Klemsan®

MODBUS MQTT Gateway

KG50xx Series
User Guide

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Chapter 1 GENERAL INFORMATION

Chapter 2 DEVICE DEFINITIONS

Chapter 3 WEB INTERFACE

Chapter 4 TECHNICAL SPECIFICATION

CHAPTER 1

GENERAL INFORMATION

1.1 Proper Use and Safety

• Installation and connections must be made by authorized persons in accordance with the instructions in the user manual. The device should not be started until the connections are made correctly.

• Before the device is connected to the mains, make sure that the power is turned off.

• Use a dry cloth to clean the device and remove dust. Do not use alcohol, thinner or an abrasive substance.

• The device must be activated only after all connections have been made. Do not open the inside of the device. There are no parts in it that users can interfere with.

• The device should be kept away from humid, wet, vibrating and dusty environments.

! The manufacturer is not responsible for any undesirable situations that may arise as a result of non-compliance with the above measures.

1.2 General Characteristics

The KG50xx Series devices are an IoT Gateway designed to convert Modbus RTU and Modbus TCP protocols to MQTT protocol. In october, In addition to that conversion, it can also be used as a Modbus gateway by converting between Modbus RTU and Modbus TCP protocols. The device has 2 RS485, 2 RS232 and Ethernet interfaces. The device can join the TCP/IP infrastructure with an Ethernet interface, as well as optionally using WI-FI and 4G.

• Supports MQTT, Modbus TCP and Modbus RTU protocols.

• Provides secure end-to-end connection thanks to TLS/SSL support.

• With the help of the MQTT protocol, it allows devices with RS485-RS232 serial communication interfaces to communicate with each other.

• It provides up to 40 remote connection support.

• Provides version update functionality via web interface.

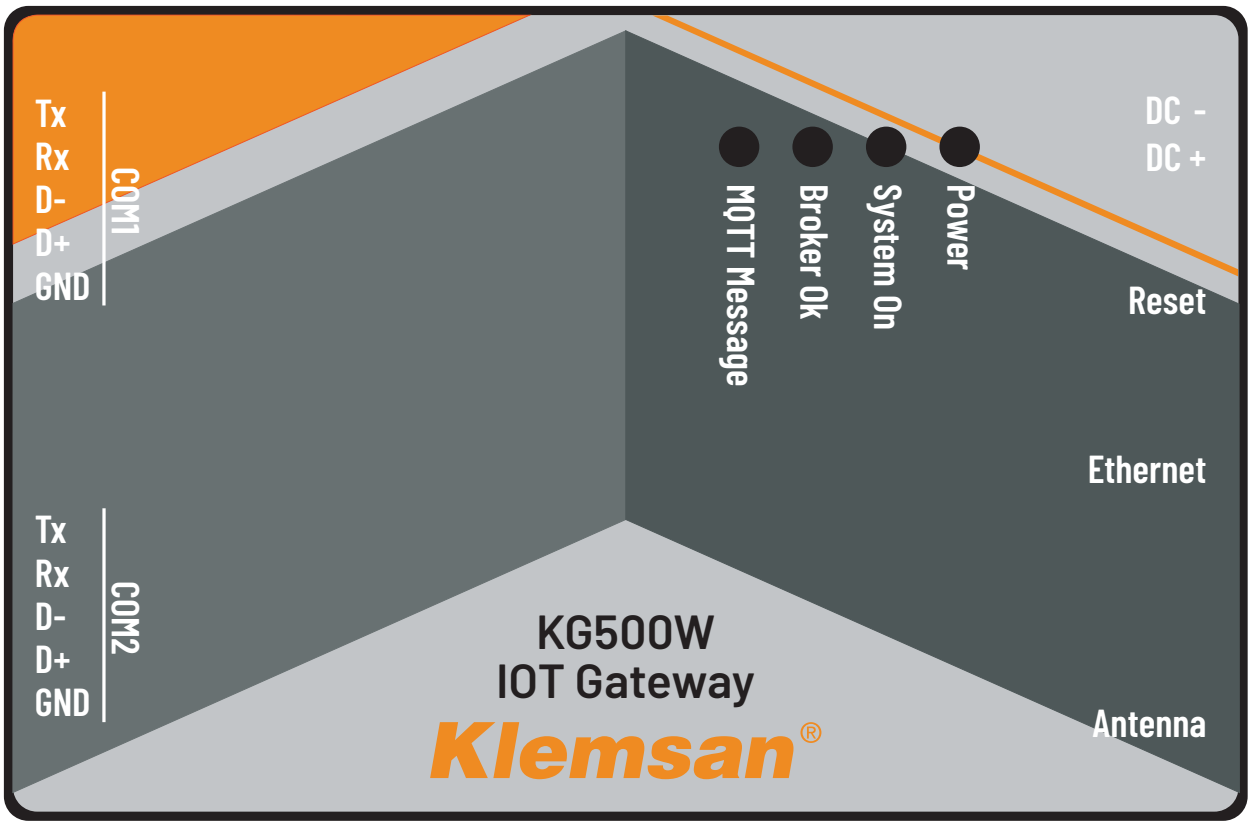
Product Selection Table

Product Name	Order Number	Product Description	Hardware Type	Register Count
KG500	601710	Modbus - MQTT Gateway	Ethernet	500
KG500W	601720	Modbus - MQTT Gateway	Ethernet + WI-FI	500
KG500G	601730	Modbus - MQTT Gateway	Ethernet + 4G	500

CHAPTER 2

DEVICE DEFINITIONS

About 30 seconds after the device is powered on, a warning sound will be heard, which means that the operating system has started. After about 40 seconds the operating system is turned on, 2 more warning sounds will be heard at short intervals. These sounds mean that the operating system is activated on the device. You can connect to the web interface of the device after operating system is activated.



2.1 Physical Connections

DC+ / DC- Terminals
These are the terminals where the power inputs are connected to the device. A voltage between 9V ... 36V DC should be applied.

Ethernet
The device communicates over Ethernet interface using Modbus TCP and MQTT protocol.

COM1 and COM2 Terminals
These are the terminals where the serial communication interfaces are located. The device has 2 independent RS485 and 2 RS232 communication interfaces.

The RS232 communication interface is named as Tx and Rx, and the RS485 communication interface is named as D+ and D-.

Antenna (Antenna)
It is found on devices that provide communication using the WI-FI network. It is the SMA type port where the external antenna connection is made.

Micro SIM Card Input
It is found on devices that provide communication using the GSM infrastructure. This input only supports micro SIM cards. If the micro SIM card is not inserted or if a micro SIM card is inserted that does not have the PIN unlocked, the device will not be able to connect to the GSM network.

2.2 LED Notifications and Buttons on the Device

There are 4 LEDs on the device.

Power
The red LED indicates that the device is energized. After the device is energized, it will remain active continuously.

System On
The yellow LED indicates that the device's operating system has started to boot. It blinks continuously when the operating system starts (approximately 30 seconds after powering up).

Broker Ok
The yellow LED indicates that it is connected to the Broker which the communication will be made using the MQTT protocol. After the connection is established, the LED will remain active continuously. As a result of any interruption of the broker connection (Ethernet, WI-FI or GSM), the relevant LED will be active for approximately 5 more minutes. During this time, the device tries to send data to the broker. If the connection cannot be established, the LED will be passive.

MQTT Message
A yellow LED means that the device is sending data to the broker. The successful and unsuccessful datas received by Modbus become active after they are sent to the MQTT broker in JSON format.

Reset Button
When the reset button is pressed for >2 seconds, the device's IP address and web interface login password will return to default.

Default IP is "192.168.35.15"
Default Password is "1234"

If IP reset is done for KG500W, WI-FI information (WI-FI SSID and password) will be deleted.

CHAPTER 3

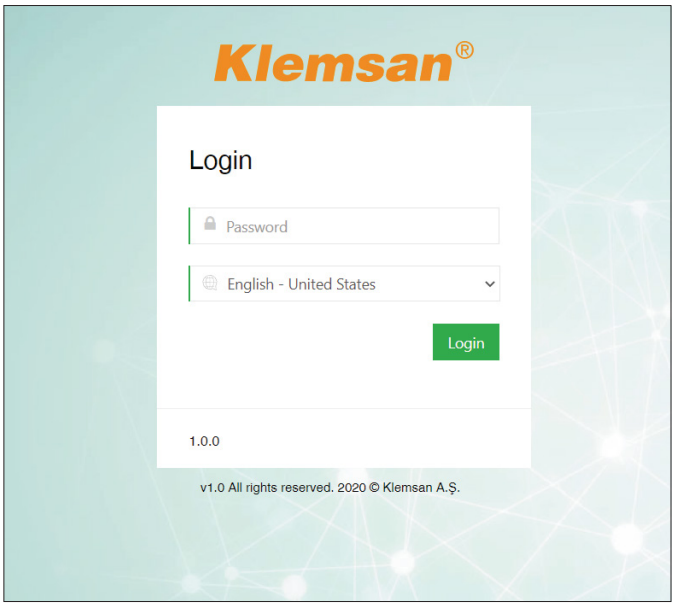
WEB INTERFACE

The KG50xx web interface is a software that runs on an embedded web server, where all devices of the KG50xx series can be configured. The home page can be accessed by typing the IP address of the KG50xx series in the address field of the Internet browser. The IP address of the forgotten devices can be returned to the default IP address by pressing the ”Reset" button for >2 seconds.

The Default IP Address is “192.168.35.15”

3.1 Login

After the IP address of the device is typed into the Internet browser, the “Login” screen opens. The password information must be entered on the login page. Devices whose password information is forgotten are set to the default password by pressing the ”Reset" button for >2 seconds.



3.1.1. Login Screen

Default Password: 1234

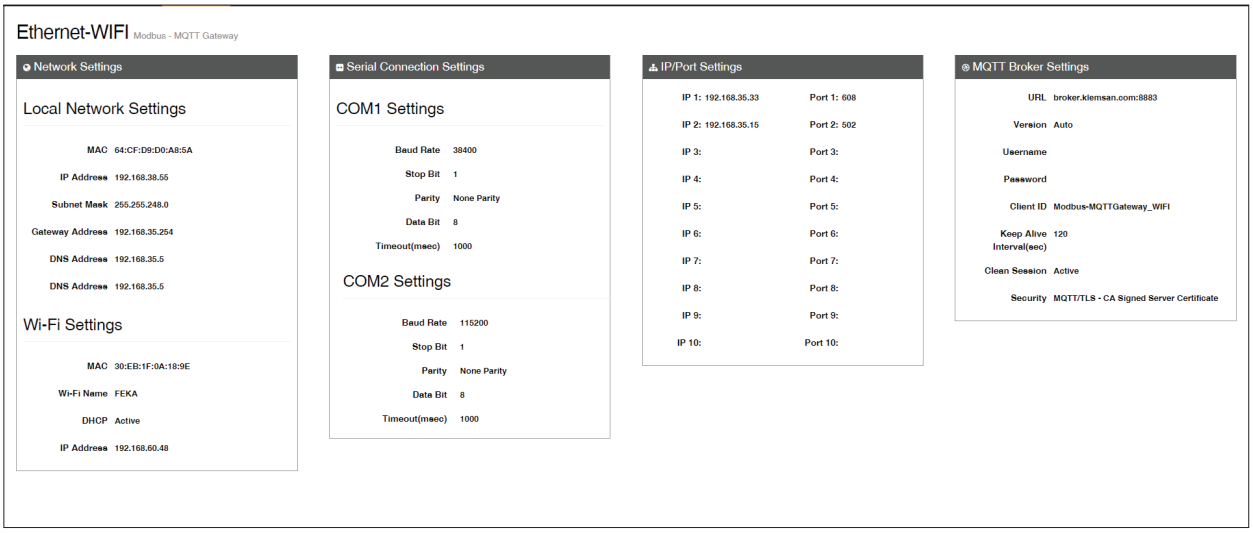
After successful login, the welcome screen opens. There are 4 pieces of information in the welcome message.

Last successful login: Shows the time information of the previous successful login.
Last successful login IP: Shows the IP address information of the computer with which the previous successful login was made.
Last failed login: Displays the time information of the previous failed login attempt.
Last unsuccessful login IP: Shows the IP address of the computer with the previous unsuccessful login attempt.

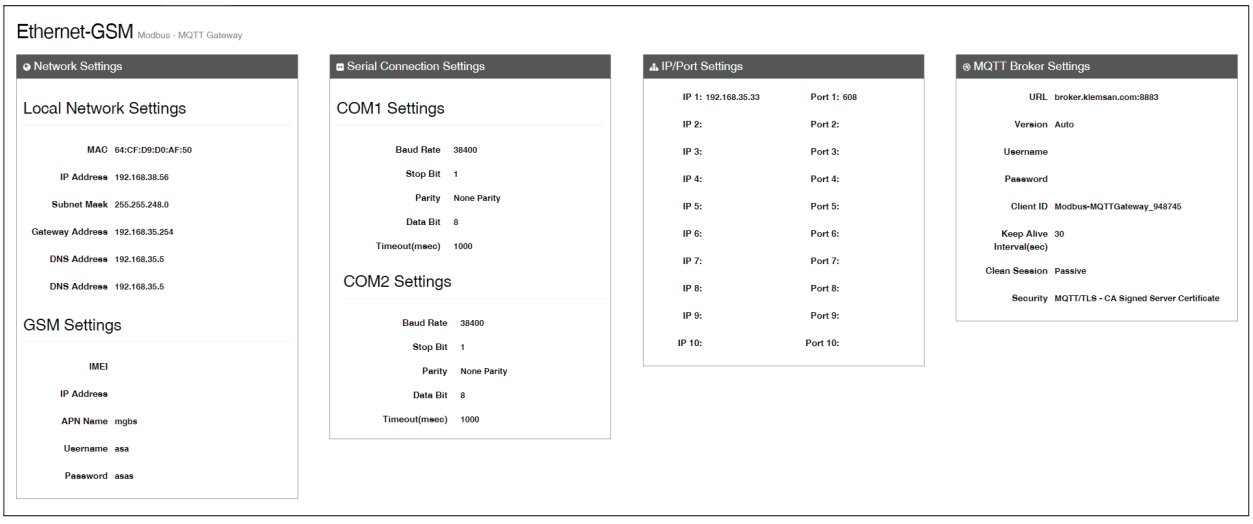
If the web interface is logged in using the default password, a password change warning is given for security reasons. Changing the password can be done by clicking on the ” OK" button. The process of changing the password is described under the Security **heading 3.4.1.**

3.2 Dashboard

It is the page where the general device settings are shown.



3.2.1 Ethernet-WIFI Model Dashboard

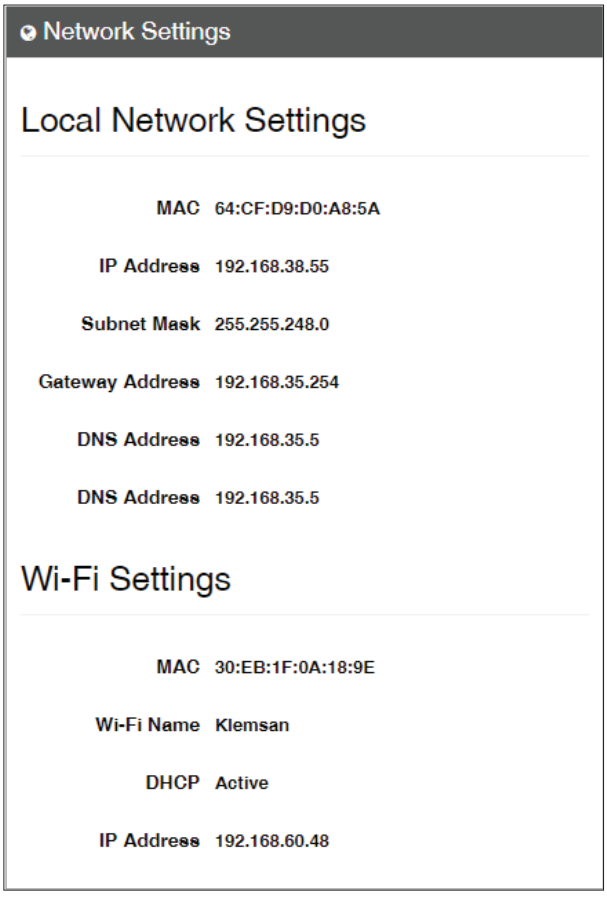


3.2.2 Ethernet-GSM Model Dashboard

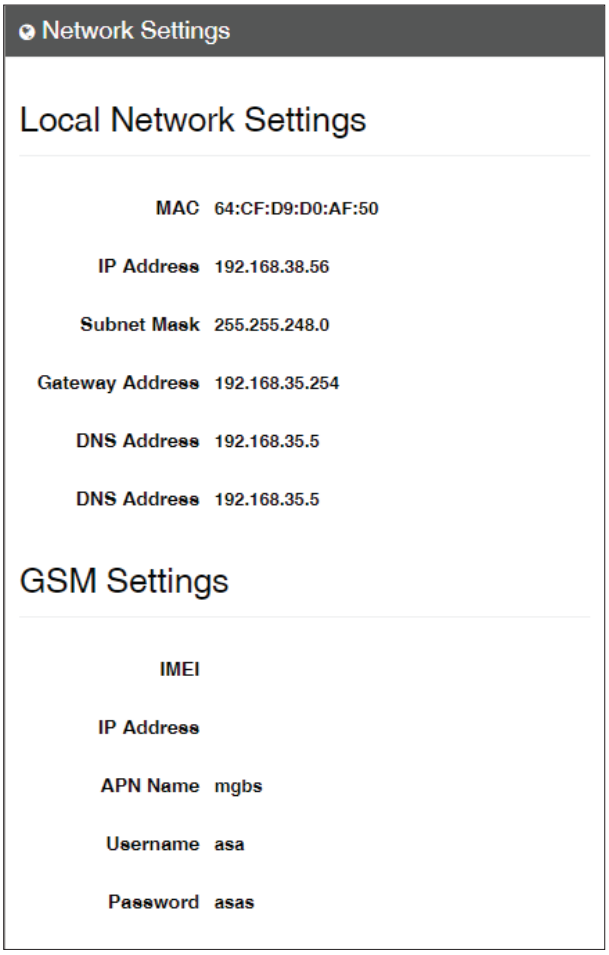
The dashboard image varies according to the models.

3.2.1 Network Settings

This is the section showing the network settings of the Ethernet, WIFI and GSM interfaces, which vary depending on the device model.



3.2.1.1 Dashboard Ethernet-WIFI Network Settings



3.2.1.2 Dashboard Ethernet-GSM Network Settings

Under the local network settings, the device's Ethernet MAC address, static IP address, subnet mask, gateway address and DNS address information are available.

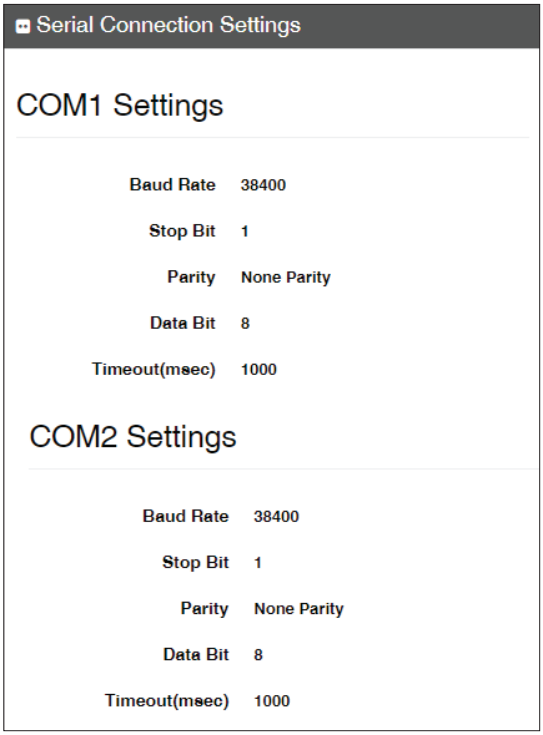
Since the Ethernet port is common to all KG50xx Series devices, **"Local Network Settings"** information is also common.

There is **"WI-FI Settings"** on the KG500W model device. Under WI-FI settings, there are WI-FI MAC address, wireless network name (SSID) connected via WI-FI, DHCP activity status information and IP address. If DHCP is inactive, subnet mask and gateway address information are also included.

KG500G series model devices have "**GSM Settings**". Under GSM settings, there are IMEI number, IP address, APN name, user name and password.

3.2.2 Serial Connection Settings

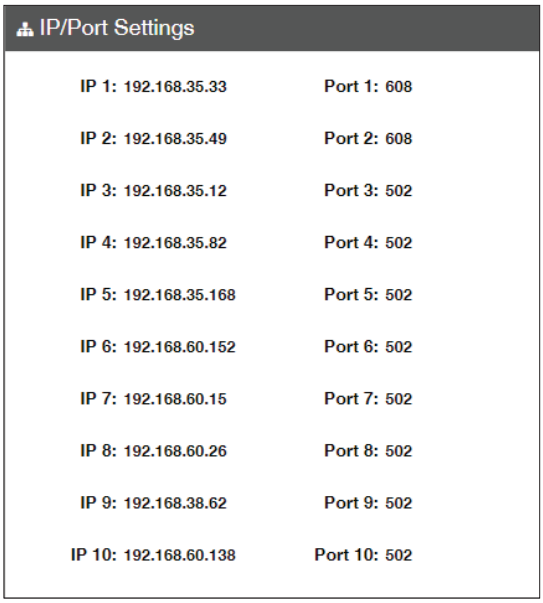
The baudrate, stop bit, parity and data bit information of the device's COM ports are included in this section.



3.2.2.1 Dashboard Serial Connection Settings

3.2.3 IP/Port Settings

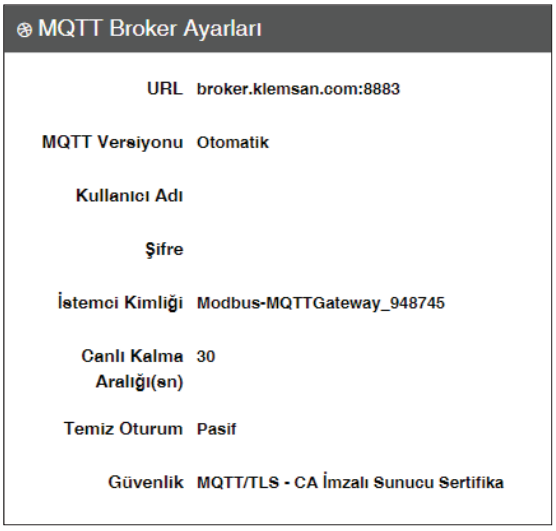
This is the section showing the IP/Port settings where Modbus TCP-MQTT conversion will be made. IP and Port information can be defined for up to 10 devices that support Modbus TCP.



3.2.3.1 Dashboard IP-Port Settings

3.2.4 MQTT Broker Settings

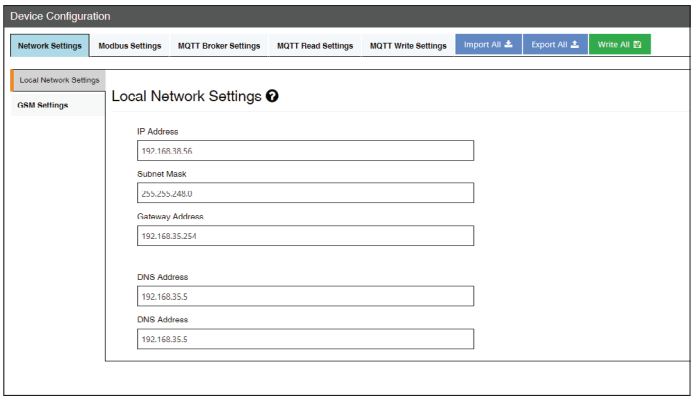
It is the section where the broker settings on the device are shown. Broker URL, version, username, password, client ID, keep alive interval, clean session, security information are displayed in this field.



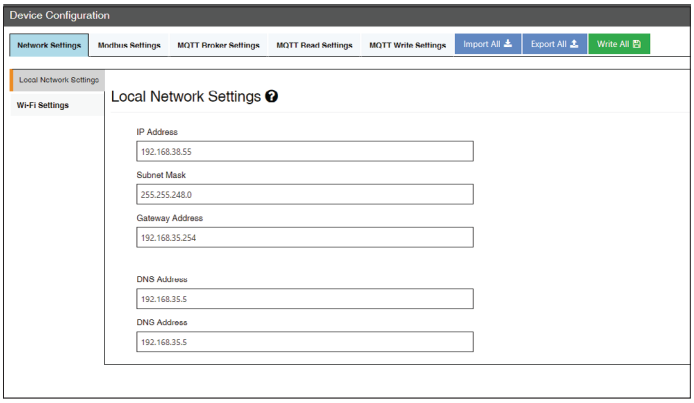
3.2.4.1 MQTT Broker Settings

3.3 Device Settings

It is the section where device settings are made. All settings can be exported or imported. After all the configurations made, the settings should be written to the device by using the **"Write All"** button.



3.3.1 Ethernet- GSM Model Device Settings



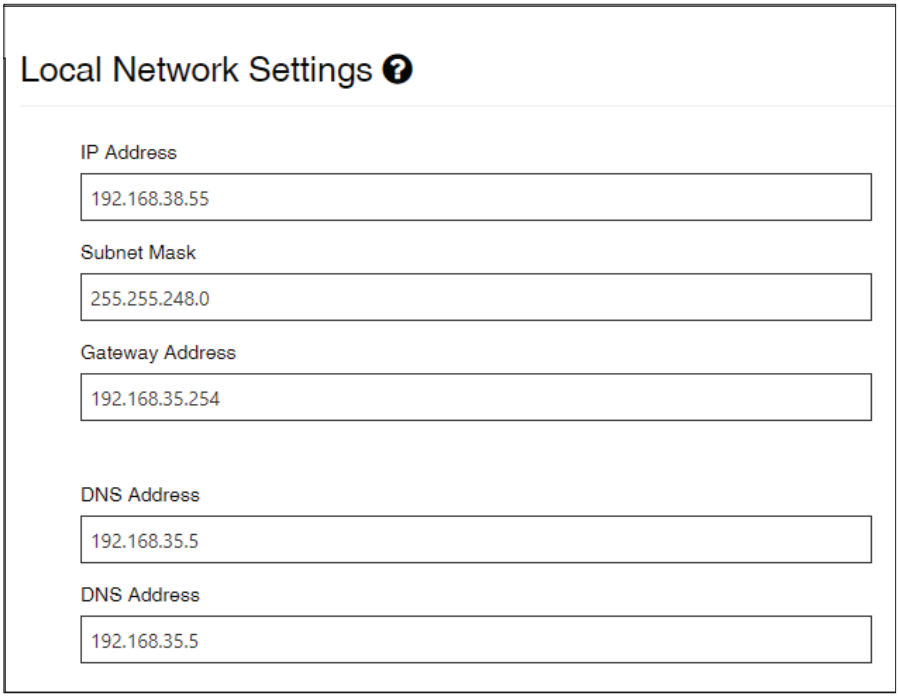
3.3.2 Ethernet-WIFI Model Device Settings

3.3.1 Network Settings

In this section, the settings of the Ethernet, WI-FI and GSM interfaces of the devices are made. Depending on the device model, the information shown on therelevant page may vary.

3.3.1.1 LAN Settings

This is the section where IP address, subnet mask, gateway and DNS address settings are made for the Ethernet interface of the device. KG50xx series devices have Ethernet port in common and this page is common to all.



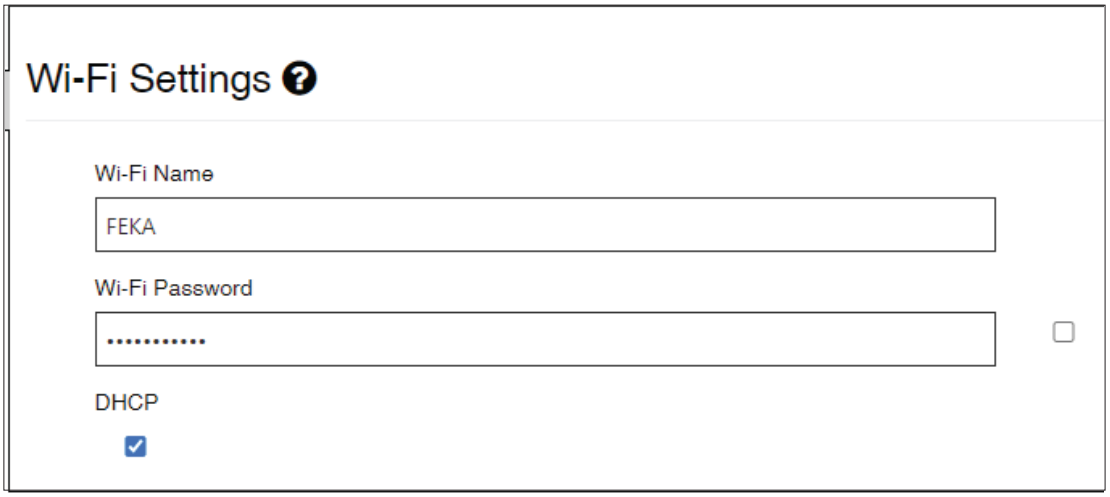
3.3.1.1.1 LAN Settings

Basic information about the menu can be obtained by navigating to the icon with an arrow on the next to the title in the page.

3.3.1.2 WI-FI Settings

In this section on KG500W devices, necessary settings are made for the device to be included in the WI-FI network. In order to join the WI-FI network, the WI-FI Name (SSID), WI-FI password and IP information must be entered. If DHCP is enabled, a random IP will be assigned to the device.

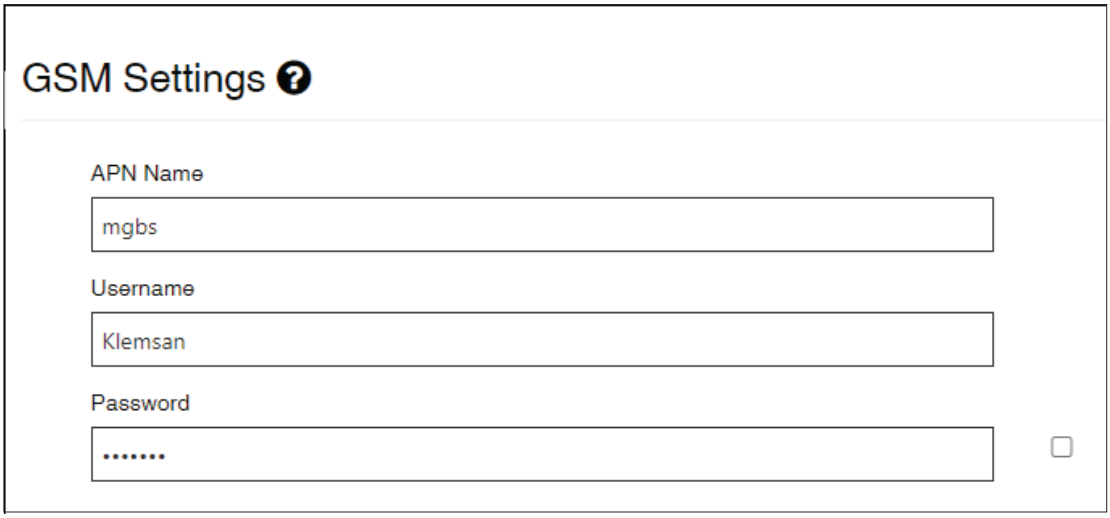
It can be connected to the web interface with the Ethernet IP or WI-FI IP of the device.



3.3.1.2.1 WI-FI Settings

3.3.1.3 GSM Settings

In this section on KG500G devices, the necessary settings are made for the devices to connect to the internet using the GSM infrastructure. APN name, user name and password are entered.



3.3.1.3.1 GSM Settings

Basic information about the menu can be obtained by navigating to the icon with an arrow on the ? next to the title in the page.

3.3.2 Modbus Settings

This is the section where the device's Modbus settings are made.

3.3.2.1 Serial Connection Settings

Serial connection settings of the device are made in this section. There are 2 COM Ports on the device. Each COM port has 1 RS485 and 1 RS232 interface.

RS485 and RS232 interfaces in the same COM Port can be used for simultaneous communication, provided that the slave ID of the serial devices connected to the KG50xx Series is different.

There is no need to make any adjustments via the web interface for this process.

Supported serial communication parameters in KG50xx Series devices are as follows.

Baudrate: 2400, 4800, 9600, 19200, 38400, 57600 ve 115200
Default: 38400

Stop Bit: 1 ve 2
Default: 1

Parity: None Parity, Odd Parity and Even Parity
Default: None Parity

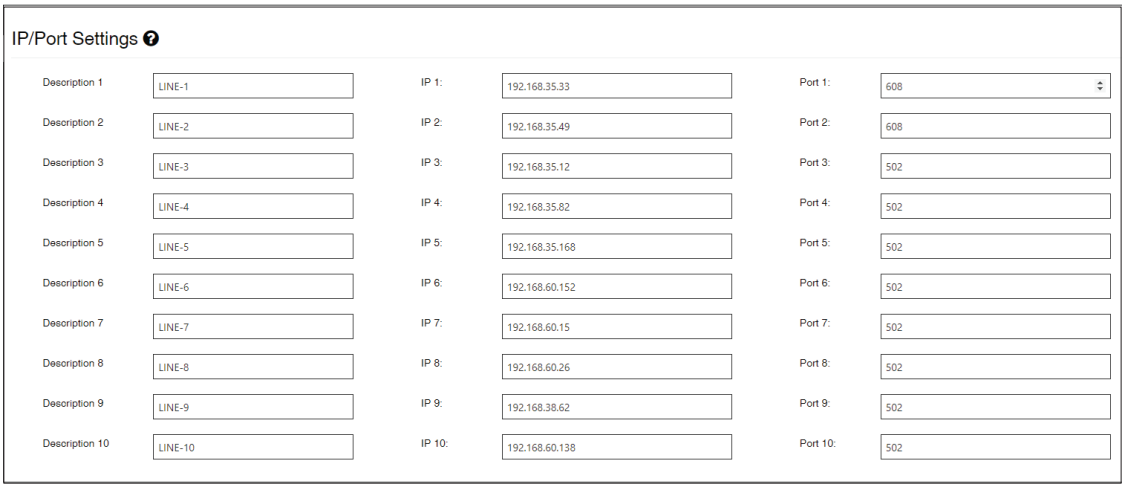
Data Bit: 7 ve 8
Default: 8

3.3.2.1.1 Serial Connection Settings

Basic information about the menu can be obtained by navigating to the icon with an arrow on the ? next to the title in the page.

3.3.2.2 IP/Port Settings

This is the section of the IP and Port information of the gateway or gateway-enabled devices where Modbus TCP to MQTT conversion will be made are entered. IP and Port information can be defined for up to 10 devices that support Modbus TCP. IP/Port data has been entered can be named thanks to the “Description” box.



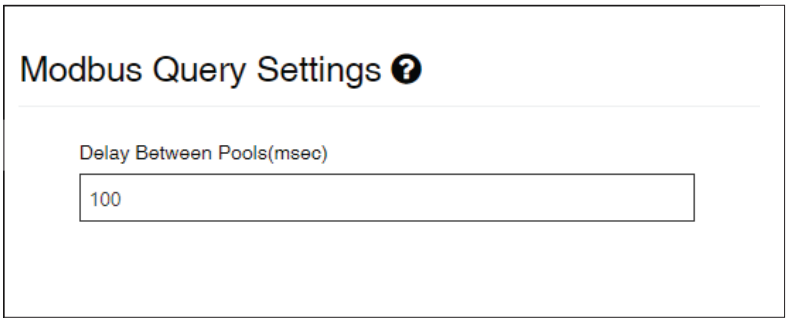
3.3.2.2.1 IP-Port Settings

> Basic information about the menu can be obtained by navigating to the icon with an arrow on the ❓ next to the title in the page.

3.3.2.3 Modbus Query Settings

It is the section where the delay time between Modbus queries is adjusted.

> This parameter is commonly used for both Modbus TCP and Modbus RTU.



3.3.2.3.1 Modbus Query Settings

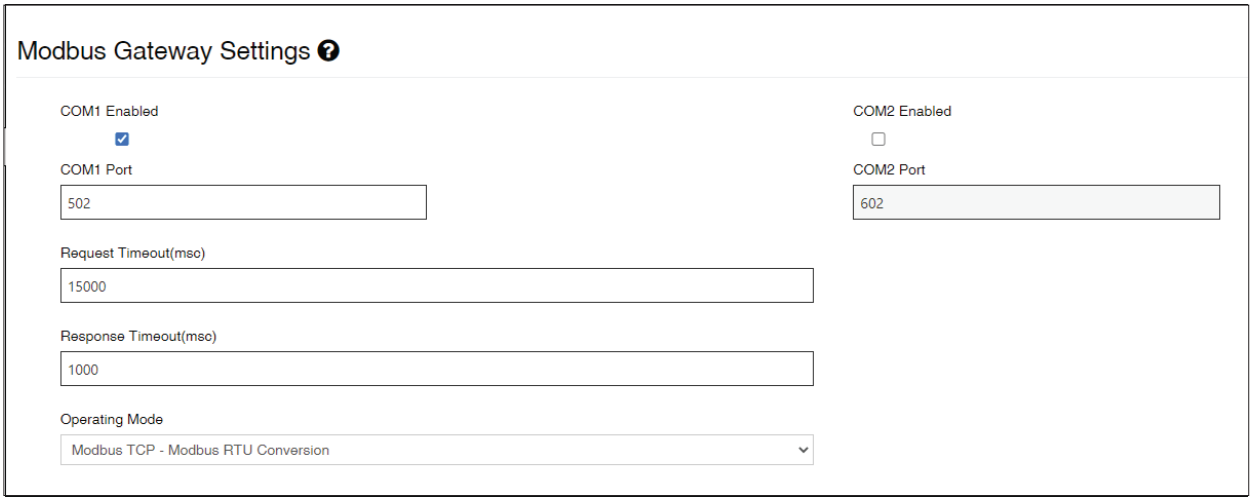
> Basic information about the menu can be obtained by navigating to the icon with an arrow on the ❓ next to the title in the page.

3.3.2.4 Modbus Gateway

The device can be used both as a Modbus-MQTT gateway and as a Modbus gateway simultaneously. When it is desired to exchange data via Modbus or transparently (independent of protocol), the relevant settings are made on this tab.

Modbus communication over which COM port/ports should be selected and Request / Response Timeouts should be determined. COM 1 and COM 2 can be activated at the same time. The operating mode of the device (Modbus TCP-Modbus RTU or Transparent) is also determined under this section.

When the COM 2 port is activated, the **"Serial Bridge"** feature cannot be used.



3.3.2.4.1 Modbus Gateway Settings

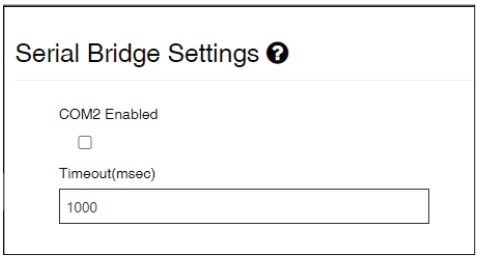
Basic information about the menu can be obtained by navigating to the icon with an arrow on the ? next to the title in the page.

3.3.2.5 Serial Bridge Settings

The KG50xx series provides monitoring and control of serial devices over TCP/IP infrastructure using MQTT and/or Modbus TCP protocols. The serial bridge function is used to communicate between the master that does not support TCP/IP infrastructure and serial devices.

Master device that does not support TCP/IP is connected to COM 2 terminals. KG50xx series forwards the query it receives from COM 2 to COM 1. It transmits the response from COM 1 to COM 2.

1- This operation can only be done for the COM 2 port.
2- When this feature is activated, Modbus Gateway feature cannot be used.



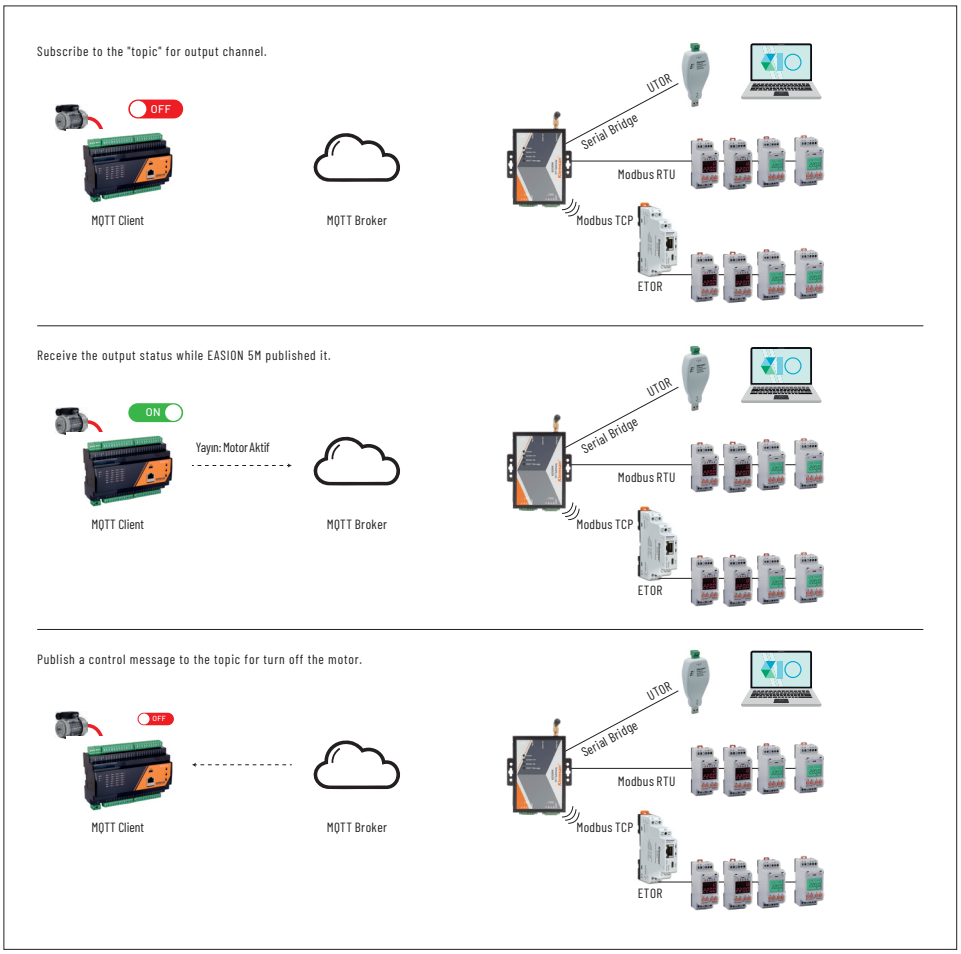
3.3.2.5.1 Serial Bridging

Basic information about the menu can be obtained by navigating to the icon with an arrow on the ? next to the title in the page.

3.3.3 MQTT Broker Settings

MQTT is a telemetry messaging protocol based on publishing and subscription, allowing communication from machine to machine (M2M). It allows publishing or receiving messages over TCP/IP.

Devices performing MQTT communication runs as a client and sends messages on the server called broker they are connected to. Brokers may be private and also brokers such as open source test.mosquitto.org, iot.eclipse.org are the most commonly used brokers.



3.3.3.1 MQTT Communication

In this section, the settings of the broker to which the device will connect and send data are made.

URL: The address information of the broker to be connected is entered in this field. This information can be entered as **"IP:Port"** or as **"URL:Port".**

Such as;
IP:Port: 5.196.95.208:8883
URL:Port: **test.mosquitto.org:8883**

MQTT Version: This is the field where the MQTT version supported by the broker is entered. Two MQTT versions, 3.1 and 3.1.1, are supported on the device. If the version information is selected as **"Automatic"**, the version information supported by the broker is automatically selected.

User Authentication: This is the part that must be activated in order to enter the "User Name" and "Password" information.

User Name and Password: If the broker to be connected supports the connection with the user name and password for security purposes, the relevant user information should be entered in this field. When this information is left blank, the device will try to connect to the broker without user name and password information.

Clean Session: When the clean session is activated, device information is not kept in the broker. When the connection is lost, the information is reset and a reconnection is required. In passive mode, there is no need to resubscribe when the connection is lost and comes back again.

Client ID: It is the identity of the client device that will exchange data with the broker. This ID must be unique for devices that will be connected to the same broker. It is recommended to add the serial number of the device to the ID provided so that this information can be uniquely identified.

Such as;
Modbus-MQTT-Gateway-xxxxxx **(xxxxxx» presents the serial number.)**

Keep Alive Interval: If there is no data flow within the time specified here, the device sends a ping to the broker and waits for a response, if it receives a response, it is confirmed that the connection still exists and this period starts over. If there is no response from the broker at the end of this period, it means that the broker connection is broken and the **"Will Message"** information defined in the device will be published by the broker.

At the end of a maximum of 2 times the time defined here; a ping is sent to the broker and it is understood whether there is a connection.

Will Flag: This is the part where the **"Will Message"** information to be sent when the broker connection is lost is activated.

Will Topic: It is the topic of the **"Will Message"** information to be sent.

Will Message: It is the message sent under the **"Will Topic"** when the connection is lost.

Will Retain: If activated, the **"Will Message"** information is kept in the broker.

Will QoS: This is the field where the quality of the **"Will Message"** information to be sent is determined.

Security: This is the part where the security type of the broker connection is determined. Three different security types are supported: “MQTT/TCP”, “MQTT/TLS - CA Signed Server Certificate” and “MQTT/TLS-Self-Signed Certificate”.

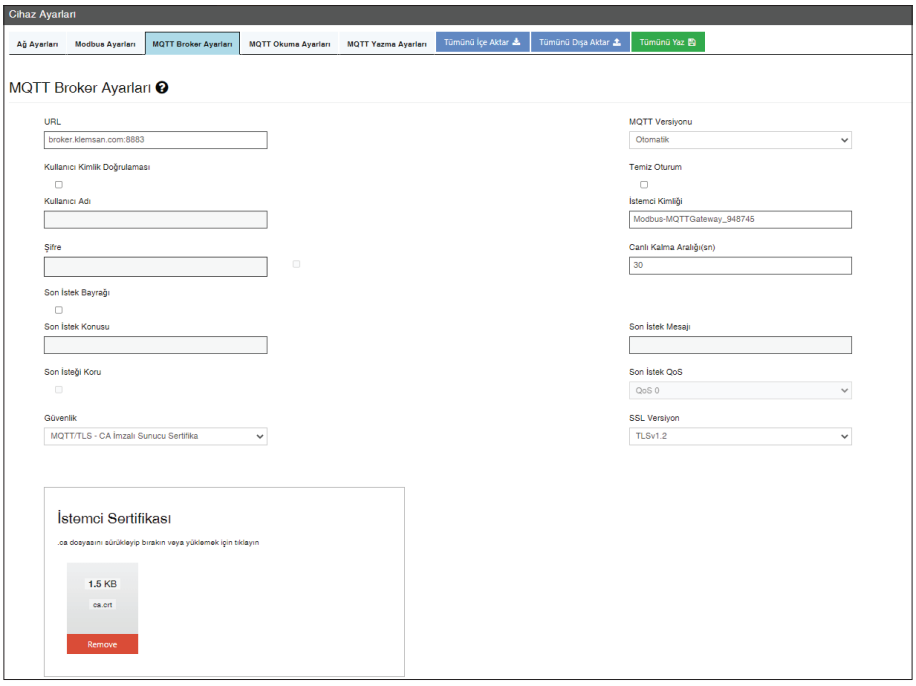
- If “MQTT/TCP” is selected, the connection is made without security. No certificate information is required.
- If “MQTT/TLS CA Signed Server Certificate” is selected, connection is made with a single-party signed certificate. "Client Certificate" is required.
- If “MQTT/TLS Self-Signed Certificate” is selected, connection is made with 2 certificates and key files. “Client Certificate”, “Server Certificate” and “Server Key File” are requested.

Devices that do not have the relevant certificates cannot be connected to the broker.

MQTT protocol is actively used with TLS/SSL support for security reasons both in private applications and IoT platforms. In order to use it with TLS/SSL support, certificates must be created on the server where the broker is located.

SSL Version: It is active when the Security Type MQTT/TCP is not selected. The SSL/TLS version of the certificate created for the relevant broker must be selected.

In this context, KLEMSAN offers broker and certificate services.



3.3.3.2 MQTT Broker Settings

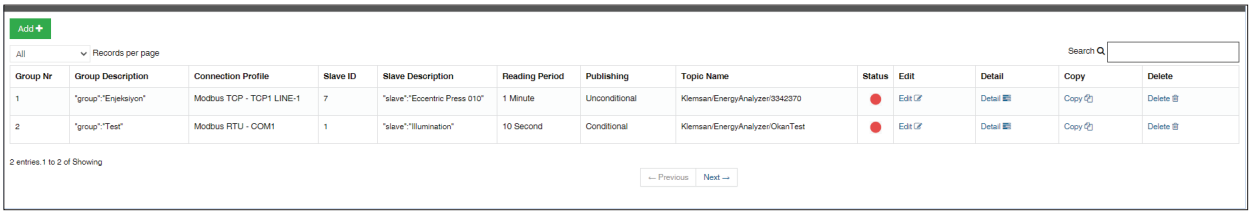
Basic information about the menu can be obtained by navigating to the icon with an arrow on the ? next to the title in the page.

3.3.4 MQTT Reading Settings

The KG50xx series send data read using the Modbus protocol to the broker via the MQTT protocol by converting it to the JSON format. The read Modbus values are managed on this page.

3.3.4.1 Creating a Data Group

A new data group can be added to be read using the “Add” button located at the top left of the page. The added data group contains the information ”Group Nr“, ”Group Description“, ”Connection Profile”, Slave ID“, ”Slave Description“, ”Reading Period“, ”Publishing“ and ”Topic Name".



3.3.4.1.1 MQTT Reading Settings

Group Nr: It is a field that increases numerically with the “Add” button and cannot be changed by the user.

Group Description: Description of the added data group should be entered here.

Connection Profile: It is the part where Modbus data is selected from which channel to be received. 2 different COM terminals (COM 1 and COM2) and one of 10 different TCP/IP addresses must be selected.

Slave ID: The slave ID of the serial device on the defined Modbus channel should be entered.

Slave Description: This is the part where the description information of the serial device whose slave ID is defined is entered.

Reading Period: This is the field where the data transmission period from the device to the broker is determined. The value and unit of time are defined separately. The minimum time value can be entered as “1”. The unit of time is; It can be selected as “Seconds”, “Minute”, “Hour”, “Day” and “Live Mode”. When "Live Mode" is selected, the device will continuously read data by Modbus and send it to the broker.

Publishing: There are two different options, conditional and unconditional. It is determined here whether the data group will be sent to the Broker when reading is performed. Data groups set to "Unconditional" are sent to the broker, while data groups set to "Conditional" are sent to the broker when the desired condition is met.

Detailed information about the transmission conditions are given under the heading **"3.3.4.2 Defining Modbus Addresses".**

Topic Name: It is the header information of the MQTT message to be sent to the broker.

After the settings described above are configured, the "Save" button is clicked to complete the data group creation process. Saved data groups can be edited by clicking the "Edit" button, and copied with a new "Group Number" by clicking the "Copy" button.

3.3.4.2 Defining Modbus Addresses

Modbus addresses must be defined after the data group saving is complete. Address identification can be done by clicking on the "Detail" section on the line containing the data group whose registration has been completed.

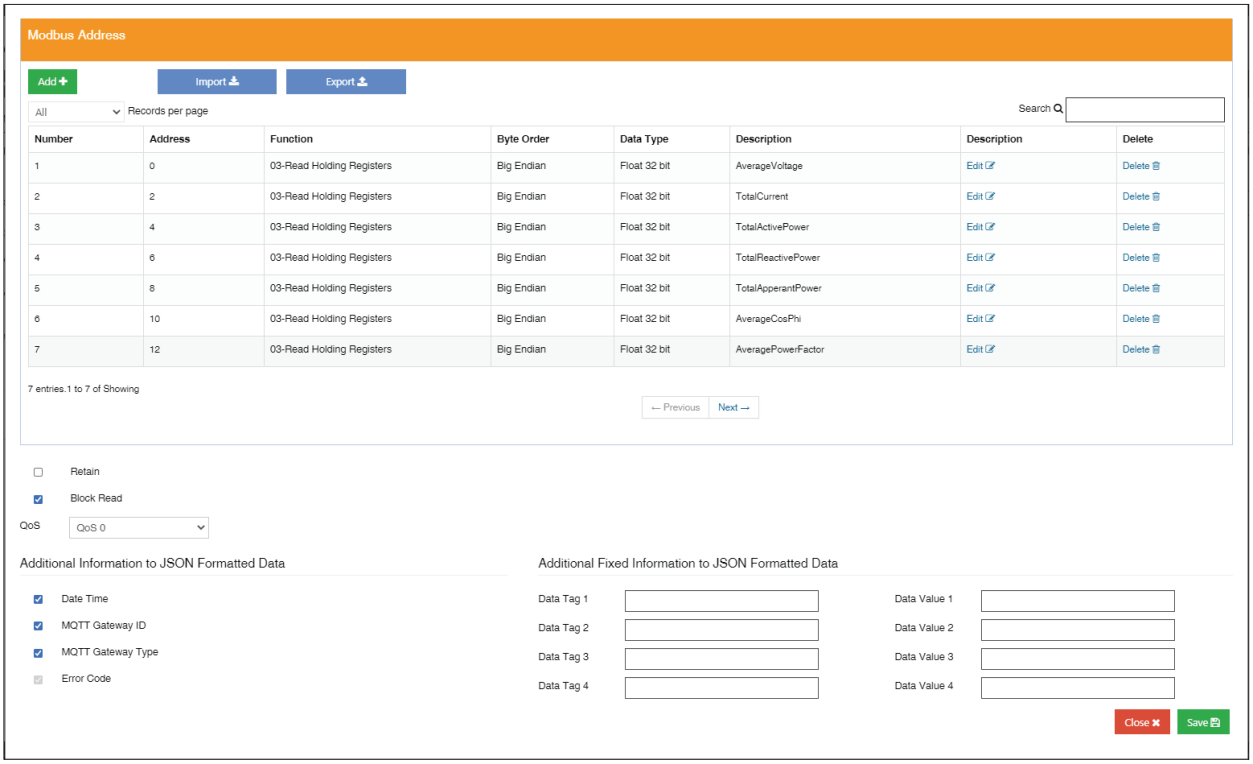
Address definition differs according to the "Conditional" and "Unconditional" options selected in the "Publishing" field. The number of addresses defined varies depending on the model.

In a data group defined as unconditionally, Modbus addresses can be created up to the number allowed by the device. In a conditionally defined data group, the number of Modbus addresses to be added is “1”.

The maximum number of addresses to be defined in the KG500x Series devices is 500.

3.3.4.2.1 Unconditional

In the "Publishing" type, which is defined unconditionally, the data received by Modbus is transmitted to the broker without checking. When the "Detail" part is clicked, there is an "Add" button in the upper left. Adding is done by clicking this button. In this field, “No”, “Address”, “Function”, “Byte Order”, “Data Type” and “Description” parameters are defined.



3.3.4.2.1.1 Unconditional Publsihing-Detail

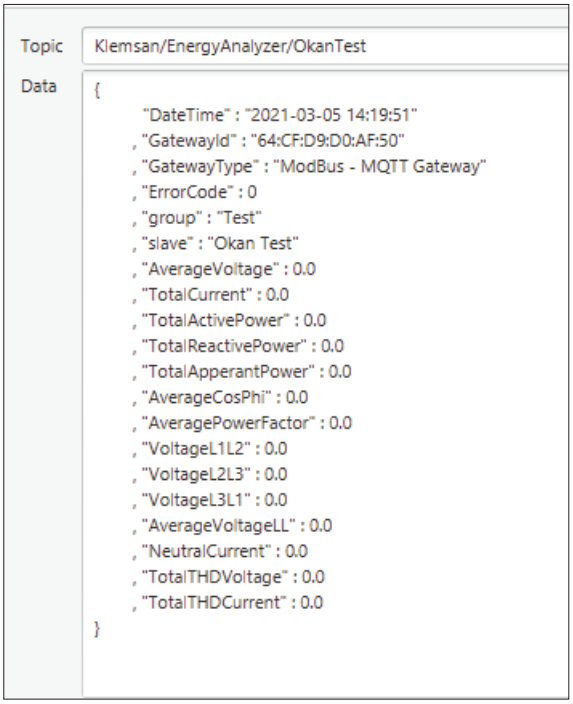
No: It is a field that increases numerically with the "Add" button and cannot be changed by the user.

Address: It is the Modbus address to be read.

Function: It determines with which function the relevant Modbus address will be read.

Byte Order: The format of the read data is defined.

Description: It is the name given to the Modbus address. The data read is sent with this name.

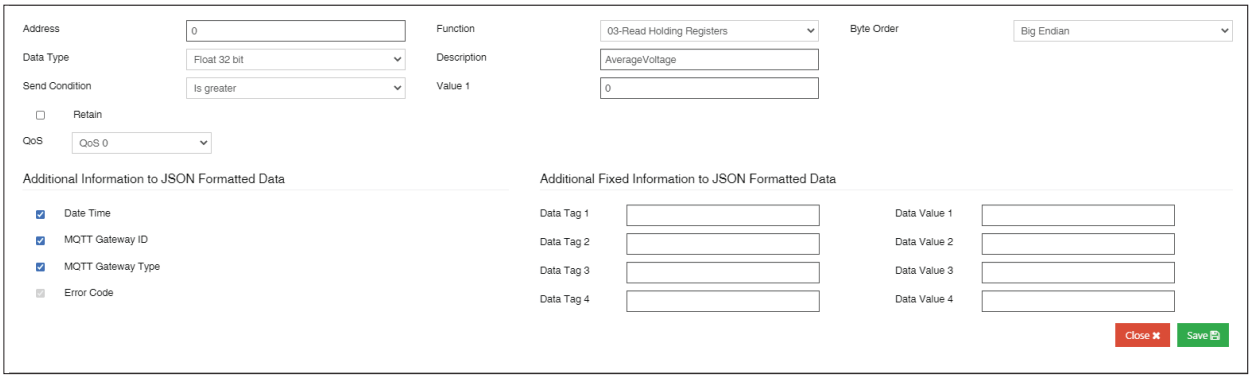


3.3.4.2.1.2 Unconditionally Published MQTT Message

"Additional Information to JSON Formatted Data", "Additional Fixed Information to JSON Formatted Data", "Retain", "Block Read" and "QoS" settings at the bottom of the detail page are explained under the heading **"3.3.4.2.3 Common Settings".**

3.3.4.2.2 Conditional

In the conditionally defined "Publishing" type, the data received by Modbus is transmitted to the broker if it complies with the specified condition. When the "Detail" section is clicked, a condition can be created for one Modbus address. In this field, "Address", "Function", "Byte Order", "Data Type", "Description", "Send Condition", "Value 1" and "Value 2" parameters are defined.



3.3.4.2.2.1 Conditional Publishing-Detail

Address: It is the Modbus address to be read.

Function: It determines with which function the relevant Modbus address will be read.

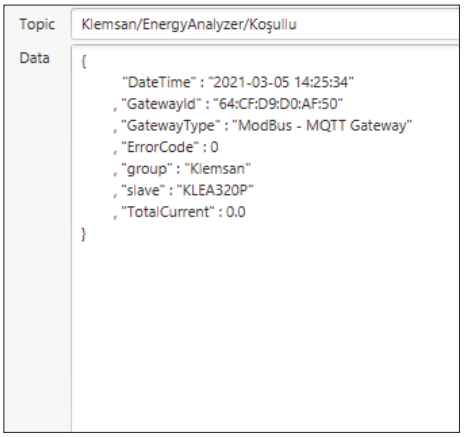
Byte Order: The format of the read data is defined.

Description: It is the name given to the Modbus address. The data read is sent with this name.

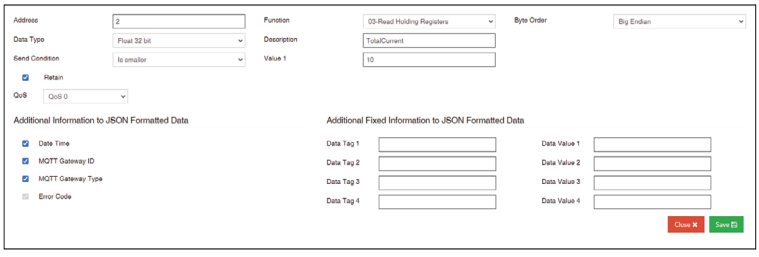
Send Condition: The condition of the data to be transmitted is selected here. 8 conditions can be selected. The conditions are as follows.

- Greater
- Smaller
- Equals
- Not equal
- Great Equal
- Small Equal
- In Range
- Out of Range

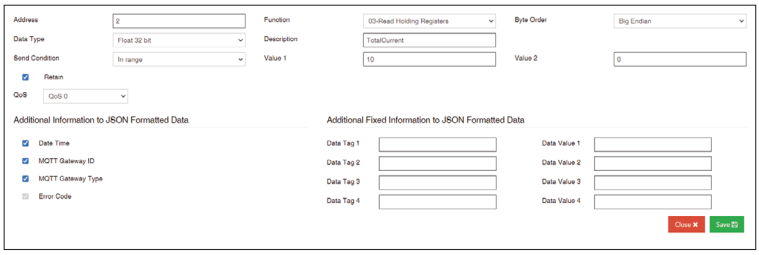
Value 1 and Value 2: "Value 1" and/or "Value 2" are entered according to the specified sending conditions.



3.3.4.2.2.2 Conditionally Published MQTT Message



3.3.4.2.2.3 Less than



3.3.4.2.2.4 In Range

"Additional Information to JSON Formatted Data", "Additional Fixed Information to JSON Formatted Data", "Retain", "Block Read" and "QoS" settings at the bottom of the detail page are explained under the heading **"3.3.4.2.3 Common Settings".**

3.3.4.2.3 Common Settings

Commonly made settings in "Publishing" types defined as "Conditional" and "Unconditional" are explained under this heading.

Retain: This is the part that is activated to store the last message sent to the broker. In case the connection is broken or no new data is received, the previous data will always be kept in the broker.

Block Reading: It is the part where it is determined whether the Modbus addresses to be read will be queried in a single query or separately. When activated, block addresses are read in a single query.

For example, 10 reads from address "2000.Modbus" and 6 from address "3000.Modbus"

Since only 1 data can be read in conditional reading, there is no **"Block Reading"** option.

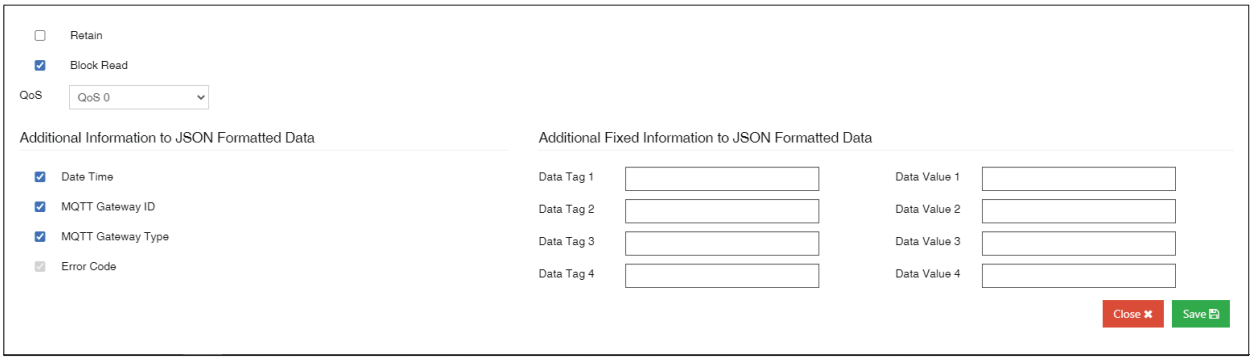
QoS (Quality of Service): It is the area where the message quality of the data to be sent is determined. There are 3 different options in total, 0, 1 and 2.

- QoS 0: The message is transmitted once at most. There is a possibility that it will not be transmitted.
- QoS 1: The message is transmitted but there may be repetitions.
- QoS 2: The message is transmitted exactly once.

Additional Information to JSON Formatted Data: Additional information to be sent in addition to the data read over Modbus is selected. If the following 4 parameters are activated, they are added to the sent MQTT message.

- Time; Device time at the time of Modbus read
- MQTT Gateway ID; MAC address of the device
- MQTT Gateway Type; Product model name
- Error code; The code of the error occurred in the read state (The error code is always active.)

Additional Constant Information to JSON Formatted Data: Additional constant information to be sent in addition to the data read over Modbus is specified in this field. For data submission, "Data Name" and "Data Value" information must be entered.



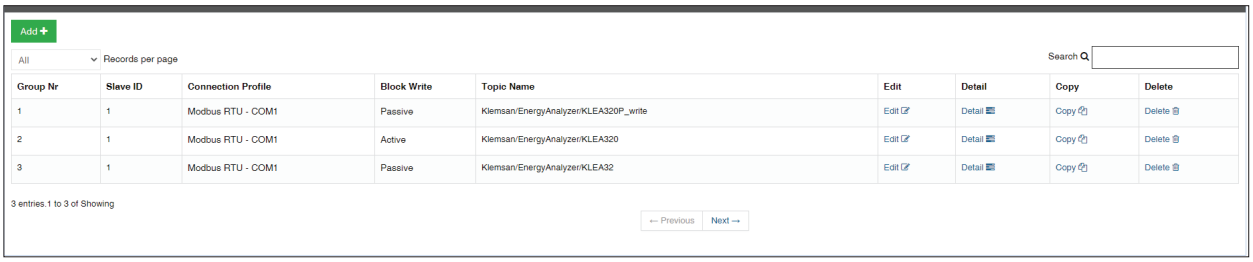
3.3.4.2.3.1 Detail- Common Statements

3.3.5 MQTT Writing Settings

KG50xx Series converts write commands sent with MQTT protocol to Modbus protocol and transmits them to serial devices. Related Modbus addresses are defined on this page.

3.3.5.1 Data Group Creation

Thanks to the "Add" button on the top left of the page, a new data group to be written can be added. The added data group includes information such as “Group Number”, Slave ID”, “Connection Profile”, “Block Write”, “Topic Name”.



3.3.5.1.1 MQTT Writing Settings

Group Nr: It is a field that increases numerically with the “Add” button and cannot be changed by the user.

Slave ID: The slave ID of the serial device in the defined Modbus channel and to which the data will be written must be entered.

Connection Profile: It is the part where MQTT data converted to Modbus protocol is selected to be written to the serial device on which channel. 2 different COM terminals (COM 1 and COM2) and one of 10 different TCP/IP addresses must be selected.

Block Write: It is the part where it is determined whether the Modbus addresses to be written will be written in a single query or separately. When activated, block addresses are written in a single query.

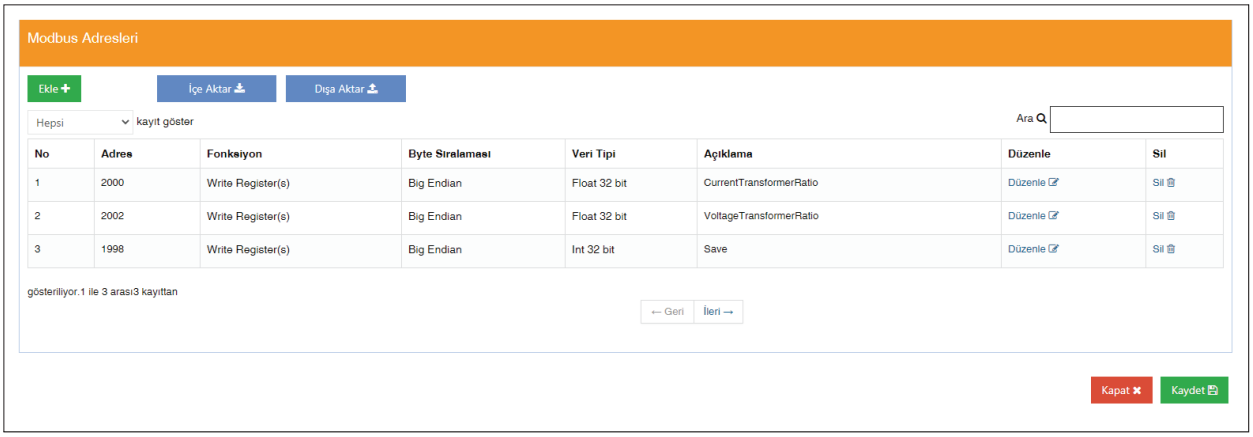
The latest data to be sent must be sent to the Modbus address defined for the registration command.

If it is desired to write data to an address after the Modbus address specified for the save command in the serial device, the register address must be sent in another query or block writing must be disabled.

E.g; assume that the 2006th Modbus address is reserved for the "Save Command" and it is desired to write data to 10 Modbus addresses starting from the 2000. Modbus address.

If block writing is active;
Modbus addresses will be listed in ascending order and commands will be sent. The write operation will not be successful because the saving address is found before the other addresses. In this case, the save address must be sent in a different data group in order for the write operation to be successful.

If block writing is disabled,
Modbus addresses will query the addresses defined in order. The registration address should be defined in the "Modbus Address Identification" section, in the bottom row.



3.3.5.1.2 Example of Block Writing Passive

Topic: It is the header information of the MQTT message to be read by the broker.

3.3.5.2 Defining Modbus Addresses

Modbus addresses must be defined after the data group saving is complete. Address identification can be done by clicking on the "Detail" section on the line containing the data group whose registration has been completed. When the "Detail" part is clicked, there is an "Add" button in the upper left. Adding is done by clicking this button. In this field, the expressions “No”, “Address”, “Function”, “Byte Order”, “Data Type” and “Description” are defined.

No: It is a field that increases numerically with the "Add" button and cannot be changed by the user.

Address: It is the Modbus address where the data will be written.

Function: It determines with which function the relevant Modbus address will be written.

Byte Order: The format of the data to be written is defined.

Description: It is the name given to the Modbus address. The data to be written must be with this name in the JSON message The JSON message to be sent must be in the form of "Description": "Value". E.g;

“DI1” : 1
“DICounter” : 26

If you want to send a "1" command to a Modbus address while writing Modbus, the following expressions can be used.

- 1
- On
- on
- True
- true

If a "0" command is wanted to be sent to a Modbus address while writing Modbus, the following expressions can be used.

- 0
- Off
- off
- False
- false

For example, a JSON message like the one below can be sent.

{
"CurrentTransformerRatio" : 2
, "VoltageTransformerRatio" : 1
, "Save" : True (instead of 1 is "True")
}

Thanks to the "Export All" button, all the data set (except "Network Settings") can be saved in xml format. The saved data can be edited and the setting data can be updated with the "Import All" button.

In the Modbus addresses defined in the MQTT reading and writing settings (by pressing the "Detail" button in the data group line), data is saved in excel format with the "Export" button. The recorded data can be edited and added to the data group with the "Import" button.

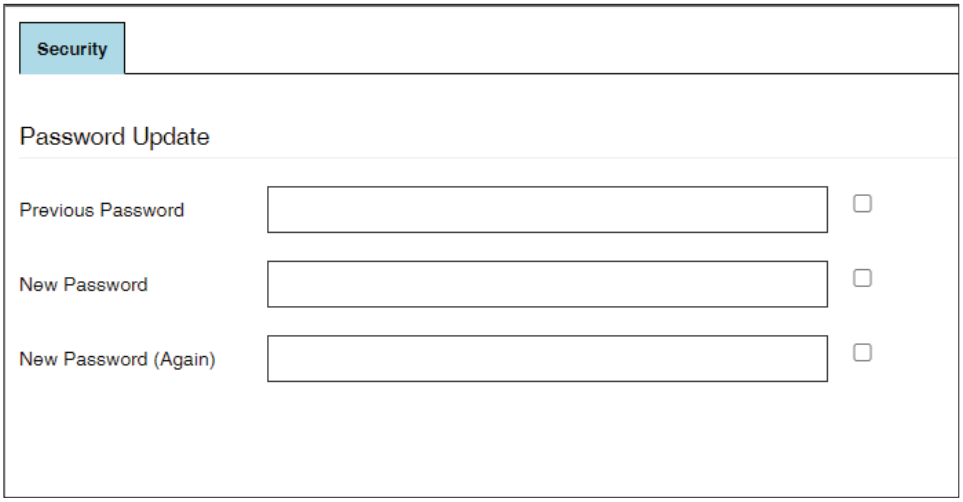
After all the changes made, the “Write All” button should be clicked. Then the device must be restarted.

3.4 Security Settings

The security settings of the device are made in this tab.

3.4.1 Security

This is the section where the password used when entering the web interface is changed. The current password must be entered first. In the next two fields, the new password to be created must be entered.



3.4.1.1 Password Update

3.4.2 IP Filtering

This section is only available on KG500G model devices. It is possible to connect from the web interface externally if the devices connected to the mobile network via 4G are used with the static IP option in the internet or private APN. In addition to the web interfaces, if the Modbus Gateway feature is active, the specified ports will also be open to external access. In order to prevent such security vulnerabilities, IP filtering is performed.

For IP filtering, the "IP Filtering Activate" box must be checked. Then, up to 3 IP addresses are defined to allow device access. When devices with IP addresses other than these IP addresses try to access the KG500G, the device gives an error 403 (Unauthorized Access).

IP filtering only applies to 4G IP.
There is no such restriction in Ethernet IP.

Ensuring secure communication in MQTT communication for certification purposes. Thanks to these **certificates**, the broker connection is made. Client without corresponding certificate devices cannot connect to the broker.

3.4.2.1 IP Filters

Basic information about the menu can be obtained by navigating to the icon with an arrow on the ? next to the title in the page.

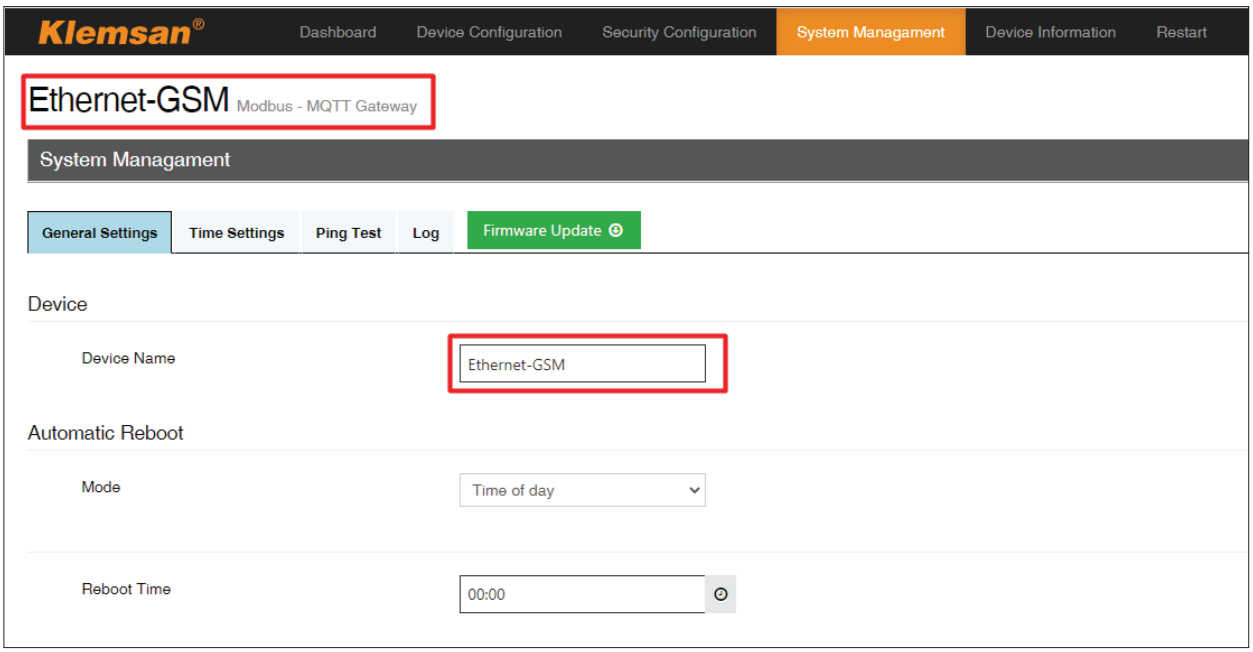
3.5 System Management

General settings of the device are made under this section. The page has 4 sub-menus and "Firmware Update" is done under this menu.

3.5.1 General Settings

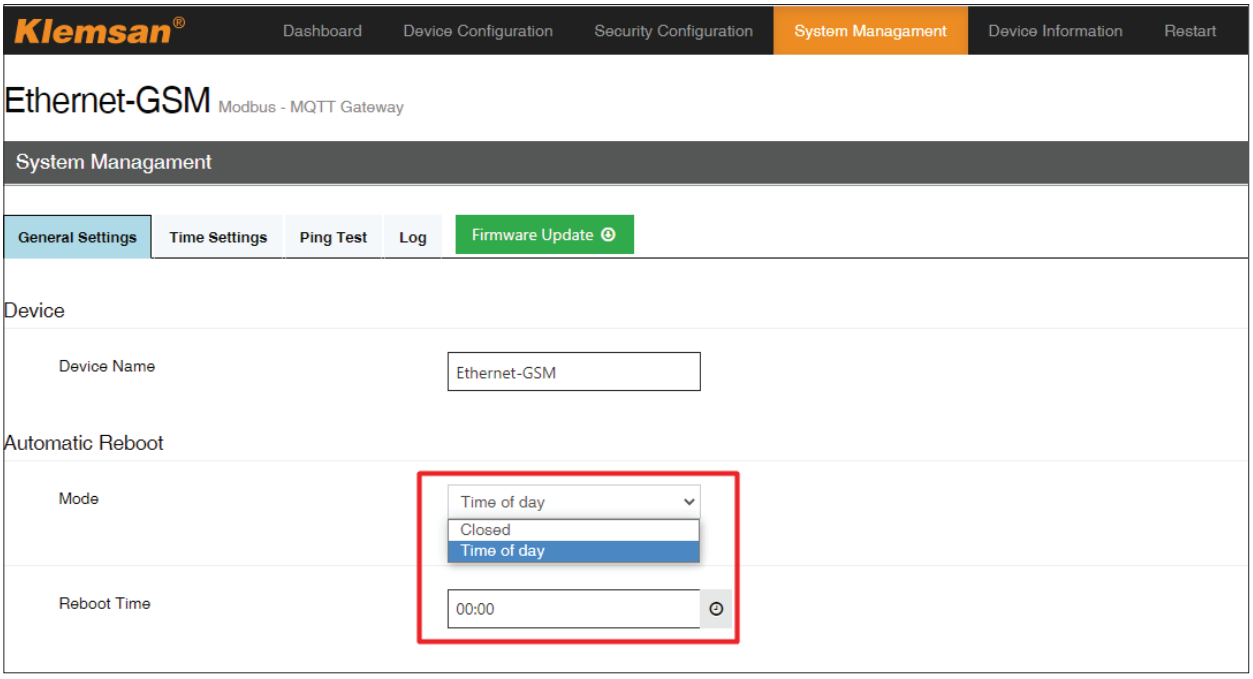
“Device Name” and “Automatic Reboot” are set under this tab.

Device Name: It is the identity information given to the device. After entering this information, this ID is included in the connection to the device via the web interface, in the browser tab header and on the web pages.



3.5.1.1 Device Name

Automatic Reboot: It is used to restart the device at a certain time of the day. Thanks to the internal battery in the device, real time information is kept in the device. When this setting is activated, the device will reboot when the specified time is reached.



3.5.1.2 Automatic Restart

3.5.2 Time Settings

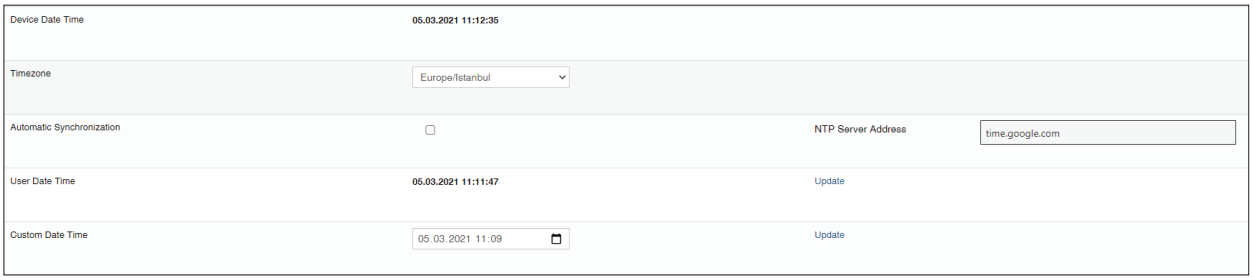
The time information and settings of the device are located under this tab. The time zone should be selected correctly when making the time settings. Daylight saving time information is calculated according to these selected time zones. According to the time zone information selected in daylight saving time applications, the time of the device is updated automatically.

When automatic synchronization is activated, the time update is done automatically via the specified NTP server.

In case the domain name is written as the NTP Server Address, the DNS address settings must be entered correctly so that the device can synchronize time.

3.5.2.1 Automatic Synchronization Active

In addition to automatically updating the time, a time update is also performed manually.



3.5.2.2 Automatic Synchronization Passive

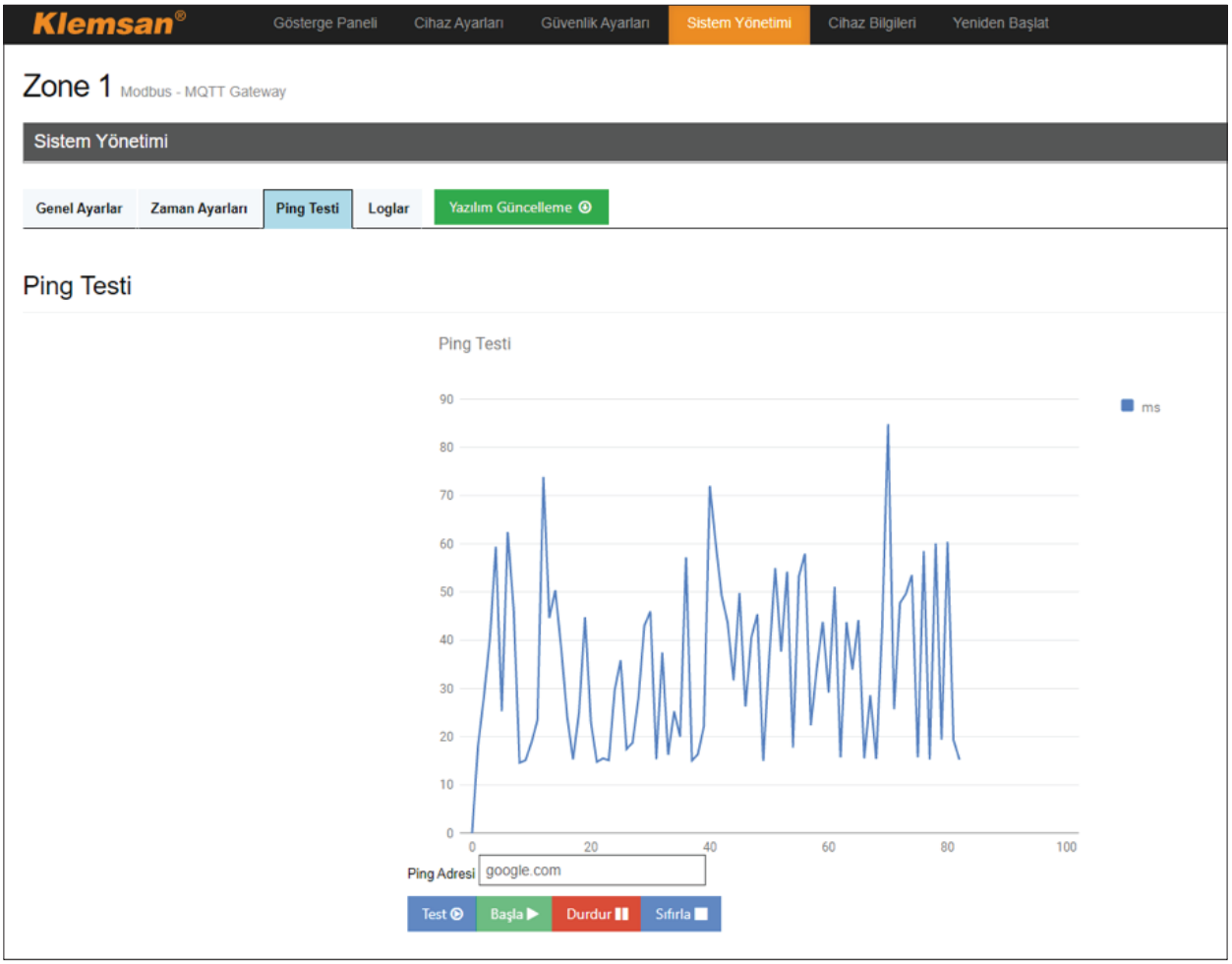
After the settings changes, the “Save” button must be pressed and the device must be restarted.

3.5.3 Ping Test

The ping test has two main uses.

1. **Checking the correctness of the device's network settings.**

The image below shows the result of the ping sent to the "google.com" by the device.



3.5.3.1 Ping Test

Görselin ingilizcesi yok”

The following comments can be made for this image.

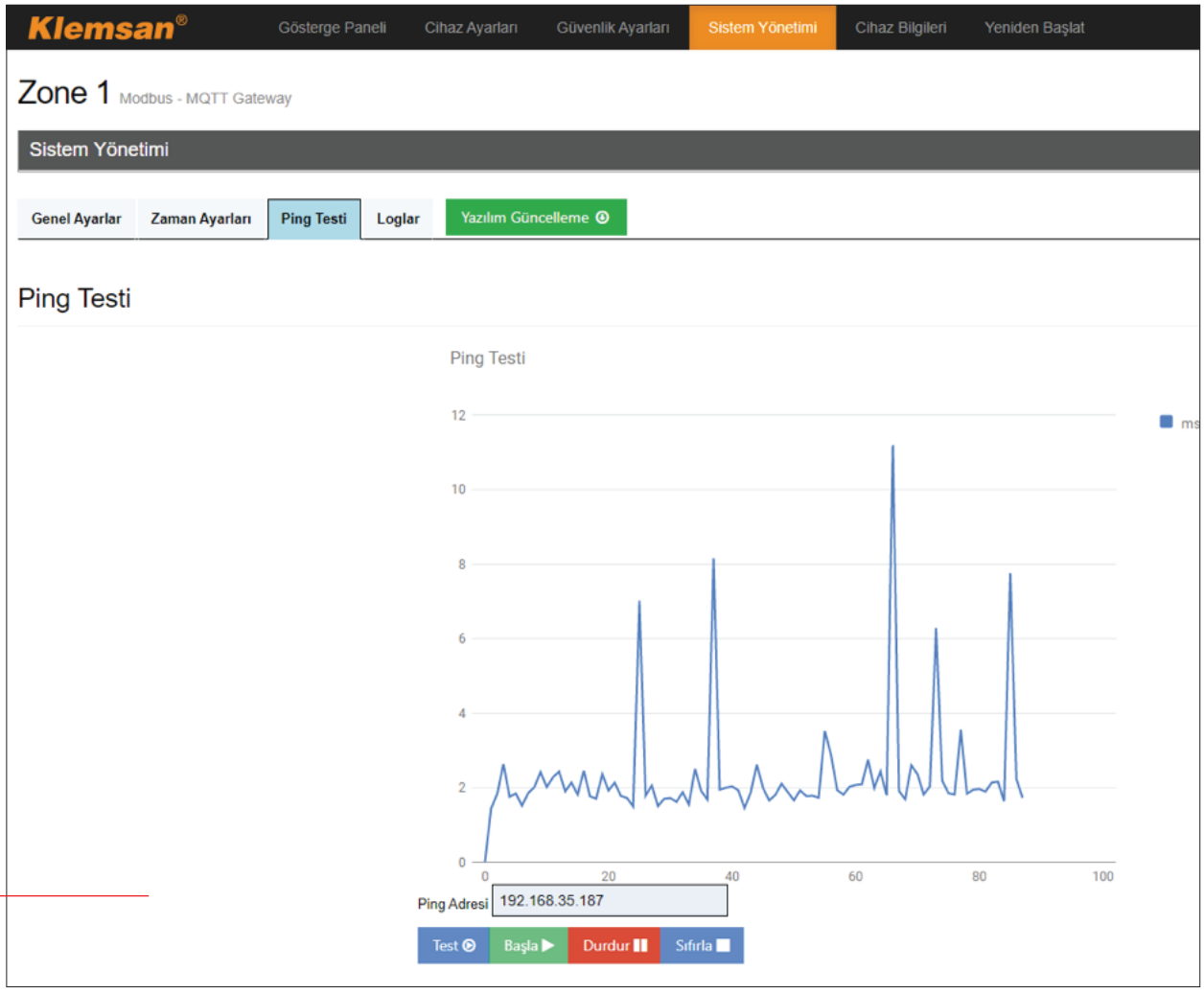
- The settings of the network to which the device is connected are correct.
- The device is connected to the internet.
- The DNS settings of the device are correct.

If the device can ping an IP address on the internet and cannot ping a domain name that is sure to exist, it means that the DNS address of the device was entered incorrectly.

If the device pings an IP address or domain name found on the Internet, it means that the device is included in the local network (because it is connected to the Web interface) but cannot connect to the Internet. In this case, the "Default Gateway" setting should be checked.

2. Testing the working conditions of the devices on the same network as the device.

The image below shows the result of the ping sent to the address "192.168.38.157" by the device. According to the ping test, it can be interpreted that the device with the IP address "192.168.38.57" is actively working on the network.



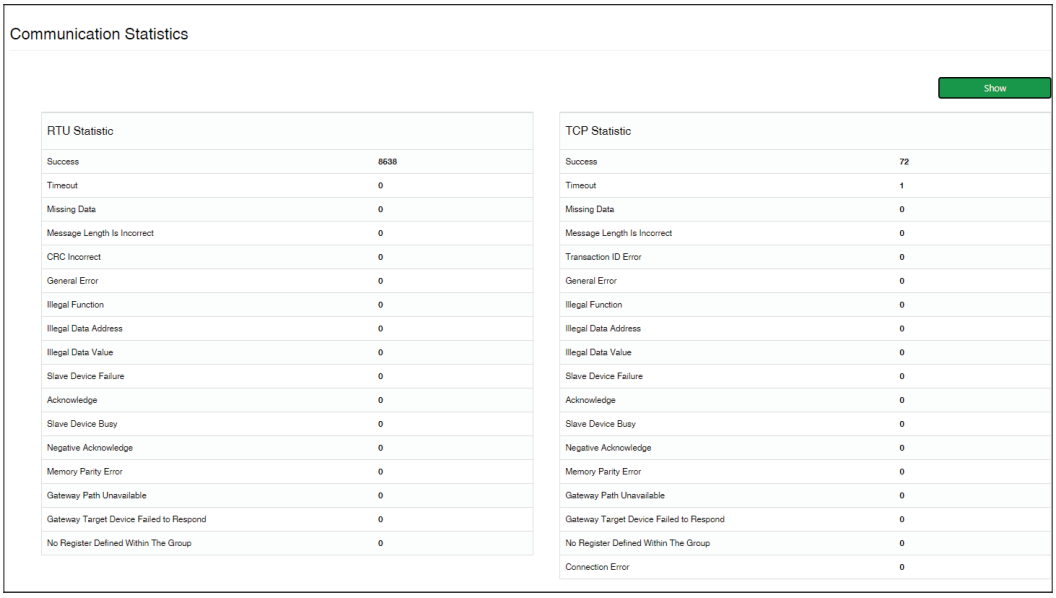
3.5.3.2 Ping Test

3.5.4 Logs

Communication logs and statistics of the device are found in this section.

3.5.4.1 Communication Statistics

Under this section, there are statistical information of Modbus communication with serial devices. Modbus communication statistics can be viewed with the "Show" button in the upper right. For Modbus RTU communication, "RTU Statistics", for Modbus TCP communication, "TCP Statistics" should be checked.



3.5.4.1.1 Communication Statistics

Error codes for Modbus RTU communication are as follows.

Status Code	Status Description	Detail
0	Successful	Group reading was successful.
2	Time out	Response to the query could not be received within the timeout period.
3	Missing Data	The response received is shorter than expected.
4	Message Length Incorrect	The message length information in the received reply content is incorrect.
5	CRC Incorrect	The content of the received response is corrupted.
100	General Error	An error was received in the codes that were run while the reading was taking place.
201	No Register Defined Within the Group	No definition has been made to the read group detail.

Error codes for Modbus TCP communication are as follows.

Durum Kodu	Status Code	Detail
0	Successful	Group reading was successful.
1	Connection error	The connection to the specified IP/Port could not be established.
2	Time out	Response to the query could not be received within the timeout period.
3	Missing Data	The response received is shorter than expected.
4	Message Length Incorrect	The message length information in the received reply content is incorrect.
5	Transaction ID Incorrect	The received response ID and the query ID are different from each other.
100	General Error	An error was received in the codes that were run while the reading was taking place.
201	No Register Defined Within the Group	No definition has been made to the read group detail.

Standard Modbus error codes are as follows.

Error Code	Error Description
101	Illegal Function
102	Illegal Data Address
103	Illegal Data Value
104	Slave Device Failure
105	Acknowledge
106	Slave Device Busy
107	Negative Acknowledge
108	Memory Parity Error
109	Gateway Path Unavailable
110	Gateway Target Device Failed to Respond

"Error Code" received during Modbus communication is converted to JSON format and sent as an MQTT message.

3.5.4.2 Modbus Communication

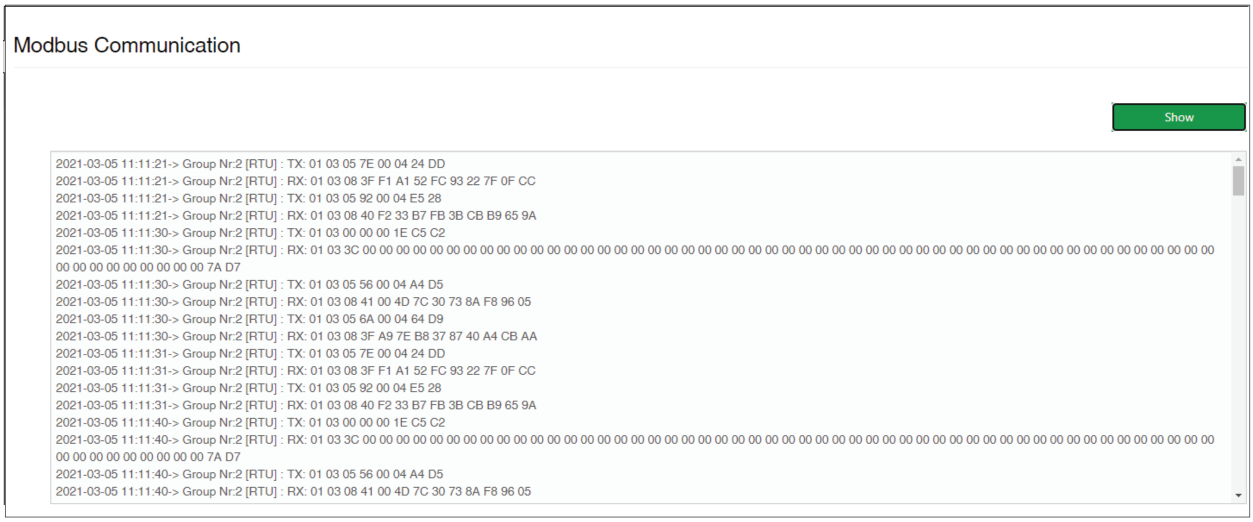
Data packets received/sent via Modbus are recorded in the device. The device stores the last 100 Modbus queries and the answers of these 100 queries in its memory. (There are 200 record lines in total.)

The record line detail is as follows:

Information when the query was sent to the line -> Group Number [Communication Protocol] : Query Direction : Data

Such as;

2021-02-23 16:01:01-> Group Nr:2 [RTU] : TX: 01 03 00 00 00 1E C5 C2
2021-03-03 20:14:40-> Group Nr:2 [RTU] : RX: 01 03 08 3F A9 7E B8 37 87 40 A4 CB AA

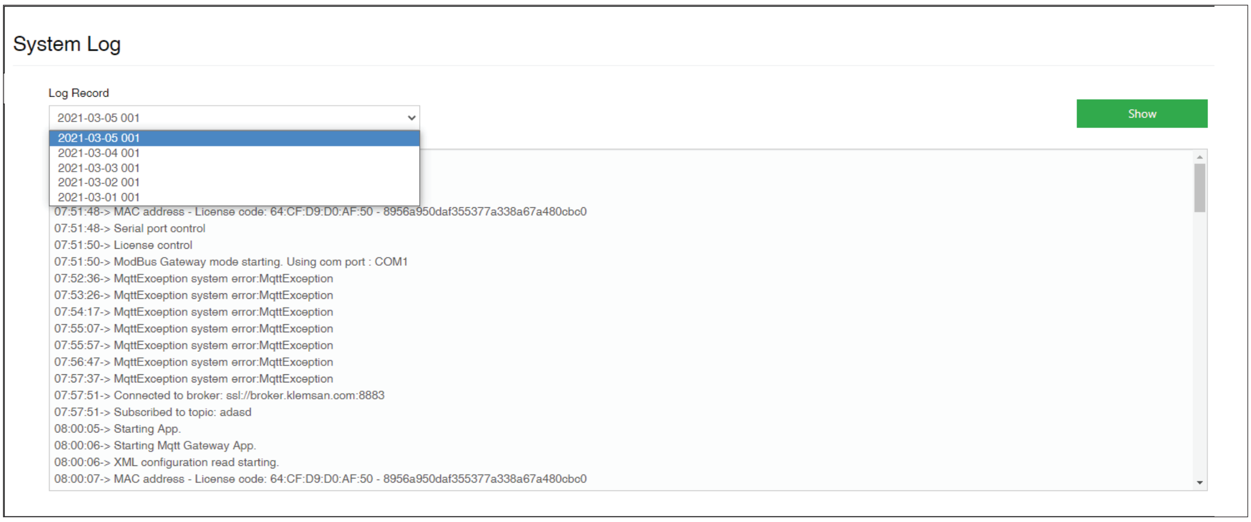


3.5.4.2.1 Modbus Communication

3.5.4.3 System Log

They are event records that contain basic information about the operations performed by the device during operation. System log records of the last 5 days are kept on the device. Older records are deleted.

Each log record can contain 1000 lines of log records. While the first 1000 data is recorded as Year-Month-Day 001, if it exceeds 1000, it is kept in the continuous records as Year-Month-Day 002.

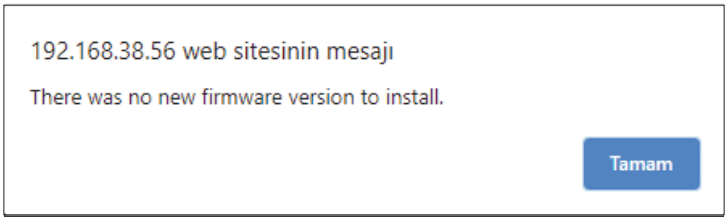


3.5.4.3.1 System Log

3.5.5 Firmware Update

This page is used when updating the device firmware or installing a new language pack on the device.

When the "Firmware Update" button is pressed, a warning is given on the page that opens with information about whether the device firmware is up-to-date.



3.5.5.1 Software Update Warning Message

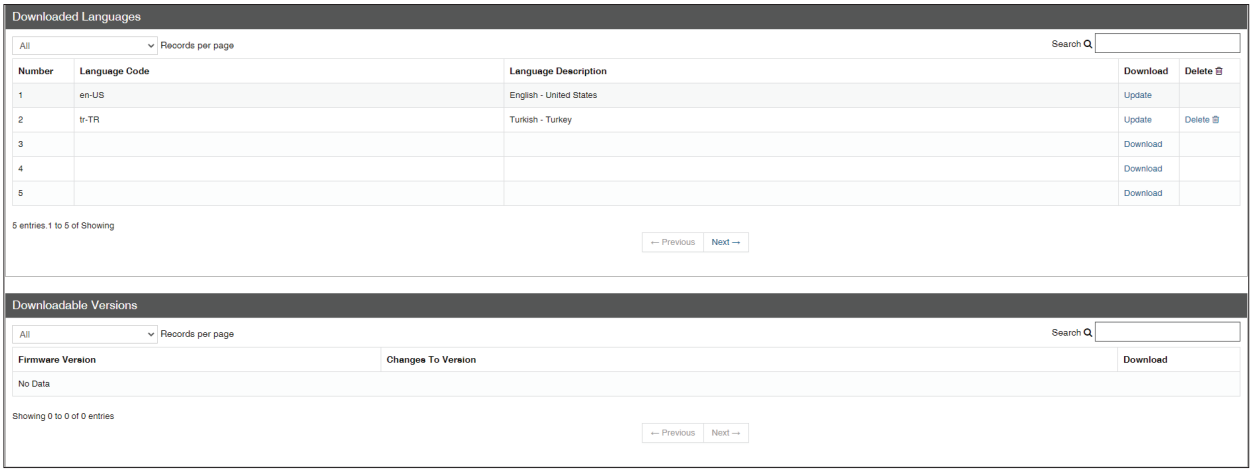
The “Downloaded Languages” section is the area where the language packs of the device are displayed and new language packs can be installed. In this section, a new language pack can be added as well as the language pack updates of existing devices.

The flags in the upper right should be used to change the language of the web interface.

In the "Downloadable Versions" section, the firmware installation can be done. There are versions available to install in this section.

The most up to date version of the device is shown under the "Downloadable Versions " section.

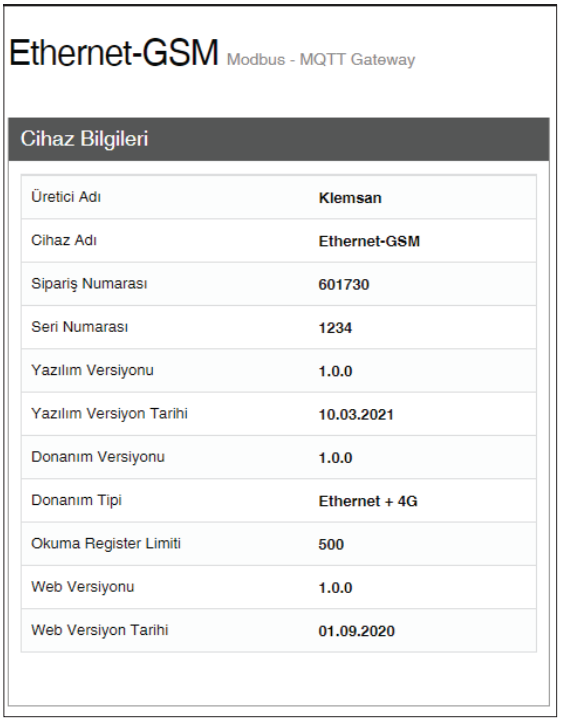
The firmware update process is performed by using the “Install” button. It is recommended to check the "**Firmware Version**" information from the "**Device Information**" section after the installation is completed.



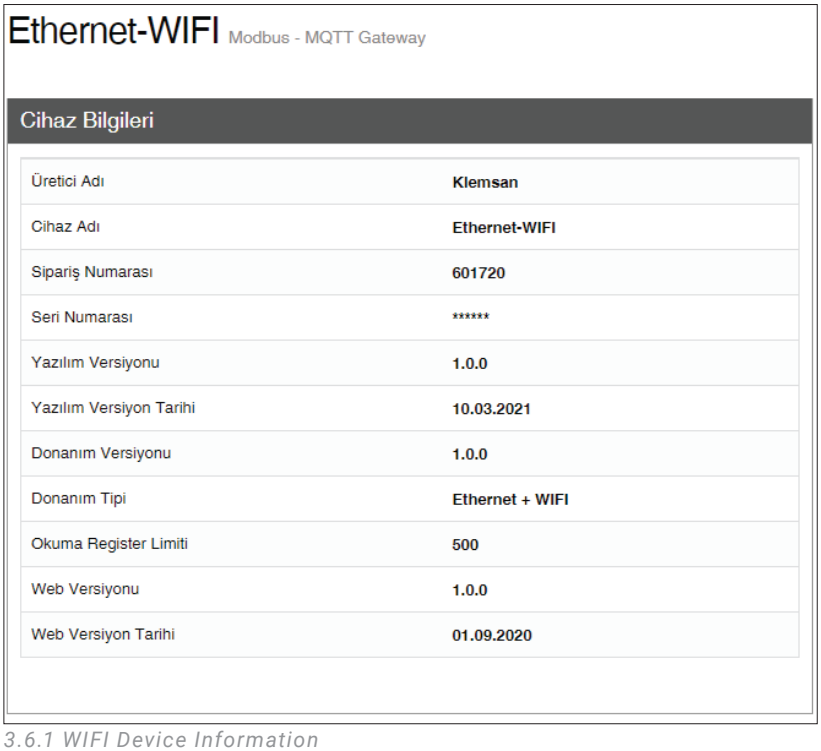
3.5.5.2 Firmware Update

3.6 Device Information

This is the section with general information about the device. On this page, “Manufacturer Name”, “Device Name”, “Order Number”, “Serial Number”, “Firmware Version”, “Firmware Version Date”, “Hardware Version”, “Hardware Type”, “Read Register Limit”, “ Web Version”, “Web Version Date” information is included.



3.6.1 GSM Device Information



3.6.1 WIFI Device Information

Manufacturer Name: Displays the name of the manufacturer company name.

Device Name: It refers to the ID given to the device in the **"Device Name"** section under "3.5.1 General Settings".

Order Number: Displays the order number of the device.

Serial Number: The serial number of the device is displayed. It is recommended to add this information to the client ID in the MQTT Broker settings.

Firmware Version: The firmware version of the device is displayed. It is recommended to check after a new firmware update on the device.

Firmware Version Date: Shows the date of the firmware version.

Hardware Version: Shows the hardware version.

Hardware Type: Shows the type of hardware the device has.

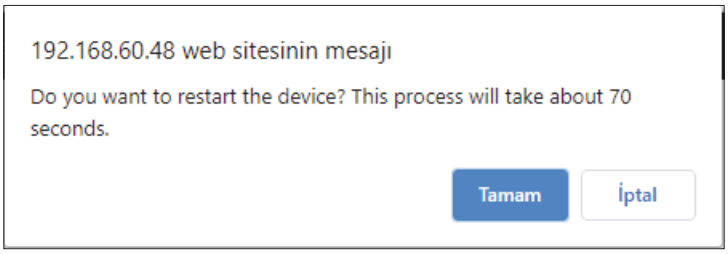
Reading Register Limit: The maximum number of registers to be read is displayed.
(See 3.3.4.2 Defining Modbus Addresses)

Web Version: It is the version information of the web interface.

Web Version Date: Shows the date of the web interface version.

3.7 Restart

It is the menu command that enables the device to be restarted via the web interface. The reboot time takes approximately 70 seconds.



3.7.1 Restart Warning Message

The user session can be terminated safely with the **"Logout"** button at the top right.

CHAPTER 4

TECHNICIAL SPECIFICATIONS

Processor	ARM Cortex A8 series TI AM335 2 600MHz
Memory	Onboard 256 MB DDR3 SDRAM
Storage	Onboard 256 MB NAND Flash
Reset IP	1x Reset switch Reset IP
Ethernet	1x 10/100M LAN RJ45 connector
Serial/Parallel	2x RS232/RS485, Support 2.5KV photoelectric isolation protection
Storage	1*Micro SD on board
LED	1*PWR, 1*RUN, 2*GPIO
Power	Input 9-36VDC Wide Voltage
Power Connector	3.5mm 1 x2 Pin power input connector
Power Consumption	250mA/12V
Dimensions (LxHxW)	110x25x75 mm
Operating Temperature	-20~70°C
Storage Temperature	40~85°C
Humidity	10 to 90% @40°C
Certification Meet	CE/FCC Class A
Operating System	Linux kernel 4.4.12/3.2.0

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