User Guide
DAT 3680IOT

GATEWAY MODBUS / MQTT

GENERAL DESCRIPTION

The **MQTT (Message Queuing Telemetry Transport)** protocol is a messaging protocol used in the Internet of Things (IoT). It is designed for communication between devices with limited resources, such as temperature sensors, actuators, etc...

The MQTT protocol is a model based on three parties involved: the *publisher*, the *broker* and the *subscriber*.

The *publisher* is the device that sends messages, the *broker* receives the messages and distributes them to interested subscribers, while *subscribers* are the devices that receive the messages.

MQTT topics are used to identify messages. *Publishers* send messages to a specific topic, while *subscribers* subscribe to one or more topics to receive only the messages of their interest.

The **broker** manages the subscriptions and distributes messages to interested subscribers. This communication model allows for great flexibility and scalability in the IoT model, as devices can selectively communicate using only the messages that are relevant to them.

An **MQTT gateway** is a fundamental component in the communication between IoT (Internet of Things) devices. It allows you to collect data from the field through devices that operate with industrial protocols (Modbus TCP, Modbus RTU, etc.) and send them to a cloud/broker using the MQTT protocol.

The **DAT3680IOT** works as a MQTT Client with the possibility to send or receive messages to/from the MQTT broker by collecting data from the field devices. This message exchange is based on the publish-subscribe architecture of the MQTT protocol. The DAT3680IOT is ideal for Industry 4.0 and IoT applications.

The module is configured through an integrated web server without the use of additional software.

The web interface is compatible with the most used browsers (Chrome, Firefox, Edge, etc.)

For a correct installation of the device, refer to the product datasheet downloadable from the website *www.datexel.it*

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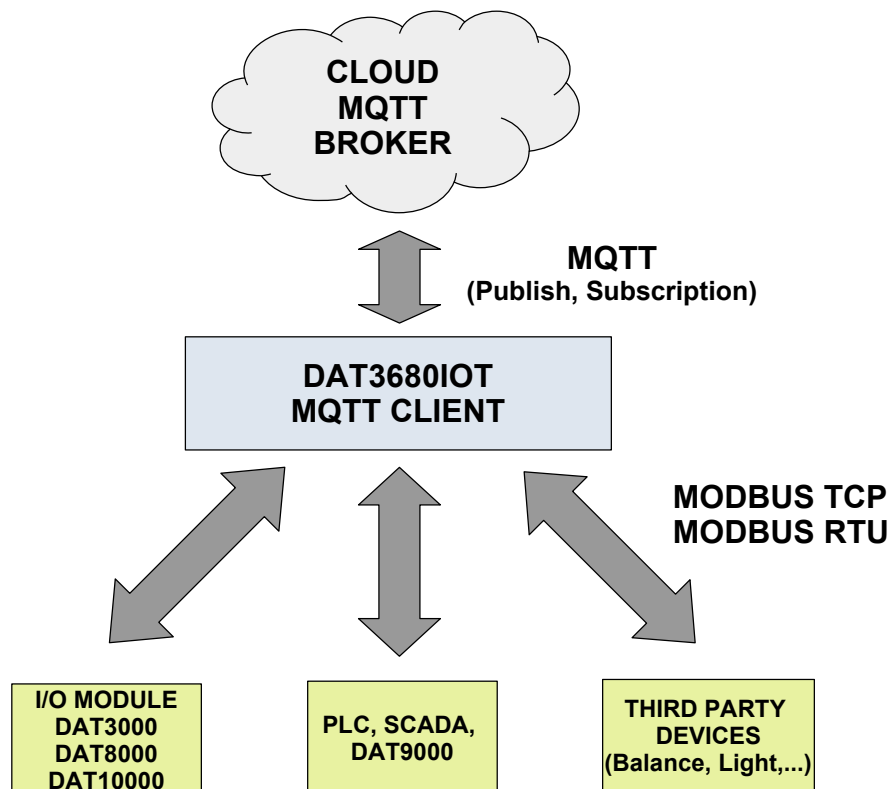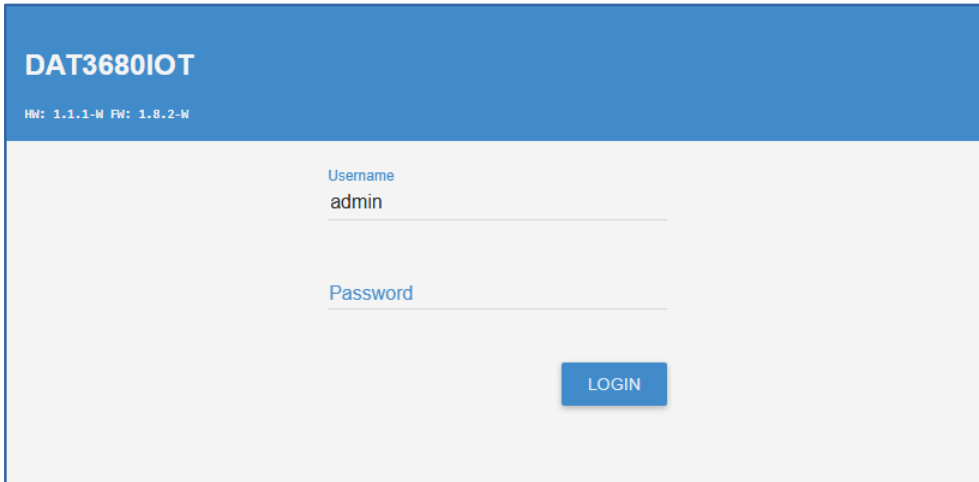
To access the webserver, you must type in the address bar of your browser the IP address of your device.
When first used, the Wi-Fi is disabled, so it is necessary that the DAT3680IOT is connected to the wired Ethernet network to access the webserver.
Caution: make sure that the IP address of your device belongs to the same subnet as your PC!
If you do not know the IP address of your device, please refer to the "Recovery" section.
After typing the IP address in the browser's address bar (default: 192.168.1.100), the following "Login" screen will appear:

DAT3680IOT

HW: 1.1.1-W FW: 1.8.2-W

Username
admin

Password

LOGIN

At the first login in to the web server, use the following default credentials:
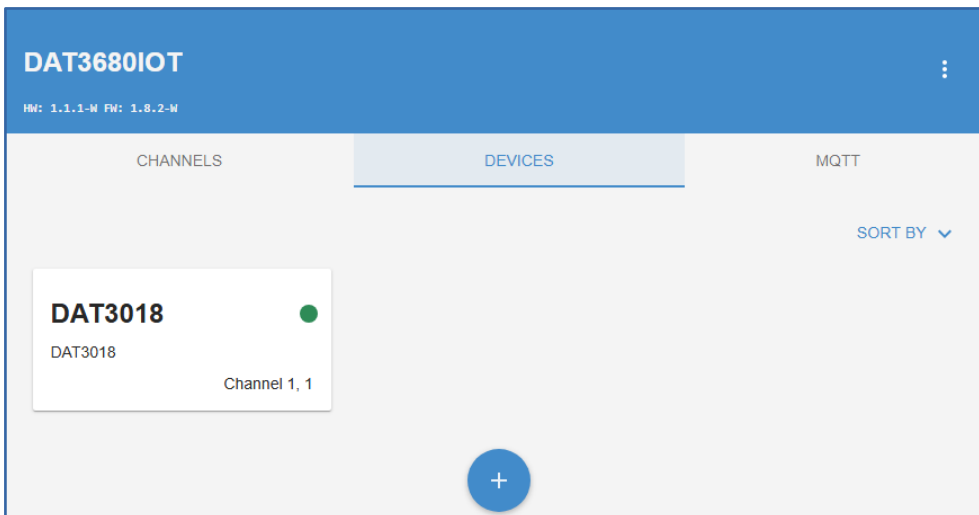
- **Username:** admin
- **Password:** password

After the first login, you will be requested to change your password.
The password must differ from the default one.

You can change your login details later in the "*Change Password*" section.

After typing the login credentials and clicking on the "*Login*" button, the DAT3680IOT's Home Page will appear.

DAT3680IOT

HW: 1.1.1-W FW: 1.8.2-W

| CHANNELS | DEVICES | MQTT |

SORT BY ∨

DAT3018 ●
DAT3018
Channel 1, 1

＋

The webserver consists of 4 sections:

- **CHANNELS:** It allows to create the communication channels between the gateway and field devices and edit the Modbus protocol's communication parameters. It is possible to create one Modbus RTU channel and up to 8 Modbus TCP / Modbus RTU over TCP channels.

- **DEVICES:** It allows to define the devices to be interrogated and the sampling mode of their variables;

- **MQTT:** It allows to edit the parameters of the MQTT protocol in order to connect the gateway to the broker;

- **Service Menu(⋮):** It allows to configure the network interface, import or export configuration, change password, select language, change date/time, update firmware or logout.

Use **"Logout"** to exit the web server.

CHANNELS

Defines the protocol configuration parameters through which to communicate with field devices.
It is possible to create one Modbus RTU channel and up to 8 Modbus TCP channels (or RTU over TCP).

To add a channel, click on +
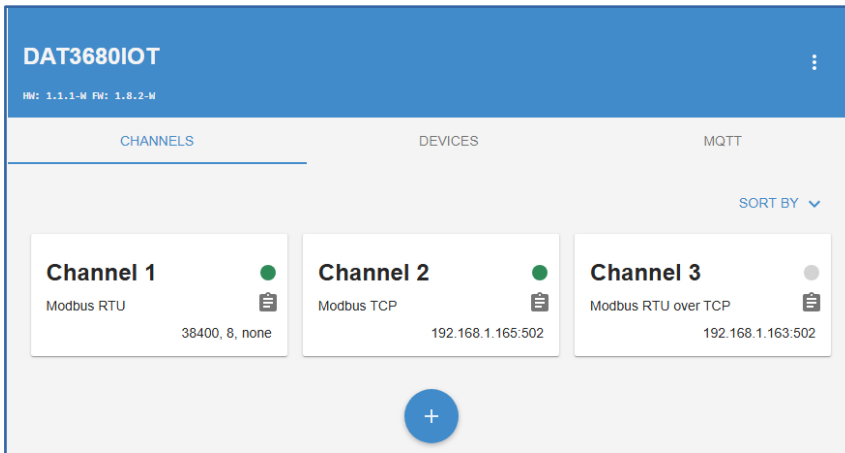
The LED indicates the status of communication
(⚪not defined, 🔴in alarm, 🟢regular).
In case of the communication is in alarm state,
please follow these:
- check the connection of the ethernet network
 cable or the RS485 serial;
- check if the network parameters are correct
(in case of modbus TCP or modbus RTU over
TCP channel);
- check that the serial port parameters (baud
 rate, parity, etc...) are correct (in case of
 modbus RTU).

By pressing the icon 📋, it is possible to track
the protocol messages related to the channel.

Modbus RTU
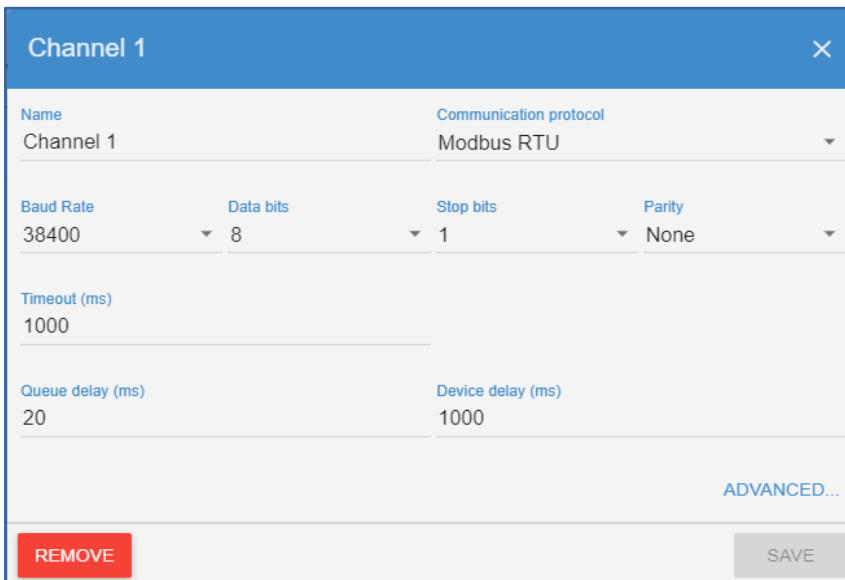
Click on **"SAVE"** to store the parameters set.
Click on **"REMOVE"** to delete the channel.
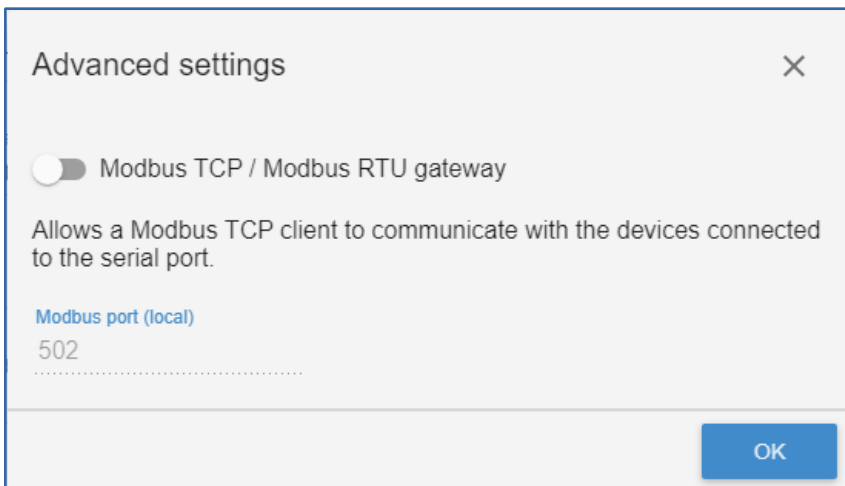
Name: assign an identifier to the channel.

Communication protocol: allows you to
configure the communication protocol with field
devices (Modbus TCP, Modbus RTU, Modbus
RTU over TCP).

Baud Rate: sets the communication speed of
RS485.

Data Bits: sets the message bit number. In
modbus RTU is fixed to 8.

Parity: sets the parity

Stop Bits: sets the stop bits number

Timeout: sets the maximum time (in ms) within
to receive a valid response from the device in
the field.

Queue Delay: Sets the waiting time between
two requests on the same device. Used when
"block sampling" is not active in the GENERIC
device.

Device Delay: Sets the waiting time between
two different devices on the same channel.

ADVANCED…
Only for the modbus RTU channel, you can
configure the device as a Modbus TCP Modbus
RTU gateway. If you enable this setting, a
Modbus TCP client device can query the
devices connected on the RS485 serial port in
Modbus RTU.

Modbus TCP and Modbus RTU over TCP

Click on **"SAVE"** to store the parameters set.
Click on **"REMOVE"** to delete the channel.

Name: assign an identifier to the channel.

Communication protocol: allows to configure the communication protocol with the devices in the field (Modbus TCP, Modbus RTU, Modbus RTU over TCP).

IP Address: sets the IP address of the device to be queried.

TCP port: sets the communication TCP port (default 502).

Timeout: sets the maximum time (in ms) within to receive a valid response from the device in the field.

Queue Delay: sets the waiting time between two requests on the same device. Used when *Block Sampling* option is not active in the GENERIC device.

Device Delay: sets the waiting time between two different devices on the same channel.

DEVICES

In this section, it is possible to define the devices to be queried through one or more of the configured channels and how their variables are sampled. It is possible to connect devices from the internal library (DAT3000,DAT8000, DAT9000 and DAT10000) or build generic devices (GENERIC). Up to 32 devices can be connected.


Click on "SORT BY" to sort the devices by *Name, Type, Channel* or *Address*.

The LEDs indicate the status of communication (⬤ not defined, ⬤ in alarm, ⬤ regular).

List of devices

To add devices, click on the symbol (+)

It is possible to filter the device series by clicking on the names of the series on top left corner.
Click on each series (deselect) to remove the devices from the list in order to simplify the search.
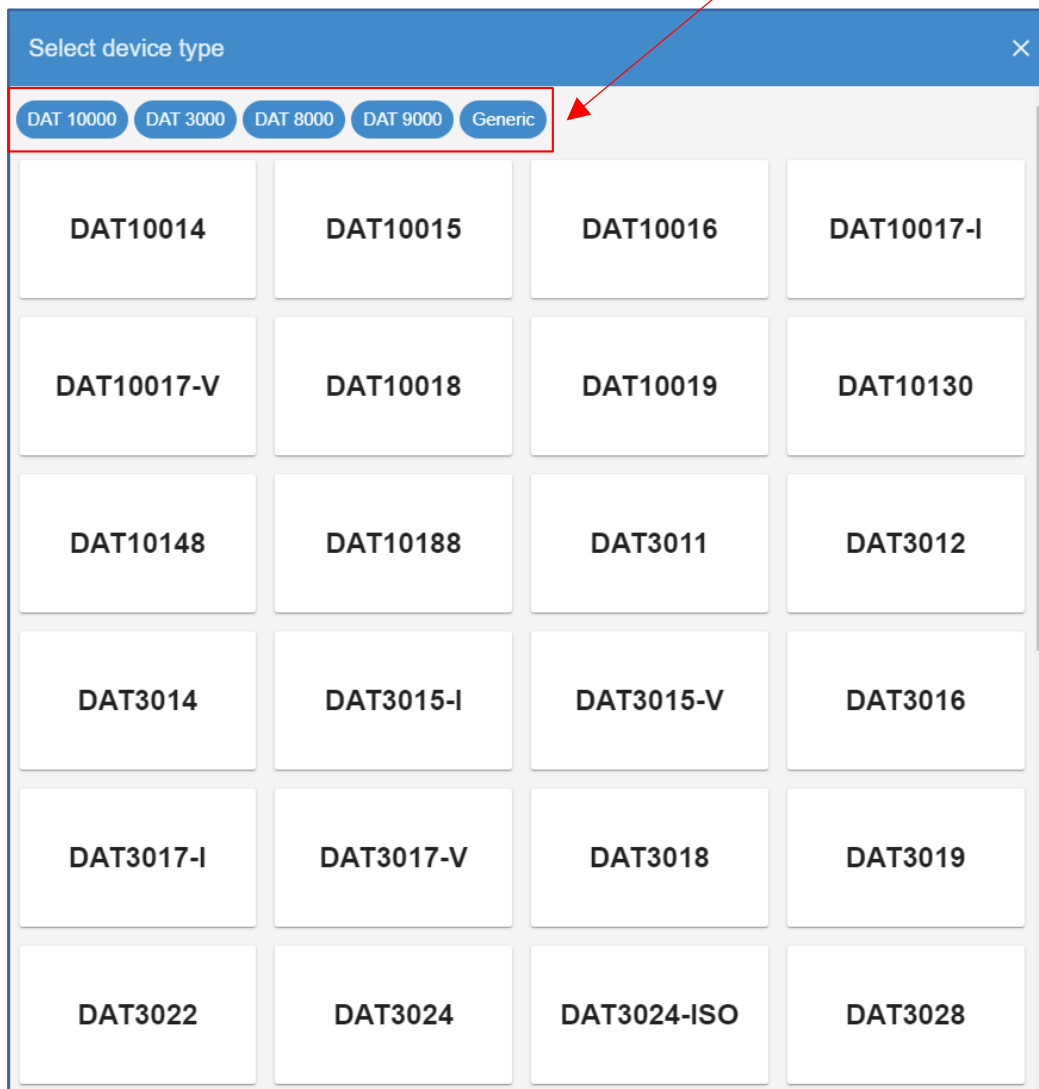
- **DAT3000:** Modbus RTU slave devices
- **DAT8000:** Modbus TCP server devices
- **DAT9000:** Intelligent client/server units with modbus RTU and modbus TCP protocol
    → DAT9000IO includes the devices: DAT9000DL-IO and DAT9000USB-IO
    → DAT9012 includes the following devices: DAT9012, DAT9012-DL and DAT9012-USB
- **DAT10000:** Slave devices with modbus RTU protocol in 6 DIN modules format
- **GENERIC:** generic device with modbus protocol.

For the devices in the library, the variables are listed by default, while for the GENERIC device it is possible to add one or more variables.

LIBRARY DEVICES (SERIES DAT3000, DAT8000, DAT9000, DAT10000)

Each device in the library has a default mask where the variables for that specific device are already listed.

For each device in the library it is possible to specify:

Name: set the device name.

Channel: set the channel/protocol to use

Address: sets the device's modbus address/node.

For each default variable selected it is possible to specify:

Name: name of the variable;

Topic: subject of the message;

QoS: Quality of service level:

> 0 - does not include acknowledgment of receipt;
> 1 - ensures the delivery of the message at least once to a recipient;
> 2 - ensures delivery of the message once and only once to a recipient.

Retain: the variable is maintained by the MQTT Broker always available for client requests.

Publish: publication of the message on variation or at fixed frequency. In case of publication on change of value/status of the variable, it is possible to define the inclusive threshold. If the publication is at fixed frequency, it is possible to define how often the message will be published. The time of publication is expressed in seconds.

Input/output type (only for devices with analog inputs/outputs): this is used to define the type of variable read in relation to the connected sensor. This setting allows you to sample the value of the variable with the correct formatting of decimals.

GENERIC DEVICE (GENERIC)

For each device it is possible to specify:

Name: Set the device name.

Channel: set the channel/protocol to use

Address: Sets the modbus address/node of the device.

Block sampling: defines if a Modbus query should be performed for each variable or if, in case of contiguous variables, they should be requested as block.

For each defined variable selected it is possible to specify:

Topic: Message topic.

QoS: Quality of service level:

> 0 - does not include acknowledgment of receipt;
> 1 - ensures delivery of the message at least once to a recipient;
> 2 - ensures the delivery of the message once and only once to a recipient.

Retain: the variable is maintained by the MQTT Broker always available for client requests.

Publish: publication of the message on variation or at fixed frequency. In case of publication on change of value/status of the variable, it is possible to define the inclusive threshold. If the publication is at fixed frequency, it is possible to define how often the message will be published. The time of publication is expressed in seconds.

For each created variable it is possible to define (Variable Setting):

Read-only: defines whether the variable is read-only (RO) or can be written (RW);

Format: variable format with or without sign;

Name: name of the variable;

Address: address of the Modbus variable;

Function Code (read): specifies the code of the Modbus read function;

Function Code (write): specifies the Modbus write function code (RW only). It appears only if the variable is defined as RW.

Conversion: allows a linear conversion between two points of the variable read;

Validity: add a secondary variable that contains data on the validity of the main variable.

MQTT

Defines the configuration parameters of the MQTT protocol by which messages are published to a BROKER.

The led indicates the status of communication (not defined, in connection, in alarm, regular).
Click on **"SAVE"** to store the parameters set.

Broker Address: sets the address of the broker.

Broker Port: sets the TCP port of the broker.

ClientId: sets the Client ID.

Keep Alive: frequency of sending the Keep Alive message to the broker.

Clean session: if enabled, it requires the renewal of topic subscriptions by the Client at each connection with the broker.

Username: login credential to access the broker.

Password: password credential to access the broker.

Enable TLS/SSL: sets the TLS/SSL encryption standard for transmitted data. Allows to load:

- Certificate,
- Private Key,
- CA Certificate

Payload Structure (Payload Editor): allows you to customize the structure of the payload. It also provides a preview of the message in case of valid and invalid value.

Message queue: enable message queue

Diagnostic messages: Defines a specific topic that contains the gateway's diagnostic information.

Log: Displays all messages that are exchanged between the broker and the gateway such as connection status, topic-related messages and other diagnostic messages.

PREVIEW: Preview the message in JSON format that will be sent to the broker.

Press **OK** to confirm.

By clicking on the three dots in the upper right (⋮), you can access the service menu that allows you to configure the network interface, change date/time, import or export a configuration, change password, change language, Access maintenance services or log out.
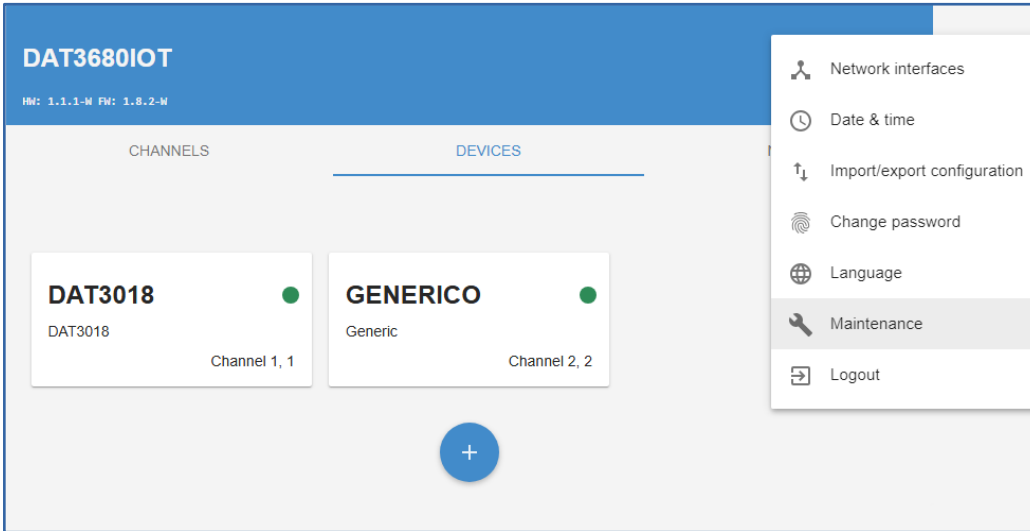
NETWORK INTERFACES

This section allows you to view and edit (if allowed) the gateway network parameters.

ETHERNET

Hostname: device hostname.

MAC: The mac address of the device over Ethernet.

DHCP: If there is a router or modem in the network where your device is connected with DHCP enabled, this feature allows the device to automatically receive the IP configuration needed to establish a connection.

IP address: set the device's IP address (DHCP not active)

Subnet mask: sets the device's Subnet mask (DHCP not active).

Gateway: sets the device gateway (DHCP not active)

Primary DNS: sets the primary DNS (DHCP not active)

Alternate DNS: set the alternate DNS (DHCP not active)

Click on **"SAVE"** to store the parameters set.

Network interfaces

Hostname *
DAT3680IOT

☑ Enable WiFi interface

☐ Prioritise WiFi over Ethernet

ETHERNET   WI-FI

MAC
b8:27:eb:36:23:2d   [CONNECTED]

SSID *
lab   ⓘ

Password
•••••••••   👁

☐ DHCP

IP Address *   Subnet mask *
192.168.1.131   255.255.255.0

Gateway
192.168.1.1

Preferred DNS
8.8.4.4   ×   Alternate DNS   ×

TEST INTERNET CONNECTION (WI-FI)

SAVE

WI-FI

Hostname: device hostname.

MAC: mac address of the device over Wi-Fi.

SSID: Wi-Fi network identifier to which the device is connected

Password: The password of the Wi-Fi network to which the device is connected.

DHCP: If there is a router or modem in the network where your device is connected with DHCP enabled, this feature allows the device to automatically receive the IP configuration needed to establish a connection.

IP address: set the device's IP address (DHCP not active)

Subnet mask: sets the device's Subnet mask (DHCP not active).

Gateway: sets the device gateway (DHCP not active)

Primary DNS: sets the primary DNS (DHCP not active)

Alternate DNS: set the alternate DNS (DHCP not active)

Click on **"SAVE"** to store the parameters.

DATE AND TIME

This section allows you to set the date and time of your device, time zone and NTP server to which you want to sync (if enabled).

Date & time

System date
16/12/2024 16:17   [SYNCHRONIZED]

Time zone
Etc/UTC   ×

☑ Enable NTP

NTP server
pool.ntp.org

SAVE

Click on **"SAVE"** to store the parameters.

IMPORT / EXPORT CONFIGURATION

This section allows you to import an existing configuration or export one by saving it on your PC in JSON format. This feature is useful if you need to configure multiple gateways with the same parameters and devices, avoiding re-entering everything.

CHANGE PASSWORD

This section allows you to change the password for accessing the webserver.

Click on **"SAVE"** to store the parameters.

LANGUAGE

This section allows you to set the desired language.

MAINTENANCE

This section allows you to update the device firmware, to have information about request technical assistance, save a Log file (diagnostic) of the system on your PC and restart the device.

**Important:** to update the firmware you need to have the update file with extension. *swu*

The DAT3680IOT devices are equipped with *"Recovery"* mode. The *Recovery* section provides access to device maintenance, reset of default parameters and firmware update.
To start the device in recovery mode, turn on the DAT3680IOT by holding the button on the front pressed for at least 5 seconds, then release it.Via browser it is possible to access to the Recovery section by typing the default address **192.168.1.100** in the browser's address bar.
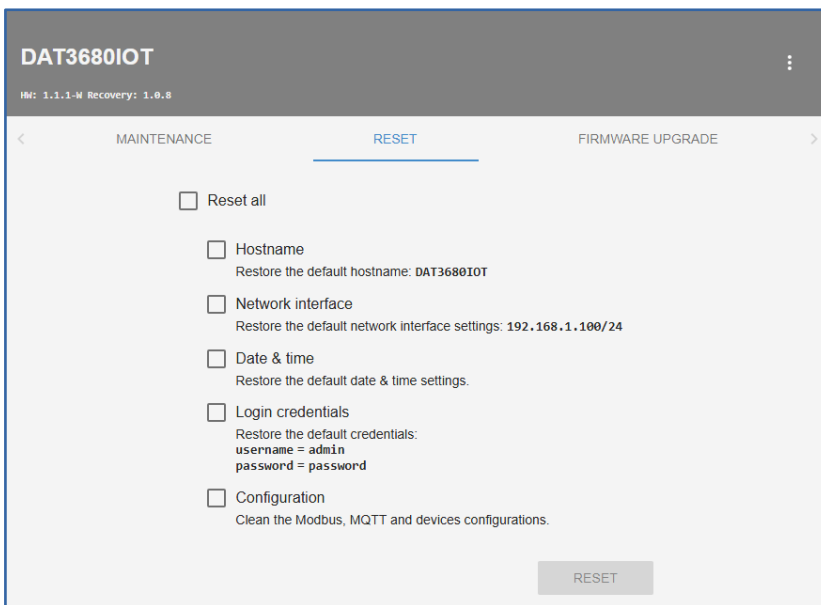
MAINTENANCE
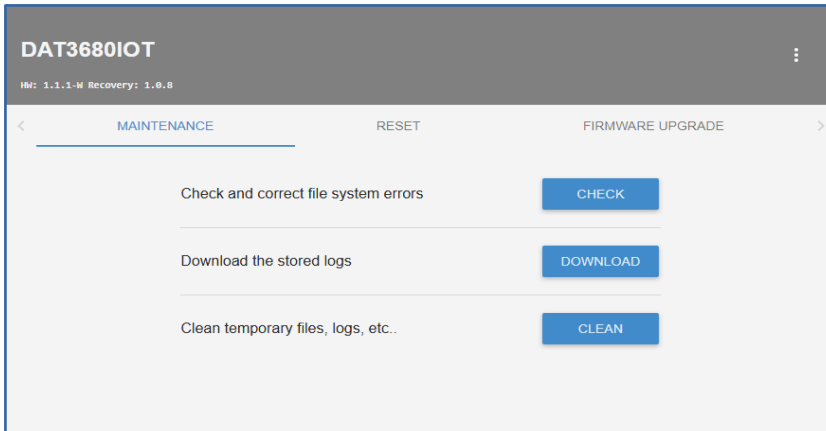
<u>From this page it is possible:</u>

- Check and correct errors in the file system;

- Download system logs;

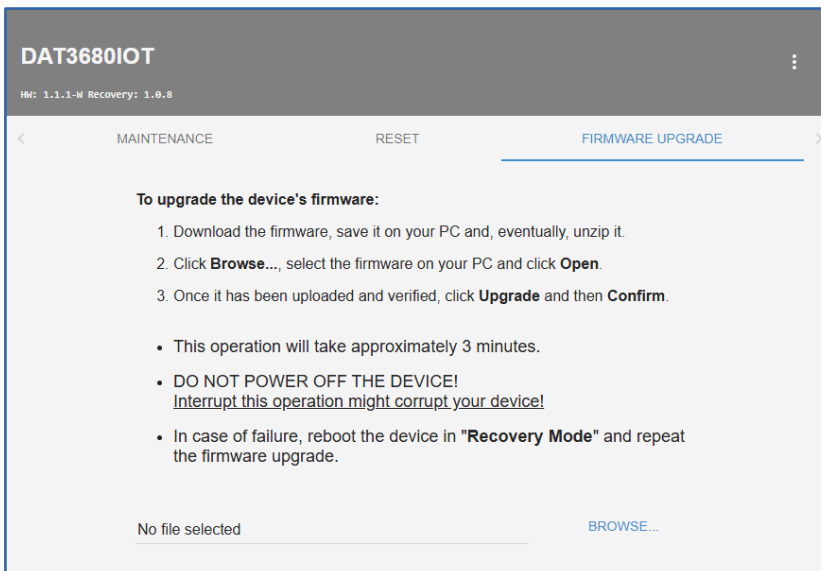- Perform cleaning of temporary files.

RESET

<u>From this page it is possible:</u>

- Perform a full reset by returning the device to its factory state;

- Restore the hostname;

- Restore the default IP address;

- Restore the default login credentials;

- Restore the Modbus, MQTT and device configuration.

FIRMWARE UPDATE

If it isn't possible to upgrade the device from the dedicated *Firmware Update → Maintenance* section of your webserver, it is possible to use this recovery section.

Important: follow the instructions carefully to ensure that the update is successful.
To update the device, it is necessary have the update file with extension *.swu*

ED.01.25 REV.00