker. This will appear in the list of the selectable brokers, as MQTT service is being configured.

Subsequently, enter the IP address and the Port, through which the data exchange between broker and IoT SCADA Server application will take place.

IoT SCADA application supports brokers either with no authentication, or the ones which require a normal type of authentication (Username and Password), or SSI type (Secure Sockets Layer). In the latter case, click **"Add certificate"** to upload a digital certificate that will allow MQTT service to authenticate and communicate with the broker.

When the configuration is done, click "Test Connection" to test the reachability of the broker. If the test succeeds, you will receive the message "Successful connection".

Click **"Save"** to apply changes.

5 Configuration

5.2 Installation

5.2.1 System devices connection and configuration

This section describes how to add and remove new devices connected to the IOT SCADA SERVER via the RS485 serial interface or via Ethernet.

The examples below are valid for any kind of device or machinery you want to connect: PLC, inverter, CNC, remote modules with digital and analog input and outputs, etc. in the library or created new drivers.

5.2.1.1 Adding new devices

Any device from which you want the IOT SCADA SERVER to collect measures must be inserted in the section **Installation -> Devices configuration**.

Figure 8. System devices configuration

To add a device, press the **"Add"** button. A popup window appears as in Figure 8, showing device drivers loaded in the IOT SCADA SERVER catalogue. To add new devices please refer to Section 5.5.1

5 Configuration

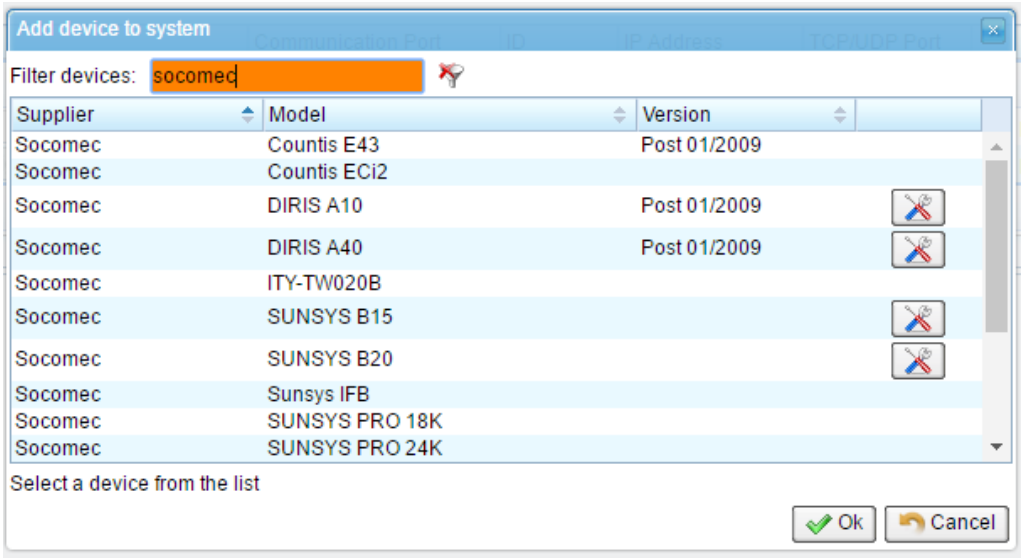


Figure 9. List of supported devices

The list contains all of the devices supported by IOT SCADA SERVER and can be sorted and filtered by manufacturer, model and version in order to facilitate the search.

To add a device to the system configuration, select it, set the number of identical devices present and press the **"Add"** button. The number of devices selected will be inserted in the main page and will appear with a green background to indicate that they have just been added:

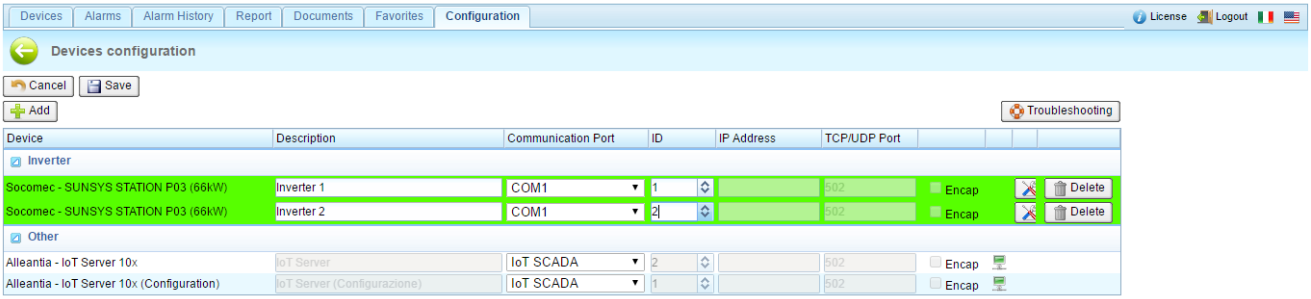


Figure 10. New devices added

Each new device shall be assigned a unique name to be recognised in the user interface (e.g. West Inverter 1), a unique numeric identifier to allow addressing on the RS232/485 bus or Ethernet (the ID in the case of the Modbus protocol) and the communication port to poll. For the list of existing ports or to add new ones using converters, refer to **Section 5.1**.

The device parameters can be inserted directly on the line. The **"IP Address"** and **"TCP / UDP Port"** fields will also be completed for the devices with Ethernet interface which, in the case of Modbus TCP / IP, is generally **"502"**.

Repeat the operation for all devices to add.

5 Configuration

CAUTION:
The identifier must be assigned to the first device (e.g. Inverter) according to the procedure described in the device's manual, and then copied in the configuration section of the IOT SCADA SERVER.

The devices with "<disconnected>" communication port are not "polled" as they are not associated with any communication line (Ethernet or serial). If a device is out of service its communication port can be set to "<disconnected>" to avoid any communication errors and speed up the reading of data from the system without changing the configuration.

Once the system configuration is complete, press the **"Save"** button at the top to make the changes effective. After a few moments the IOT SCADA SERVER will begin to poll the devices and an icon will appear next to each representing the communication status with the device itself.

If the configuration and wiring are correct the icon will be green: , while if the device is not reachable the icon will be red: .

Figure 11. System configured

The measures collected by the devices will appear in the **Devices** section in the main menu, see **Section 6.2.1.** Each device provides a number of measures that can be appropriately chosen by the user to facilitate the readability of the synoptics, as explained in **Section 5.2.3.**

5.2.1.2 Removing a device

If a device is no longer present in the system it can be removed from the configuration by pressing the **"Delete"** button at the end of device line. The device will disappear from the list and the change will become effective after pressing the **"Save"** button.

CAUTION:
Deleting a device will cause the loss of all of its recorded data. If you no longer wish to poll the device but keep the collected data, set its communication port to "<disconnected>".

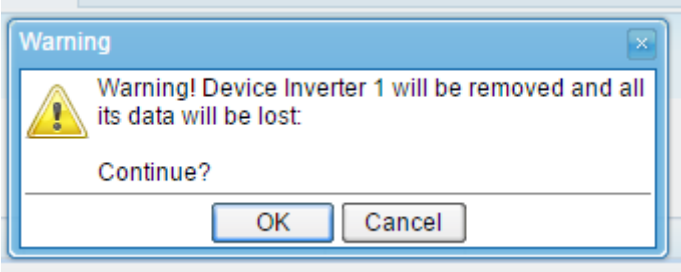


Figure 12. Confirmation Popup window for the removal of a device

5.2.1.3 Installation support manuals

During both the device selection, as shown in Figure 7, as well as in the device list as shown in Figure 8, two icons can appear next to each device that allow to download and view the help documentation during installation:

 User manual

 Quick installation guide

The **User Manual** is the same as that provided by the device manufacturer configured in IOT SCADA SERVER, while the **Quick Start Guide** is a concise guide created by Alleantia to help you configure the device and IOT SCADA SERVER.

In the event of communication problems between the IOT SCADA SERVER devices, refer to the troubleshooting guide that can be downloaded by pressing the button:

5.2.3 Devices measures setup

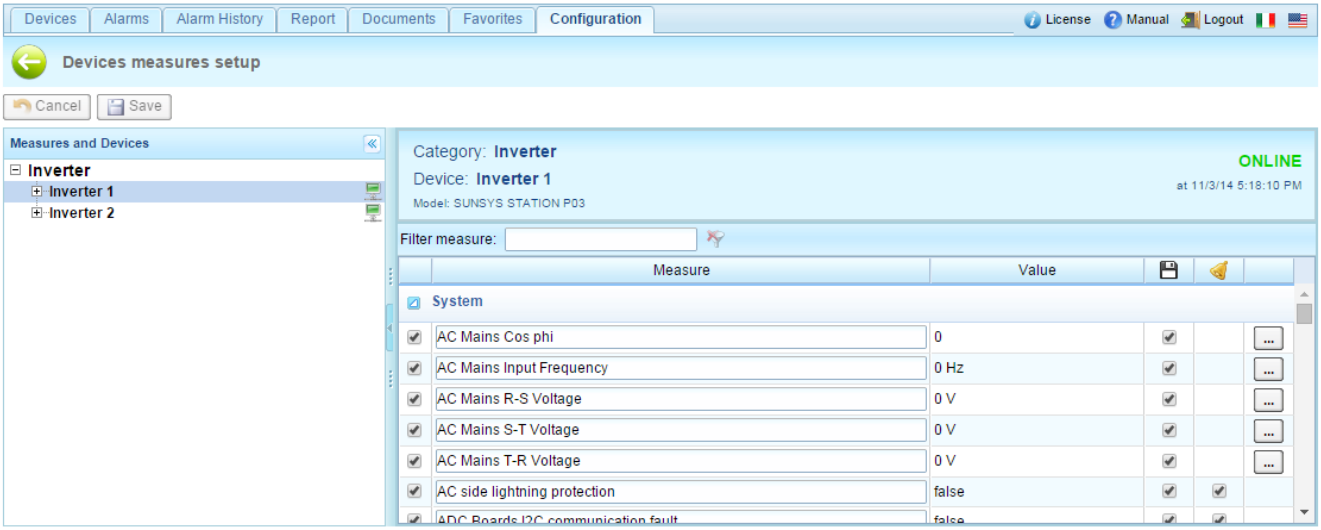


Figure 13. Devices measures setup

5 Configuration

Each device supported by IOT SCADA SERVER carries all information about any measure provided by the device. In order to avoid showing too many measures and slow down the scanning of the devices, only the measures actually considered useful for the monitoring are read when the device is added.

To change the default configuration, access the **Installation -> Devices measures setup** section; there is a tree menu on the left where all devices that the IOT SCADA SERVER is polling can be seen, organised by category. Once you have selected a device, all available measures will appear on the right.

Checking the boxes at the beginning of each line enables the reading of a single measure. Unchecking disable reading check boxes in the column with the symbol, it is possible to enable or disable measure logging in the IOT SCADA SERVER.

CAUTION:
Graphs can only be generated for the measures with enabled logging

Nel caso in cui la misura rappresenti un allarme, sarà presente anche una casella di spunta nella colonna con il simbolo , spuntandola l'IOT SCADA SERVER visualizzerà un allarme quando la misura assumerà un valore all'interno della soglia impostata oppure sarà un allarme automaticamente generato (PLC, CNC, etc). Il sistema provvederà all'invio di mail in automatico per notifica allarme ai destinatari impostati. È possibile modificare il nome della misura direttamente nella casella di testo, per modificare invece le altre impostazioni, se presenti, è possibile aprire un popup dedicato cliccando sul pulsante ... .

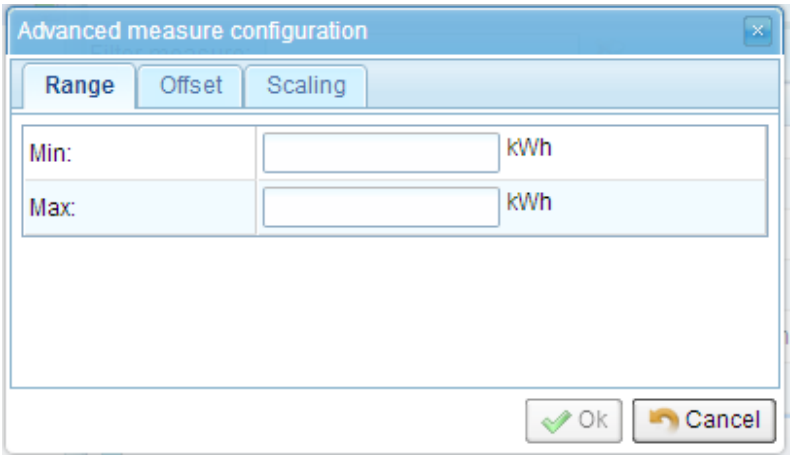


Figure 14. Measure range configuration popup window

By specifying a minimum and maximum value in the popup window **"Range"** tab it will be possible to make the screen reading of the measure easier (see, for example, the horizontal bars of some measures in Figure 16).

5.2.3.1 Measures offset

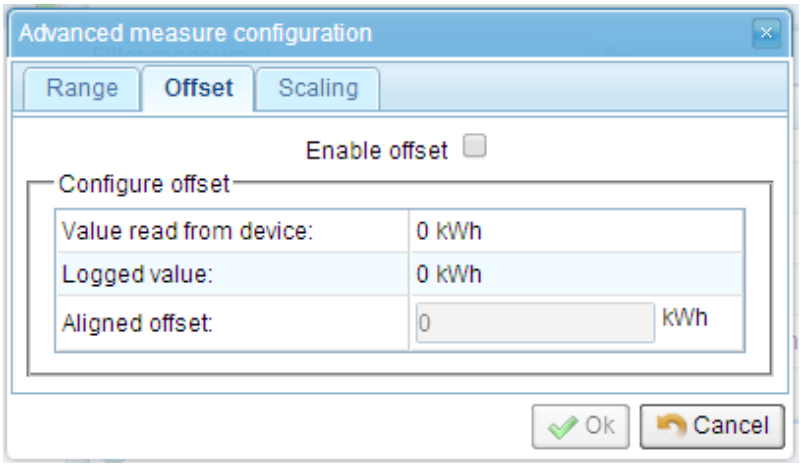


Figure 15. Measure offset configuration popup window

The measure offset feature is very useful in the case of network analysers that measure the energy produced or consumed. These devices are in fact often installed in parallel to an exchange meter and begin counting from 0 kWh, while the meter has a higher value. To facilitate the reading it can be aligned with that of the existing meter "correcting" the value displayed and recorded.

In the advanced configuration popup window **"Offset"** tab (see Figure 16) a value can be set in the **"Aligned offset"** box. The IOT SCADA SERVER will calculate the difference between the actual value and that desired, and this will be applied to the measures read by the device from that moment on. The values of the measures so aligned will appear in italic as a reminder that these values are not the real ones read but those purposefully modified by the user.

5.2.3.2 Measures scaling

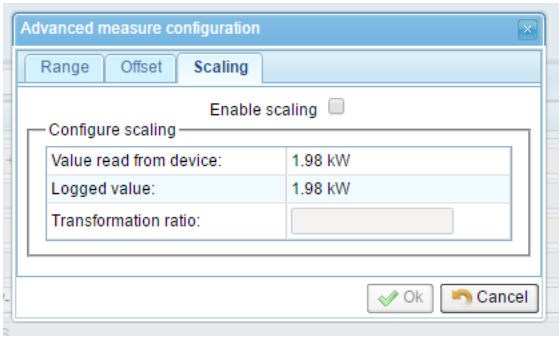


Figure 16. Measures scaling configuration popup window

The measure scaling feature is very useful in the case of fiscal meters that measure energy through external current transformer. The measured value is a fraction of the real value, i.e. 1 / K, with K the transformation ratio of the current transformer.

In the advanced configuration popup window **"Scaling"** tab (see Figure 16) a value can be set in the **"Transformation ratio".** The IOT SCADA SERVER will multiply the value aligned (see Section 5.2.3.1) for the transformation ratio set.

The values of the measures scaled in this manner will appear in italic as a reminder that these are not real values but those purposefully modified by the user.

5.2.4 General settings

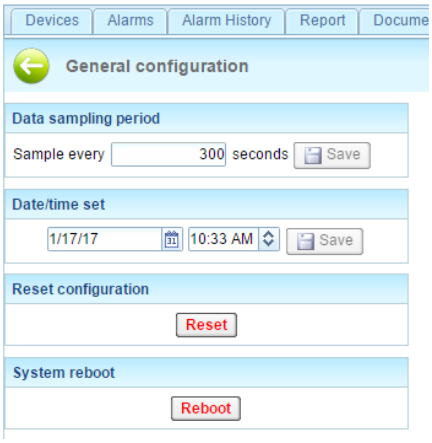


Figure 17. Data sampling configuration

Data sampling will affect the accuracy of the measure as it will increase or decrease the number of samples available to be analysed. A too high number of samples could excessively slow the processing.

On the same page you can set the system date and time: **Date-Time Set, System Reset** and **System Reboot**. It's even possible to reset IOT SCADA SERVER configuration by clicking on the **Reset** button, in this case:

CAUTION:
In case of reset all data and configurations of devices, alarms and notifications WILL BE LOST without possibility to recover

5.2.5 Password change

To change the access password to the configuration section, go to the **Installation -> Password Change** section and enter the old password (the initial installation default password is webloggerSU, as specified in **Section 5**). Select the new password and re-enter to confirm the selection. When finished, press the **Save** button.

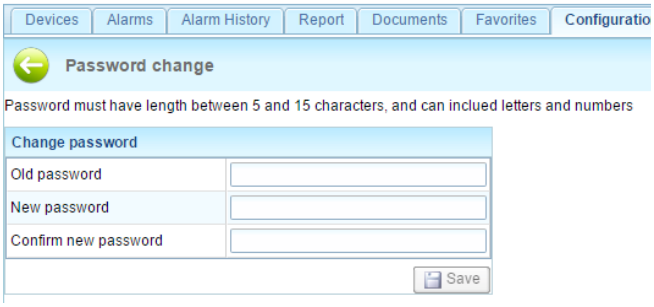


Figure 18. Password change

CAUTION:
For security reasons it is strongly recommended to change the IOT SCADA SERVER admin password immediately

5 Configuration

5.3 Customization

5.3.1 Logos and title

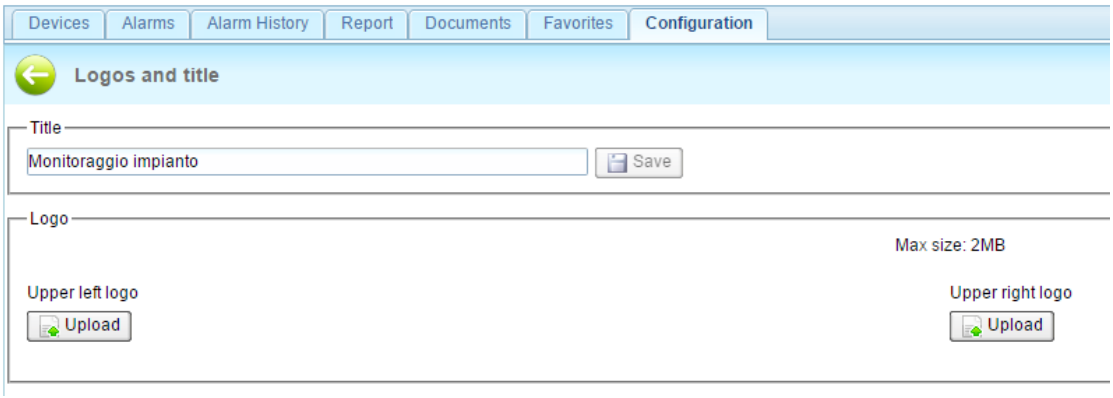


Figure 19. System logos and title customization

In the **Customization -> Logos and title** section the IOT SCADA SERVER interface can be customized:

- in the **Title** section the upper title present in all the pages of the interface can be set,
- in the **Logo** section 2 logos can be entered, one on the upper right and one on the upper left. These are also always present in all the pages GUI.

5.3.2 Custom measures

In addition to the measures read by the devices, you can define custom measures (such as, for example, sums of other measures): clicking the **Add** button in the **Configuration > Synoptic measures configuration -> Custom measures** section (Figure 19) a popup menu will open that allows you to enter the name of the new measure and select the existing ones which, when summed, will contribute to its value (Figure 20).

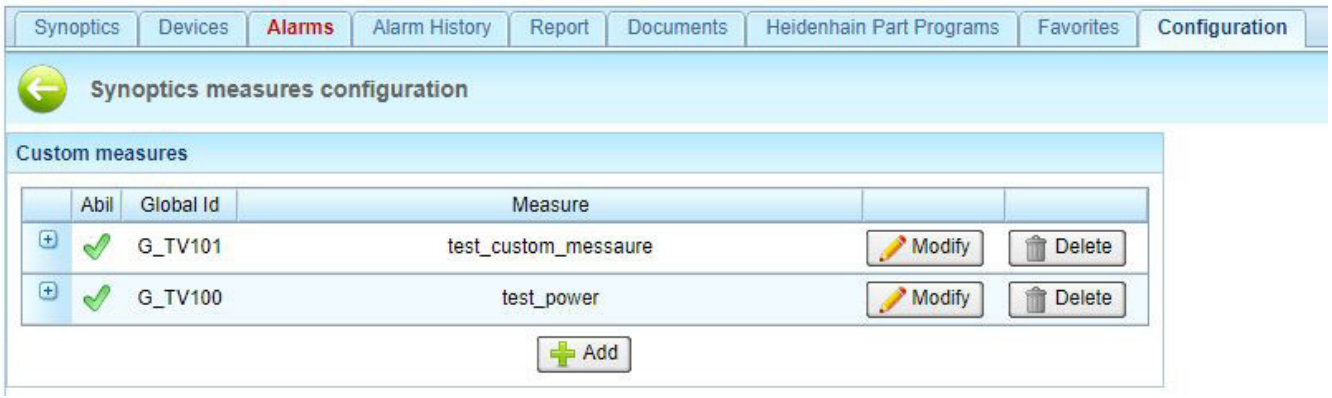


Figure 20. Custom measures

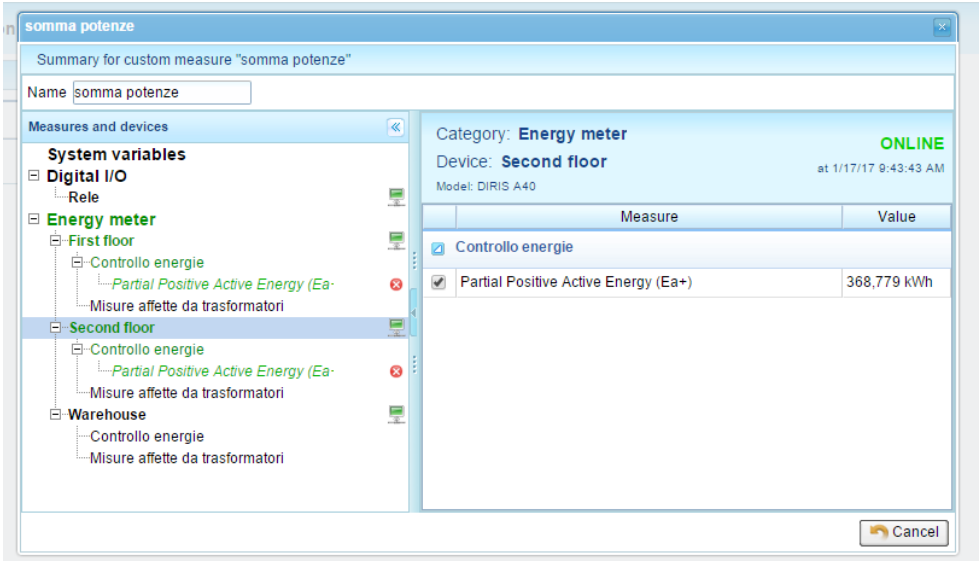


Figure 21. Custom measures popup window

For example, if the system is divided into two levels, you can create the custom measures “East Power” and “West Power” and select the power of the inverters associated to each level for each one. Please note that it is only possible to choose measures with the same measure units. Therefore, after selecting the first one, an automatic filter will remove all those that have different units of measures from the list on the right.

5.3.3 Custom alarms

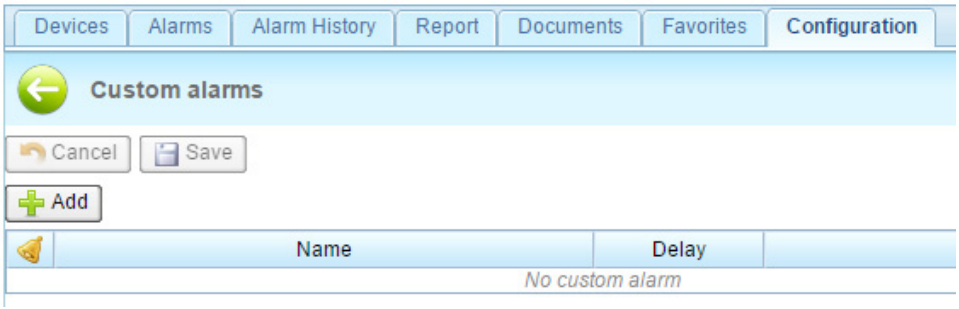


Figure 22. Custom alarms start screen

By accessing the **Customization -> Custom alarms** section it is possible to define new and more complex alarm conditions, in addition to those that are already set in the device. For example, if you want to create a new alarm condition that notifies an anomalous situation of low production on a solar inverter. Pressing the **Add** button will open a popup menu that allows you to configure the new alarm in detail:

5 Configuration

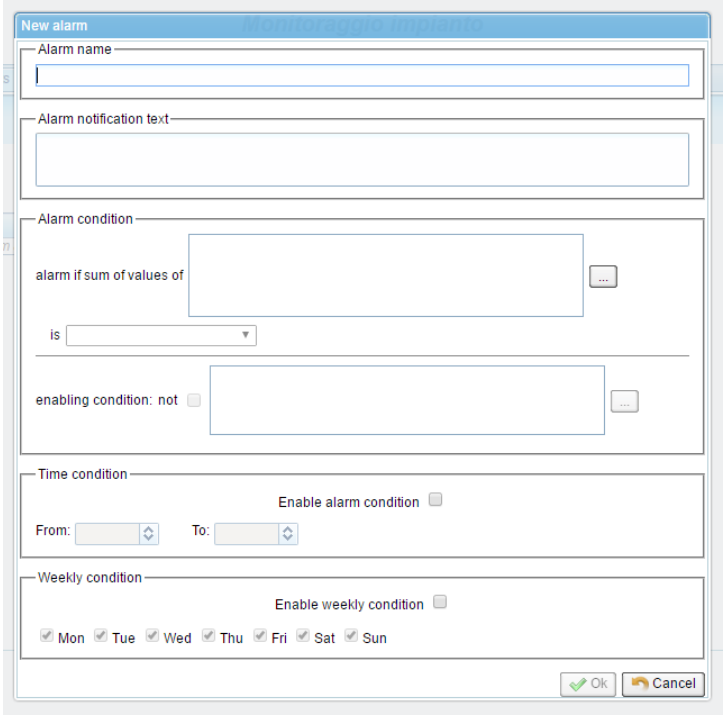


Figure 23. New custom alarm configuration

In the popup window insert the name for the alarm and text description that will be used during the notification to the user. Below, in the **Alarm Condition** section proceed to the selection of all the measures that you intend to monitor by pressing the  button. In this case we select only the power of inverter 1. Following the selection, the list of measures selected will appear next to the button. The check boxes enable the control types to be performed on the measure value. In this case the alarm will be triggered if the power of the inverter 1 falls below a certain threshold:

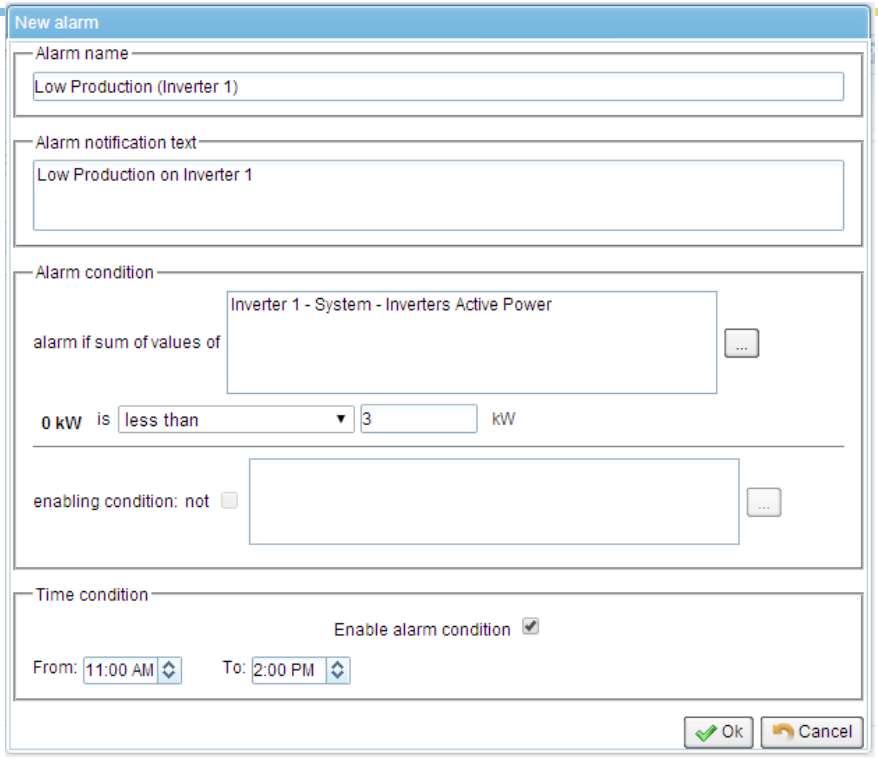


Figure 24. Low production alarm

A time range for the control can be specified. In this case, to avoid the control perform during the night when the solar inverter is not active. To save and activate the alarm, press **Ok** and then click on **Save** in the **Custom alarms** screen.

Once this alarm is entered, it is displayed on the main screen where it can be enabled or disabled using the checkbox and it is possible to set the delay time before which the alarm is to be considered as true (for example, 5 minutes), thus limiting the effect of transients:

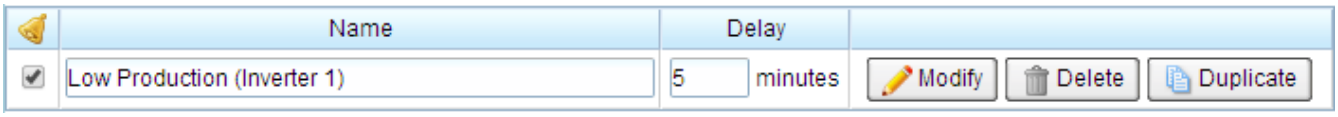


Figure 23 - New alarm

It is also possible to enable an alarm in relation to another: for example, using a pyranometer the alarm previously created can be reinforced by connecting the value of irradiation and then testing the low production only at times when it is expected to be high. To do this, simply create a new alarm to act as an “enabling condition”, an alarm that shall not be notified and, therefore, without the relevant box being checked:

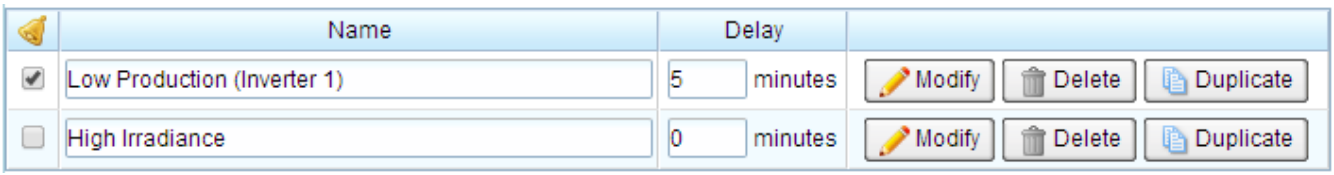


Figure 25. Multiple custom alarms

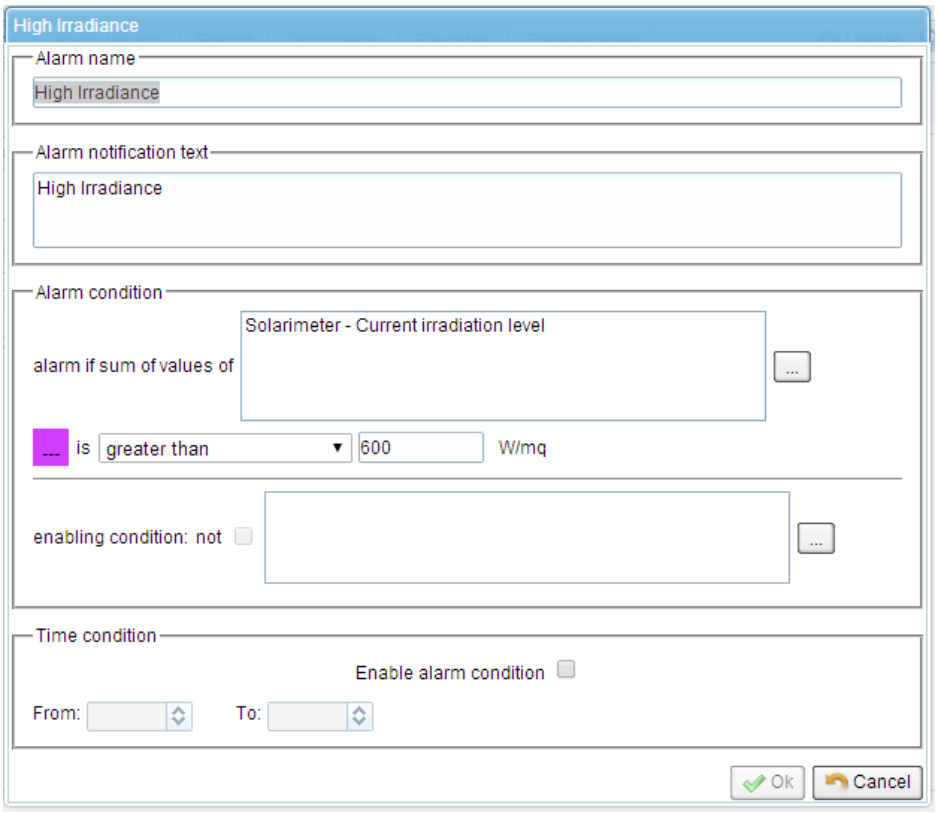


Figure 26. High irradiance condition

The alarm condition is unusual in this case (and is, in fact, not notified), but allows the user to avoid the application of a time condition: a "low irradiance" condition without a time slot would be triggered every night. Once the alarm condition has been saved, change the low production alarm to link it to that of the irradiation thanks to the *"enabling condition"*:

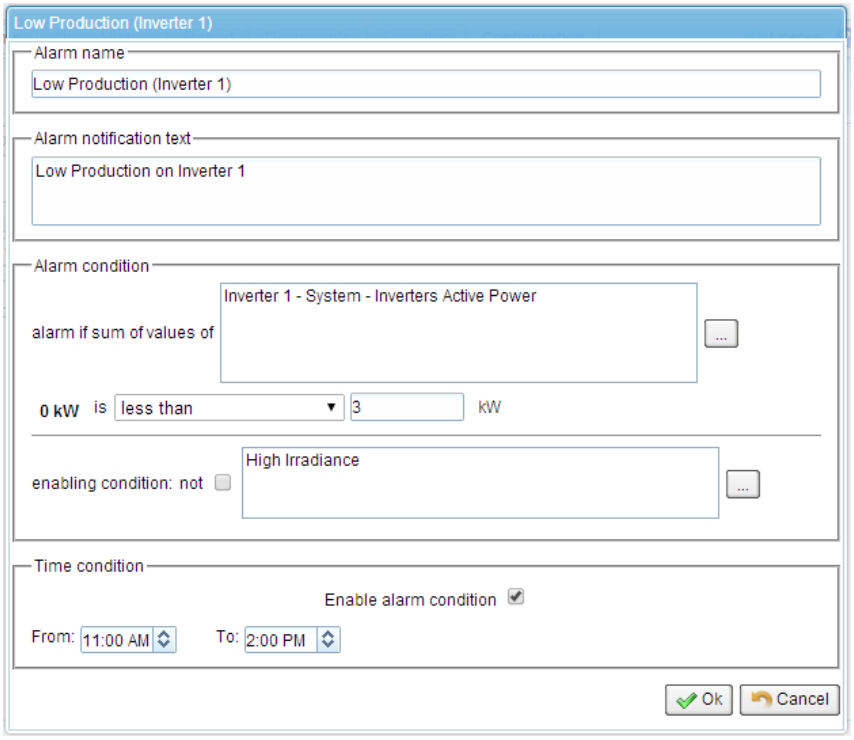


Figure 27. Change low production alarm enabling condition

At this point the time condition can be removed from this alarm as well given that there will not be high irradiation during the night and the low production alarm will not be enabled.

It is useful to create an alarm that acts as an enabling condition for many others.
If there are 10 inverters it would then be possible to insert the "High irradiance" condition only once and use it in the 10 "Low production" alarms.

5.3.4 Events

In the section **Customisation > Events** it is possible to define one or more events.

The set *Events* monitor the happening of a given set condition on a single variable - or on a combination of variables - and in the same moment "to photograph" the value acquired by any variable, configured in the application.

The occurrence of an event will not be shown on the application's interface, unlike *Custom alarms* (see Section 5.3.2), nevertheless the software keeps track of it in its archiving database, and offers the possibility to transfer the data, associated to them, through the cloud services *Microsoft IoT Hub, SQL, MQTT Service.*

Click **"Add"** to create new event and to open the configuration window (see Figure 28).

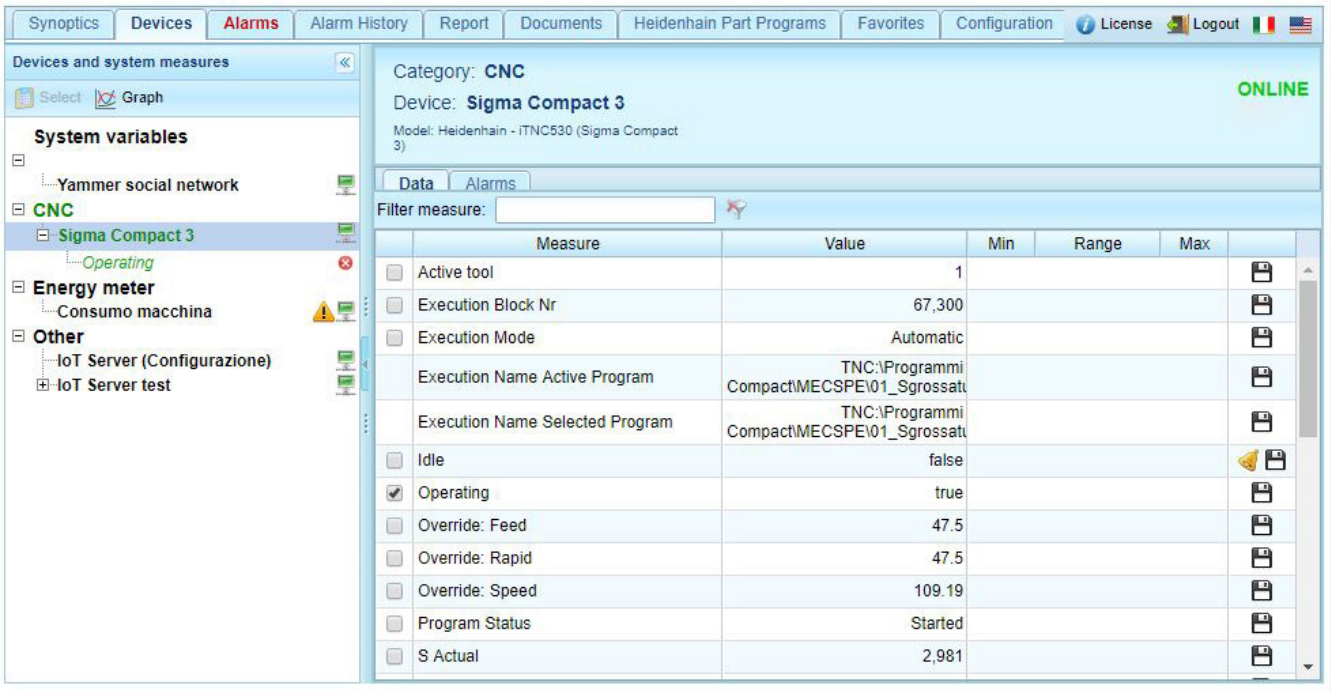


Figure 28. Events: selection of the chosen variable to set the event condition

Click **Ok**, then the system will select the chosen variable, entering the corresponding *GlobalId* inside *condition bar* and *GlobalId, Description* and *Total value* of the variable chosen inside **Variables summary** field (see Figure 29).

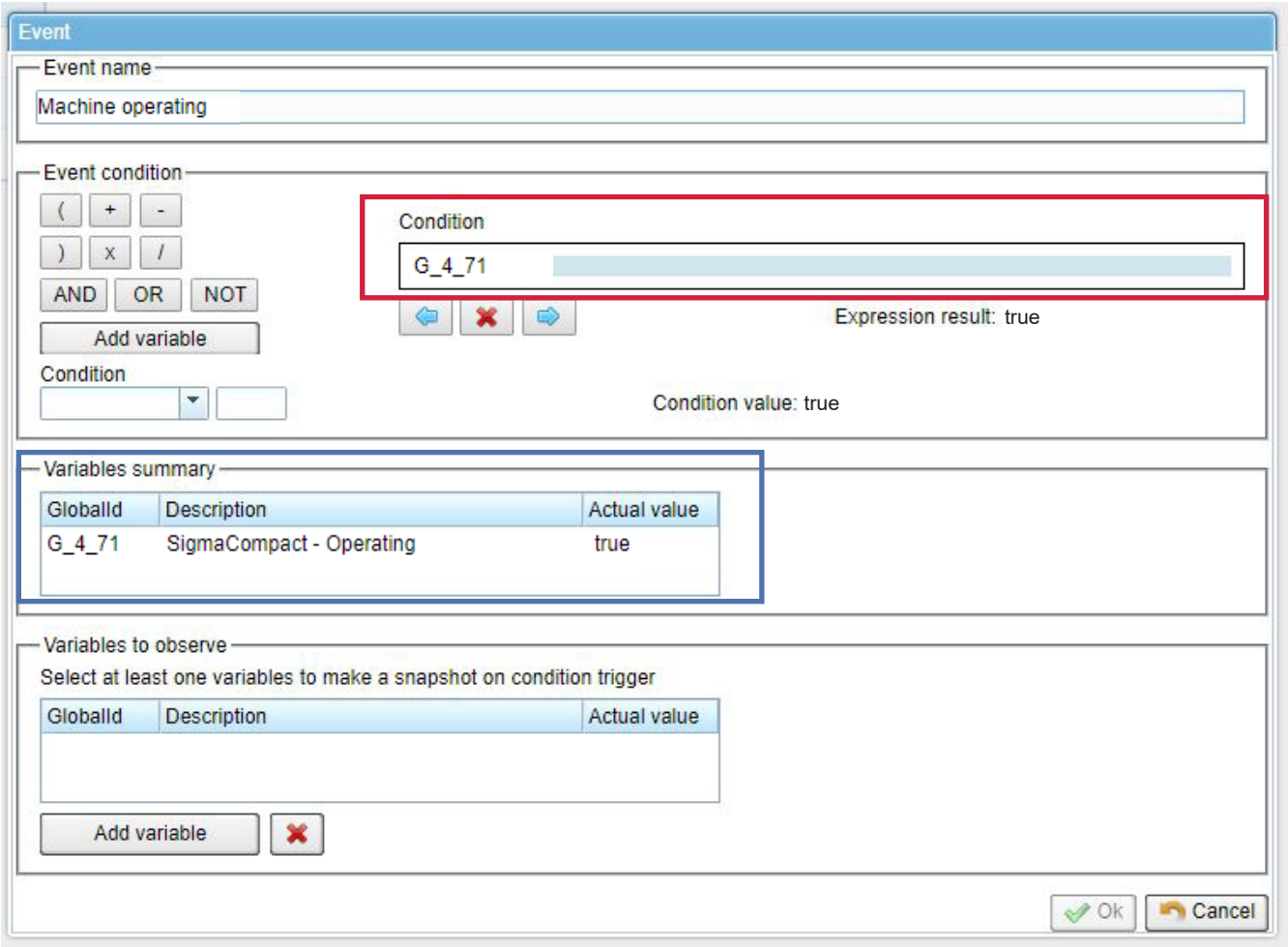


Figure 29. Events: Condition bar (red) and Variables summary window (blue).

Then, set the condition that determines the happening of the event. Select *"equal to"* condition from the dropdown menu (see Figure 30).

In the field next to it, enter the value 1 that corresponds to the boolean value *True*. On the right, a text line reports *currently acquired value* of the event as it has just been configured.

In the conditions of the example, the event will be verified at the moment of its creation (*Condition value: True*) (see Figure 31).

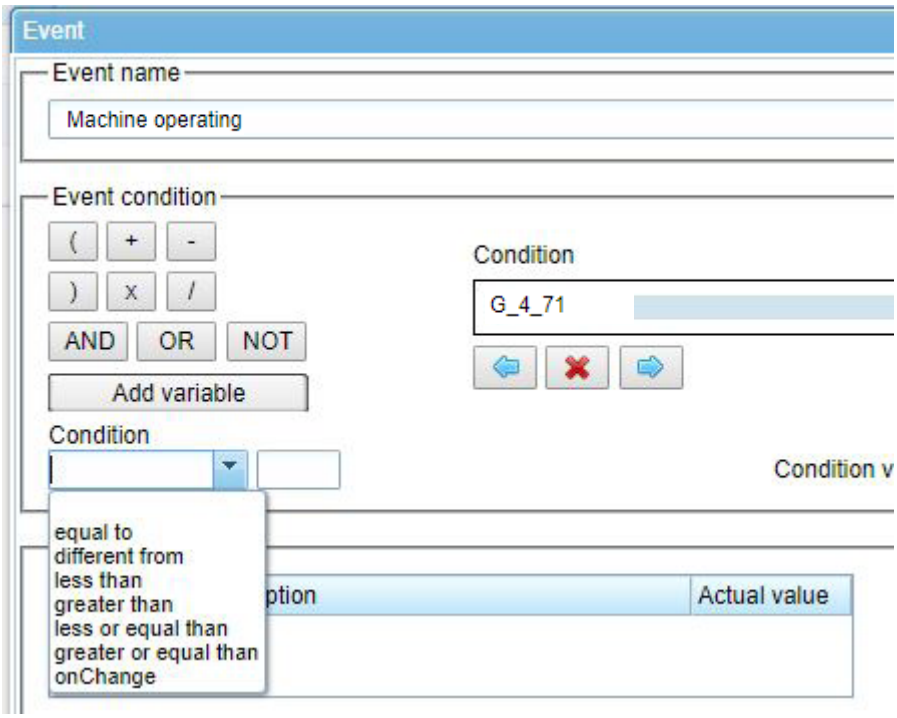


Figure 30. Event configuration: selecting the condition

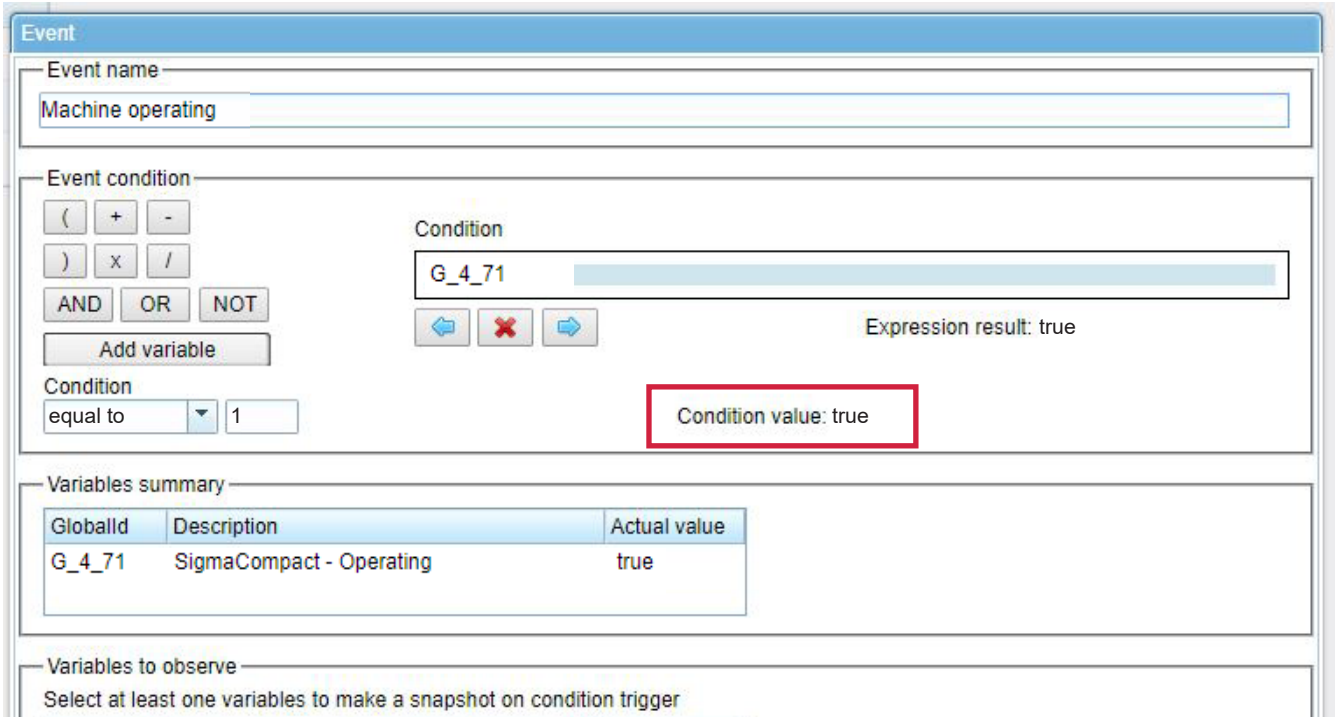


Figure 31. Defined event condition and currently acquired value of the event (red)

Finally, it is **compulsory** to specify a **snapshot variable**: the value of this variable will be registered, if the set condition of the event is verified. Click **"Add variable"** to enter the **snapshot variables** into **"Variables to observe"** section.

A pop-up window shows up, select the variable to set the event's condition (see Figure 30). It is possible to select more than one **snapshot variable**.

For example, it is interesting to know which program is running at the moment of the actual machine operation. To get this information select the variable **Execution Name active Program** as **snapshot variable,** in this way when the machine starts production, the event will report the program's name running in the machine. Chosen snapshot variable will be displayed in "Variables to observe" section, with *GlobalID, Description, Actual value* (see Figure 32).

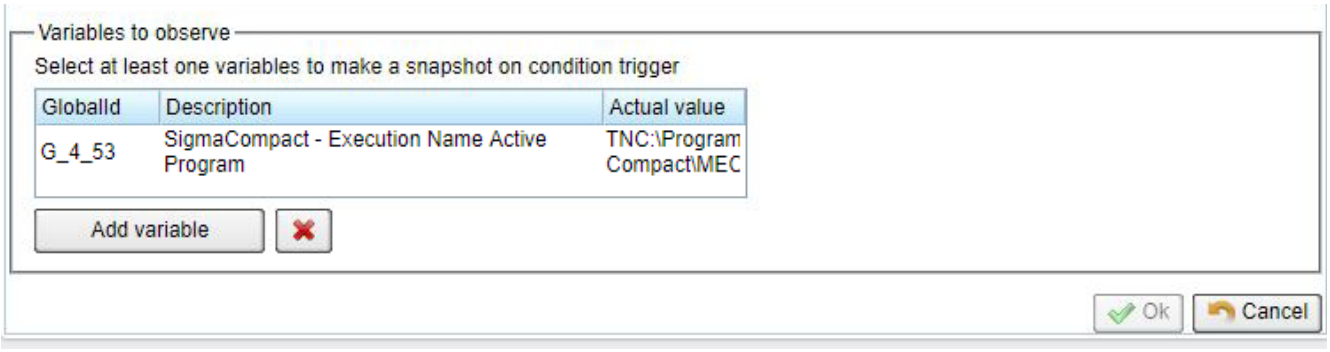


Figure 32. Summary of variables to observe

In this example, the event's condition was defined as a single variable, it is possible to combine more variables in one condition, using the editor on the configuration screen. The editor has traditional mathematical operators (*+,-,x,/*), logical operators **AND, OR,** and **NOT,** and rounded brackets, so, everything to combine the variables according to the standards of *Regular Expression (Regex)* (see Figure 33).

Click  and  to scroll through the **Condition bar**, selecting the elements of the **Regex** (selection with the blue background). To delete any element of the expression, select it and click 

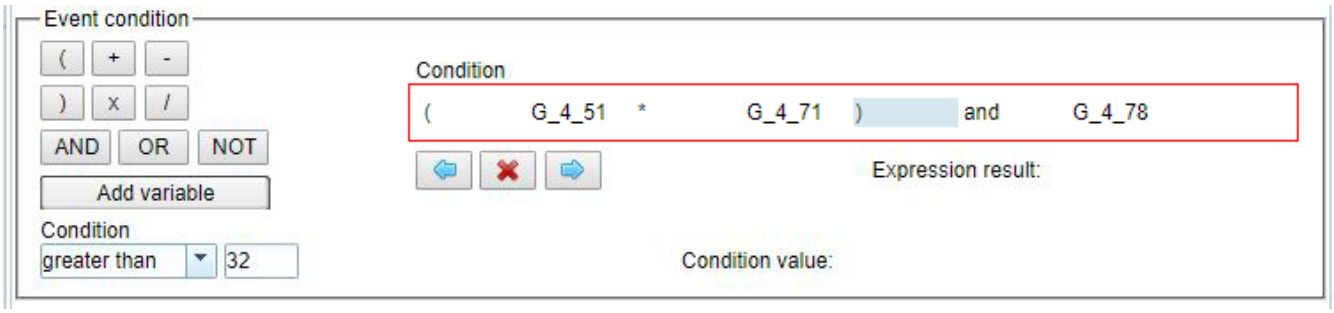


Figure 33. Example of Regular Expression

The created event will be displayed on the main Events panel *(Configuration > Events)*. Enable or disable the event checking the box, click **Modify** to modify it, or click **Delete** to delete it (see Figure 34).

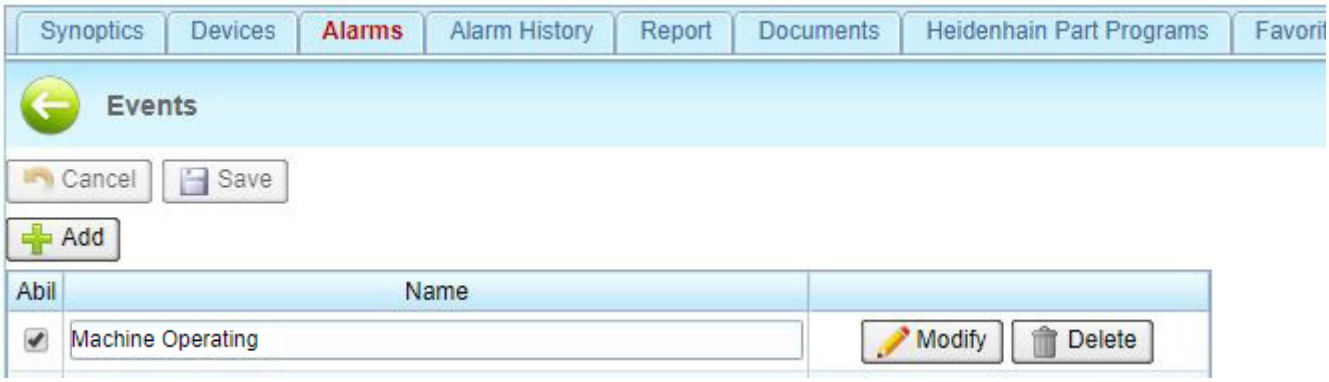


Figure 34. Events: the created event is displayed on the main Events panel

In the end, click **Save** to apply the changes.

5.3.5 Synoptics configuration

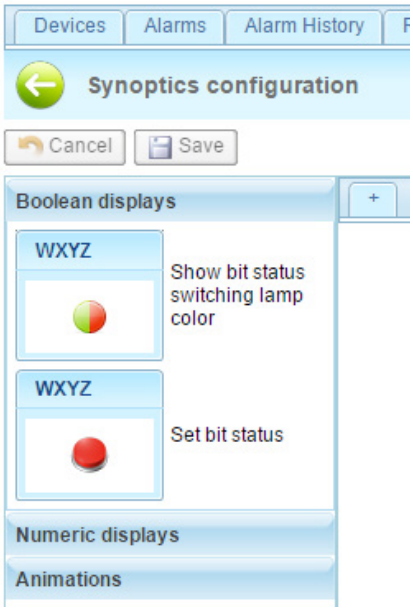


Figure 35. Creation of system synoptics

5 Configuration

In the **Customization -> Synoptics configuration** section you can create custom synoptics with a personalised background and measures.

To create a new synoptic, click on the + tab. A popup window will appear as in Figure 35, to choose the screen sizes most commonly used for tablets and monitors, the background and the title.

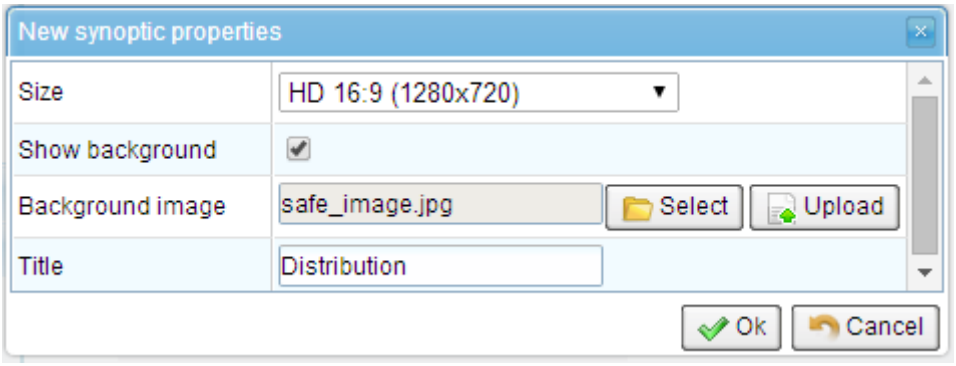
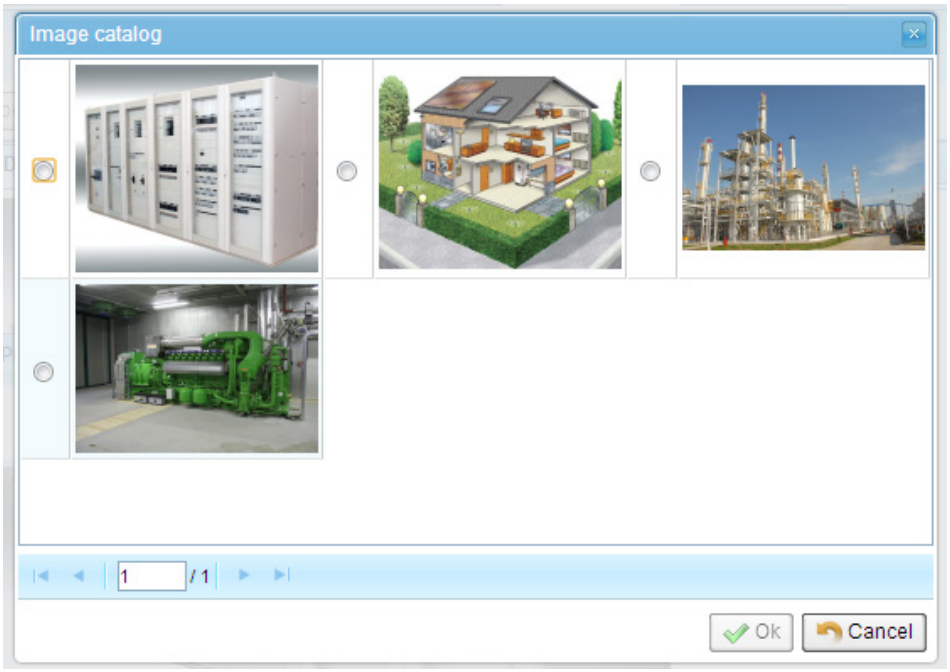


Figure 37.Image catalogue

The IOT SCADA SERVER contains a catalogue of reusable images. In order to load an image in the catalogue, press the **Upload** button and choose the file from the hard drive of your PC/tablet. This will be loaded into the IOT SCADA SERVER and will be available for the creation of more synoptics. To reuse, press the **Select** button and choose from the catalogue images, as in Figure 37:



The image is uploaded in the original size and automatically resized depending on the size chosen for the synoptic.

At the end of the changes the empty synoptic will be displayed, as shown in Figure 30:

5 Configuration

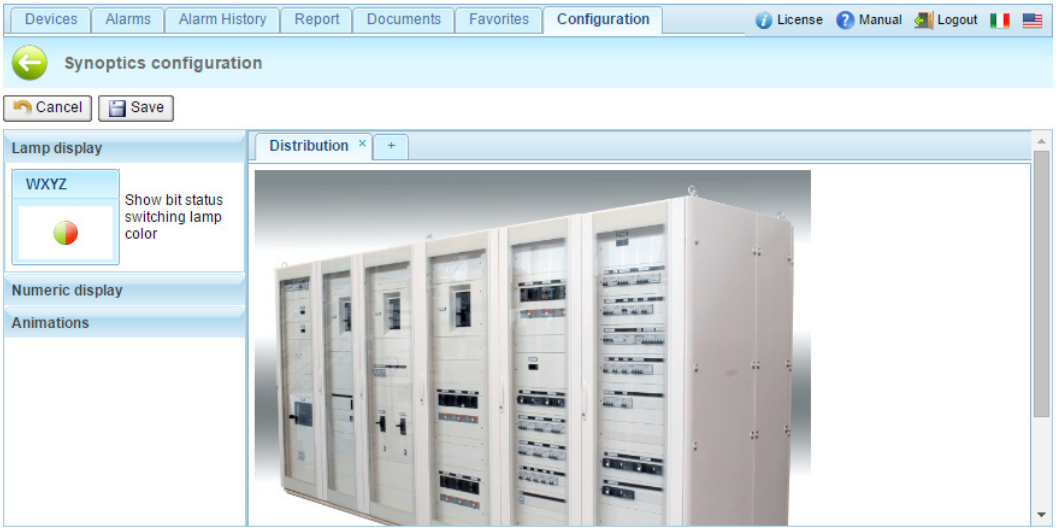


Figure 38. Empty synoptic

To change the properties of the synoptic double click on the corresponding tab or on the background. The popup window in Figure 39 will appear again.

To delete the synoptic, click on the "X" in the upper right corner of the corresponding tab.

From now on it is possible to add the displays that will show the values of the measures in the system, which are of 2 types: numeric and visual (lamp) displays. The numeric display shows just numeric values, while the lamp display shows Boolean values.

These two displays are shown on the left side of the page. To add one, simply drag it on to the synoptic into the position where you want it to be shown. Once released, a popup window will appear as in Figure 38 and Figure 39 to change its properties.

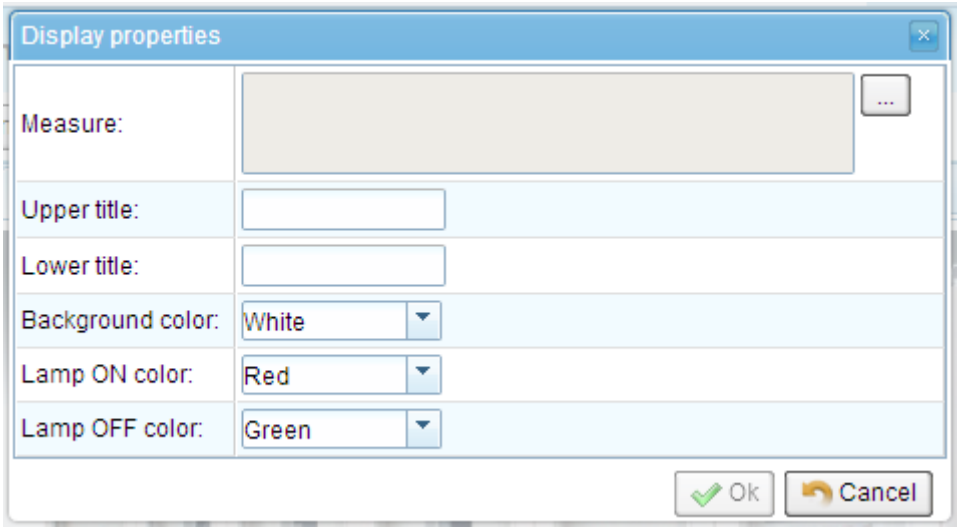


Figure 39. Lamp type display properties

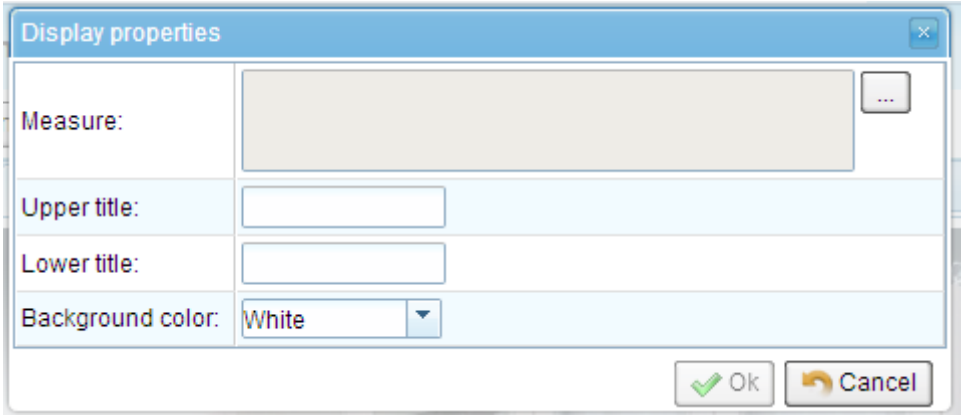


Figure 40. Numeric type display properties

The measure to be shown, the upper (first line) and lower (second row) title, the colours of the background and of any lamp displays can be chosen.

Once the parameters have been entered, the synoptic will appear for example as shown in Figure 41:

Figure 41. Synoptic with display

To subsequently change the properties of the display, double click on the displays themselves. The popup window in Figure 40 and Figure 41 will appear again, from which it is possible to delete the properties.

In the **Animations** section the synoptic in the home page can be automatically changed by selecting the check box **Enable synoptic rotation** and defining an interval in seconds.
Once defined the synoptic will appear in **Synoptic** window of the graphic interface (see Figure 41 at the top left).

5 Configuration

5.4 Interface and Cloud services

5.4.1 E-mail and SMS notifications

The IOT SCADA SERVER can automatically send e-mail and SMS notifications in the following cases:

- an alarm condition occurs
- notification of the backup occurring (see **Sections 5.4.2** and **5.4.3**)

To take advantage of these features, **Cloud Services -> E-mail and SMS configuration** must be enabled.

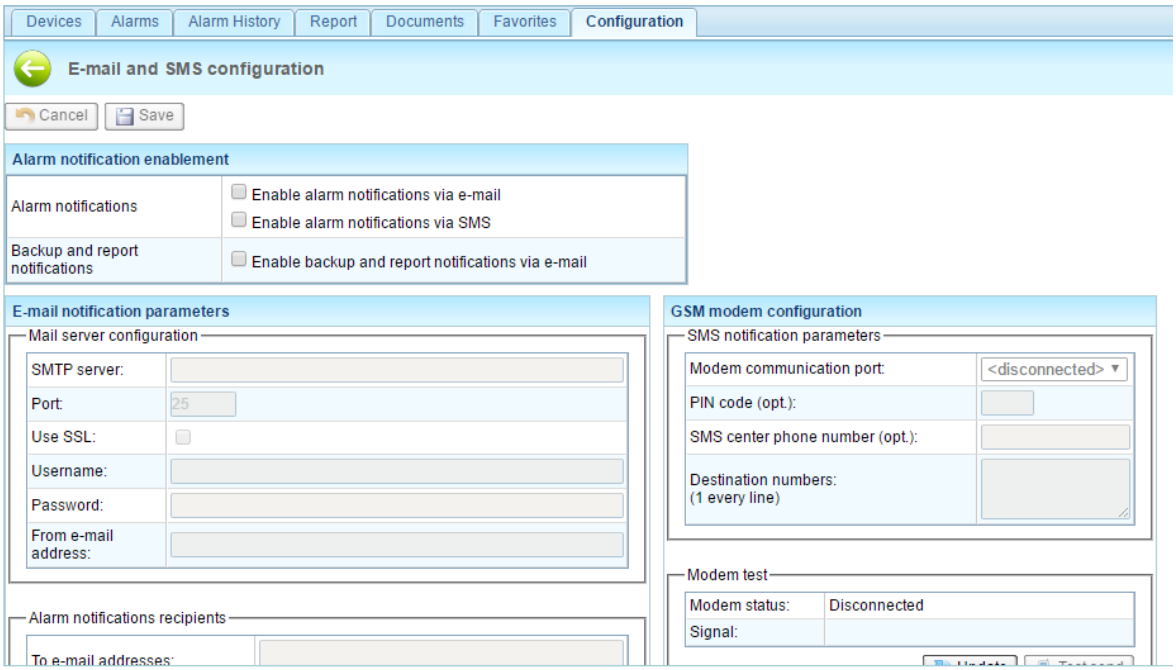


Figure 42. Alarm and data logging configuration

After having ticked at least one checkbox to enable notifications, the email notification in the **E-mail notification parameters** and SMS notification in the **GSM modem configuration** can be configured.

For the e-mail notification the details of your SMTP server for sending email and that of the recipient must be included. At the end a test email can be sent to verify the correctness of the settings entered by pressing the corresponding **Send test mail** button.

For the SMS notification a GSM modem must first be connected to one of the IOT SCADA SERVER, serial ports, selecting from among those supported. The serial port must be properly configured according to the GSM modem manufacturer's instructions, see **Section 5.1.1.** The parameters of the recipients must subsequently be entered.

If the settings are correct, following the application of the changes, the IOT SCADA SERVER will connect to the modem and **Modem Status: Connected** will appear in the **Modem Test** box; then check the GSM signal strength in the appropriate **Signal** indicator and evaluate the displacement of the GSM antenna or the purchase of a magnified one if the signal is low, otherwise an SMS alarm notification may not be received.

You can send a test SMS to check the correctness of the settings entered by pressing the corresponding **Send test mail** button.

5.4.2 Dropbox connection

An existing Dropbox account can be indicated as an additional destination for the backup files. This account can also be used to upload the documents generated by IOT SCADA SERVER on the Dropbox by pressing the Send to Dropbox buttons in the application (for example, in energy reports). Before connecting a Dropbox account make sure internet connection is available on the device from which you are configuring.

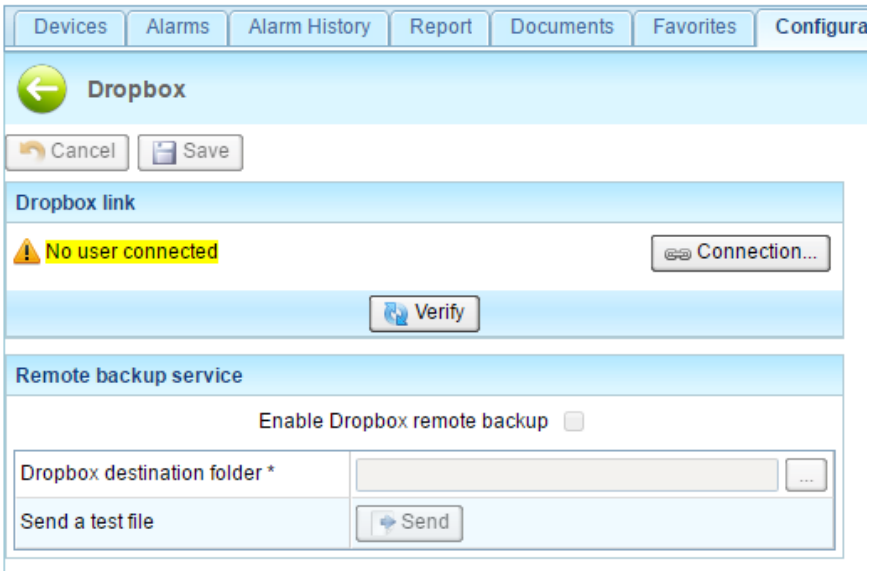


Figure 43. Dropbox account configuration

Go to **Configuration -> Cloud Services -> Dropbox** and press the **Connection...** button to start the connection procedure of the IOT SCADA SERVER to a Dropbox account. The popup window of Figure 44 will open.

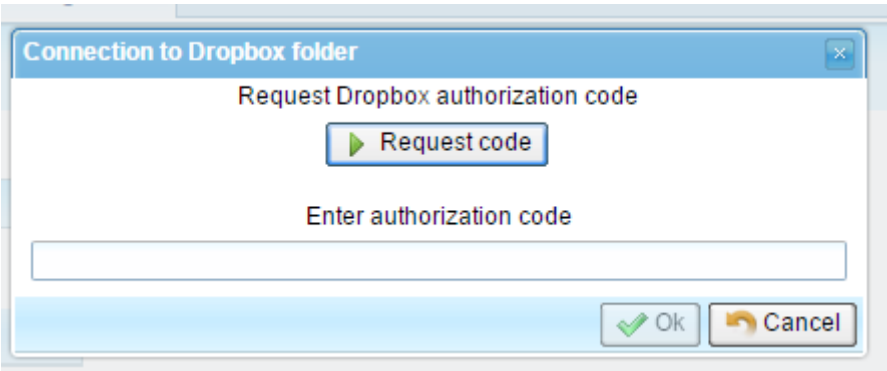


Figure 44. Authorization code request

Press the **Request code** button to access your Dropbox account, if necessary by entering your email and password (Figure 45).

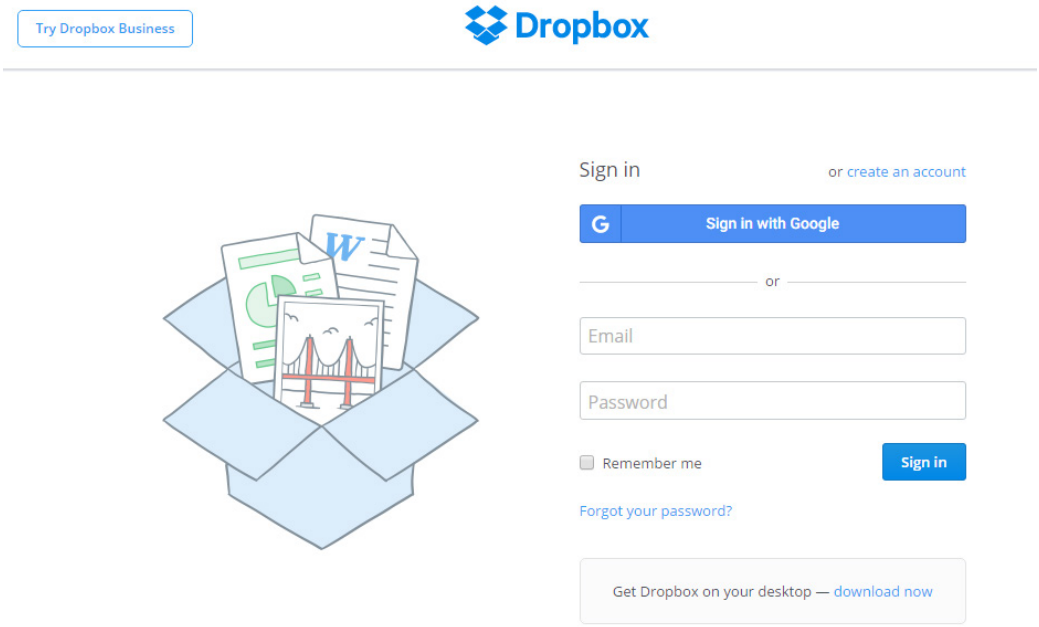


Figure 45. Dropbox account access

On the subsequent screen, click **Allow** to allow the IOT SCADA SERVER access to your Dropbox folder (Figure 46).

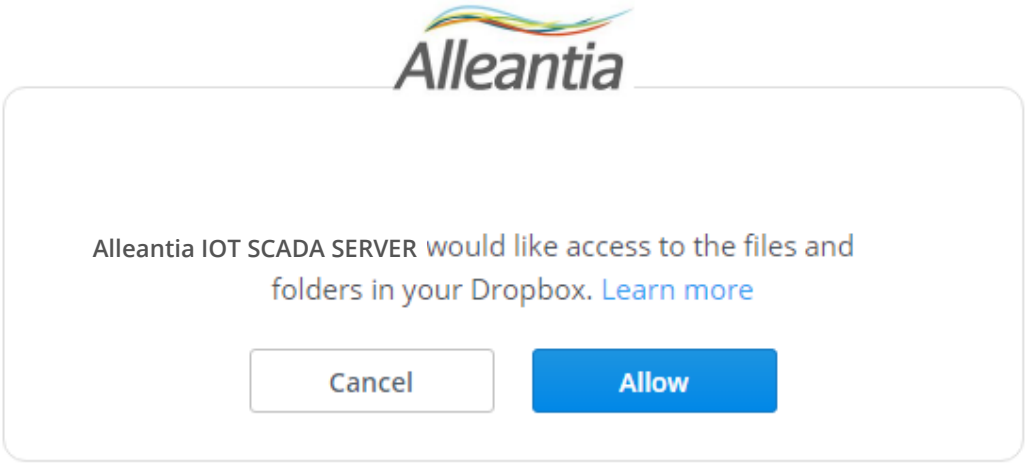


Figure 46. Authorization

Enter the code shown in Figure 47 in the start popup window (Figure 48).

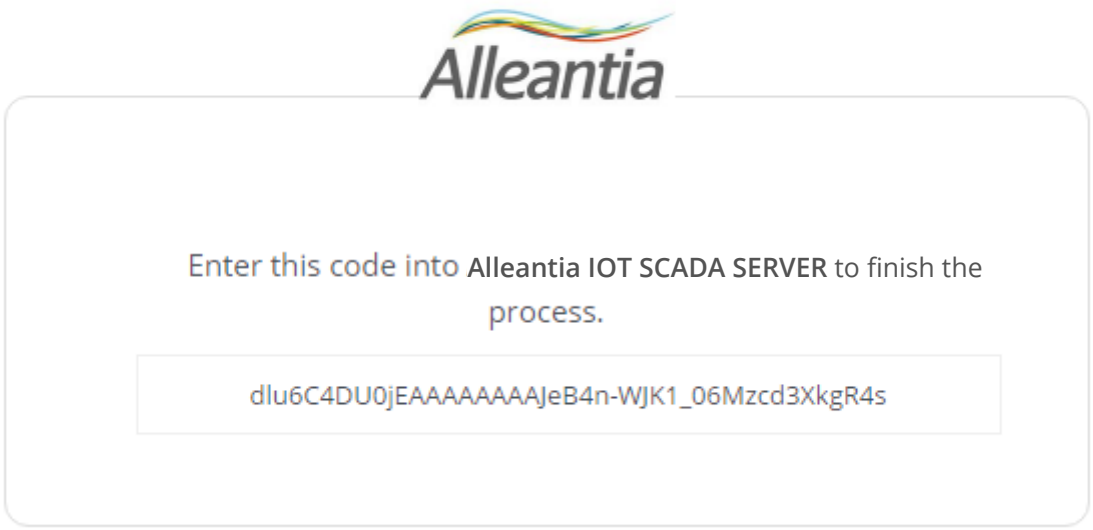


Figure 47. Authorization code

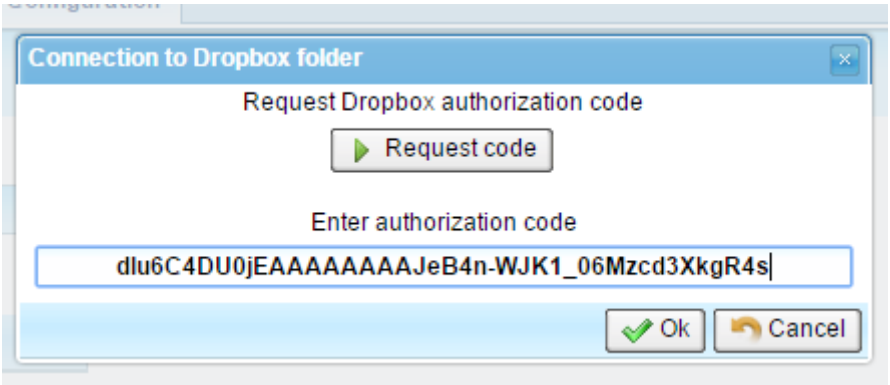


Figure 48. Authorization code shown in IOT SCADA SERVER

Press **Ok** to end the procedure. If successful, the account appears correctly connected (Figure 49).

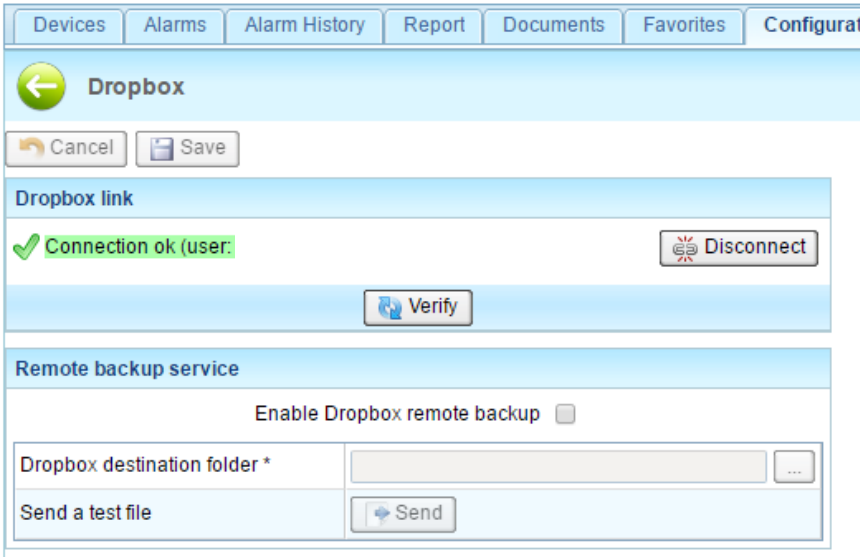


Figure 49. Dropbox account connected

At this point the **Send to Dropbox** buttons of IOT SCADA SERVER can already be used to send documents on Dropbox. To disconnect the account in the future, simply press the **Disconnect** button.

If you want to enable the sending of backups to Dropbox press **Enable Dropbox remote backup** (Figure 50) and choose a destination folder for the files by clicking on the button **"..."**. To test the backup feature, send a test file to the specified folder by pressing the **Send** button. When finished, press the **Save** button to save the configuration.

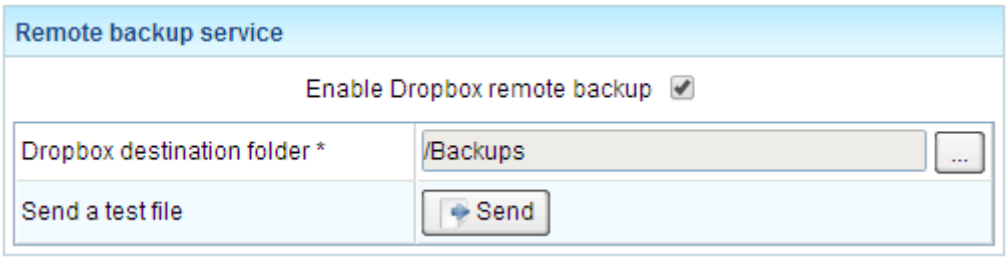


Figure 50. Backup parameters

The backup files sent to Dropbox are not related to those of any FTP backup: in other words, complete backups of IOT SCADA SERVER will be present on both Dropbox as well as FTP.

5.4.3 OneDrive account

An existing OneDrive for Business account can be indicated as an additional destination for the backup files. This account can also be used to upload the documents generated by IOT SCADA SERVER on the Microsoft cloud. Before connecting OneDrive for Business account **make sure internet connection is available on the device from which you are configuring.**

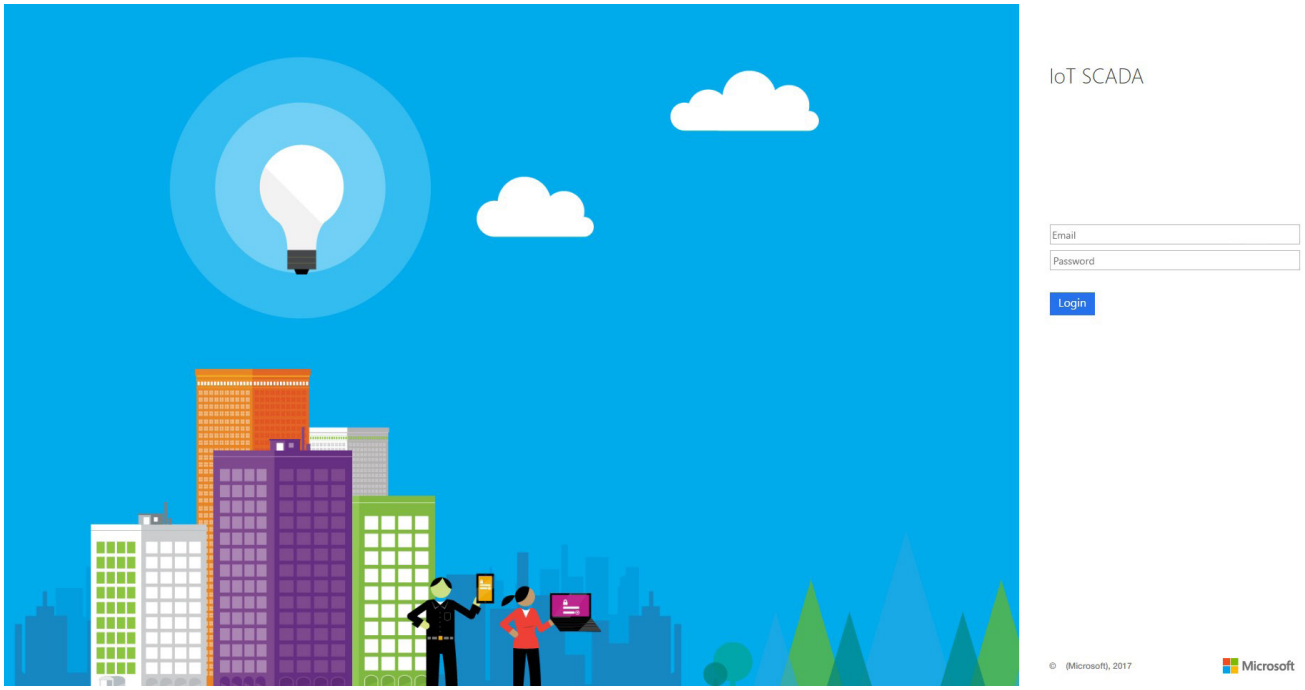


Figure 51. OneDrive for Business account

CAUTION:
it is possible to synchronize OneDrive Business account only

Press the **Connect Account** button. The popup window will open with a request to insert email and password of the account to be synchronized. If successful, the account appears correctly connected. The IOT SCADA SERVER will synchronize with the OneDrive for Business cloud for the backup saving.

At this point the **Send** button of IOT SCADA SERVER can already be used to send documents on OneDrive for Business. To disconnect the account in the future, simply press the **Disconnect** button.

If you want to enable the sending of backups to OneDrive for Business, press **Enable OneDrive remote backup** and choose a destination folder for the files by clicking on the button **"..."**. To test the backup feature, send a test file to the specified folder by pressing the **Send** button. When finished, press the **Save** button to save the configuration.

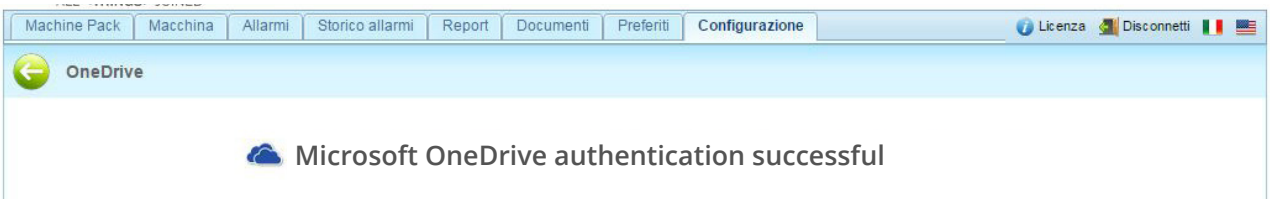


Figure 52. OneDrive for Business authorization

5.4.4 FTP Backup

The remote backup function to FTP provides for the creation and sending of daily backups of IOT SCADA SERVER data and the configuration on an FTP server in order to ensure recovery in case of hardware failure of the internal hard disk.

To use this function an FTP server must be available on which to make the transfer, as well as all the parameters necessary for its access, which are to be entered in the **Configuration -> Cloud Services -> FTP remote backup** section:

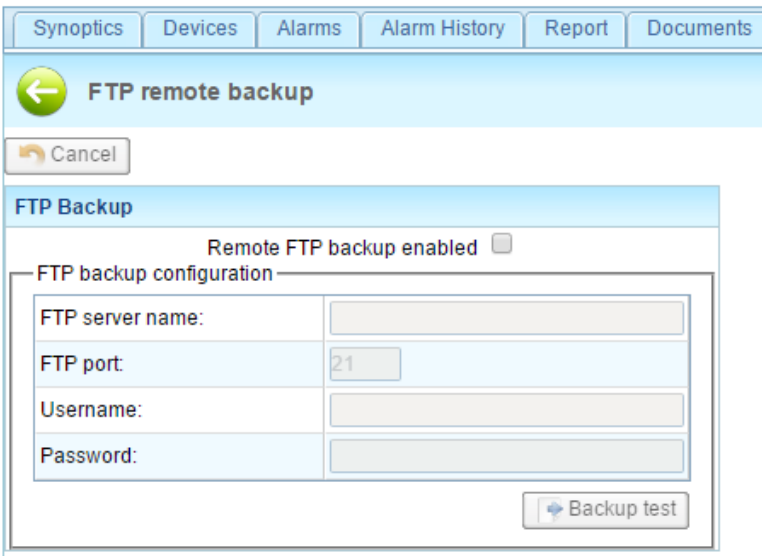


Figure 53. FTP remote backup configuration

A test file can be sent to check the correctness of the settings entered by pressing the corresponding **Backup test** button.

5.4.4.1 Details of the transferred files

IOT SCADA will send 3 files every night called:
backup_*date*_*hour*.zip
backup_*date*_*hour*.zip.md5
backup_*date*_*hour*.zip.sig
in which *date* represents the date, and *hour* the UTC time in which the backup was made such as, for example, “backup_23062017_0144.zip”.

The file with the zip extension contains the CSV file with the IOT SCADA data and an encrypted file with its configuration.

CAUTION
The backup performed by this IOT SCADA SERVER feature is incremental. To rebuild the system in the event of failure all the files transferred over time are required. The remote backup can be interrupted at any time by disabling it in the dedicated configuration section. If subsequently re-enabled, it will resume the backup of your data from where it was last interrupted.

The file with the md5 extension contains a signature with the MD5 algorithm to verify the correct transfer of the file. The file with the .sig extension contains a RSA signature to verify that the file was actually generated by an Alleantia product and has not been manipulated to alter the content.

The remote backup function is incremental in respect to the previous backup.
If the previous backup is of the previous night, the zip will contain the data of a single day. If the previous backup does not exist, or it is the first run, the zip file will contain ALL the data of the system starting from the commissioning of the plant.

5.4.5 Connection with Microsoft SQL Server

It is possible to configure a database MySQL or Microsoft SQL Server as destination of all data, events and alarms, taken from the IOT SCADA.

First, select the type of database to connect to IoT SCADA application, from the dropdown menu in the configuration window (Database type).

5 Configuration

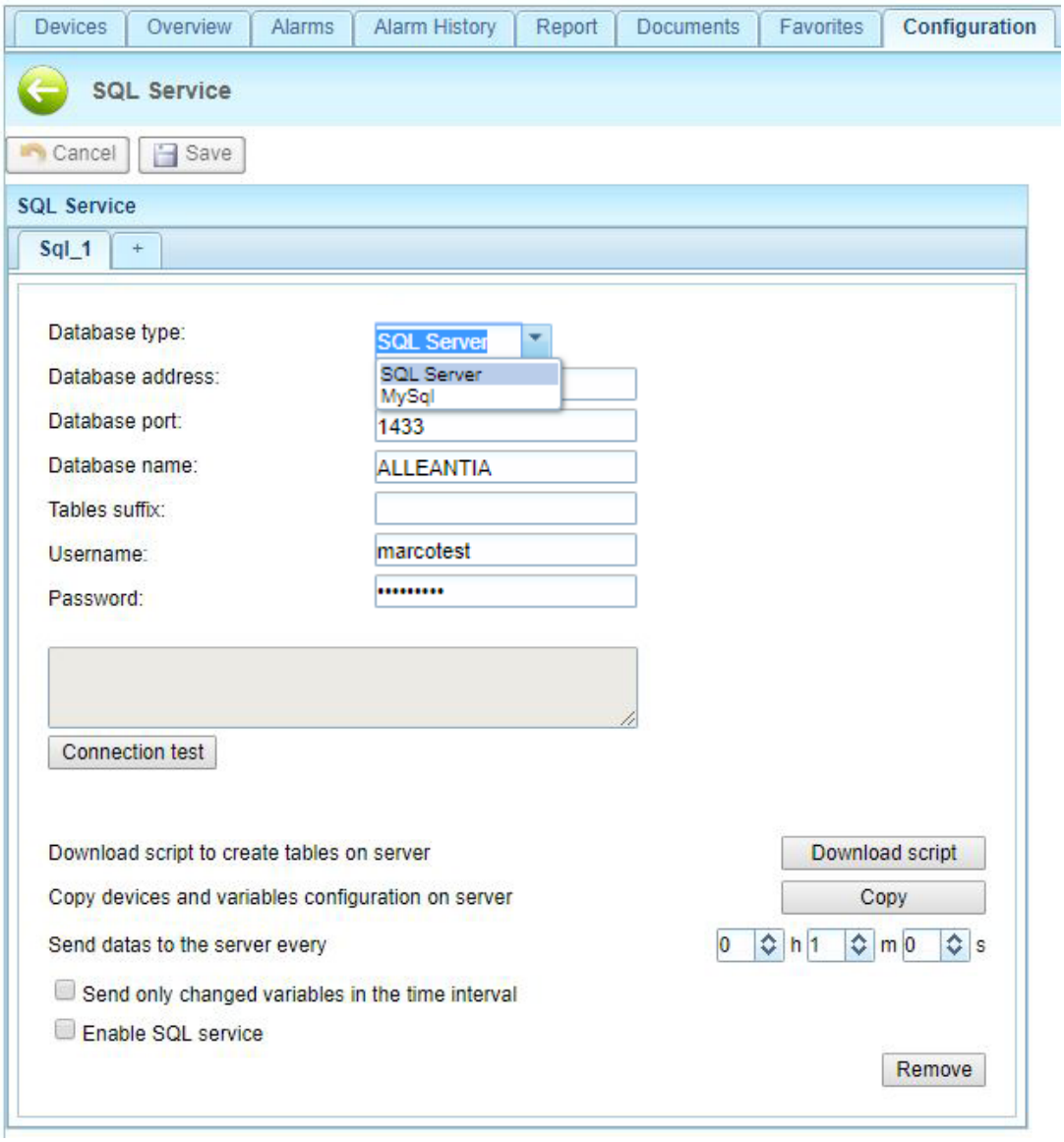


Figure 54. "SQL Service" configuration interface

Then, on MySQL or SQL Server database, create again a database with compatible structure with IoT SCADA application. Click **"Download script"** to download the script of creation of a new database on SQL platform, that contains the data from Alleantia application.

After having entered the connection parameters to the database (IP address, Port, Database name, Tables suffix, Username, Password), check the connection by clicking **"Connection test"**. the message "Connection success" will be shown.

Click **"Copy"**, the configurations of variables and devices, configured in IoT SCADA application will be forwarded to SQL database.

The time interval for data forwarding can be set independently of the logging time of the variables. Set it in **h, m** and **s** fields.

Check **“Send only changed variables in the time interval”** box to forward only the variables, which did not changed their value during the fixed forwarding time, to SQL platform.

In addition, a line will appear, indicate there the number of periods (1 period=forwarding time), after this number of periods the variables will be forwarded to the database, even if their value remained the same as the last entry.

After that, the service is completely configured, so check **“Enable SQL service”** box to enable the service.

Click **Save** to apply the changes.

IoT SCADA software also sends registered data to more SQL platforms at the same time. The maximum number of SQL platforms to forward data depends on the purchased license.

If this number is exceeded, the message as in the figure below will be shown.

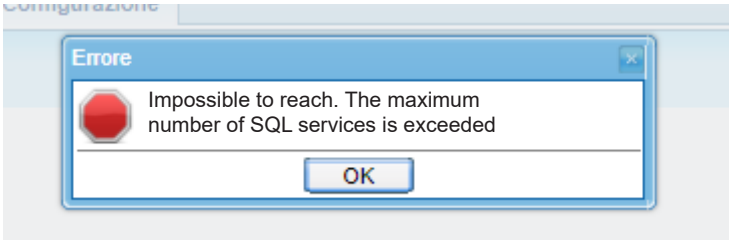


Figure 55. Error message shown when the number of available SQL platforms is exceeded

To add a new database to forward data, click **“+”** tab. To delete it, click “Delete” in right corner below.

5.4.6 Connection to Azure IoT Hub

In Microsoft Azure, after creating IoT Hub, get the connection string.

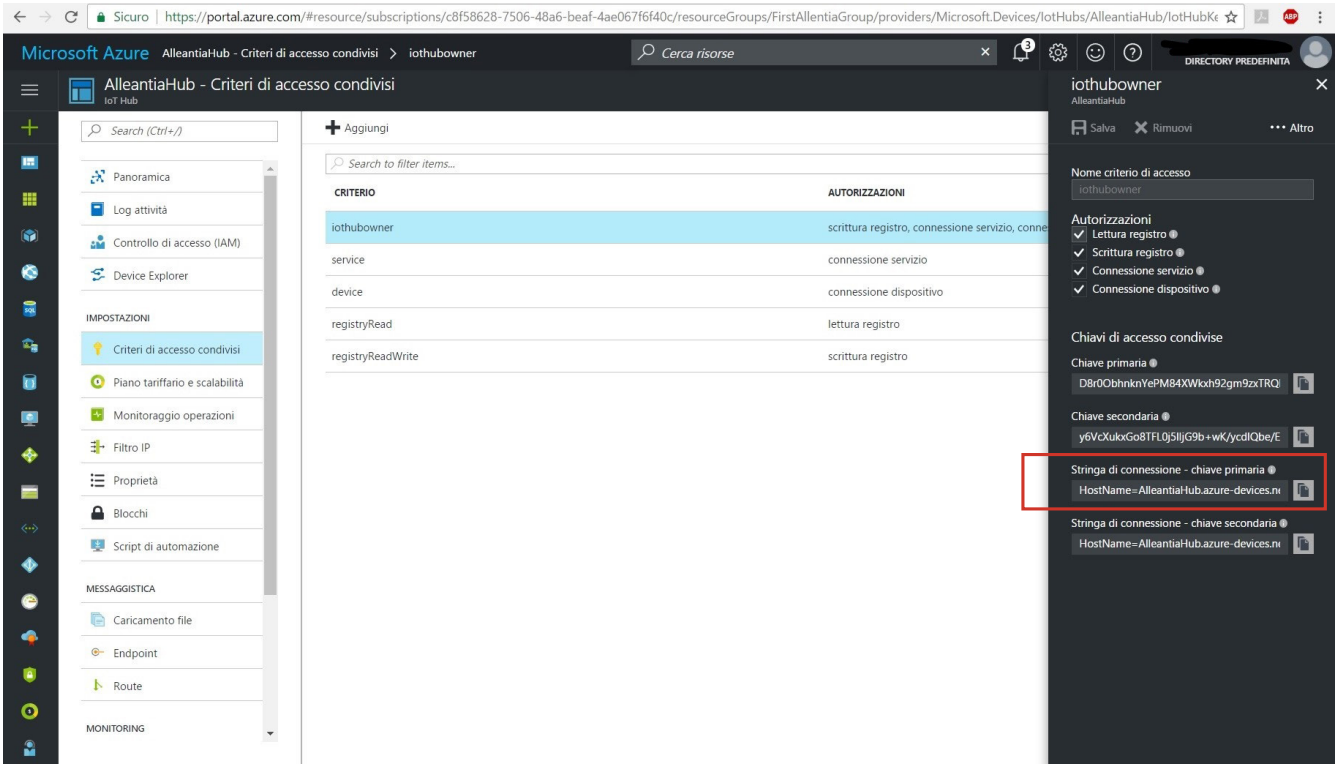


Figure 56. Microsoft Azure

Insert the string into the box in configuration panel. Then press **Create IoT Hub Identity** button to register the device in IoT Hub.

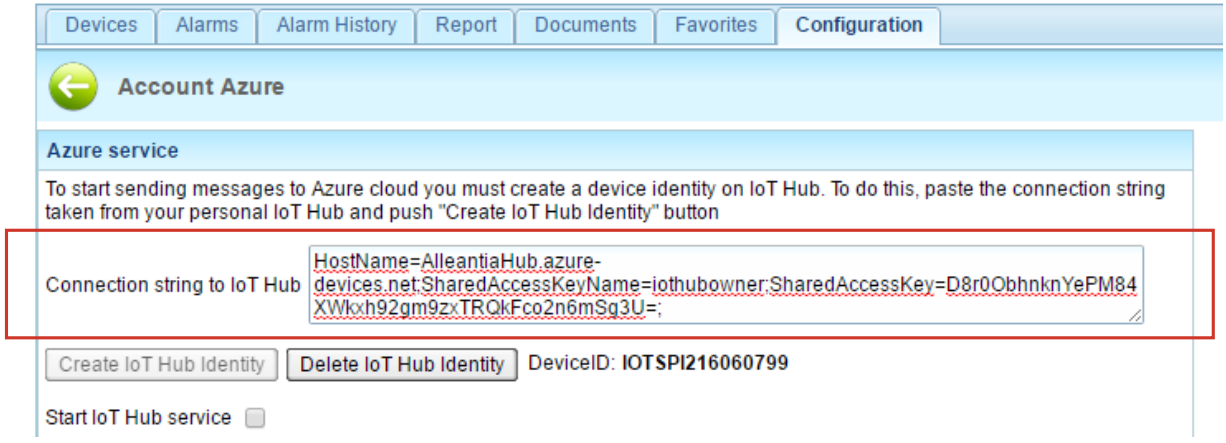


Figure 57. Connection string

If the registration was successful, **Device ID** will be displayed next to the button.

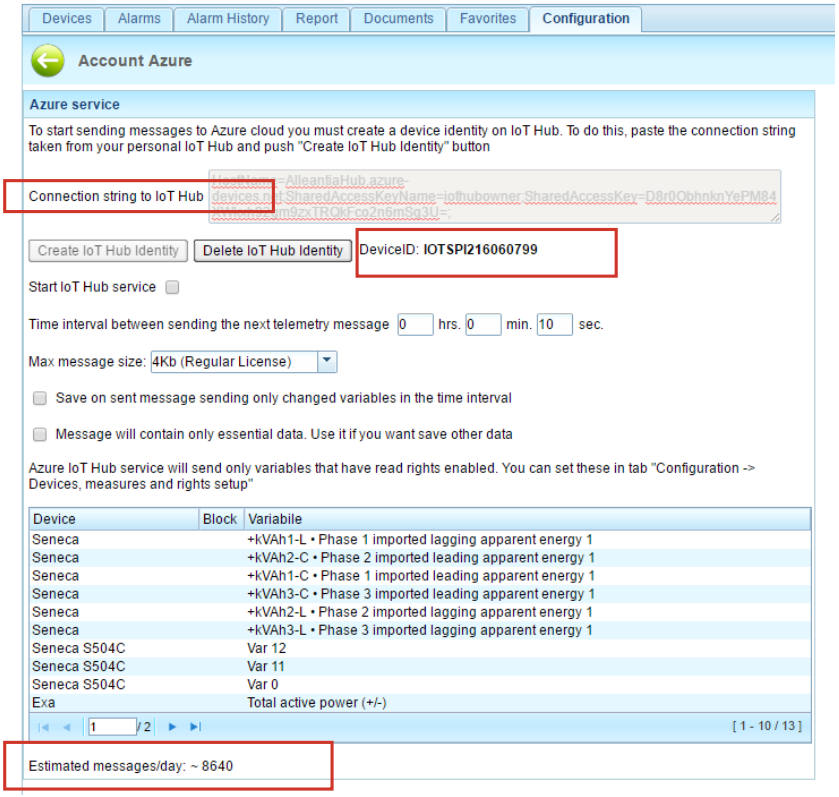


Figure 58. Account Azure

Now you can set time interval between sending next telemetry message and mske other settings. It will send messages only for variables/alarms with read/write/alarm rights (Figure 59).

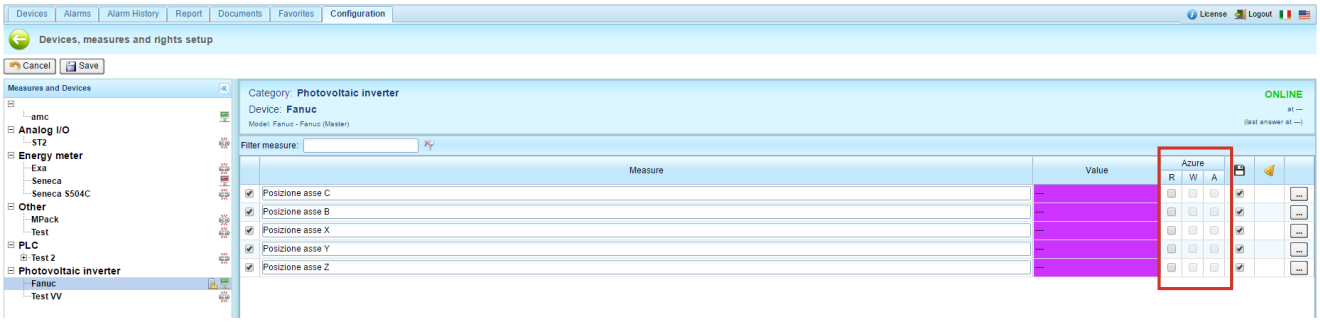


Figure 59. Devices, measures and rights setup

You can set these rights in **Devices, measures and rights setup, Synoptics measures configuration** and **Custom alarms** sections.

Write permission can be enabled only for measures which can be modified from outside. The alarms' permissions (A) can be enabled only for measures defined as an alarm in Xmod driver.

Finally, check the checkbox **Start IoT Hub service** to activate. Depending on the selected options, estimated messages sent per day will be shown (Figure 60).

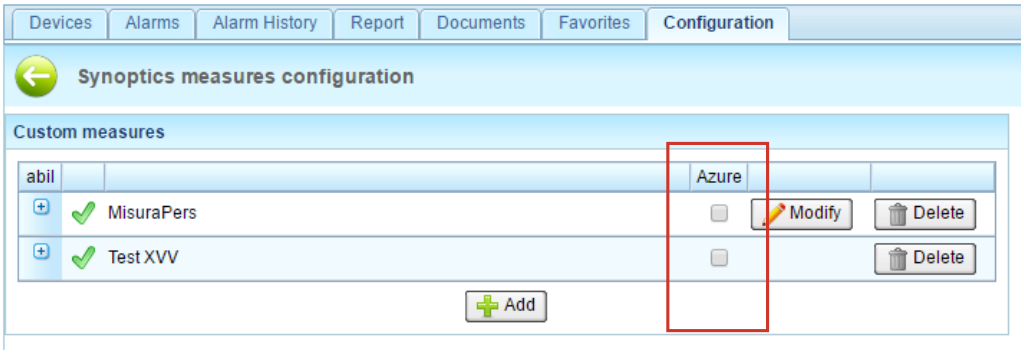


Figure 60. Synoptics measures configuration

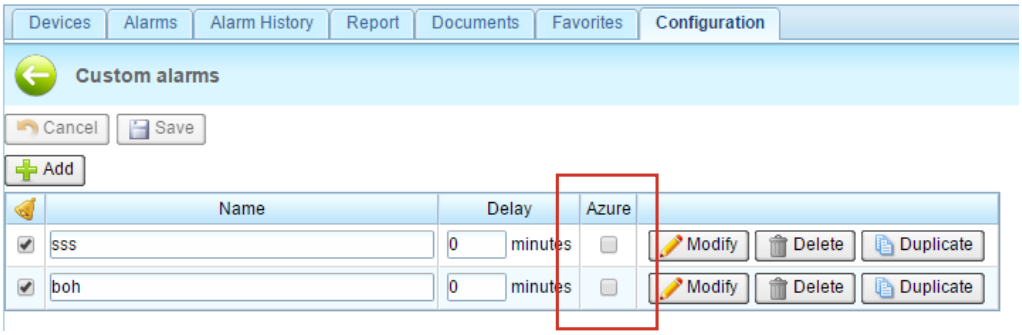


Figure 61. Custom alarms

The service uses MQTT v3.1.1., to run this protocol the 8883 port or web socket of 443 port are needed. Make sure that these ports are open.

5.4.7 MQTT Service

5.4.7.1 Getting started

Through *MQTT Service*, IoT SCADA application can publish data collected from different devices and sensors on a listening MQTT broker.

The exchange through MQTT protocol happens according to *publish/subscribe* type, indicating with *publisher* a device that can publish the data on a specific broker, and *subscriber* a device that can "subscribe" to a broker to receive different messages from the publishers. The communications happen on various channels, in order to be grouped based on the type of exchanged information *(alarms, events).*

Each communication channel among these takes *topic* as name.

5 Configuration

Go to **Configuration > MQTT service**.

Select the broker to forward data. From the dropdown menu, next to **"Select Broker"** line, select the broker among the ones configured in **Communication > MQTT brokers configuration** (see Section 5.1.6).

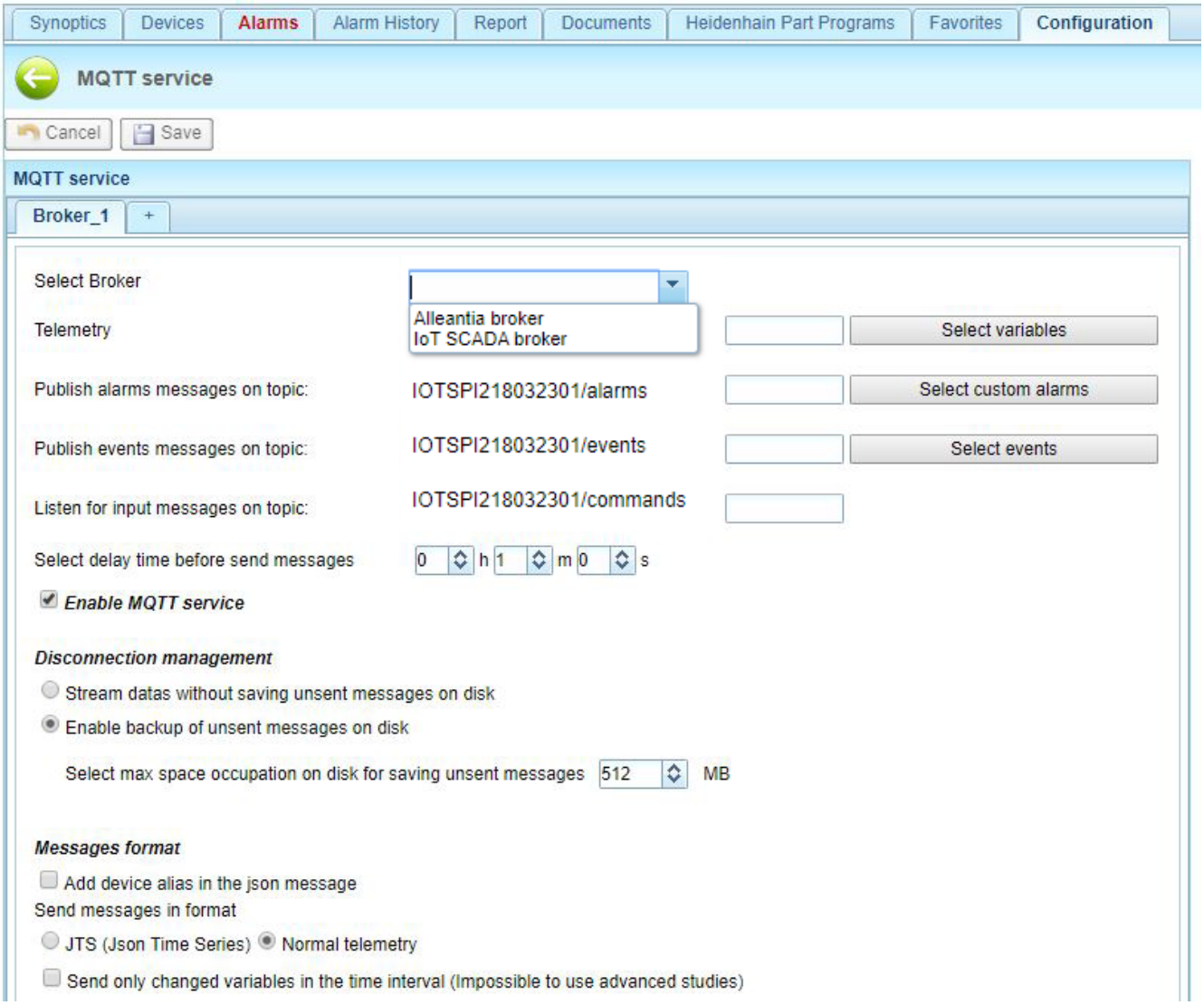


Figure 62. MQTT service: selection of the broker to forward data

IoT SCADA application contains four topics. *Telemetry, alarms, events* are used by MQTT Service to publish messages of the configured broker (*publisher*). While the application listens on *commands* topic, waiting for requests from the broker (*subscriber*).

Forwarded data and topics functions description:

- **devSn/telemetry:** measures sampled by IoT SCADA application are sent to this topic;
- **devSn/alarms:** in case of alarm, MQTT service will forward the relevant data regarding the alarm to the topic;
- **devSn/events:** all the data related to the events are forwarded to *events* topic;

- **devSn/commands:** unlike the others, *commands* topic is *subscriber* topic type. It means that IoT SCADA application listens on the topic in order to find when messages from the broker arrive. For example, there is the possibility to ask the application the information on the software version, devices configuration and associated variables, publishing the request on *commands* topic. Based on the received request, the application will publish the response on *telemetry* topic (see Section 3 of *"MQTT Protocol User Manual"*).

To customise the structure of the topic's name, enter a *personalTag* in the text field next to the standard name (see Figure 63).

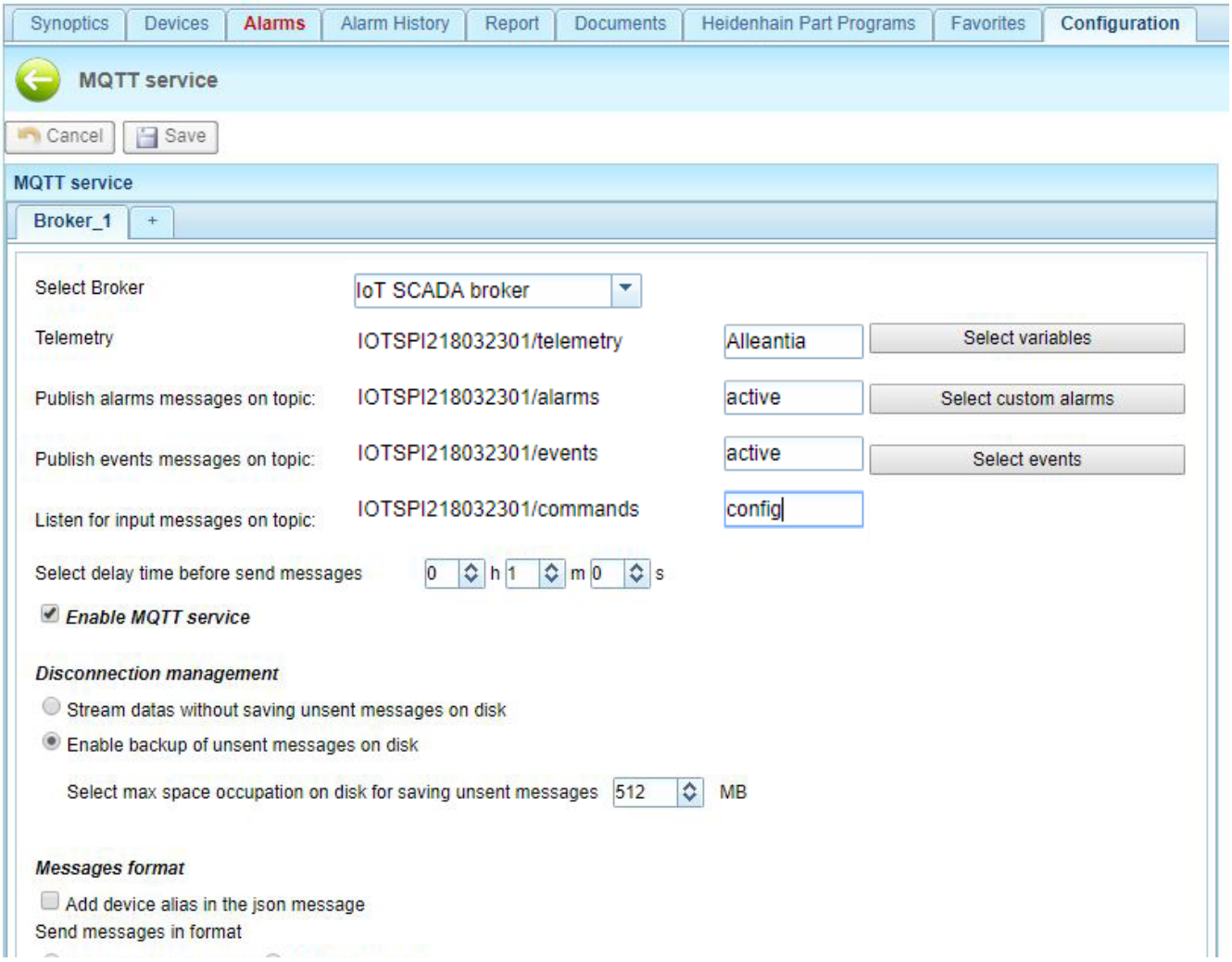


Figure 63. MQTT Service: customisation of topics' names

For example, nelle condizioni della Figura 63, the topics will be labelled in the following way:

IOTSPI218032301/telemetry/Alleantia
IOTSPI218032301/alarms/active
IOTSPI218032301/events/active
IOTSPI218032301/commands/config

The topic's name will have the following structure (e.g. general structure of *telemetry* topic):

devSn/telemetry/personalTag

5.4.7.2 Configuration of the information to send on MQTT Broker

After the initial configuration described before, select which information to forward to each topic.

Click **Select variables** on the right of the text field. A window will show up, select the variables to forward to *telemetry* topic (see Figure 64).

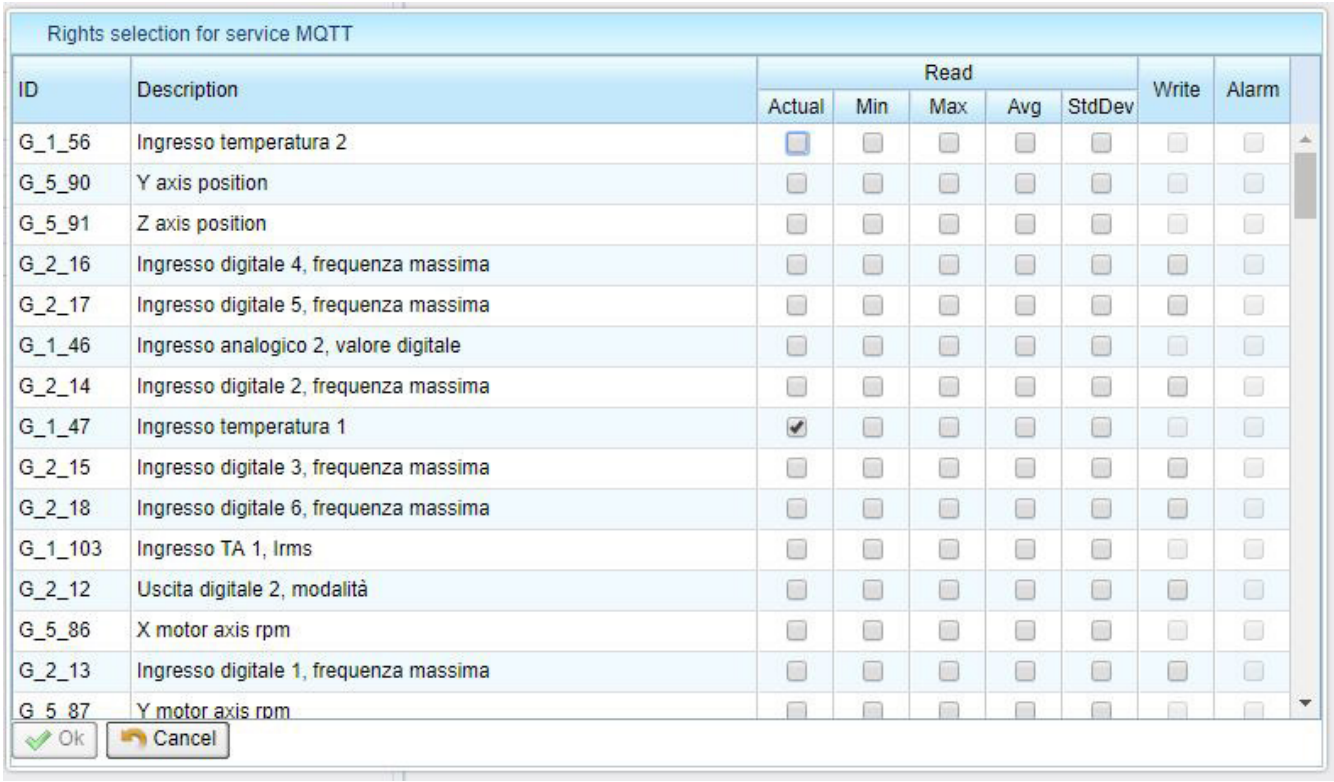


Figure 64. Right selection for MQTT service

In this window, there is a list of the variables of every device configured in IoT SCADA application. The first column (*ID*) shows *Global_Id:* identification numbers of all variables, configured in the application.

Description column shows the variable description as it was configured in Xmod driver of the monitored device.

To enable MQTT broker, check the boxes in *Read* column, which is divided into 5 sections:

- **Actual**: selecting the boxes in *Actual* column, MQTT service will be given the permit to forward the *instantaneous value of* the variable to the broker;
- **Min**: forward *minimum value* acquired by the variable in time interval between forwards;
- **Max**: forward *maximum value* acquired by the variable;

- **Avg**: calculate *medium value* of the time interval between forwards;
- **StdDev**: calculate *standard deviation* of the variable.

WARNING:
***Min, Max, Avg* and *StdDev* are calculated on a quantity of measuring points equal to the number of *statistical samples in the time interval.* Therefore, in the case where the number of statistical samples is set to 1, these quantities will return the current value.**

Check the box in *Write* column to give the possibility to MQTT service to set the variable's value, if it is of *read/write* type; note how the box is not enabled for variables of type readOnly.

Finally, if an alarm is active on an *alarmed* variable, *Alarm* column allows to forward the information related to the current alarm on the topic *telemetry*. The box will be active only for the variables with a *default alarm* associated, that is a preconfigured alarm when generating the Xmod driver, which therefore does not need to be configured from the Custom Alarms section (see Section 5.3.3).

Click **Select Custom Alarms** and **Select Events** to enable MQTT service to forward the information related to the alarms and the events configured on the IoT SCADA application.

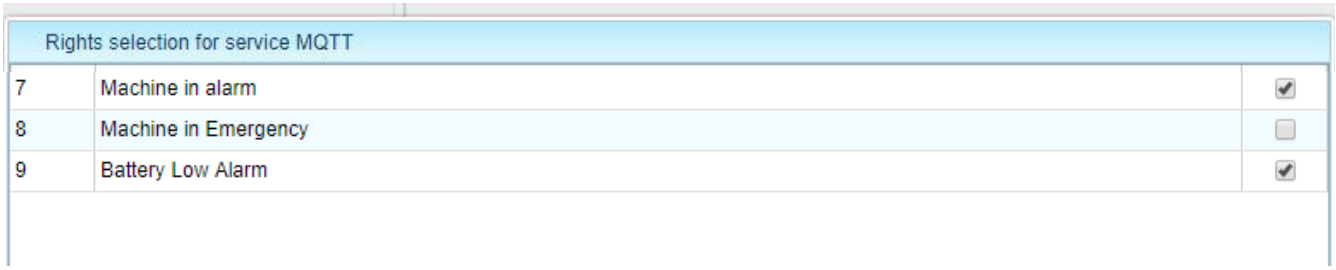


Figure 65. MQTT Service: window for selecting the alarms to be sent to the broker

In each case a window will open, showing the list of alarms or events configured in the application. Just check the box related to the chosen events or alarms to send the associated information to the chosen MQTT broker.

The left column contains *alarmId* and *eventId* of each alarm or event.

5.4.7.2 Final configuration

Once the initial configurations have been completed and the permissions to send the information to MQTT broker have been set, it is necessary to complete the configuration of MQTT service by customizing the time the messages are sent, the behaviour of the application in case of an absent connection and the format of the forwarded messages.

It is possible to *set the time interval for forwarding to the broker* through the three windows *h, m* and *s* next to the dedicated line. MQTT Service will wait for the time set here before sending an additional message to the broker.

If there is no connection, the application can behave in two different ways. The user can choose from two modes (see Figure 66):

- *Stream data without saving unsent messages on disk:* in this case, when there is no internet connection, and, therefore, it will not be possible to reach the broker, all the data recorded up to that moment will not be forwarded to the broker and it will not be possible to restore them when the connection is restored (data will be saved only on the application's internal DB);
- *Enable backup of unsent messages on disk:* in this case, the data will be temporarily saved on the physical memory (hardware), when the connection is restored, the communication with MQTT broker will be re-established. In the window below it is possible to specify the maximum amount of memory (in Megabytes) that the data recorded in the absence of a connection can occupy. Once the set threshold has been reached, the data will be lost and the application will behave with the same logic as described in the previous point.

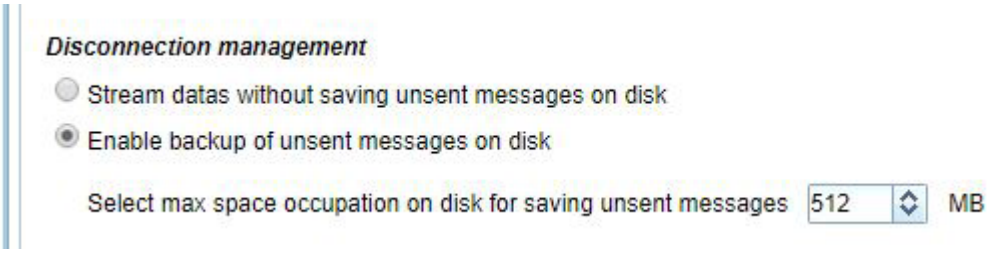


Figure 66. MQTT service: Disconnection management settings

Finally, it is possible to customize the messages that will be forwarded to the broker, such as the quantity of parameters and the syntax.

Checking the box **"Add device alias in the json message"** will include the device alias among the components of the forwarded message.

It is possible to choose from two messages formats: **"Normal telemetry"** and **"JTS"** (see *"MQTT Protocol User Manual"* for more details).

Selecting JTS format for the forwarded messages, it will be possible to set only the number of *samplings in the time interval* (see Figure 67). This is equal to setting the number of points, that the application will calculate with *Min, Max, Avg* and *StdDev* (see Section 5.4.7.2).

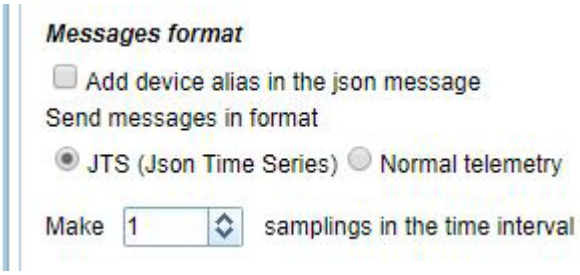


Figure 67. Avaliable settings when Json Time Series message format is selected

If the user chose **Normal telemetry** format message, besides the number of **samplings in the time interval,** it is possible to make other settings, customising the forwarded messages to the broker (see Figure 68).

Checking the box **"Send only changed variables in the time interval",** only the variables whose value is changed after a time equal to the *time interval* will be forwarded. When you check the box, you will see an extra line from which the user can set the periods' number, after which the variables will be forwarded send in any case, even if their value is not changed (see Figure 68). A period is equivalent to the *time interval between forward to the broker*.

It is specified that if this option is operative, the *additional statistical values*, set in the process of configuration of information to forward on broker, will not be calculated (see Section 5.4.7.2).

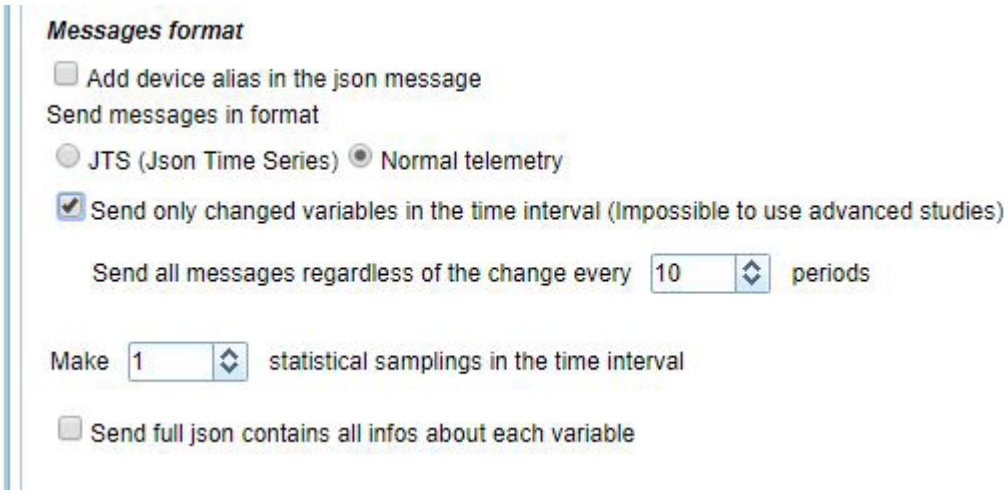


Figure 68. Normal telemetry settings

Further to what said until now, the messages on the broker can be personalized sending all the information available on the variables, checking the dedicated box *(forward a json that include any information about variables).* The json structure will remain the same, but it will contain a bigger number of tags than before, since the number of forwarded information is greater (See par 2.1 *MQTT Protocol User Manual*).

At this point, the configurations are completed, so you only have to check the box **"Enable MQTT service"** to activate the service. Finally, click **"Save"**.

It is possible to configure a number of MQTT brokers same as those available in license. To know the number of brokers to add to the application IoT SCADA Server, go to **Configuration > License management** (See par. 5.5.2) and check the value shown in the line **"Number of configurable MQTT Services"** (See Figure 64).

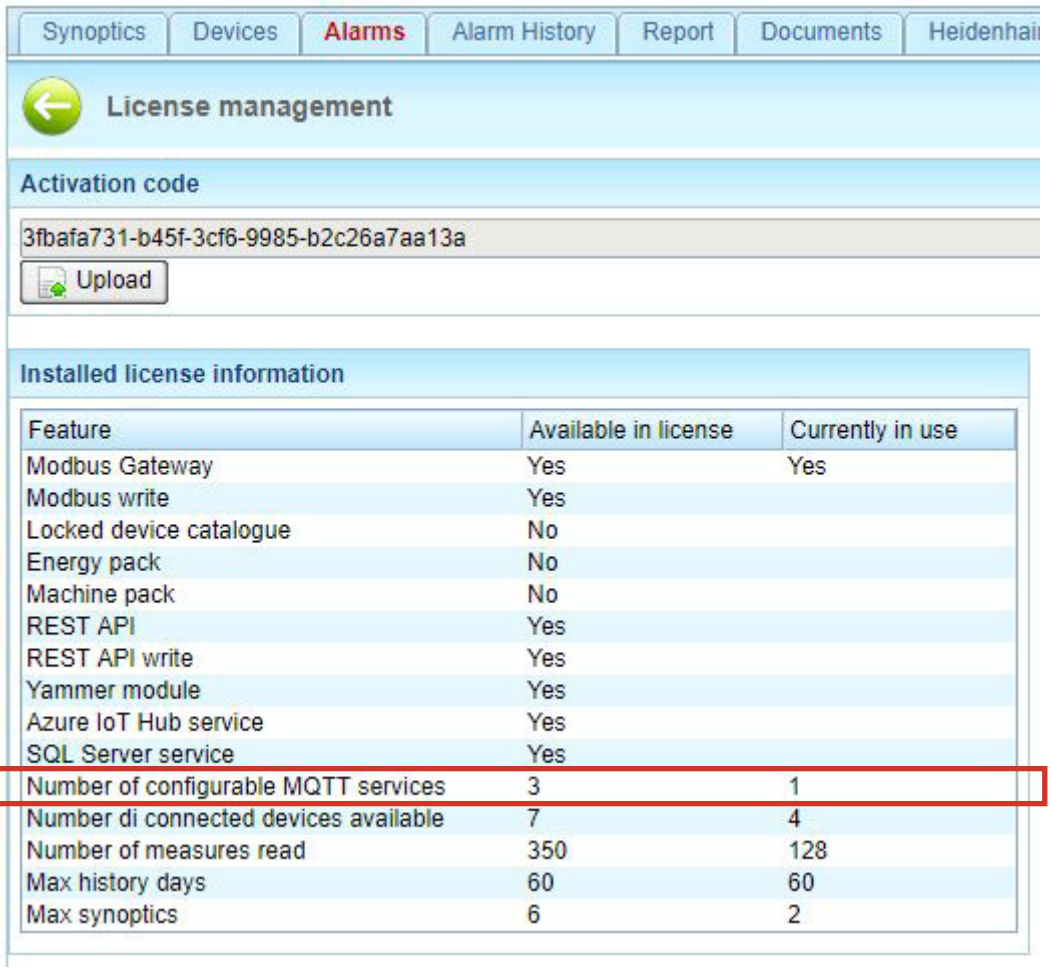


Figure 69. Number of configurable MQTT services

In the column **"Available in license"**, the number of brokers currently in use are shown.

If you have reached the maximum number of MQTT services available in license, you will see the pop-up error message, as shown in Figure 65.

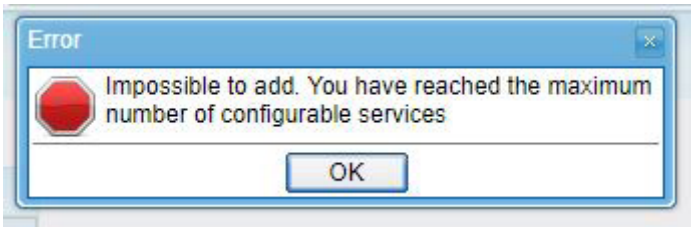


Figure 70. Pop-up error message: maximum number of MQTT services, available in license, have been reached

5 Configuration

5.5 Information

In Section Information you can find information about the system and change such its data as licence and device catalogue.

5.5.1 Device catalogue

Every IOT SCADA SERVER system is released with database of connected devices with default configurations. This may contain not all the devices of the Alleantia's Library of Things, which is continuously updated and is available here http://cloud.alleantia.com/info/products.zul. Therefore you can download one or more .xmod files of devices configuration and upload it in the used IOT SCADA SERVER system, using the functionality of this section. The user can, in the same way, insert in the system ad hoc configured devices (e.g. PLC) using the Alleantia's tool
http://cloud.alleantia.com/xmod/convert.zul which creates an .xmod file for every device.
In section **Information -> Device catalogue** a window with the existing library of devices will open.

Figure 71. Device catalogue

Pressing the **Add** button a popup window will open, that allows you to select different types of files: .xmod files of device's library to connect, and .pdf files for device's user manual.

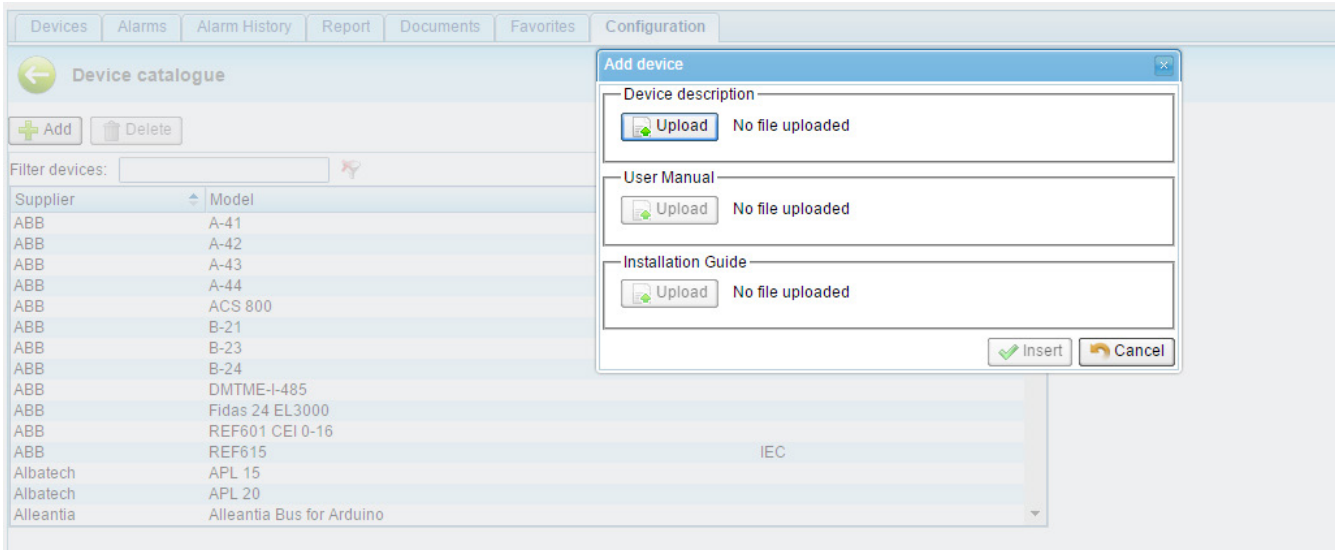


Figure 72. Add device

Pressing the **Upload** button it will be possible to navigate the file system and select the file you need. For the .xmod file, the system recognizes and verifies correctness of the file and will permit or not to insert it in the IOT SCADA SERVER system's database.

5.5.2 License management

In this section you can verify the license key or insert a new license (e.g. of updating or upgrading) and insert the related activation key provided by Alleantia or by its vendor.

In section **Information -> License management** a popup window will open with the activation key, possibility to upload a new license and the installed license characteristics, and options:

5 Configuration

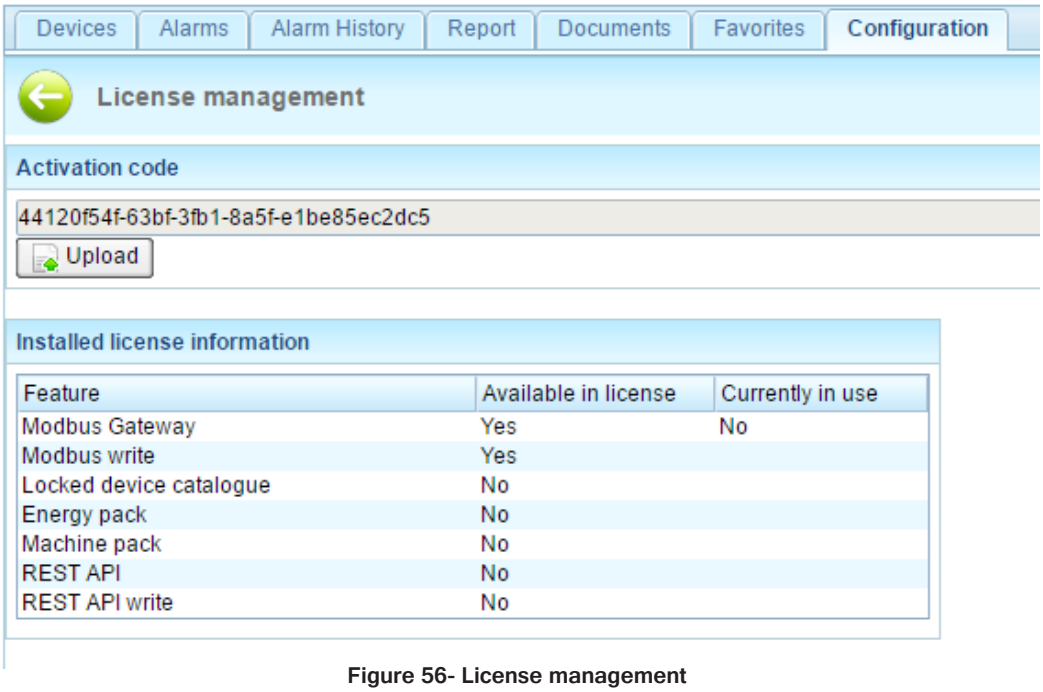


Figure 56- License management

5.5.3 Informations

In this section the version of installed software license is provided.

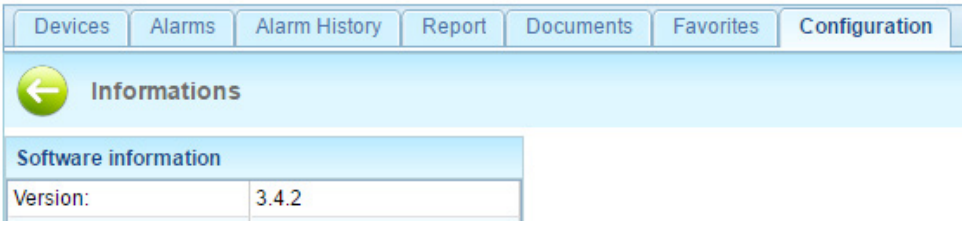


Figure 57 - Informations

5.5.4 Logs

It is possible to generate audit log in different sections of software, useful to debug problems in different levels: communication protocols, devices, user interfaces.

Go to section **Information -> Logs** a page for the logs configuration will open.

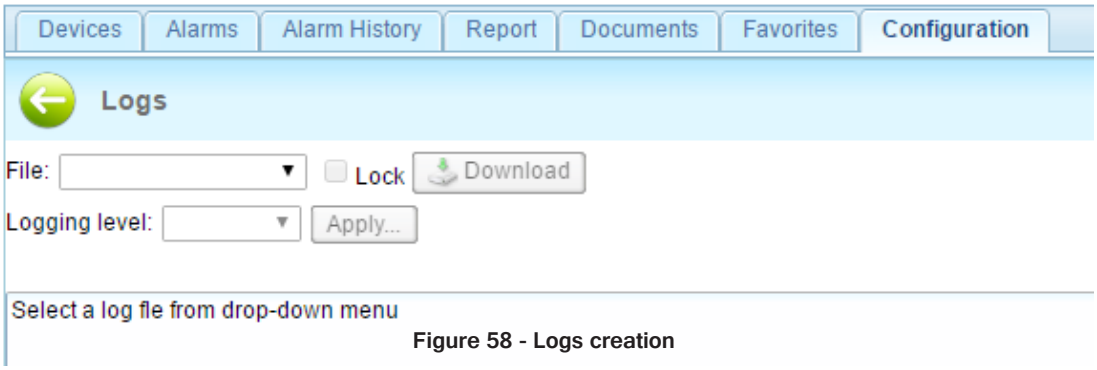


Figure 58 - Logs creation

3 logs files can be generated: “Logging engine”, “Graphic interface” e “Protocol traffic”. The levels of logging that can be selected are: ERROR, WARN and DEBUG. It is possible to download generated logs files, clicking the **Download** button.

6 User interface

6.1 Synoptics

Figure 59 shows a complete synopsis of a system in which the 2 synoptics have been created in section **Configuration -> Customization -> Synoptics configuration** (see Section 5.3)

Figure 59 - Home page with synoptics

This screen is automatically displayed on the HDMI output of the IOT SCADA SERVER.

The **Synoptics** tab is not shown if there are no configured synoptics, in which case the IOT SCADA SERVER home page becomes that of the **Devices** tab.

If a device in the system is in alarm, the *"Alarms"* text in the respective tab turns red.

The background of the text measures turns purple if at least one device from which they draw a value does not respond to requests.

6 User interface

6.2 Devices

6.2.1 System measures display

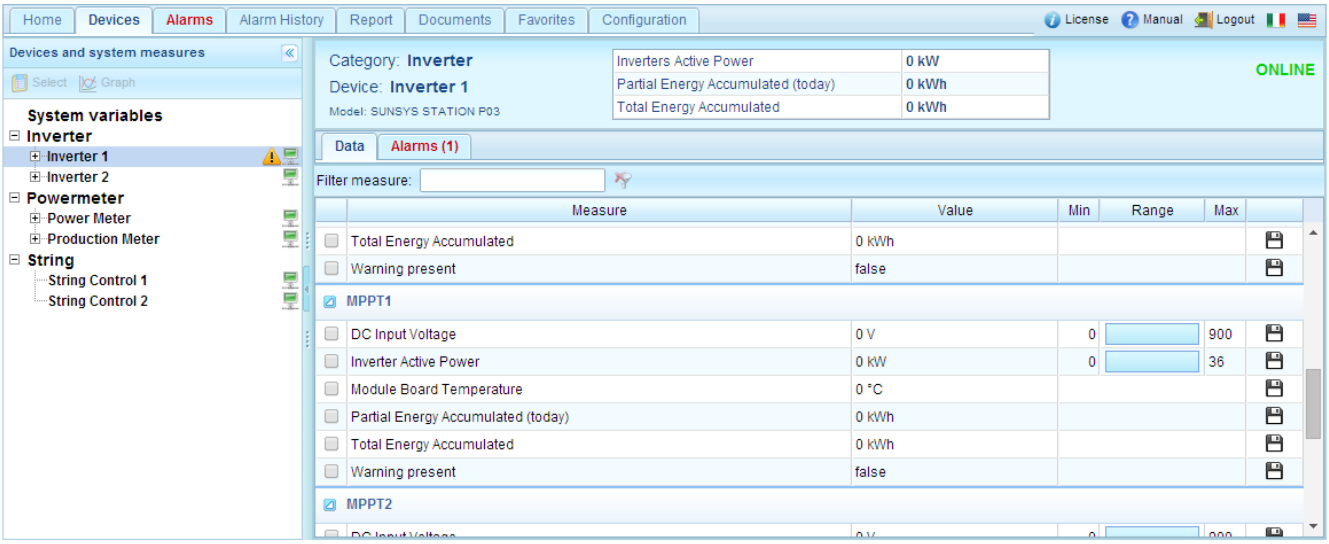
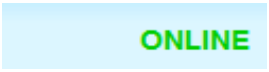
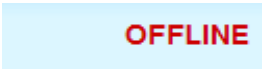


Figure 60 - System measures display

All of the devices being polled by the IOT SCADA SERVER can be seen in the tree menu structure on the left, sorted by category, and beside each device there is an icon that represents the reachability state. If operating normally the  icon will appear, and if the device is not reachable the  icon will appear; if there are alarms for a device, an additional warning icon  will appear next to the name, and if some measures were not read correctly the  icon will appear.

Once you select a device, the reachability state will be replicated in area on the right as well, together with the date and time of the last communication attempt made:





CAUTION
If the device is not reachable, first ensure that the device is turned on, then check the wiring and finally the configuration of the IOT SCADA SERVER.

6.2.1.1 Data and alarms display

The device measures read are divided into the two tabs **Data** and **Alarms**. Information and icons can be associated with each:

Logging enabled

Logging disabled

Alarm enabled

Alarm disabled

Active alarm

During normal operation the **Alarms** tab will look the same as the **Data** tab. In the presence of active alarms, however, the text of the **Alarm** tab will appear in red and the number of active alarms will be indicated. Selecting this tab will display all the measures associated with an alarm and those in active alarm condition will have a red background:

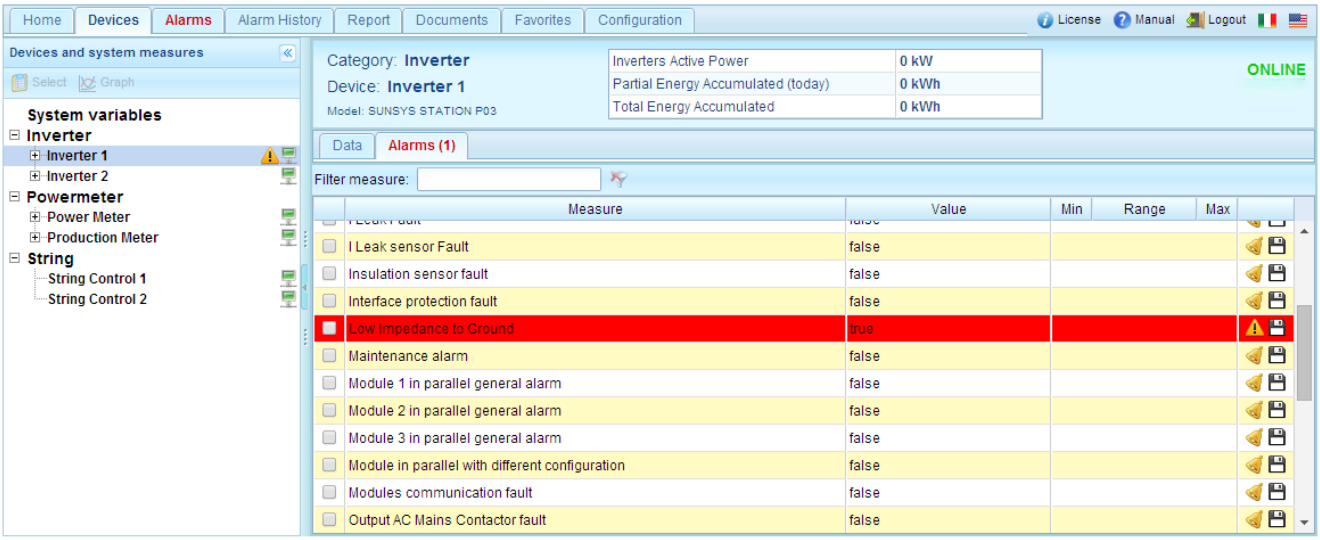


Figure 61 - Measures in alarm state

In the event that the device is offline, the background colour of all its measures will be purple and the value displayed will be that related to the last valid reading, or a series of dashes if there has been no communication:

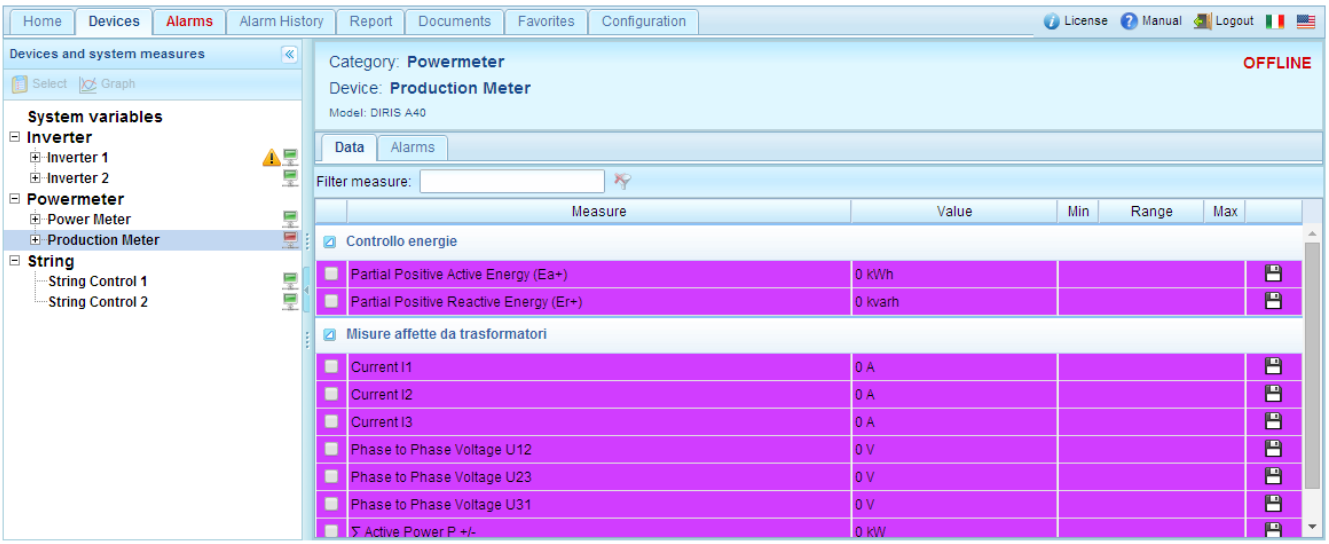


Figure 62 - Communication error device

To facilitate the search for a measure, it can be filtered by name with the appropriate field:

Figure 63 - Measure name filter

Or use the breakdown in sections, if any, selecting a single section from the tree menu structure on the left, such as, for example, “MPPT2”, which will result in the closure of all the sections except that selected, making visible only part of the device measures:

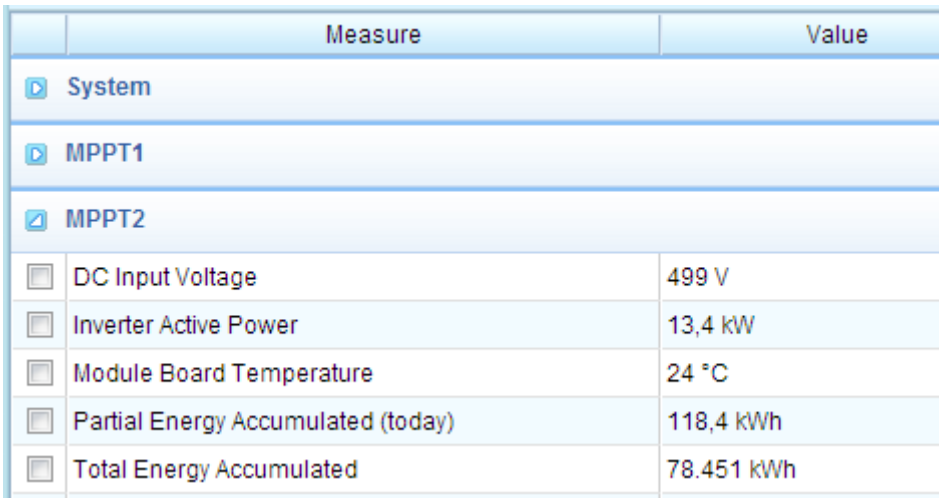
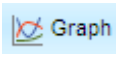


Figure 64 - Device sections

6.2.2 Graphs

To generate a graph of the time trend of one or more measures, select measures of interest by checking the appropriate box and then press the button:



CAUTION
The graph can only be generated for measures that were recorded in the time interval chosen. To change the recording state of a measure see Section 5.2.3.

A screen will appear as in Figure 65:

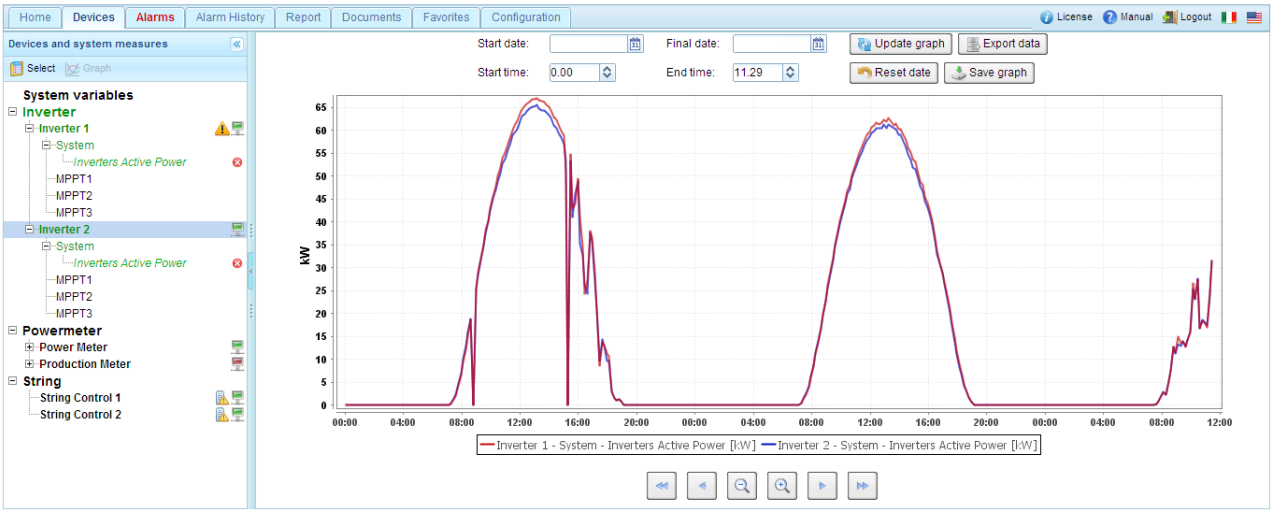


Figure 65 - Graphs

The temporal controls for the generation of the graph are located at the top. The default date and time interval runs from the current date and time to midnight on the previous day. These can, however, be edited and a new graph generated by pressing the **Update graph** button.
To restore the default interval, press the **Reset date** button.

Once a graph has been created, the reference time interval can be changed using the buttons below:

 moves the time interval back by 90%

 moves the time interval back by 40%

 decreases the time interval by 20%

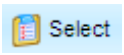
 increases the time interval by 20%

 moves the time interval forward by 40%

 moves the time interval forward by 90%

The graph is automatically regenerated after pressing one of these buttons.

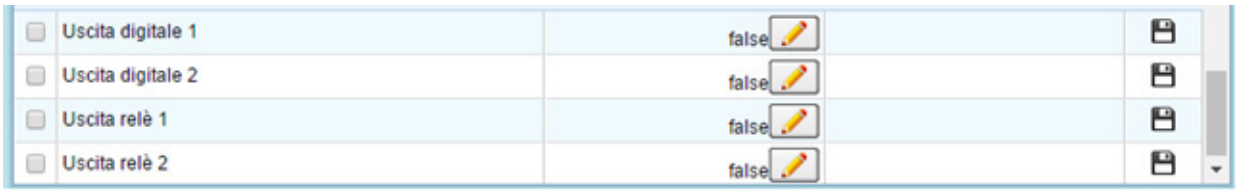
To change the selection of the measures to be plotted, return to the system and device measures display screen by pressing the button:



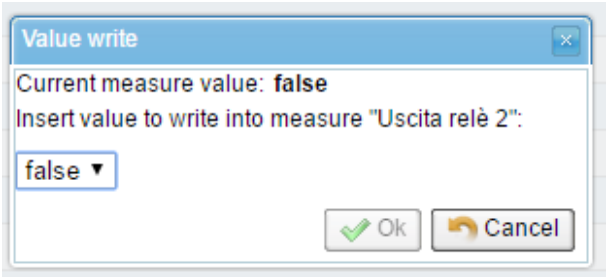
Select or clear the measure by using the check box again.
The measures currently selected are listed in the tree menu structure on the left. These can also be removed by pressing the icon:

6.2.3 Measure write

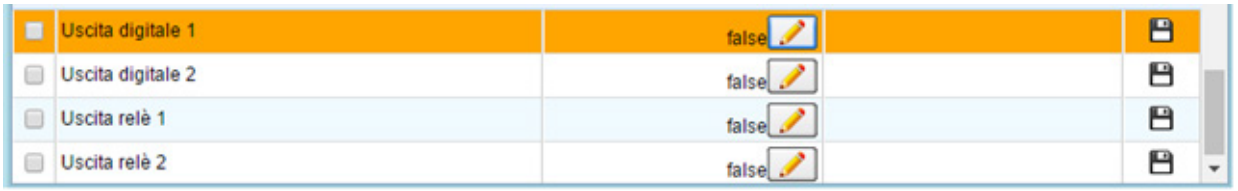
Some measures can be written, therefore it is possible to insert value to write into measure. To do it you should be authorized by logging in with user/password: go to section **Configuration,** login, and return to section **Devices**. Select a device to open the measures list. The writeable ones can be identified by the presence of a button on the row, see figure below.



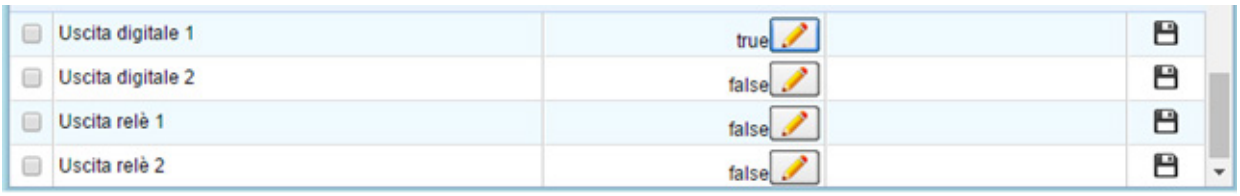
Pressing the button a popup window will open that allows to insert new value.



Writing is carried out in few seconds and while waiting the selected measure's line turns orange, keeping the old value.

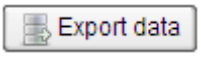


Once writing is complete, the line turns white again and the value is updated.



6.2.4 Exporting data to Excel

Once a graph has been generated, the data can be exported in Excel format by pressing the button:



You will be prompted to save the dataExport.xlsx file containing ALL of the values recorded by IOT SCADA SERVER for the measures that are currently selected within the selected time interval in Excel 2007 format. N.B. Excel 2007 limits the number of rows in an Excel spreadsheet to 65536. If the number of data exported is greater, the “excess” data will be automatically deleted.

6.3 Alarms

The current active alarms on all devices to which the IOT SCADA SERVER is connected can be viewed in the **Alarms** section. The list is sorted by date and time, but the order in any column can be changed by clicking on the corresponding heading.

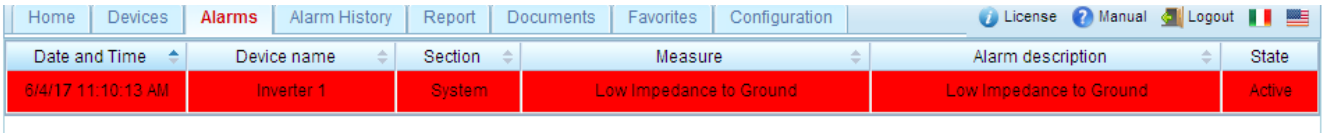


Figure 66 - Active alarms

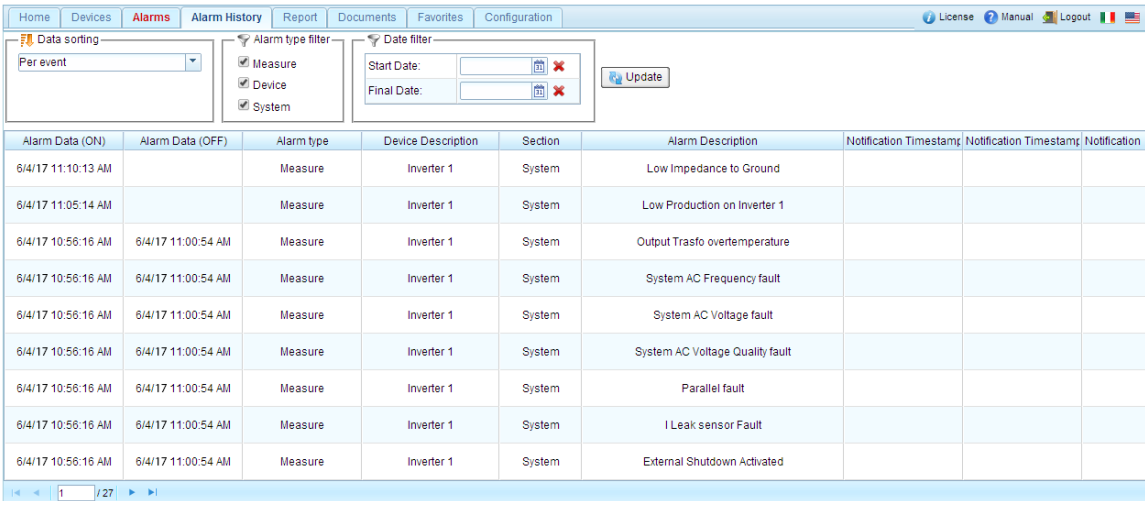
If there is no alarm the message **No active alarm** will be displayed. If alarms are present, the text in the **Alarms** tab will be red, even when the tab is not open.

Custom alarms are also reported in this section.

6 User interface

6.4 Alarms history

To display a history of the alarms that were triggered in the devices connected to IOT SCADA SERVER enter the **Alarm history** section. If alarms are present, the screen that appears is like that in Figure 67:



Alarm Data (ON)	Alarm Data (OFF)	Alarm type	Device Description	Section	Alarm Description	Notification Timestamp	Notification Timestamp	Notification
6/4/17 11:10:13 AM		Measure	Inverter 1	System	Low Impedance to Ground			
6/4/17 11:05:14 AM		Measure	Inverter 1	System	Low Production on Inverter 1			
6/4/17 10:56:16 AM	6/4/17 11:00:54 AM	Measure	Inverter 1	System	Output Trasfo overtemperature			
6/4/17 10:56:16 AM	6/4/17 11:00:54 AM	Measure	Inverter 1	System	System AC Frequency fault			
6/4/17 10:56:16 AM	6/4/17 11:00:54 AM	Measure	Inverter 1	System	System AC Voltage fault			
6/4/17 10:56:16 AM	6/4/17 11:00:54 AM	Measure	Inverter 1	System	System AC Voltage Quality fault			
6/4/17 10:56:16 AM	6/4/17 11:00:54 AM	Measure	Inverter 1	System	Parallel fault			
6/4/17 10:56:16 AM	6/4/17 11:00:54 AM	Measure	Inverter 1	System	I Leak sensor Fault			
6/4/17 10:56:16 AM	6/4/17 11:00:54 AM	Measure	Inverter 1	System	External Shutdown Activated			

Figure 67 - Alarm history per event

The list is sorted by date and time in descending order and the alarms displayed can be filtered based on a date interval to be specified in the **Date Filter** fields, and on the type of alarm, to be specified in the **Alarm type filter** box. Thereafter the alarm corresponding to the filters set will be displayed by clicking on the **Update** button.

There are 3 types of alarms in IOT SCADA:

- Measure alarms
  - o These are default alarms set on catalogue device measures, or defined by the user as shown in Section 5.3.3.
- Device alarms
  - o These are generated when a device does not respond to requests and becomes offline
- System alarms
  - o These are generated by multiple abnormal situations, such as a backup failure, an improper shutdown of the IOT SCADA SERVER, an error while sending a notification, etc.

In Figure 67, **Per event** selected in the **Data sorting** box, the alarm ON and the corresponding OFF alarm, if any, are grouped together in the same row, thereby facilitating the relationship between alarm events.
If it is not possible to display all the alarms on the same page, the list can be scrolled by means of the page navigation controls at the bottom.
If the alarm notification has been configured (see Section 5.4.1), there is a  button at the end of each row. If this is pressed, a popup window as in Figure 68 will be displayed, with details on the forwarding of the notification.

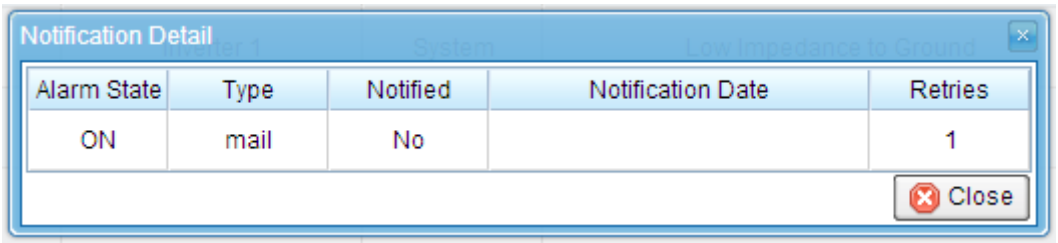


Figure 68 - Notification details

6 User interface

The alarm history can also be viewed by sorting the data in a chronological manner (i.e. selecting the option **Chronology** in which the alarms are presented in the reverse order in which they occurred, that is with the most recent at the top of the list together with the information about the state of the alarm ON (device in alarm) separate from that of the alarm OFF status (device alarm over), as in Figure 69:

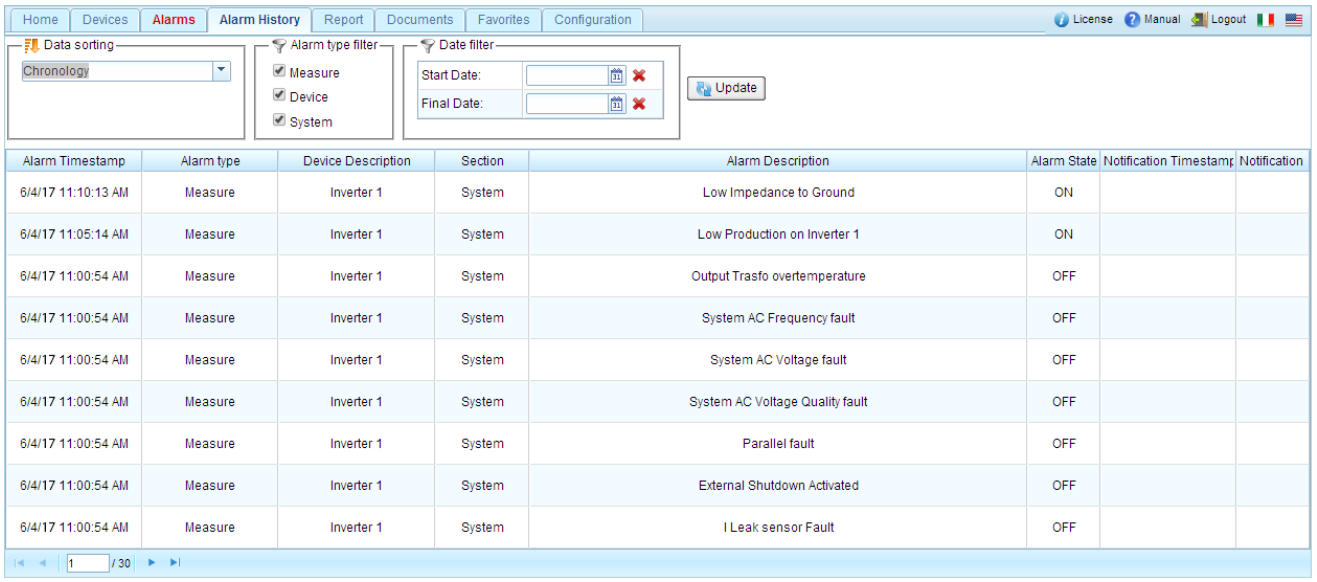


Figure 69 - Chronological alarms history

6.5 Report

In the **Report** section of the main menu it is possible to choose the type of report to generate:

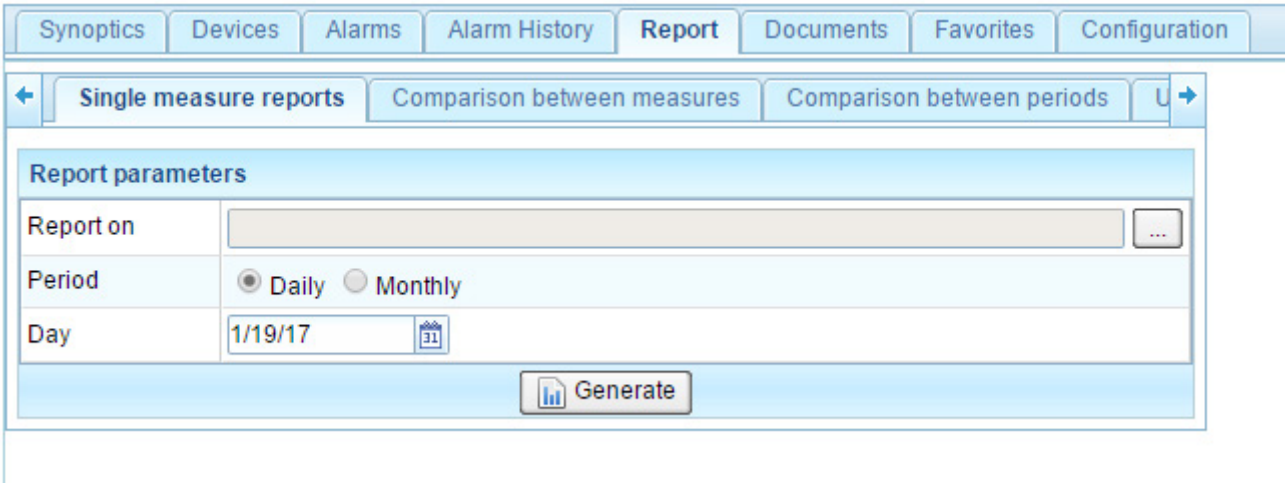


Figure 70 - Types of report

6 User interface

Energy reports can be generated (growing monotonic measures), enabling the daily or monthly progress of the energy measures to be analysed in different ways:

- the single measure energy report represents the simplest type of energy reports focusing the analysis on a single energy measure. This is the most compact of the various reports as it is composed of a single page with a bar graph and data table.
- the energy report "comparison between measures" highlights the differences between energy measures over the same period of time. This is useful in comparing energy production and consumption in a system, as well as for discovering any inefficiencies in devices regarded as similar (e.g. different production by inverter of the same model connected to the same number of strings). This contains a line graph and one or more data comparison tables between different measures.
- the energy report "comparison between periods" analyses the performance of one energy measure over several days or several months. It enables, for example, the comparison between the energy produced in July 2016 with that produced in the same month of 2017. It contains a line graph and one or more data comparison tables between different periods.

The measures and the periods over which the analysis is to be performed must be defined in each of these reports by filling in a special form of input parameters.

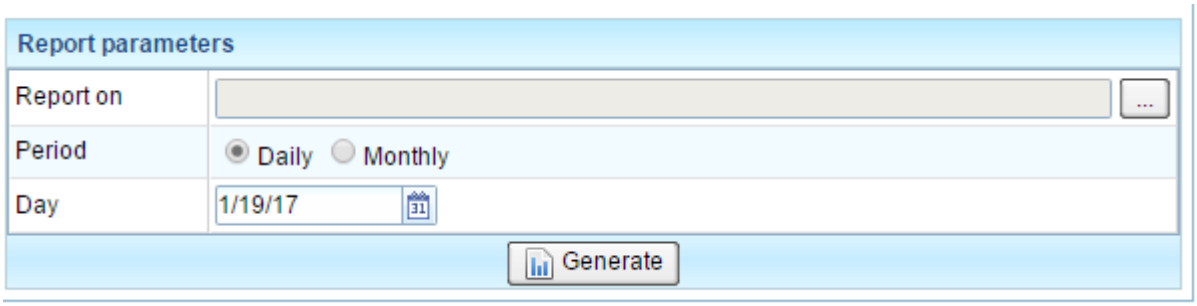


Figure 71 - Input parameters form for the single measure report

If the report is a comparison of several measures, then more than one measure can be chosen. Similarly, for the comparison report between several periods more than one period can be chosen.

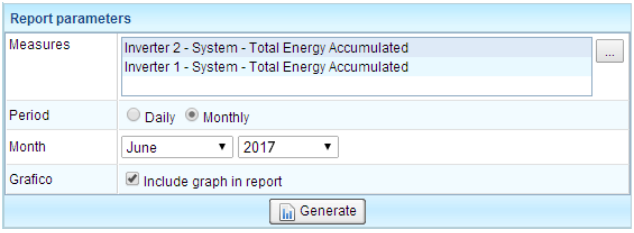


Figure 72 – Choice of multiple measures for the comparison report between different measures

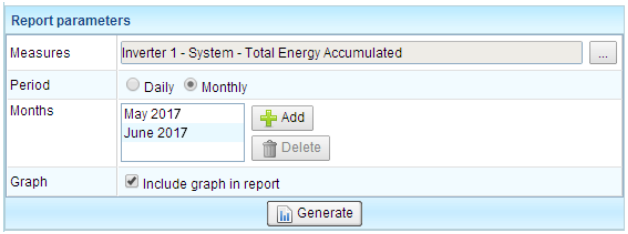


Figure 73 – Choice of multiple periods for the comparison report between different measures

After filling in the parameter input form, a preview of the report can be generated by pressing the **Generate** button. A few moments later a popup window will open displaying the generated document consisting of a graph and one or more tables; at the bottom of the popup window there are buttons that are used to save or forward the report displayed via email. The email forwarding occurs after the recipients of the mail have been entered in the appropriate popup window that appears after the **Send** button is pressed. To use this feature the notification parameters must be configured, as described in Section 5.4.1.

6 User interface

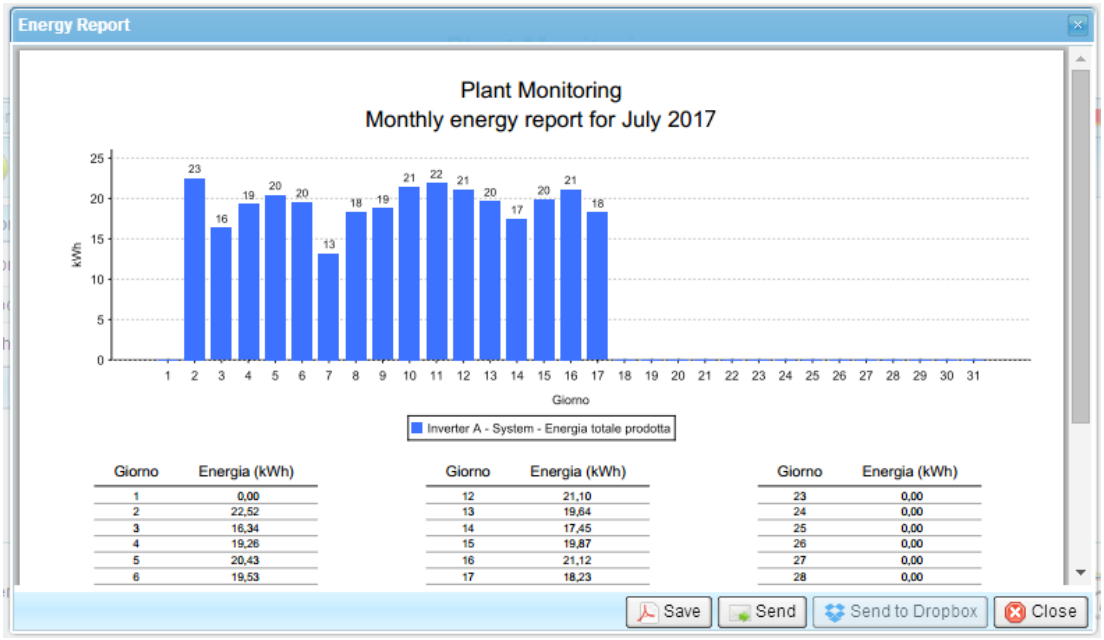


Figure 74 - Single measure energy report

6.6 Documents

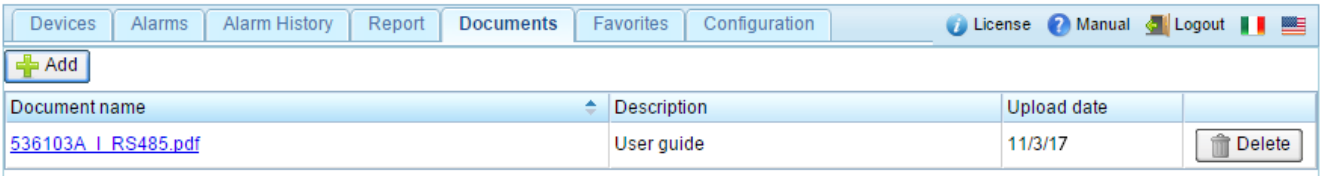


Figure 75 - System documents

For convenience, documents that are deemed useful to the system being monitored, such as wiring diagrams or other, can be loaded in IOT SCADA SERVER.

A popup window, as shown in Figure 75, opens when the **Add** button is pressed. Thereafter the **Upload** button must be pressed and the document to be loaded chosen. A description, such as **System Wiring** must be entered and subsequently the **Ok** button pressed.

You must be logged in to delete a document, in which case the **Delete** button next to each document will appear.

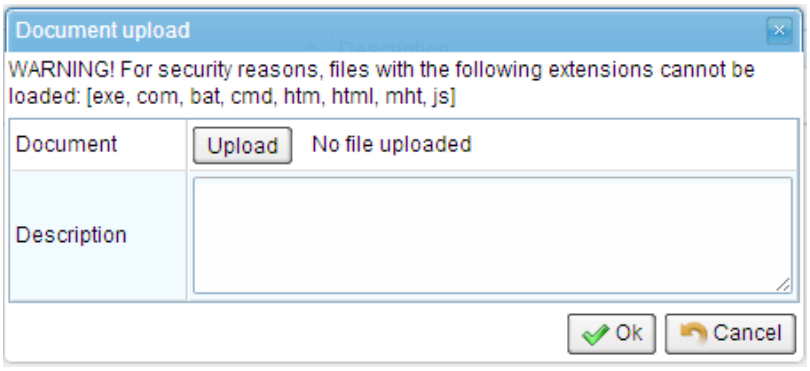


Figure 76 - Document upload

6.7 Favourites

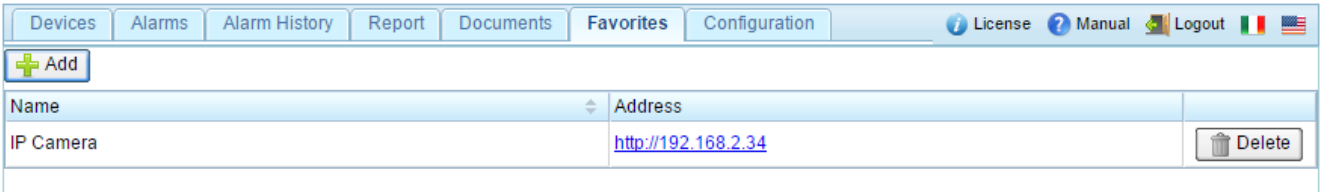


Figure 77 - Favourite addresses

Favourites, that is addresses of IP cameras present in the system or of other sites that are of interest, can be entered in the IOT SCADA SERVER configuration.

By pressing the **Add** button a popup window opens as shown in Figure 77. A name must be entered to help understanding, such as **System cameras,** the address itself, and then the **Ok** button must be pressed.

You must be logged in to delete a favourite, in which case the **Delete** button next to each document will appear.

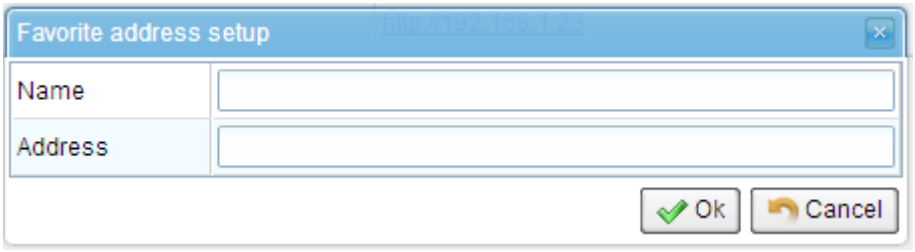


Figure 78 - Favourite addresses insertion

This will open in a new browser window when clicking on the address.

7 Troubleshooting – FAQ

7.1 Specific functions for Machine tools and Machining centres

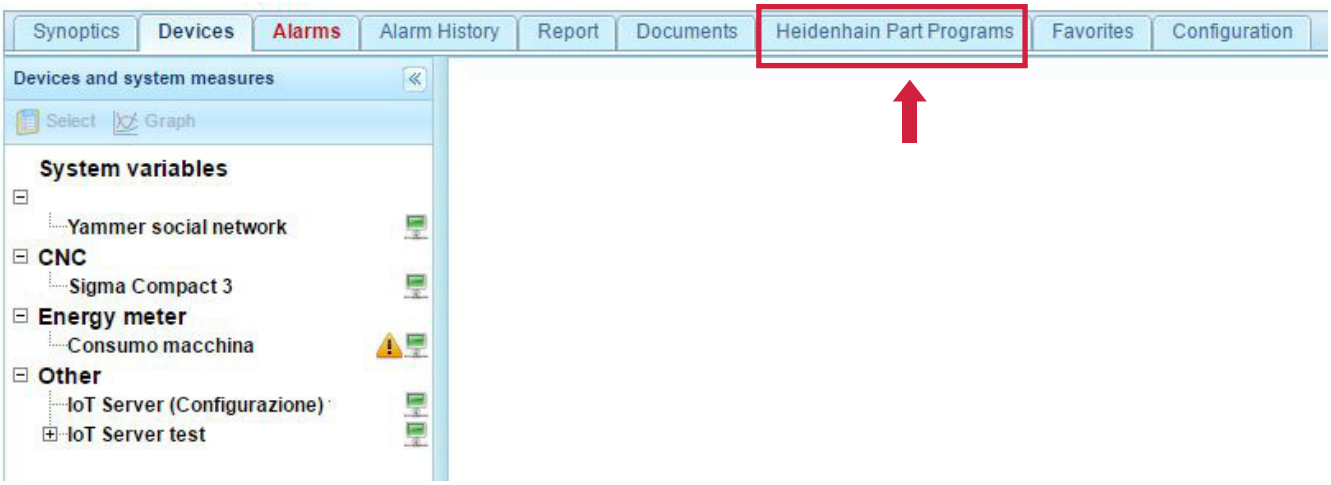
The IoT Scada Server system has specific functions to connect the device to CNC of machining tools or machining centres.

It supports drivers of primary brands, such as, for example CNC Siemens, Fanuc, and Heidenhain. When uploading this kind of drivers, there are additional functions available, as part program transfer and sending of working documents in **Documents** folder.

7.2 Remote part program transfer (machine instructions)

Not all families/versions of CNC support these functions (e.g. old CNC families).

When adding a device and choosing a driver of supported CNC brands (described in previous sections), **Part Programs name CNC** page will appear.



Follow this procedure:

- Connect gateway's Ethernet port to CNC's Ethernet port (very old CNC might not have Ethernet ports);

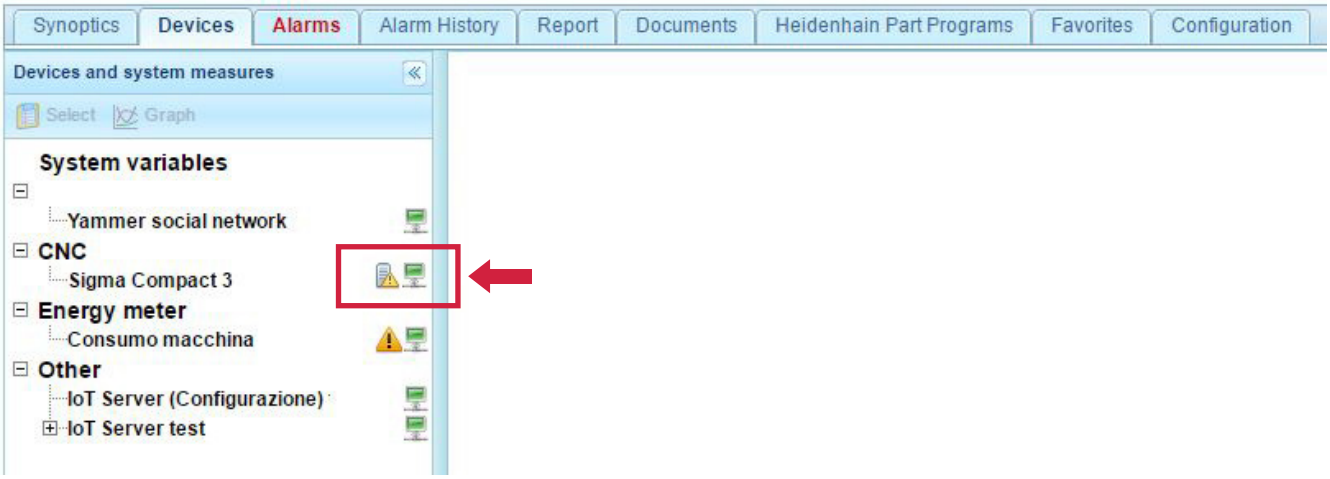
- Enable communication and connection ports from CNC: in some cases you should enable Ethernet port to allow the CNC to send data. Verify that the CNC can send data to the third parties (in some cases you should purchase additional optional functions of the CNC, provided by its manufacturer);

- Setup the Ethernet ports, as described in sections 4 and 5. Pay attention to the correct settings of assigned IPs to the CNC, gateway and local LAN network in order to avoid conflicts. The devices equipped with DUAL LAN allow the gateway to connect to CNC with IP of a certain family and, for ex., with the office PCs or servers with other IP, without coming into conflict;

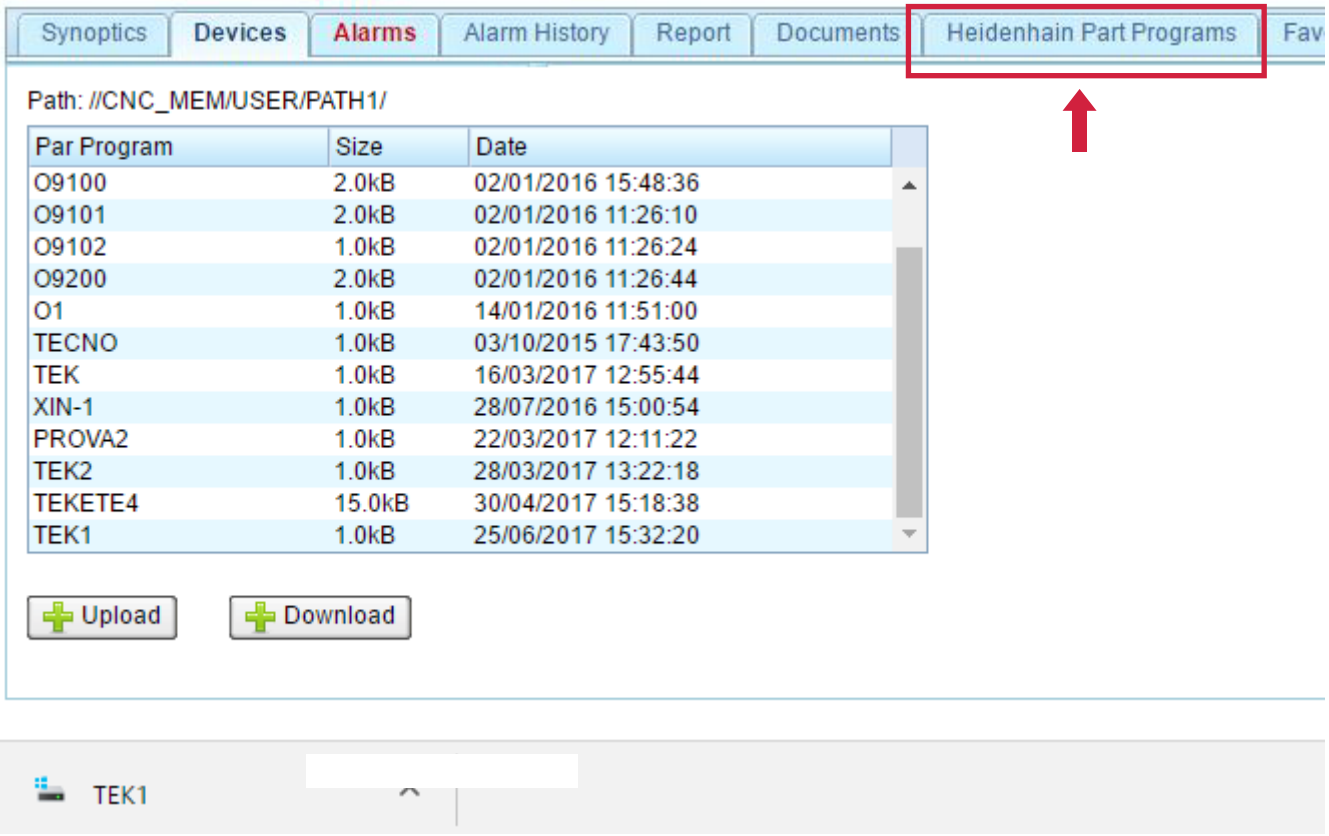
- Make all communication **TCP/IP Tests** that can be found at **Configuration** tab (see **section 5**) and test a single IP address to ping on the CNC, office PC and server. In case of a successful outcome, the screen icon next to the device will turn green.

7 Troubleshooting – FAQ

In case of communication problems the screen icon will turn red . If the communication test succeeds but the icon remains red or the CNC icon remains red, it means that you should enable CNC's ports.



- After setting up the connections and the communication ports, click **Part Programs.** The screen as in figure below will appear.



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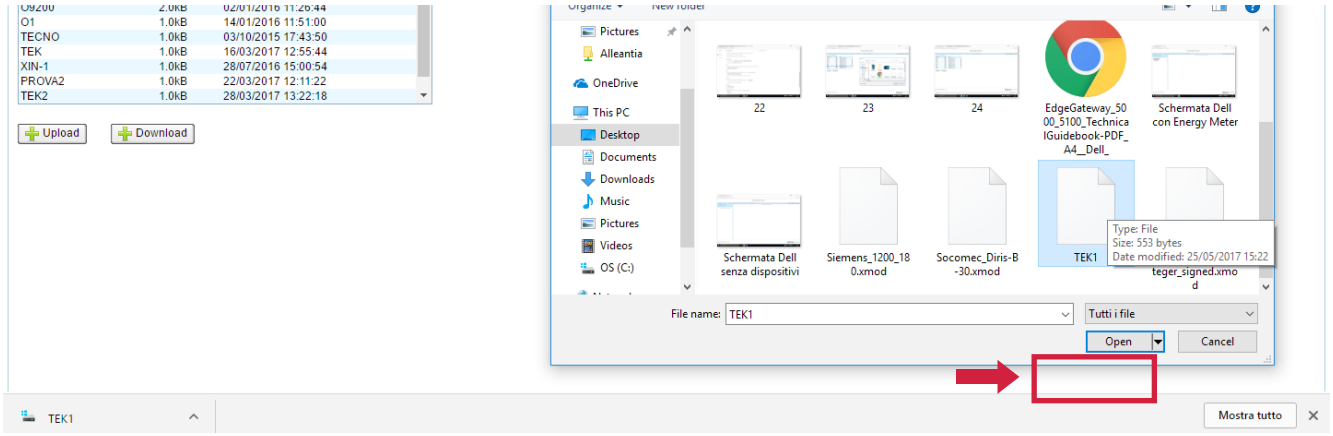
In the box you will see all part programs on the monitored machine's PLC.

Then you can download and upload the part program files (machine instructions).

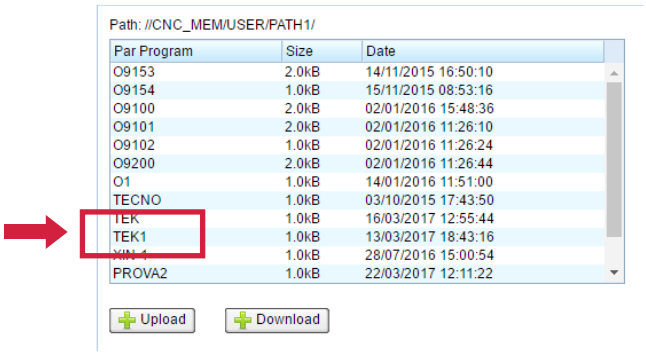
So it will be possible to send the instructions directly from a PC to the machine and transfer new part program.

- Click **Upload,** in the popup window select the file from your PC (as shown in the figure below) and click **Open**. The system in few seconds will transfer it to the machine's CNC, at any distance it is. In this example TEK1 part program was used.



- Click **Open,** wait for a few seconds.

- When the system has finished the file transfer (it depends on the file dimension and the kind of connection), you can check the transfer: click **F5** button to refresh the web page and scroll the list of part programs on the CNC. You will see TEK1 file in the list: the file transfer was successful.



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On-board controller can start the program or work.

The purpose of this function is to organize/program all sequences of working that the machine performs, to organize and plan the production, etc.

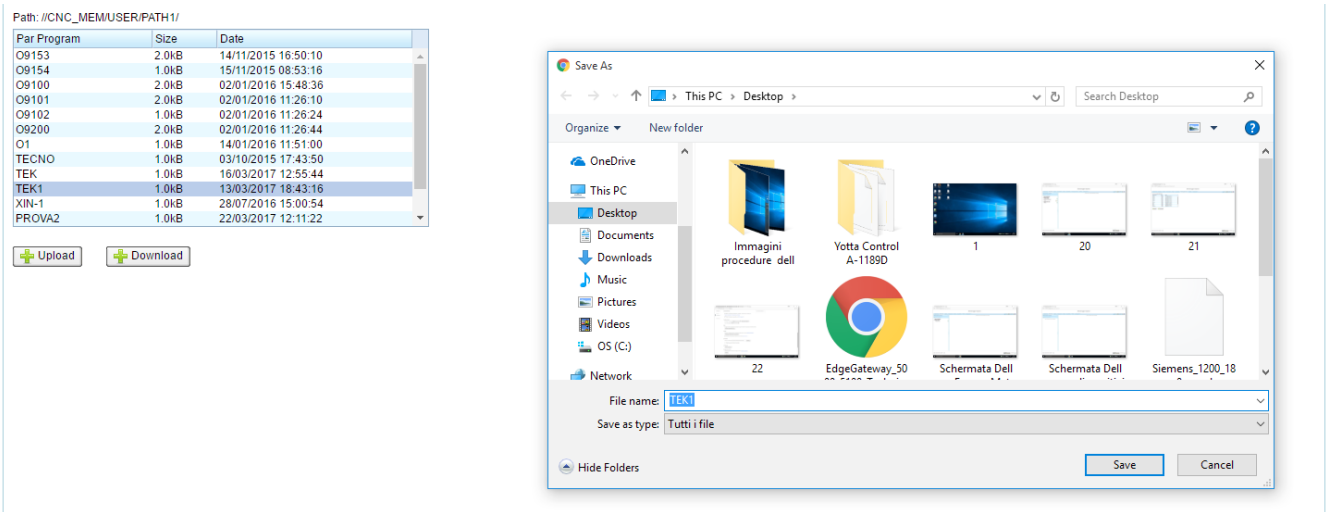
CAUTION:
If you are accidentally trying to transfer remotely a part program to the CNC, which is already on the machine, the operation will not have success, as the files are protected from being overwritten remotely. Rename the file, adding revision (TEK1rev, TEK1r1 and so on).

CAUTION:
The files that start with "O" cannot be downloaded and managed remotely, for security reasons. Rename the file (add another letter in the beginning).

- To download a part program from the machine's CNC (for ex., to modify the instructions remotely), select the file and click **Download**.

Choose the folder to save the file.

The file WILL NOT BE DELETED from the CNC. For security reasons, when working nothing is modified or overwritten.



After that, on the on-board CNC screen you can easily check that the file has not been removed or modified.

CAUTION:
In some cases in might happen that, after selecting the part program to download, clicking the "Download" button, Google Chrome is set by default to download files in "Downloads" folder (see figure below).

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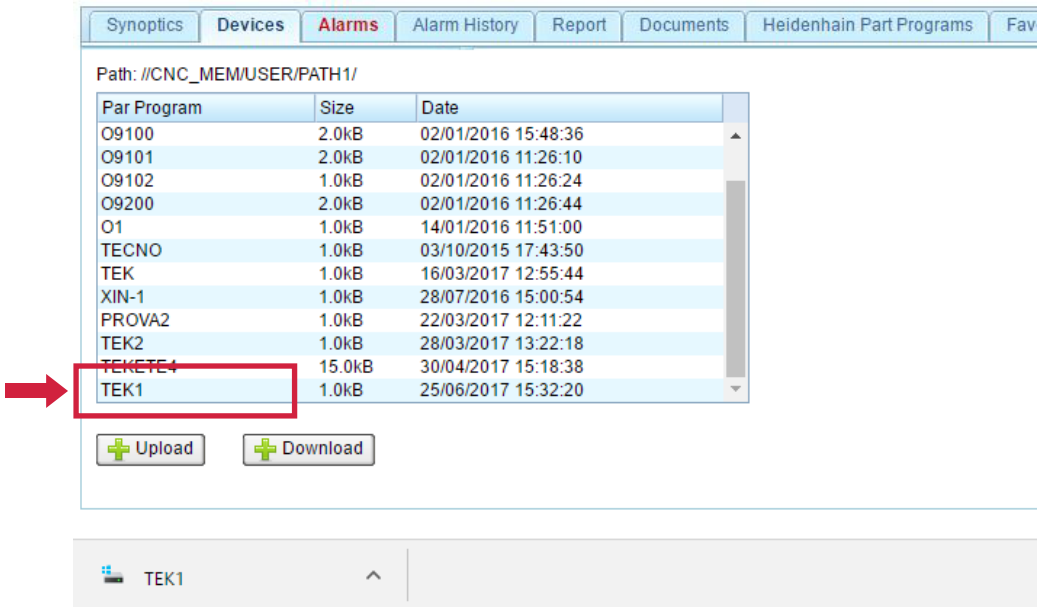
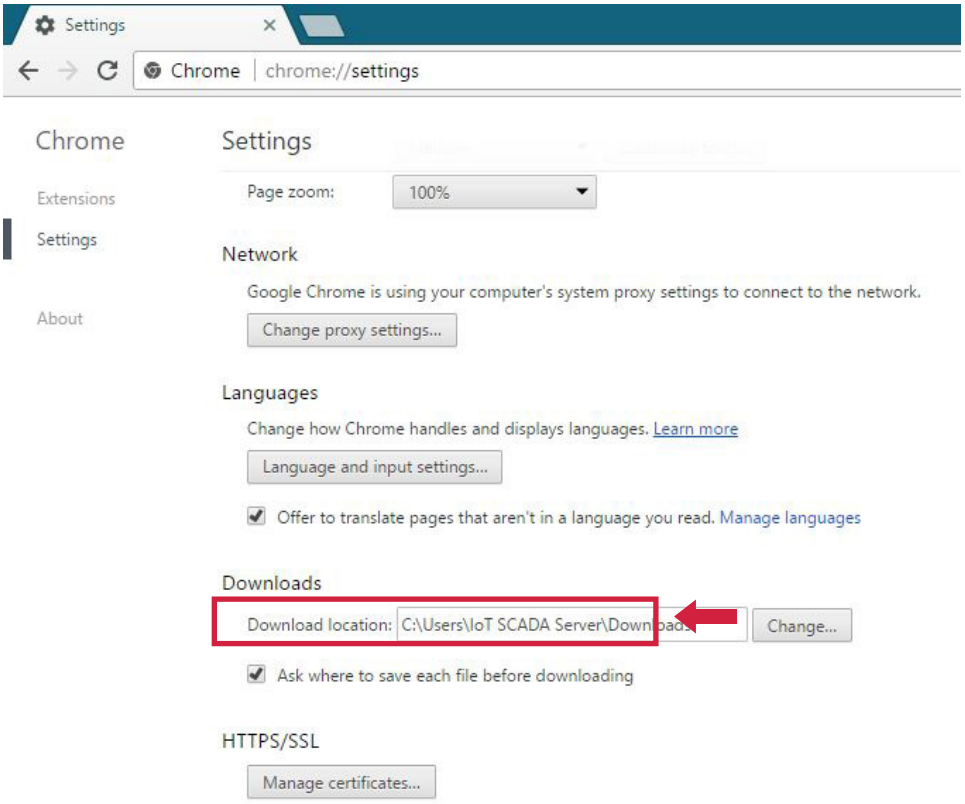


To change the folder, go to Google Chrome settings, check **Ask where to save each file before downloading** box.



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7.3 IOT SCADA SERVER does not switch on

For the Base and UPS models (code IxS_1y1), check there is 12 V direct current on jack with terminal positive on DC+ and negative on DC-. If voltage is over or below 12 V, change power supply or, if possible, adjust output voltage of existing one.
For the Multi and Multi+UPS models (code IxS_1y2, IxS_1y3), check there is between 12 V and 24 V direct current or between 15 V and 26 V alternating current on terminal DC+ and DC-. If the measured voltage is not comprised in the specified intervals, change power supply or, if possible, adjust output voltage of existing one.

7.4 Unable to complete Internet communication test

Verify that the Ethernet or Wi-Fi connections have been made correctly and check activity state of LED LAN or Wi-Fi on the IOT SCADA SERVER (Section 2.3.1) and the switch/router. If the IP address has been manually configured, verify the parameter configuration with your network administrator or with the router.

7.5 Communication problems with serial devices

In the event of communication problems with serial devices, refer to the troubleshooting guide in the section **Configuration -> Installation -> Devices configuration** that can be downloaded by pressing the button:

7.6 Unable to access IOT SCADA SERVER from the local network

Check that the IP address and subnet mask of the device from which you want to reach IOT SCADA SERVER are compatible with the IP address and the subnet mask of the IOT SCADA SERVER itself (see Sections 4.4 e 5.1)

7.7 Unable to access IOT SCADA SERVER from the Internet

Check that “NAT” has been configured on the local router on port 80 of the IP address of the IOT SCADA SERVER.
In the event that you are trying to access the IOT SCADA SERVER through a name, and not through an IP address (e.g. mymachine.no-ip.org), check the DDNS configuration of the router.

7.8 Auto start of the IOT SCADA system and the gateway at power-up of the machine

In order to allow the auto start when power up from the network when it is installed in machine or electric board, follow the procedure:

- Switch on the PC and press F2 several times, BIOS grey screen will appear
- Click **Power management > AC recovery >** Select **Power on**
- Click **Apply**
- Check the **Save as custom user settings** box > Click **Ok > Exit**

This procedure diables the gateway’s power button.
For the IOT SCADA auto start see **paragraph 4.1**.

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7.9 System hotspot activation

To automatically activate the access point every time the gateway is powered up: access the IOT SCADA from a PC, laptop, tablet or smartphone, when in coverage of your gateway (see section 4 for the connection via Wi-Fi to the software).

This procedure can be activated only on the gateways with the appropriate hardware characteristics (if there is Wi/Fi card, possibility to set it up correctly, etc.).

This test has been done on Advantech UTX-3115.

1. Download **Tool Connectify Hotspot 2017** (there is also a free version).

2. The **Lite** license has the following options:
   - the system generates **"Connectify-me"** hotspot
   - the hotspot password can be modified

3. In **"Internet to share"** section select Wi-Fi card. In our case (Advantech UTX-3115) it is "**Realtek PCIe GBE Family Controller".**

4. This tool can be set to start automatically along with Windows: go to **Settings** section in the upper right corner, click **Startup Options,** check **Start interface on login.** Select **Always** in **Resume hotspot on boot-up.**

5. Return to the beginning and check **Start hotspot** box to switch it on.

NOTE: these 5 steps should be done only once, during the device setup. Then the program will do it automatically.

The password can be modified.

Now you can use Wi-Fi:
a. Open IoTSCADA web interface.
b. Go to **Configuration** tab and log in:

username: admin
password: webloggerSU

c. Click **"TCP/IP configuration"**
d. Select **"Microsoft Wi-Fi Direct Virtual Adapter #2"**
e. In the browser address bar copy 192.168.XXX.X IP address, shown in the table to access the IoTSCADA web interface from a mobile device, connected to **"Connectify-me"** Wi-Fi network.

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7.10 System configuration

In the gateway, the following programs are already installed:

- TeamViewer
- UltraVnc
- OpenVpnGUI
- App. IoT SCADA Server

In addition, to ensure the best performance, the following Windows services were disabled:

- Windows Defender
- Windows Firewall

8 Contacts

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