MC251 Documentation

https://www.overvis.com/docs/en/mc251/

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Overvis MC251

The Overvis MC251 is a Cloud-first programmable RS-485 to Ethernet / GSM / LTE gateway and controller designed for industrial automation and remote monitoring applications. It bridges Modbus RTU/ASCII protocols to the cloud platform, enabling seamless integration of legacy industrial equipment with the cloud. It can also bridge to modern TCP/IP networks, SCADA systems, and IoT infrastructures.

Complete Documentation Available

View all documentation on a single page – Perfect for printing or offline reading

Key Capabilities

- **Secure Cloud Connection**: Built-in WireGuard VPN client for convenient cloud management and monitoring
- **Protocol Bridge**: Convert RS-485 Modbus RTU/ASCII to Modbus TCP for seamless equipment integration
- **Dual Connectivity**: Ethernet (10/100 Mbps) and 4G/LTE with GSM fallback, configurable priority and automatic failover
- **Flexible Operation**: Function as Modbus master, slave, or transparent bridge; address remapping option
- **Web Interface**: Complete browser-based configuration and monitoring interface with multi-level access control
- **HTTP API**: RESTful API for programmatic access to device settings, functions and real-time data
- **Programmable Logic**: Execute custom automation tasks, event triggers, and data logging via scripting

- **Data Storage**: MicroSD card support (up to 32TB) for firmware updates, configuration backups, scripting, and data logging
- **On-Device Display**: Built-in OLED screen shows real-time connection status and diagnostic information, and speeds-up quick start
- **Industrial Grade**: DIN-rail mountable, IP20 rated, operating temperature –35°C to +55°C

Common Use Cases

- Integration with Overvis cloud platform
- Bridging legacy Modbus RTU devices to modern SCADA systems
- Remote monitoring and control of RS-485 equipment over cellular networks
- Network extension and consolidation across multiple locations
- Data logging and archival with local storage
- SMS-based alerting and remote diagnostics
- Interconnection of monitoring and control equipment
- Providing timer or schedule functionality for control equipment

Documentation Structure

Getting Started

- **Quick Start Guide** – Get your MC251 up and running in 15 minutes with step-by-step setup instructions
- **Operating Manual** – Complete safety information, technical specifications, and operating procedures
- **User Interface** – Web interface overview and navigation guide

Configuration

- **Connections & Network Setup** – Ethernet, GSM/LTE, and server VPN link recommendations
- **Modbus Interface** – Modbus RTU/ASCII and TCP configuration, parameter reference
- **Memory Card** – Using microSD cards for storage, automations, logging, and firmware updates

Advanced Features

- **Logic Programming** – Create custom automation tasks, triggers, and event handlers
- **HTTP API Reference** – Complete REST API documentation for programmatic device control
- **Firmware & Updates** – Firmware versions, update procedures, and release notes
- **Software Tools** – Download utilities for testing and configuration

Resources

- MC251 Product Page – Full product information and specifications
- One-Page Documentation – Complete documentation on a single page for printing
- MC251 Full Manual (PDF) – Download complete operating manual file

Support

- **Knowledge Base**: Browse this documentation for detailed guides and references
- **Support Center**: Visit our Support Center for FAQs and troubleshooting

- **Report an Issue**: Submit a support ticket for technical assistance
- **Contact Sales**: Questions about purchasing or licensing? Contact our sales team

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Ready to get started? Head to the Quick Start Guide to set up your MC251 in minutes.

Quick Start Guide

This guide walks you through setting up your Overvis MC251 gateway from wiring to successful connection in about 15 minutes.

The Overvis MC251 is a programmable gateway that bridges RS-485 Modbus devices to modern networks, letting you monitor and control industrial equipment remotely via Ethernet or cellular connections.

> ⚠ **Read Safety Instructions First**
>
> Before setting up or operating the MC251 device, you must thoroughly read the safety information in the operating manual. This includes electrical safety requirements, installation precautions, and proper operating procedures. Operating the device without following these instructions may result in equipment damage, injury, or loss of warranty coverage.

What You'll Need

From the delivery box: MC251 device, Ethernet cable, GSM antenna, 2GB microSD card.

You'll also need:

- 12V DC power supply (9-30V range supported)
- Device with web browser for initial setup (computer, phone, or tablet)
- RS-485 Modbus devices to connect
- Twisted-pair cable for RS-485 (Category 1+, shielded recommended)
- Stranded wire (≥1 mm² cross-section), ferrules, and tools (screwdriver, wire stripper)

> ⚠ **Safety First**
>
> Always disconnect power before making connections. Never open the device or operate it with damaged housing. Keep water away from terminals.

Step 1: Physical Setup

Mount your MC251 on a standard 35mm DIN rail in a well-ventilated location. The device operates from -35°C to +55°C, but avoid areas with excessive vibration, humidity, or corrosive atmospheres.

Install memory card: Insert the provided 2GB microSD card into the `SD` slot. The memory card is required for firmware updates, data logging, and automation logic programming features.

Install SIM card (if using GSM/LTE): If you plan to use cellular connectivity, insert your SIM card (with data service enabled) into the `SIM` slot now. Attach GSM antenna to the `ANT` connector.

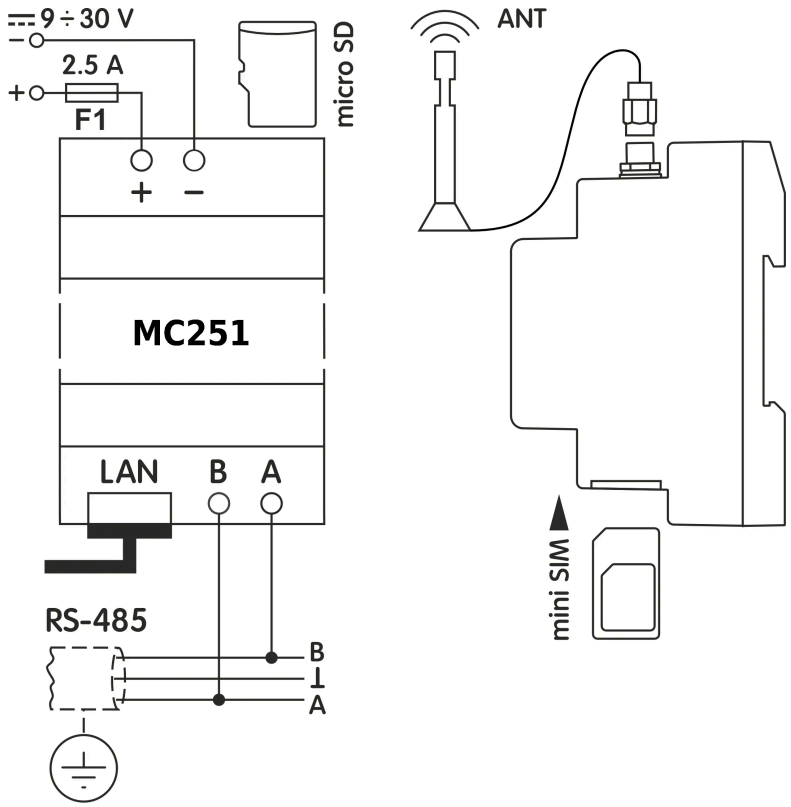
Network connection: Connect the Ethernet cable from MC251's `LAN` port to your router or directly to your computer.

Before making any electrical connections, ensure all devices are powered off.

Tighten terminal screws to 0.4 N·m — enough for solid contact without damage.

RS-485 wiring: Connect twisted-pair cable to MC251's RS–485 terminals: terminal A for non-inverted signal, terminal B for inverted signal (your devices might label these as A/D+/+ and B/D-/- respectively). Run the cable to your Modbus devices and connect accordingly. Use shielded twisted-pair cable (Category 1 or better) for reliable communication over distance.

Power: Connect 12V DC power to the 9÷30V terminals. For safety, install a 2.5A fuse in the power circuit. Use stranded wire with ferrules, stripped 5mm. Wire cross-section should be 0.5-3 mm².



Step 2: Power On

When you apply power, all LEDs light up briefly during the 2-second initialization, then the device spends 10-15 seconds establishing network connections.

The PWR LED stays on to confirm power. The LAN LED turns on when Ethernet connects (blinking during data transfers). The GSM LED blinks slowly (every 1.5s) when registered to cellular network, or rapidly (3 times/second) after TCP/IP link start.

The display shows IP addresses (prefixed with (E) for Ethernet or (G) for GSM), plus data rates and signal strength.

Step 3: Access Web Interface and Configure Internet Connection

Note the IP address from the display (press R to wake it). If connected via Ethernet with DHCP, you'll see the assigned address.

> **Connecting directly to a PC?**

Open a web browser and enter the IP address shown on the display (e.g., `http://192.168.0.111`).

Login to quick setup: You'll see a login page. Press the R button on MC251 for temporary password-free access.

Configure network: Enable/disable DHCP, set static IP if needed, adjust subnet mask and gateway. For GSM, enter your mobile operator's APN (Access Point Name) and SIM card PIN (if present).

> **Note**
> Click "Save & Reset" after changes. The device restarts in about 15 seconds with new settings.

Step 4: Connect to Overvis Cloud

Overvis Cloud provides remote monitoring and control through a web dashboard.

The device label includes a QR code and PIN for quick setup. It is necessary to connect the device to Overvis, which allows to further configure, operate and monitor MC251.

1. **Access Overvis server:** Scan the QR code on the device label or manually enter the link from the label (format: `https://c.overvis.com/ABCD1234` where the last part is your PIN). The link redirects to Overvis server's login page.
2. **Login or create account:** Enter your credentials if you have an account. New users should create an account first.
3. **Create Network:** After login, Overvis shows the "Create Network" page. If you came from the QR code/link, the PIN is pre-filled. Otherwise, enter the PIN from the device label and click "Check connection."
4. **Verify connection status:** Overvis displays the connection status — either "Connected" or "Device is not connected to the server." If not connected, check that MC251 has internet access (Ethernet or GSM) and verify the Cloud tab settings in the web interface.
5. **Configure your network:** Give your network a descriptive name (a "network" represents your MC251 plus all connected Modbus devices). MC251 itself (unit ID 111) is added automatically.
6. **Add connected devices:** Select your RS-485 device models from the dropdown menus and enter their Modbus addresses. Overvis creates device instances from templates matching your selections.
7. **Test communication:** Open a device page in Overvis and read its parameters to confirm real-time communication is working.

Troubleshooting

Display shows `(E) 0.0.0.0`: → Normal during first 20-60 seconds while DHCP negotiates. If it persists, check cable connection and router DHCP. Try direct PC connection with static addressing settings.

Display shows `(E) 192.168.0.111`: → DHCP failed or is unavailable. MC251 has switched to its factory default static IP address. Either configure your client device to the same subnet (192.168.0.x) or enable DHCP on your router.

Can't access web interface: → Verify IP address entered in browser matches what's on the display. Ensure Ethernet address is used (the one marked with `(E)` in the second line). Check PC and MC251 are on the same subnet. Temporarily

disable firewall. Press R for password-free access. Clear browser cache.

GSM won't connect: → Verify SIM card is fully inserted (until you hear a click), check the antenna is attached, check the GSM settings. Check that data service is active. Check signal strength on display (should be >0%). Try relocating antenna to better position. Try to disable PIN. Try manually configured APN settings.

Cloud server states "Device is not connected" → Check internet connectivity (verify IP addresses on display), check MC251 web page for configuration, status and errors

Cloud server does not accept the device PIN → Verify you entered the exact PIN from this device label

Can't create cloud account → Ensure email address entered is valid, check email for verification link

No data response from MC251 itself → Check Modbus ID in the cloud device configuration for "MC251" device

MC251 responds but RS-485 devices don't: → Most common issue is mismatched settings. Select MC251 device (in newly created network) and configure baud rate and parity to match all the devices. Check A/B wiring polarity (swapping these is very common - this doesn't cause equipment damage, but prevents communication). Try increasing delays in MC251 settings for RS-485. Ensure protocol (Modbus RTU/ASCII) and parity are the same for all the devices. Start with 9600 baud, RTU, AUTO-STOP parity.

Wrong data returned as a response → Check register address matches your device's documentation. Check the parameter type in the configuration of the cloud device parameter (with this address)

Service Button Quick Reference

The R button functions depend on press duration:

Quick press: Wake display, show status, grant temporary web access

Hold 2-8 seconds: Prepare for safe memory card removal and restart device

Hold 8+ seconds: Factory reset (erases all settings)

> ⚠ **Caution**
>
> Protect the R button from unauthorized access with tamper-evident tape or by installing MC251 in a locked enclosure.

What's Next?

- MC251 Operating Manual — Complete technical documentation
- Web Interface Guide — Configuration options explained
- Connections Guide — Network setup, VPN, and security
- Modbus Interface — Protocol details and register reference

Need Help?

For technical support and assistance:

- Email: support@overvis.com

- Support portal: www.overvis.com/support

MC251 Operating Manual

This Operating Manual explains the design, safety requirements, operating rules, and maintenance procedures for the Overvis MC251 RS-485 interface controller.

Safety information

ATTENTION

ALL REQUIREMENTS OF THIS OPERATING MANUAL ARE MANDATORY.

TO ENSURE SAFE OPERATION, IT IS STRICTLY FORBIDDEN TO:

- PERFORM INSTALLATION OR MAINTENANCE WITHOUT DISCONNECTING MC251 FROM THE MAINS
- OPEN OR REPAIR MC251 YOURSELF
- OPERATE MC251 IF THE HOUSING IS MECHANICALLY DAMAGED

PREVENT WATER FROM REACHING THE TERMINALS OR INTERNAL PARTS.

During operation and maintenance, observe the requirements of applicable regulatory documents, including:

- Regulations for Operation of Consumer Electrical Installations;
- Safety Rules for Operation of Consumer Electrical Installations;
- Occupational Safety Rules for Operation of Electrical Installations.

Only qualified personnel who have studied this Operating Manual should perform installation, adjustment, and maintenance.

When used in accordance with this manual, the Overvis MC251 is safe in operation.

The Overvis MC251 meets the requirements of the following standards: EN 60947-1; EN 60947-6-2; EN 55011; EN 61000-4-2.

The device contains no hazardous substances in excess of maximum permissible limits.

The development and production quality management system complies with ISO 9001:2015.

General description

The Overvis MC251 is a Cloud-first programmable RS-485 to Ethernet / GSM / LTE gateway and controller. It:

- collects data from connected Modbus devices;
- transfers data to a cloud server;
- provides access to data via Modbus TCP or SMS text messages;
- tracks events and executes actions (for example, sending SMS notifications, writing values to Modbus devices, or logging values to a memory card).

The Overvis MC251 provides the following capabilities:

- **Flexible connection options:** Ethernet (wired) or wireless GPRS / FDD-LTE, automatic selection of the connection method to the cloud server, automatic or manual selection of GSM options and communication parameters, automatic or manual Ethernet settings
- **Access security:** no default password, encrypted Cloud VPN connection, passwords for setup mode and connections to the Modbus network, passwords for SMS-based device control
- **Flexible RS-485 communication:** Modbus RTU or ASCII, even/odd/no parity, wide range of baud rates, adjustable delays
- **Programmable logic** for data collection, event tracking, and actions in response to events (see Operations logic programming)
- **Service functions:** real-time clock, astronomical timer, diagnostic logs, automatic or manual firmware update

Front panel and indicators

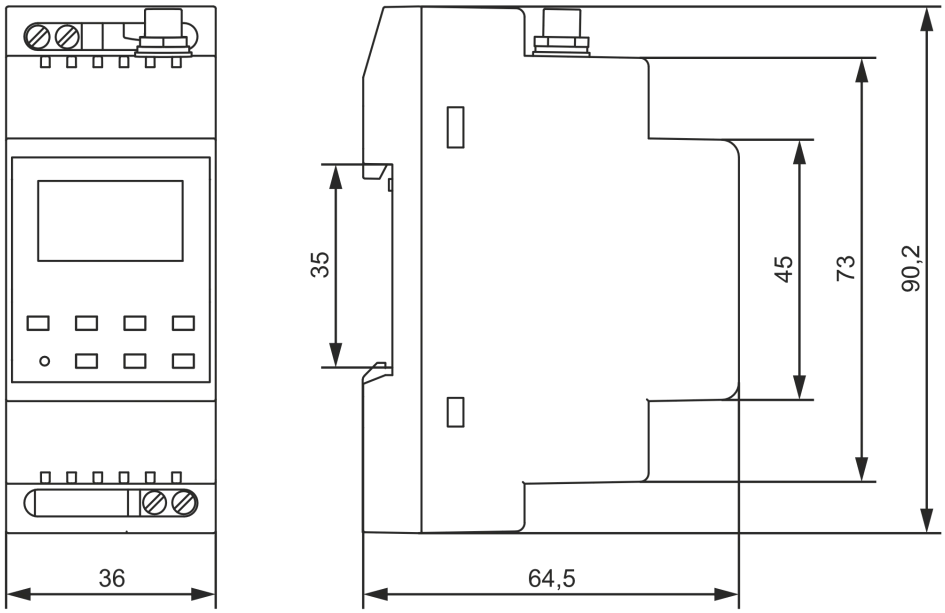


Fig.1 – Overall and mounting dimensions of MC251

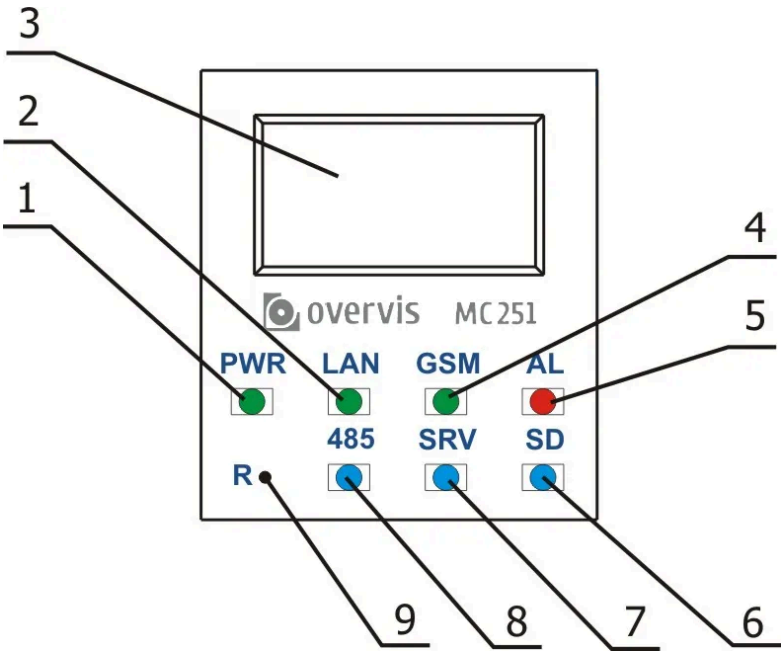


Fig.2 – Controls of the Overvis MC251

1. PWR LED is on when there is supply voltage;
2. LAN LED is on when connected to Ethernet network, and is blinking during the data exchange on the network;
3. The display shows the state of the device, active connections, device addresses, and the load of communication interfaces;
4. GSM LED flashes every 1.5 s when GSM (2G) communication is available; flashes 3 times per second when LTE (4G) communication is available, or when GPRS or FDD-LTE data is being exchanged;
5. AL LED warns about the error as a result of analysis of the received data;

6. SD is on when there is a memory card in its slot, and is blinking during the data exchange with the memory card;
7. SRV is on when the connection is present with the Overvis Cloud VPN server, and is blinking during the data exchange via this connection;
8. 485 is on when waiting for data from a device on RS-485 bus, and is blinking during the data exchange on this bus;
9. R service button (accessible through a hole in the front panel, press with a thin non-conducting object) grants quick access to MC251 or resets the controller.

Operating conditions

The Overvis MC251 is designed for operation under the following environmental conditions:

- Ambient temperature: –35 ... +55 °C
- Atmospheric pressure: 84 ... 106.7 kPa
- Relative humidity (at +25 °C): 30 ... 80%

> ⚠ **Do not operate MC251:**
>
> - In conditions of significant vibration or shock
> - At high humidity levels (condensation)
> - In aggressive environments (air containing acids, alkalis, etc.) or in severe contamination (grease, oil, dust, etc.)

Delivery set

Table 1 – MC251 delivery set

Item	Quantity
MC251	1
Cable for Ethernet connection	1
GSM antenna	1
Memory card (microSD 2 GB)	1
Operation Manual	1
Packing	1

Technical specifications

Table 2 – MC251 technical specifications

Parameter	Value
DC rated supply voltage	12 V
Data exchange interfaces via wired network	10Base-T/100Base-T Ethernet, RS-485

Parameter	Value
Supported Ethernet protocols	UDP, ARP, TCP
Data exchange interface via wireless network	GSM (900/1800), LTE (B1/B3/B5/B7/B8/B20)
Supported standards of wireless network	SMS, GPRS, FDD-LTE Cat.1
Integrated TCP/UDP clients	Modbus TCP, HTTP, WIREGUARD, NTP, DNS
Integrated TCP servers	Modbus TCP, HTTP
Maximum number of incoming TCP connections	4
Supported Modbus protocols via RS-485	Modbus RTU, Modbus ASCII
Transmission speed via RS-485	75 ... 230400 bps
Maximal output voltage of driver RS-485	3.3 V
Short circuit output voltage of driver RS-485 (maximum)	250 mA
Resistance of built-in terminator	1000 Ohm
The recommended number of connected devices in RS-485 network:	
– when the input current of receivers on RS-485 bus is less than 0.125 mA;	≤ 256
– when the input current of receivers on RS-485 bus is less than 1 mA	≤ 32
Readiness time when power is applied	≤ 15 s*
The supply voltage at which the operability is maintained	9 ... 30 V
Power consumption (under load)	≤ 6 W
Device service	Switchgear and controlgear
Rated operating condition	Continuous
Protection class rating	IP20
Electric shock protection class	III
Climatic design version	NF 3.1
Overvoltage category	II
Rated voltage of insulation	450 V

Parameter	Value
Rated impulse withstand voltage	2.5 kV
Conductor cross-section for connecting to terminals	0.5 ... 3 mm²
Tightening torque of the terminal screws	0.4 N·m
Weight	≤ 0.400 kg
Overall dimensions (Fig. 1), H×W×D	64.5 × 90.2 × 36 mm
Installation (mounting) of the device	On standard 35 mm DIN-rail
Device orientation	Operable in any position in space
Housing material	Self-extinguishing plastic

* Establishing connections in Ethernet / GSM / Internet networks can take more time.

Device architecture

MC251 provides monitoring and control over Modbus RTU/ASCII devices in an RS-485 network for the cloud server.

The secure VPN connection to a cloud server is established:

- via Ethernet network using an integrated Ethernet interface chip;
- via GPRS / FDD-LTE using a built-in modem (used when Ethernet connection is not available).

MC251 also provides access to RS-485 devices via Ethernet, GSM / LTE, or SMS.

In addition, MC251 can connect via the Modbus TCP protocol to exchange data with Modbus TCP devices or with another MC251 controller.

MC251 receives and processes SMS messages that contain a password and a read/write command for Modbus devices.

When you insert a memory card with prepared operation logic program files, MC251 may load this program into internal memory. This program defines data collection and event tracking. It runs in the background.

You can write collected data to the memory card in tabular or binary format. For registered events, you can configure actions such as sending SMS messages or writing corrected Modbus values.

MC251 stores network settings, security parameters, and operation logic in its built-in memory.

Installation and wiring

Before you start:

- Unpack MC251 (we recommend keeping the original packing for the entire warranty period).
- Check MC251 for damage after transportation. If you find any damage, contact the supplier or manufacturer.
- Read this Operating Manual carefully (pay special attention to the power supply in the connection diagram).
- If you have any questions regarding installation, contact the manufacturer.

Wiring requirements

If the temperature of MC251 after transportation or storage differs from the ambient operating temperature, keep MC251 under operating conditions for at least two hours before connecting it to the power supply. This prevents condensation on internal components.

> **Installation safety**
>
> PERFORM ALL CONNECTIONS WHEN MC251 IS DE-ENERGIZED.
>
> Installation errors can damage MC251 and connected equipment.

To ensure reliable electrical connections, use flexible (stranded) wires. Strip the insulation from the wire ends by 5±0.5 mm and crimp with suitable ferrules. It is recommended to use wire with a cross-section of at least 1 mm².

- When connecting to the RS-485 bus, use twisted-pair cable of category 1 or higher. A shielded cable is recommended; in that case, ground the shield according to “ANSI/TIA/EIA-485-A-1998”.
- When connecting to Ethernet, use the supplied cable or a category 5e twisted-pair cable with an 8P8C (RJ-45) plug.

Route and fasten wires so as to avoid mechanical damage, twisting, or abrasion of the insulation.

> **Electrical safety**
>
> DO NOT LEAVE EXPOSED WIRE PORTIONS PROTRUDING BEYOND THE TERMINAL BLOCK.

For a reliable contact, tighten the terminal screws with the force indicated in Technical specifications.

> **Tightening torque**
>
> Too little tightening torque can cause heating at the junction point. Eventually the terminal block may melt and the wire may burn.
>
> Too much tightening torque can damage terminal block screws or over-compress and damage the connected wire.

To improve safety and reliability, it is recommended to install the fuse F1 (or its equivalent) in the MC251 supply circuit, rated for a current of no more than 2.5 A.

Electrical connection

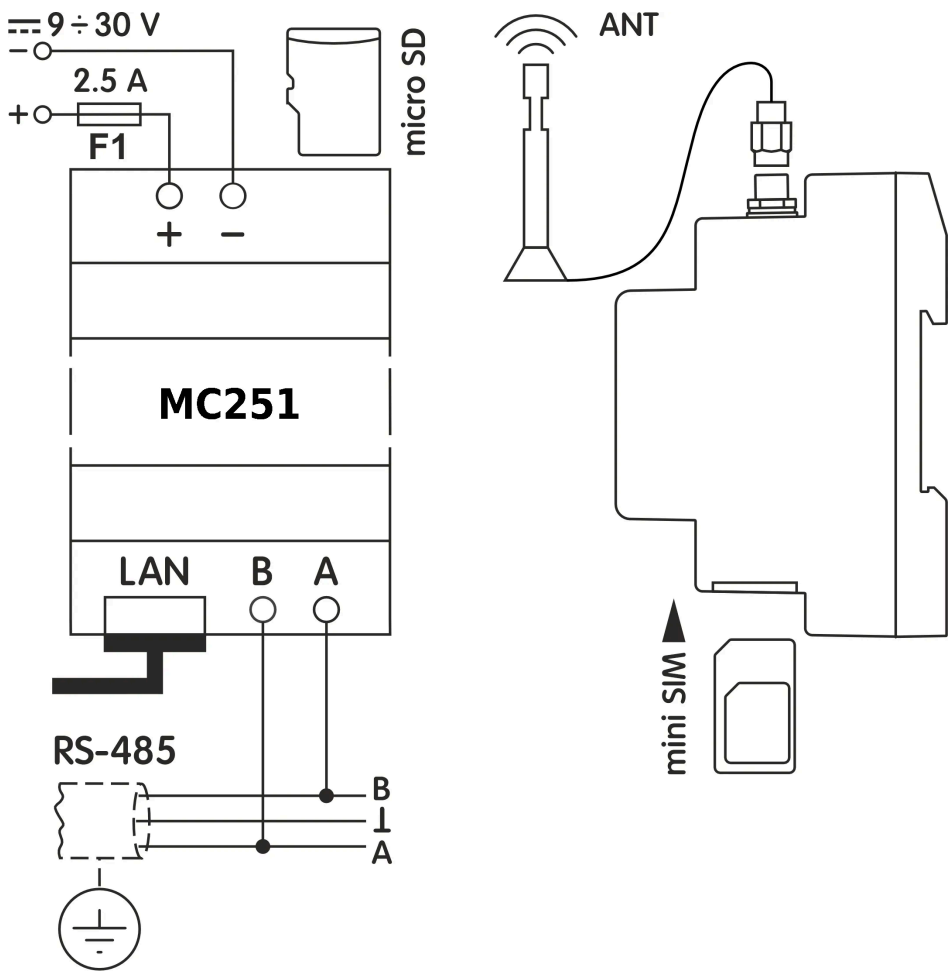


Fig.3 – Connection diagram of the device

- F1 – fuse (fuse element) rated for 2.5 A;
- Contact A – transmission of non-inverted signal;
- Contact B – transmission of inverted signal.

Follow these steps to connect the MC251:

- Connect the RS-485 bus cable to the RS–485 terminals (A and B) and to the RS-485 bus (or directly to the device with an RS-485 interface).
- If the MC251 should connect to the Internet via wired communication, to a local network, or directly to a computer, connect the Ethernet cable to the LAN connector and to the Ethernet network (or directly to a computer). Connection details, depending on the network type, are provided in Connections.
- Connect the appropriate DC power supply to the 9÷30V power connector.
- Insert the memory card (microSD) into the MicroSD slot if you plan to use data logging or operation logic programming features.
- If the MC251 is to connect to the Internet via wireless communication (or needs SMS exchange), insert the SIM card of the GSM operator into the SIM slot and connect the GSM antenna to the ANT connector (SMA F connector).

Power-up and normal operation

After power is turned on, all indicators except LAN and GSM light up, and MC251 performs initialization. After approximately 2 seconds, the indicators (except for the power indicator) go out, and the device proceeds to start the communication interfaces with networks. The display shows general information about the device (Fig. 4). Startup can take up to 15 seconds.

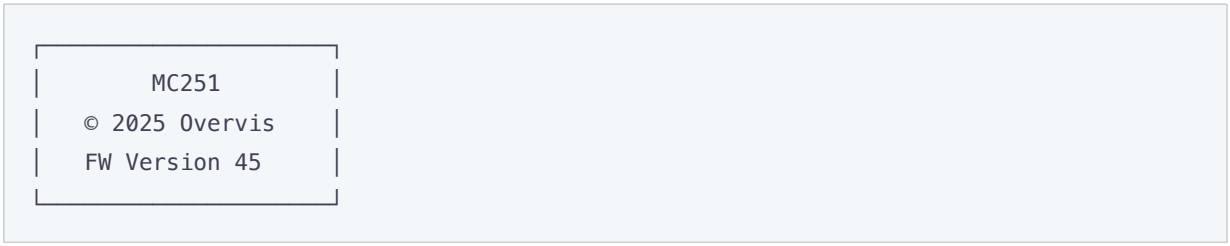


Fig.4 – Displaying of general information about the device on the display

After this, if enabled in settings, MC251 establishes a connection with the cloud server (or VPN) and starts executing the operation logic (if a program is loaded from the memory card). By default, cloud connections are disabled.

> **Malfunction indicator**
>
> IF THE AL INDICATOR IS CONSTANTLY LIT RED OR FAST BLINKING RED, PLEASE CONTACT THE MANUFACTURER OR THE PLACE OF PURCHASE OF THE DEVICE.

If configured, MC251 establishes TCP connections (via Ethernet and GSM/LTE networks) and waits for incoming TCP connections.

If a SIM card is installed, the GSM indicator shows the cellular connection status: blinking once every 1.5 seconds indicates successful network registration (but no data transfer yet); blinking 3 times per second indicates active TCP/IP data transfer via GPRS or FDD-LTE.

The display shows the interfaces load, the GSM signal strength and the IP addresses used, as shown in Figure 5.

> **Note**
>
> The display may reduce brightness over time and eventually enter energy-saving mode. In that case, wake it up with a short press of the R service button (see below).

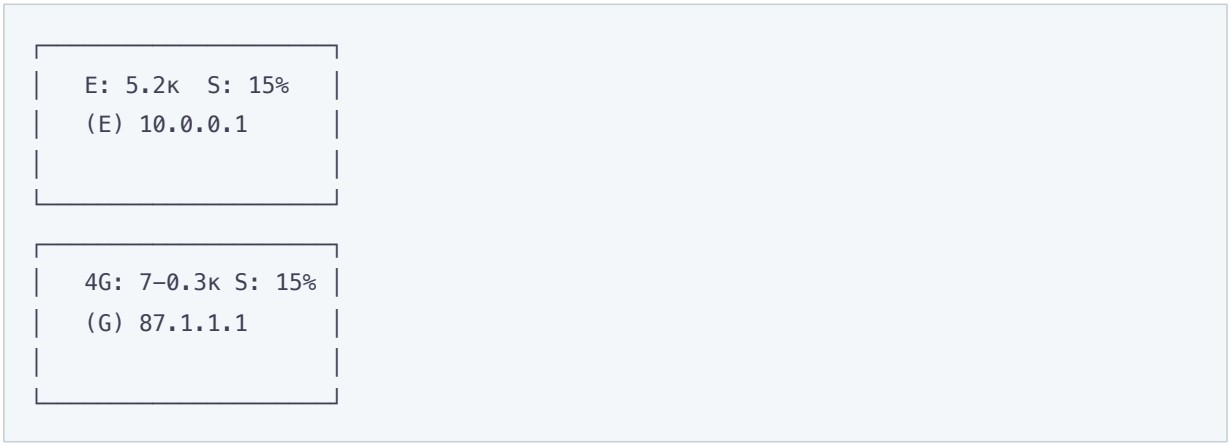


Fig.5 – Displaying the status of connections on the display

- `E: 5.2`k – the transmission speed via Ethernet is 5.2 kB/s;
- `4G: 7–0.3`k – the LTE signal level is 70 % and the FDD-LTE transmission rate is 0.3 kB/s;
- `S: 15%` – the load of RS-485 is 15 %.
- `(E): 10.0.0.1` – connection to the local network with the address 10.0.0.1;
- `(G): 87.1.1.1` – wireless Internet access with the address 87.1.1.1.

Communication modes

The Overvis MC251 is a protocol converter that bridges RS-485 Modbus RTU/ASCII networks and TCP/IP Modbus TCP devices to be available at the cloud server. It operates in multiple communication modes simultaneously, providing flexible connectivity through Ethernet, GSM/LTE networks, and RS-485 interfaces. Each mode serves a distinct purpose and can be used independently or in combination to meet your application requirements.

Connection to cloud server (VPN connection)

MC251 can establish and maintain a secure VPN outbound connection to a cloud server (using Wireguard protocol).

- MC251 initiates the outbound connection to the server, bypassing firewall issues
- MC251 authenticates at server and receives VPN parameters
- The VPN connection is started
- After the connection is established, MC251 operates as a Modbus TCP server in slave mode, waiting for connections and processing server requests
- The server connects to MC251 and sends Modbus requests through the VPN tunnel
- MC251 forwards these requests to RS-485 devices or responds with its own register values
- Returns responses back to the server
- If the SRV LED is on, the connection to the server VPN has been successfully established
- If the SRV LED blinks, data is being exchanged via this connection

Use case: Centralized monitoring and control of distributed equipment through Overvis Cloud platform, enabling secure remote access from anywhere without configuring firewall port forwarding or static IP addresses.

RS-485 Modbus RTU/ASCII master mode

In master mode, MC251 forwards Modbus requests from TCP clients to devices on the RS-485 bus and returns their responses.

- MC251 receives Modbus requests from incoming TCP connections
- Translates Modbus TCP requests to Modbus RTU/ASCII format
- Forwards requests to target devices on the RS-485 network
- Returns responses back to the TCP client
- Supports both Modbus RTU and Modbus ASCII protocols

When an operation logic program is loaded, MC251 can also autonomously poll devices at configured intervals for data logging or event tracking purposes.

Request processing is described in detail in Modbus interface.

Use case: Data collection and event tracking for serial port equipment.

Integrated Modbus TCP server (slave mode)

MC251 acts as a Modbus TCP server, accepting incoming connections and processing Modbus requests.

- Listens for incoming TCP connections from Overvis Cloud, SCADA systems, HMI panels, or other Modbus TCP clients
- Receives Modbus TCP requests from connected clients
- Responds with its own register values or translates requests to Modbus RTU/ASCII and forwards them to RS-485 devices (in master mode)
- Returns responses back to the TCP client
- Supports up to 4 simultaneous incoming TCP connections
- MC251's own registers can also be accessed directly (current time, supply voltage, logic calculation results, etc.)

Use case: Access to the RS-485 serial port equipment for the TCP devices, HMI panels, SCADA and other Modbus TCP software.

Connection to remote Modbus TCP servers (master mode)

MC251 can establish outgoing connections to remote Modbus TCP servers, enabling it to forward requests to remote devices.

- Initiates and maintains TCP connections to specified remote Modbus TCP servers via Ethernet or GSM/LTE
- Forwards Modbus requests received from other sources (some RS-485 master, incoming TCP client connections, or operation logic) to these remote servers
- Receives responses from remote servers and returns them to the requester
- Can connect to multiple remote servers simultaneously (up to 3 connections can be configured)
- Enables bridging between local RS-485 network and remote TCP-based Modbus devices

Use case: Data collection and event tracking for Modbus TCP equipment.

Reverse control translator mode (RS-485 slave, TCP master)

MC251 can operate as an RS-485 slave while acting as a Modbus TCP master, enabling reverse control scenarios.

- Receives Modbus RTU/ASCII requests from an RS-485 master device
- Translates these requests to Modbus TCP format
- Forwards them to remote TCP servers or local TCP-based devices
- Receives responses from TCP devices
- Returns responses back to the RS-485 master in RTU/ASCII format

Use case: Access to the Modbus TCP equipment for the RS-485 serial port master device.

Tunnel mode (transparent data forwarding)

In tunnel mode, MC251 accepts data “as is” (without protocol verification) and forwards it to all other directions that are configured for this mode.

This allows transmission of data in formats different from the Modbus protocol. For example, arbitrary data received via RS-485 can be redirected to a remote TCP server, and vice versa.

Tunnel mode can be configured individually for:

- Each connection to a remote TCP server
- The RS-485 interface
- Incoming connections to the Ethernet TCP port
- Incoming connections to the GSM/LTE TCP port

First, a data packet from one direction is fully received (for Ethernet or GSM/LTE, this is one TCP packet; for RS-485, the packet length is determined by the Modbus RTU maximum-pause rules). Then it is sequentially forwarded to the other tunnel directions (if there are more than two directions).

The maximum data packet length in tunnel mode is 254 bytes.

Use case: Connecting equipment with non-Modbus compatible protocols, or extending serial communication over IP networks.

Network extension (long-range RS-485 bridging)

Pair two MC251 units to extend RS-485 networks beyond physical distance limitations by converting to/from TCP.

- One MC251 operates in master mode on its RS-485 interface, while the other is in slave mode
- First MC251 receives RS-485 signals and converts them to TCP packets
- Data is transmitted over any distance via 4G/LTE or Ethernet networks
- Second MC251 receives TCP packets and converts them back to RS-485 signals
- Creates a transparent bridge between two RS-485 networks or segments
- Works in both Modbus protocol mode (with address translation) and tunnel mode (fully transparent)

Use case: Connecting RS-485 networks in separate buildings without running long cable runs, extending RS-485 beyond the 1200m distance limit, or accessing remote sites via cellular networks.

Network consolidation (address space remapping)

Combine multiple separate Modbus networks into one unified network by remapping device address spaces.

- Connect multiple isolated RS-485 networks, each with its own set of device addresses and/or baudrate and parity settings
- Configure address mapping to avoid conflicts (e.g., map first network's UIDs 1-10 to 1-10, second network's UIDs 1-10 to 11-20)
- Access all devices from a single TCP or RS-485 interface as if they were on one network
- Can combine local RS-485 devices with remote TCP devices seamlessly

Use case: Integrating multiple legacy systems with overlapping device addresses into a single SCADA system without physically re-addressing devices.

Access to Modbus network using SMS

If an active SIM card is installed, MC251 receives and processes incoming SMS messages.

- MC251 receives SMS messages sent to the SIM card's phone number
- If the SMS contains a correctly formatted Modbus request, MC251 processes it:
  - Forwards the request to the target device on RS-485 or TCP
  - Receives the response
  - Sends a reply SMS with the response data
- If the SMS is not a Modbus request, it is stored in the incoming SMS list for processing by operation logic programs

SMS Modbus request format is described in Modbus interface. Custom SMS processing is described in Operations logic programming.

Use case: Remote diagnostics and emergency control of equipment in locations without reliable internet, such as pump stations or remote substations.

Data collection and event tracking

When an operation logic program is loaded into internal memory, MC251 reads specified parameters at a configured rate. These parameters may include registers of connected Modbus devices, MC251's own registers, or MC251 memory.

The device then performs configured calculations and evaluates the received data. As a result, the following actions can be executed:

- writing the read values to a log on the memory card;
- sending SMS notifications on events;
- writing new values to parameters.

The program is loaded into internal memory from the memory card. The procedure for preparing and loading the program into the device is described in Operations logic programming.

Use case: Autonomous data logging to memory card for later analysis, or automated responses like sending alarm notifications or regulation commands when temperature exceeds thresholds.

Configuration

MC251 configuration can be performed in two ways:

- quick setup of the Internet connection via the web interface using a browser (see Web interfaces);

- quick setup via the Modbus protocol using any Modbus client software that works with MC251's own registers (see Modbus interface).
- advanced configuration at the Overvis cloud server device page.

> ⚠ **Configuration warning**
>
> When changing MC251 parameters, you may set values that interfere with or block subsequent connections. In this case, reset the parameters to factory defaults.

Use the R button to grant quick access to MC251, restart the controller, or reset factory settings. Access the button through a hole on the front panel and press with a thin non-conductive object.

To reset the device to factory settings and clear the internal operation logic memory:

- Press and hold the service button R for at least 8 seconds. After 2 seconds, the AL indicator will light up. After 8 seconds, the settings are reset, internal memory is cleared, and the device restarts; the indicators blink once.
- Release the R button.

To safely remove the memory card and restart the device (while preserving user settings):

- Press and hold the service button R for 2 to 8 seconds.
- When the AL indicator lights up, release the R button. If needed, remove the memory card after the SD indicator turns off.

To wake up the display, show connection information, and grant quick access to the device:

- Briefly press and release the service button R.
- The display lights up and shows connection information. For several minutes, configuration access (without a password) is granted for incoming connections.

> ⚠ **Security recommendation**
>
> For security reasons, protect the R button from unauthorized access (for example, by using a tape seal or installing MC251 in a locked enclosure).

Maintenance

> ⚠ **MAINTENANCE SAFETY**
>
> TERMINALS AND INTERNAL ELEMENTS MAY CARRY POTENTIALLY LETHAL VOLTAGE. DURING MAINTENANCE, DISCONNECT MC251 AND ALL CONNECTED EQUIPMENT FROM THE POWER SUPPLY.

> ⚠ **MAINTENANCE SAFETY**
>
> DO NOT OPEN THE DEVICE. THERE ARE NO SERVICEABLE PARTS INSIDE.

- Only qualified personnel should perform maintenance.

- Recommended maintenance interval is every six months.

1. Check the reliability of wire connections; if necessary, retighten terminals with the torque specified in Technical Specifications.
2. Visually inspect the housing. If you detect cracks or other damage, take MC251 out of service and send it for repair.
3. If necessary, wipe the front panel and housing with a soft cloth.

Do not use abrasives or solvents for cleaning.

Service life and warranty

1. The service life of MC251 is 10 years. After the service life expires, contact the manufacturer.
2. Shelf life is 3 years.
3. The warranty period is 5 years from the date of sale. During the warranty period, in the event of failure, the manufacturer provides free repair.

> ⚠ **Warranty conditions**
>
> IF YOU OPERATE MC251 IN VIOLATION OF THE REQUIREMENTS OF THIS OPERATING MANUAL, YOU LOSE THE RIGHT TO WARRANTY SERVICE.

4. The place of purchase or the manufacturer performs warranty service.
5. The manufacturer performs post-warranty service at current rates.
6. Before sending MC251 for repair, pack it in the original or other packaging that protects it from mechanical damage.

When returning MC251 for warranty or post-warranty service, please provide a detailed reason for the return in the claims data field.

Transportation and storage

You may transport and store MC251 in the original package at temperatures from minus 45 to +60 °C and relative humidity of no more than 80%. When transporting MC251, protect it against mechanical damage.

See also

- Versions and modifications
- Connections
- Operations logic programming
- Memory card data saving
- Web interfaces
- Modbus interface
- Firmware update

Connections and Network Setup

> **Important**
>
> Connecting an incorrectly configured device to a data transmission network can disrupt communication between other devices. Ensure all connected devices have compatible settings. Network connections involving more than 2 devices should be performed by qualified network personnel.

> **Quick Start**
>
> For a streamlined connection guide, see the Quick Start Guide.

IP Addressing

The Overvis MC251 uses standard TCP/IPv4 addressing for Ethernet communication. DHCP is enabled by default, allowing the device to automatically obtain network settings from your router. Without DHCP the factory default IP address is `192.168.0.111`.

> **IP Addressing Fundamentals**

Table 1 - Factory addressing settings for MC251

Parameter	Value
Addressing using DHCP	Yes
IP Address	192.168.0.111
Subnet Mask	255.255.255.0
Gateway	192.168.0.1

Ethernet Connection Methods

With factory default settings, MC251 supports two connection methods via Ethernet.

Method 1: Network with DHCP Server

If your network includes a router or DHCP server that assigns IP addresses to new devices:

1. Connect MC251 to the network
2. Wait for the device to obtain an IP address (appears on the display with `(E)` prefix for Ethernet)
3. If the display shows `0.0.0.0`, the address has not been received yet
4. If `192.168.0.111` appears after 20-60 seconds, DHCP acquisition failed and the device switched to its static address

Method 2: Direct Connection or Network Without DHCP

If DHCP is unavailable, or MC251 is connected directly to a computer:

1. MC251 will switch to static addressing after 20-60 seconds
2. Configure the client device with:
    - Subnet mask: `255.255.255.0`
    - IP address: `192.168.0.`X (where X = 1-254, excluding 111)
    - Ensure the chosen address doesn't conflict with other devices on the subnet

If your network uses different addressing (different mask or IP range from Table 1), or if `192.168.0.111` is already taken:

1. Temporarily disconnect the conflicting device from the network
2. Establish direct communication between your client device and MC251
3. Configure both devices for proper network communication
4. Reconnect to the network

Configuring Ethernet Connection on Windows PC

In some cases you may need to connect MC251 directly to your computer to access its web interface and change settings. Connect the device with an Ethernet cable to the LAN port on your PC, then configure your network adapter as described below.

The following example shows how to configure a Windows PC (Windows 7/8/10/11) to communicate directly with MC251 using factory settings. For other operating systems, configure your client device's addressing according to its documentation.

> **How to access network adapter settings on Windows 7 / 8 / 10**

> **How to access network adapter settings on Windows 11**

Configuring the Network Adapter

1. In the Connections window, select the desired network adapter. If multiple connections appear, choose the correct one by adapter name or consult your system administrator.

2. Right-click the connection icon and select `Properties`. The Properties window opens (Fig. 1).

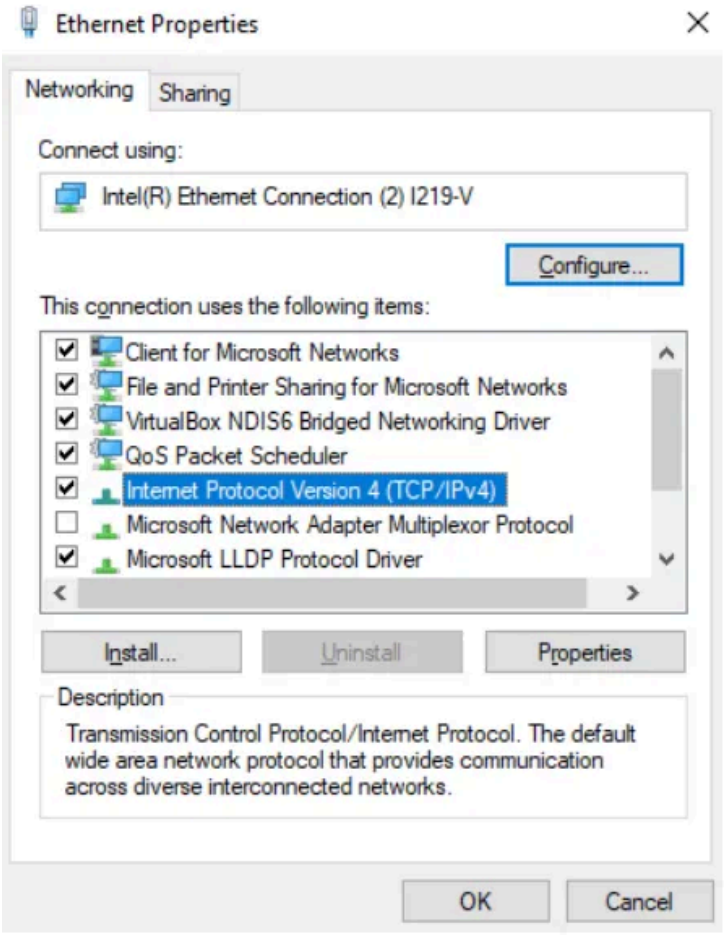


Fig. 1 – Connection properties window in Windows

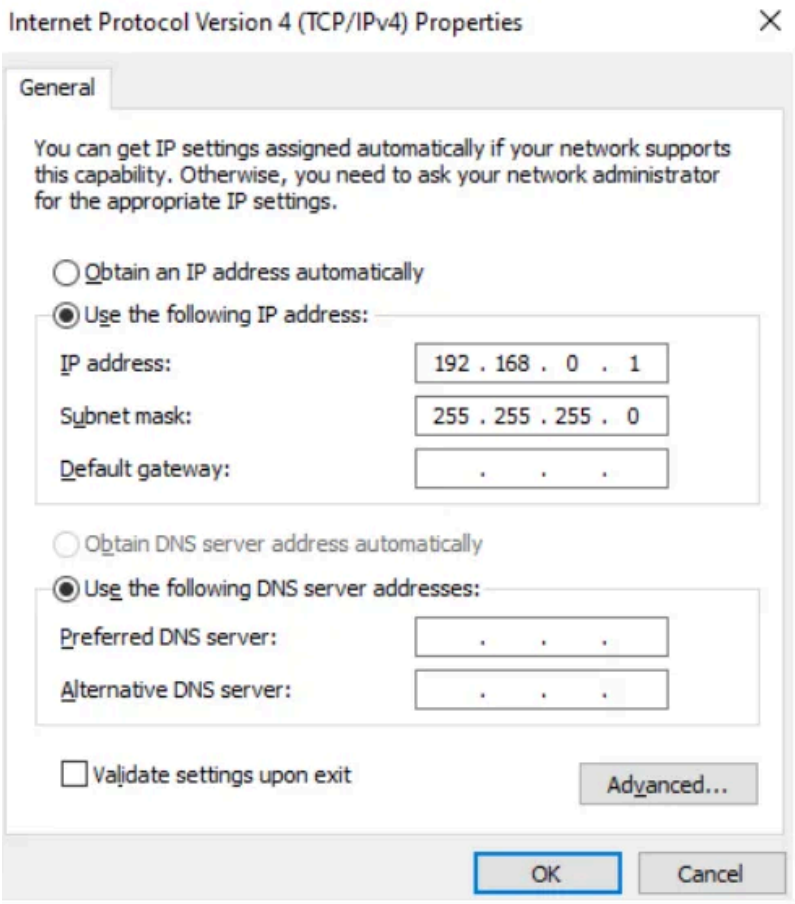


Fig. 2 – TCP/IPv4 properties window in Windows

3. Select `Internet Protocol Version 4 (TCP/IPv4)` from the component list. Ensure it's enabled (checkbox is checked). Click `Properties`. The TCP/IPv4 properties window opens (Fig. 2).
4. Select `Use the following IP address`
5. In the `IP address` field, enter an address in the range `192.168.0.1` to `192.168.0.254` (excluding `192.168.0.111`, which MC251 uses)
6. In the `Subnet mask` field, enter `255.255.255.0`
7. Leave `Default gateway`, `Preferred DNS server`, and `Alternate DNS server` fields blank or unchanged
8. Click OK to close the Protocol Settings window
9. Click OK to close the Connection Settings window
10. If prompted to restart the PC, select `Yes`

Internet Connection via Ethernet

> ⚠ **STRONGLY RECOMMENDED**
>
> Connect the device to the Internet under the supervision of your LAN system administrator and/or Internet service provider representative.

Basic Internet Setup

To connect MC251 to the Internet via Ethernet:

1. Connect MC251 to a local network router with DHCP addressing enabled
2. Ensure the router is connected to your Internet service provider (ISP)
3. **Do not** connect MC251 directly to the ISP's cable

This setup enables outgoing connections (e.g., VPN connection to Overvis cloud server, connections to other servers using hostnames or static IP addresses).

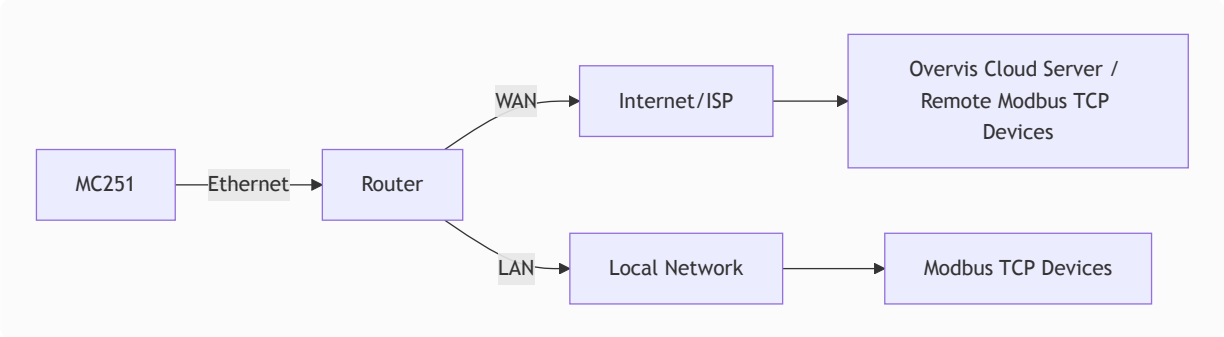


Fig. 3 – MC251 Internet connection topology via Ethernet with DHCP

Incoming Connections Setup

To access the device from the Internet via incoming connections (direct TCP connection or web interface):

1. **Acquire a Static IP**: Get a dedicated line with a static IP address from your ISP
    - Connect the ISP cable to the router's uplink port (usually color-coded, see router documentation)
    - Use a straight-through Ethernet cable to connect MC251 to the router
2. **Configure Router**: Following your ISP's recommendations, configure the router for Internet access using the router documentation.
3. **Set Up Port Forwarding**: Configure the router to redirect queries from your static public IP address to MC251's local IP address (factory default: `192.168.0.111`)
    - For web interface access: redirect to port **80** on MC251's local address
    - For Modbus TCP or tunnel access: redirect to the incoming Ethernet connections port (factory default: **502**).

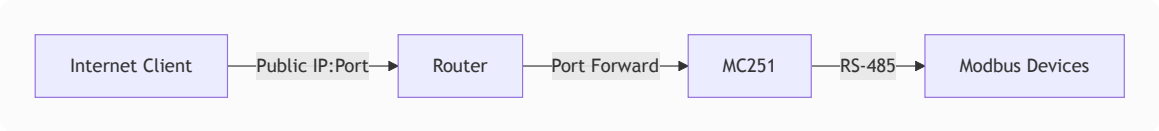


Fig. 4 – MC251 incoming connections via port forwarding

4. **Configure DHCP Reservation**: Either:
    - Configure the router to always assign the same IP address to MC251 via DHCP, OR
    - Disable DHCP in MC251 settings and use a static IP

    This ensures port forwarding works correctly.

5. **Verify Security**: Confirm that MC251's Internet connection is protected by standard security measures (see Connection Security)

6. **Access the Device**: When accessing MC251 from the Internet, use the static IP address provided by your ISP and the port specified in your port forwarding configuration

GSM Connection

> ⚠ **STRONGLY RECOMMENDED**
>
> If you are using corporate IoT APN, connect the device to the Internet under the supervision of your mobile service operator representative.

Ensure your tariff plan includes GPRS or LTE service (for Internet connectivity) and/or SMS messaging (for SMS-based control).

Basic GSM Setup

To connect MC251 via GSM:

1. **Obtain SIM Card**: Get a SIM card from your GSM operator
2. **Install Hardware**: Insert the SIM card into MC251 and connect the appropriate antenna to ensure proper signal strength at the MC251 location
3. **Verify SIM Recognition**: After starting MC251, confirm the SIM card is correctly identified
    - After communication initialization, the GSM indicator should blink continuously
    - If the indicator remains off for more than 4 seconds, check the SIM card, antenna, and GSM signal level on the MC251 display
4. **Verify Internet Connection** (if using GPRS/LTE): Ensure the operator settings are correct
    - When connected to the Internet, the GSM indicator flashes 3 times per second
    - If flashing less frequently, check the APN settings
5. **Configure APN**: If necessary, manually configure the APN according to your operator's recommendations (see APN Configuration Examples below)

This setup enables outgoing connections (connecting to Overvis cloud server, or to other servers with static IP addresses on the Internet).

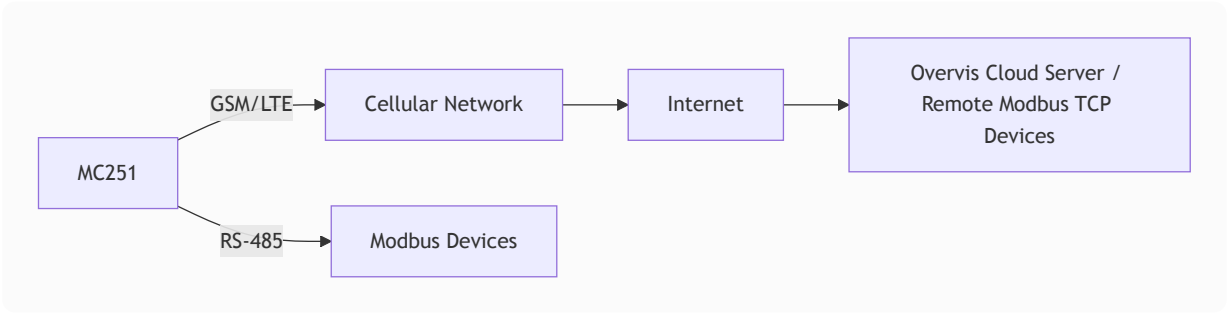


Fig. 5 – MC251 Internet connection topology via GSM/LTE

> **APN Configuration Examples**

Incoming Connections via GSM

1. **Obtain Static IP Service**: Get a static IP SIM card or service from your operator
2. **Install Hardware**: Insert the SIM card and connect the antenna to ensure proper signal strength at the MC251 location
3. **Configure Device**:
   - Set the incoming GSM connections port in settings.
   - Configure APN settings according to your operator's recommendations
   - Restart MC251
4. **Verify Connection**: Confirm the SIM card is identified correctly
   - After interface initialization, the GSM indicator should continue to flash
   - If the indicator remains off for more than 4 seconds, check the SIM card, antenna, and GSM signal level on the device display

> **Note**
>
> Your operator may provide alternative access methods, such as private IP addresses instead of public IP addresses. Private IPs are used to interlink devices within the operator's network without providing full Internet access.

Connection Security

MC251 provides several security features to protect against unauthorized access:

Built-in Security Features

MC251 has basic protection against unauthorized access via network. Access for writing and/or reading via Modbus or SMS can be deactivated in settings.

Device settings can be changed remotely by entering a password (minimum 5 characters). Access passwords can be set for restriction of writing and/or reading via Modbus or SMS.

When entering the password, all settings are only available to the specific client using the specific protocol. In case of no requests from the client over a long period, the access returns to locked mode.

⚠ SECURITY WARNING

For Modbus connections, passwords are transmitted in unencrypted form. Even with correct password authentication, the HTTP and Modbus connections remain unsecured at all segments except VPN and GSM.

Security Limitations and Recommendations:

- **Attack Protection**: The device protection system is not designed to counter malicious network attacks, especially denial-of-service attacks aimed at blocking MC251 rather than gaining access
- **Network Segmentation**: For complex and large networks (especially when providing Internet access to MC251), it is strongly recommended to:
  - Separate MC251 from unprotected networks using standard security equipment
  - Use a properly configured router with traffic filtering
  - Deploy a firewall or similar protective measures

Server Connection

MC251 is designed to operate linked to the Overvis Cloud server for configuration, data collection and management.

ⓘ About Overvis

Overvis (www.overvis.com) is a system for monitoring and remote control of technological processes that enables you to read data from and control devices including MC251, store data in a database, review the data in various formats, and receive alarm notifications via SMS or email.

After the Internet access is established, MC251 would automatically connect to the Cloud Server VPN.

For a newly connected MC251, all you need then is to link it to your Overvis account.

Connection Methods Overview

To link the MC251 to your Overvis account, use the registration information from your MC251 label:

Method 1: Use PIN/QR code from the device label

Method 2: Manually enter and follow the link from the label

Detailed connection procedure is in Quick Start Guide.

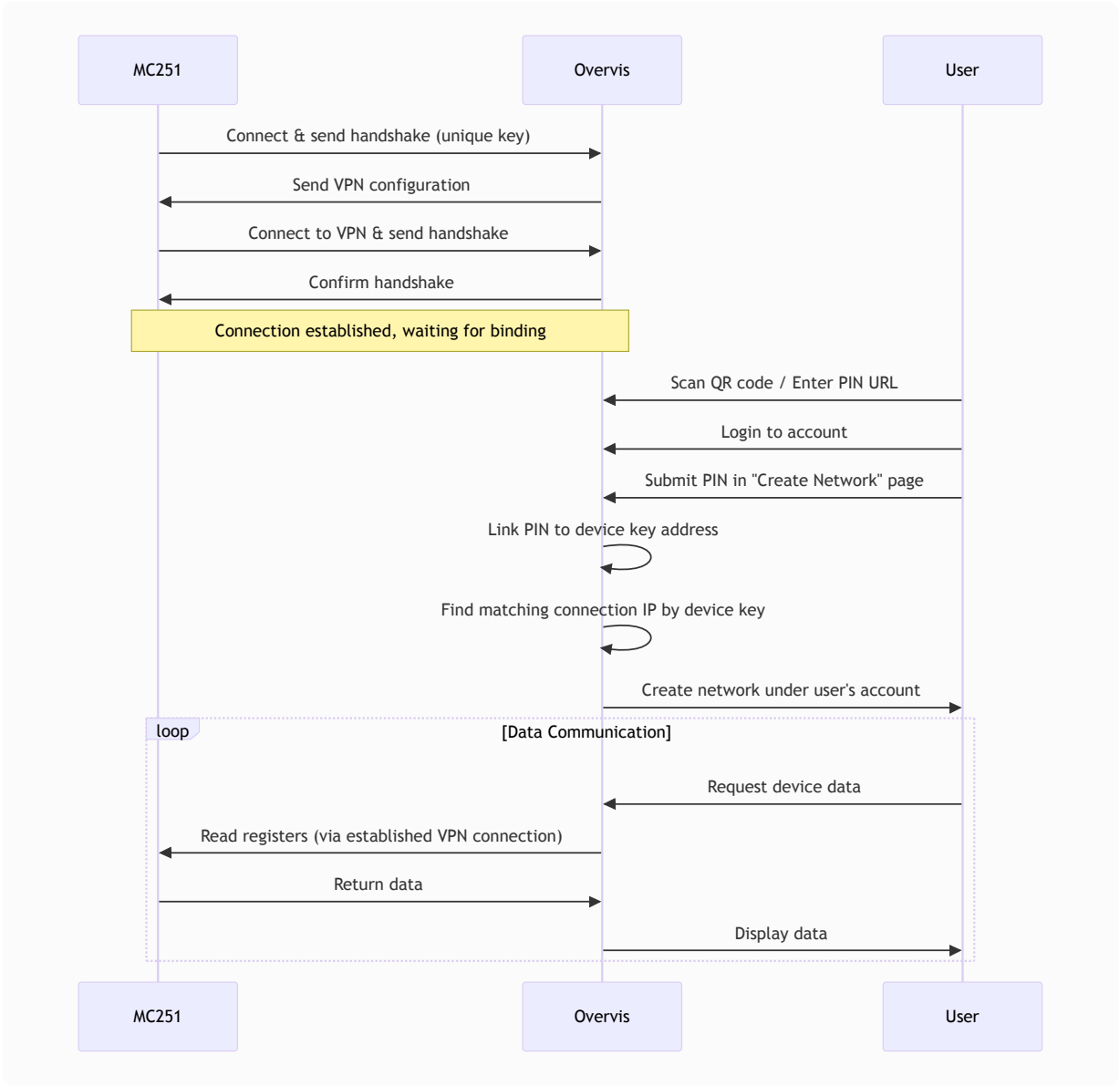


Fig. 6 – Connection sequence for PIN/QR code method (VPN connection)

Connection Flow: MC251 initiates outbound connection to Overvis VPN and maintains it. User registers by linking the PIN to this existing connection. No port forwarding required.

Prerequisites:

- MC251 connected to Internet (via Ethernet or GSM)
- QR code label on device (or PIN code from label)
- Overvis Cloud account (or create during setup)

Connection Steps:

1 **Verify Internet Connection**

Ensure MC251 is connected to the Internet. Check the device display for a valid IP address—the prefix `(E)` indicates Ethernet connection, `(G)` indicates GSM. Address should not be `0.0.0.0`.

2 **Access Overvis Server**

Scan the QR code on the device label with your phone or tablet, OR manually enter the URL from the label (format: `https://c.overvis.com/ABCD1234`). The link automatically redirects to Overvis server login page with the PIN embedded in the URL.

3 **Login or Create Account**

If you have an account, enter your credentials. New users should register for a free account first.

4 **Create Network**

After login, Overvis displays the “Create Network” page. If you came from the QR code/link, the PIN is pre-filled automatically. Otherwise, manually enter the PIN from the device label. Click “Check connection” to verify MC251 is online.

5 **Configure Network**

Give your network a descriptive name (a “network” represents your MC251 plus all connected Modbus devices). MC251 itself (Modbus unit ID 111) is added automatically. Add your RS-485 devices by selecting models and entering their Modbus addresses.

6 **Verify Operation**

Open a device page in Overvis and read parameters to confirm real-time communication.

Connecting to Other Servers

The only method of connection MC251 to other cloud servers and SCADA systems is the direct connection method via Modbus TCP.

Configure MC251 in the monitoring system as a remote Modbus TCP device. This requires setting up port forwarding on your router to redirect external connections to MC251’s local IP address and Modbus TCP port (default: 502). Your server will initiate connections to MC251 through your router, similar to Method 3 described above. You’ll need a static public IP address from your ISP, or alternatively, you can use a secure WireGuard VPN tunnel to bypass the need for public IP exposure.

Since MC251 uses the standard Modbus TCP protocol for direct connections, no special server software is required—any Modbus TCP client can communicate with the device. See the Modbus Interface documentation for complete register mappings and communication protocols.

Troubleshooting

Problem: MC251 display shows `0.0.0.0`

The DHCP server is not responding. Wait up to 60 seconds for MC251 to switch to its static IP `192.168.0.111`. If the issue persists, verify the network cable is properly connected and check your router’s DHCP settings.

Problem: Cannot access MC251 web interface

Verify your client device is on the same subnet as MC251. Check firewall settings on your client device and confirm the MC251 IP address shown on the display. You can press the R button briefly to grant temporary password-free access.

Problem: `LAN` LED is off

Check the Ethernet cable connection and verify it's not damaged. Try using a different cable to rule out cable faults.

Problem: `GSM` LED stays off

The SIM card may not be inserted correctly—remove and reinsert it. Check that the SIM card PIN is disabled (disable it using a phone before inserting). Verify the antenna is connected properly. Poor signal strength may require relocating MC251 or using an external antenna.

Problem: `GSM` LED blinks slowly (every 1.5s) but no Internet

This indicates incorrect APN settings. Verify the APN configuration with your operator. Check that your SIM card has an active data plan and review the APN configuration in MC251 settings.

Problem: Cannot receive SMS commands

Verify the SIM card phone number is correct. Check the SMS format according to the Modbus Interface documentation. Ensure SMS service is enabled on the SIM card and verify any SMS passwords are configured correctly.

Problem: `SRV` LED stays off

MC251 is not connected to the Internet—check your Ethernet or GSM connection. Verify the Cloud server connection is enabled in the web interface. Check that the server address and port are correct in settings. Your network firewall may be blocking outgoing connections.

Problem: "Device already registered" error

The device is bound to another Overvis account. Use the **Restart Activation** button in the Cloud settings page to unbind it, or contact the previous owner to remove the device from their account.

Problem: Intermittent connection drops

Check that the power supply voltage is within the required range (9-30V DC) and can provide sufficient current (up to 500mA). Look for electrical noise or interference sources near the device. Update MC251 firmware to the latest version.

Problem: RS-485 devices not responding

Verify the RS-485 wiring is correct (A and B terminals). Check that the RS-485 bus termination is properly configured. Verify Modbus RTU/ASCII settings match the connected devices. See the Modbus Interface documentation for detailed communication settings.

Further Reading

- **Web Interface** — Guide to MC251's web-based quick setup interface
- **Modbus Interface** — Register mappings and communication protocols for Modbus TCP/RTU/ASCII

Need Help?

If you’re experiencing issues not covered in this guide, we’re here to help:

- **Technical Support**: Contact the manufacturer’s support team
- **Documentation**: Visit overvis.com/support for additional resources
- **Community**: Check the user forums for solutions from other MC251 users

For warranty service or hardware issues, please contact your authorized distributor or the manufacturer directly. z

User Web Interface

The Overvis MC251 has a built-in web interface for quick-start configuration of general options. You can access this interface using any standard web browser connected to the same network as the device.

Further configuration and monitoring are available at the cloud server.

General options

Accessing the Interface

1. Ensure the MC251 is powered on and connected to your network via Ethernet (uses standard HTTP port 80).
2. Find the device's IP address. You can display the current IP address on the MC251 screen by shortly pressing the **R** (Service) button.
3. Enter this IP address into your web browser's address bar (e.g., `http://192.168.1.100`).

> **Note:** If your network uses a proxy server, you may need to add the MC251's IP address to your browser's exception list to access it locally.

Authentication

Upon accessing the device, you will be presented with a login page.

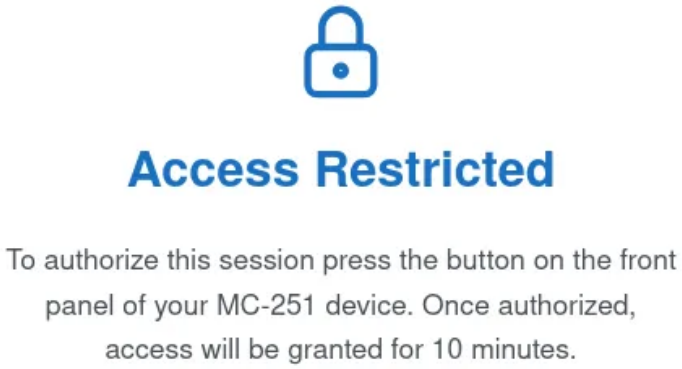


Fig. 1 - The login page

Shortly press the **R** (Service) button on the device to grant temporary access without a password.

Quick setup

After logging in, the Quick setup provides a real-time overview of the device status, allows to configure clock and Internet, and provides firmware update option (if update is available).

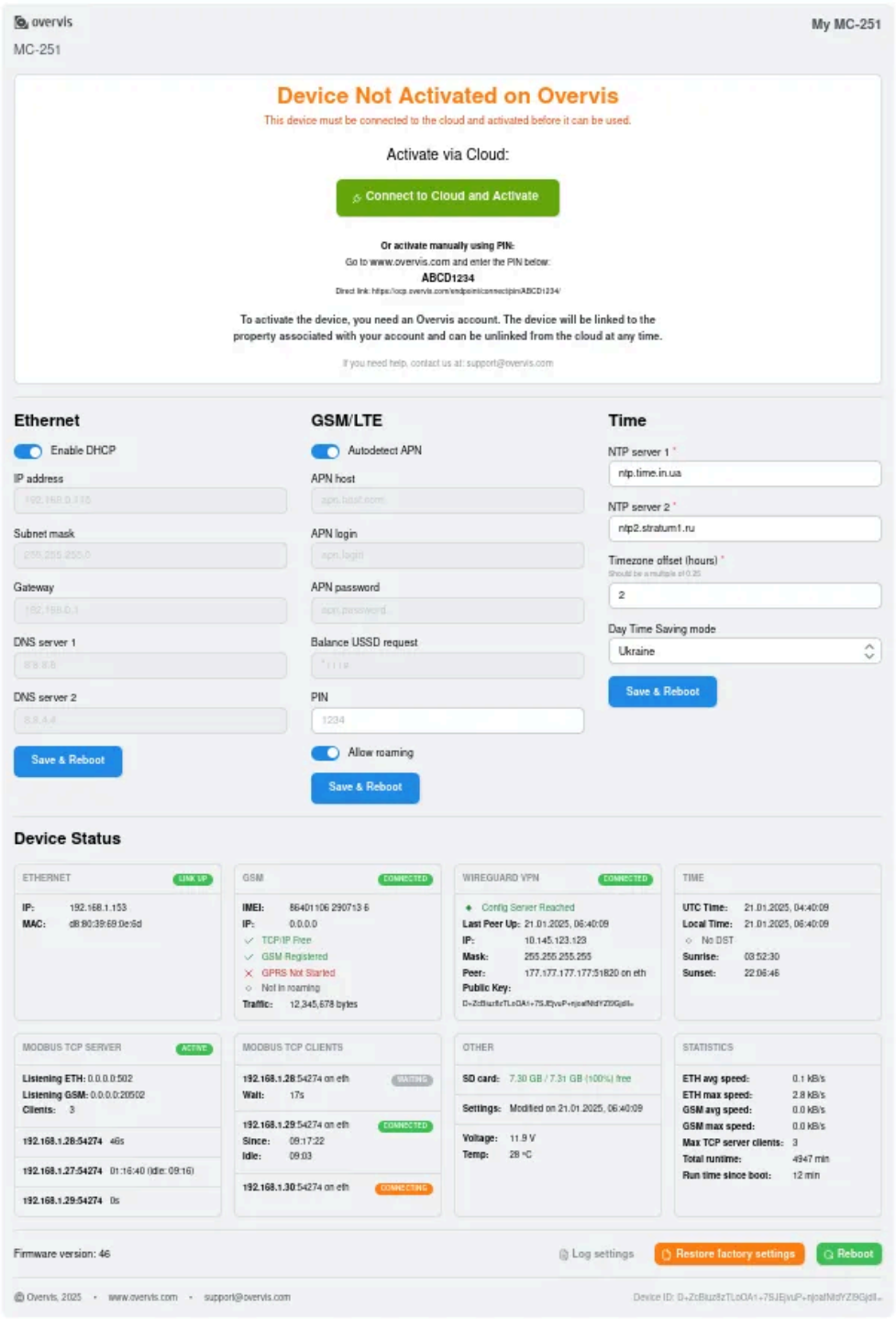


Fig. 2 - The quick setup page

The quick setup displays:

- TCP interface status
- Modbus connection states
- Memory card usage
- Data transfer statistics
- Current system time

- Cloud activation

The quick setup allows the management and configuration for:

- **System Time**: Configure the internal clock.
- **Ethernet**: Configure IP addresses, subnet, gateway, and DHCP.
- **GSM**: Configure APN settings, roaming options and PIN code.
- **Cloud VPN Connection**: Select the cloud VPN connection method and server address.
- **Firmware**: Perform firmware upgrades.

Need Help?

For technical support and assistance:

- Email: support@overvis.com
- Support portal: www.overvis.com/support

Modbus Interface Reference

The Overvis MC251 operates as a Modbus gateway, listening for Modbus TCP connections on port 502 (configurable). It supports connections from standard Modbus TCP client applications. Windows client software for basic testing is available for download here.

Upon receiving a connection request, the MC251 checks its list of active clients. If the maximum list size (as per technical specifications) has not been reached, the new client is accepted.

Once connected, the MC251 processes Modbus requests from the client. In **RS-485 Slave Mode**, it also accepts requests from a Modbus Master on the RS-485 bus.

Request Processing

The device analyzes each request based on the requested function and the client's access rights (determined by passwords entered).

- **Blocked Requests**: If a request is blocked due to insufficient rights, the MC251 sends back a Modbus exception (default code 1).
- **Internal Requests**: If the request addresses the MC251 itself, it is processed internally, and a reply is sent back.
- **Redirection**:
  - **RS-485 Master Mode**: Requests for other devices are converted (Modbus TCP/RTU/ASCII) and redirected to the RS-485 bus. The RS–485 indicator lights up while waiting for a response.
  - **Remote Server**: If configured, requests can be redirected to one or several remote Modbus TCP servers via Ethernet or GSM/LTE.

> ⚠ **Caution**
>
> Ensure there are no duplicate Modbus addresses (identifiers) across the RS-485 bus and the remote Modbus TCP server network. The response is accepted from the first responding device.

> ⚠ **Caution**
>
> Ensure there are no redirection loops. E.g. the remote server address is not the MC251 own address, etc. Redirection loops cause the responses to take longer, tend to cause exceptions or connection losses.

If a valid response is received, the MC251 forwards it back to the client.

Troubleshooting

- **Exception `Illegal Function (Code 1)` is returned for a request**: Sent either by MC251 (if insufficient rights for the request) or by the target device (if the request unsupported). Check the MC251 settings, `Administration` tab for protection settings. Send the correct password to the MC251 before using this request. Try allowing the requests.
- **Exception `Gateway Path Unavailable (Code 10 or 0x0A)` is returned for a request**: Sent if the request cannot be redirected. Check the connection to the remote is configured and established (if the target should be requested

using Modbus TCP). Check the `Modbus Master` mode is configured (if the target should be requested using Modbus RTU/ASCII). Check the Modbus address ranges on MC251 `Modbus` settings tab.

- **Exception `Target Device Failed to Respond (Code 11 or 0x0B)` is returned**: Sent if no response is received from the target device. Check the device settings match the MC251 `Modbus` tab configuration. Check the target device is powered on.
- **Some exception (not 1, 10 or 11) is returned**: Sent by the target device if it could not perform the request or produce the response data. Check the device manual. Try some other request.
- **The data has been acquired, but the values seem wrong**: Check the device manual. Ensure the Modbus device address and Modbus register address in the request are correct. Check the data formatting in the Modbus client software (which is sending this request). Try dividing the acquired value by 10, 100 or 1000.

SMS Modbus Access

With an active SIM card, the MC251 can process Modbus requests via SMS.

SMS Format

Incoming SMS messages are checked for a valid Modbus request format.

- **Modbus Requests**: Must begin with a configured password. If the password matches, the request is processed.
- **Other Messages**: Stored in the incoming SMS list and can be processed by a task file (see Logic Programming).

Request Syntax: `[Password] [Access][DeviceID][Resource][Address] [Value]`

- **Password**: As configured in settings.
- **Access**: `R` (Read, FC 1-4) or `W` (Write, FC 5-6).
- **DeviceID**: Modbus address of the target device.
- **Resource**:
  - `H`: Holding Registers
  - `I`: Input Registers
  - `D`: Discrete Inputs
  - `C`: Flags (Coils)
- **Address**: Register address.
- **Value**: (Write requests only) The value to write.

Examples:

- Read register 100 of device 1: `abc r1h100` (assuming password is “abc”)
- Write 5000 to register 174 of device 2: `stanc12 w2h174 5000` (assuming password is “stanc12”)

SMS Responses

The MC251 sends a response SMS upon processing the Modbus request command.

- **Success**: Returns the command (without password) and the register value.
  - Example: `r1h100 2200` (Read value 2200 from register 100 of device 1).
- **Error**: Returns the command, `EXC.`, the exception code, and a description.
  - Example: `r3h873 EXC.2 ILLEGAL DATA ADDRESS` (Register 873 of device 3 is not readable).

Table 1 - Standard Modbus Exception Codes

Code	Exception	Description
1	ILLEGAL FUNCTION	The received function code cannot be processed
2	ILLEGAL DATA ADDRESS	The data address specified in the request is not available
3	ILLEGAL DATA VALUE	The value contained in the request data field is invalid value
4	DEVICE FAILURE	Unrecoverable error has occurred when the addressee has tried to perform the requested action
5	ACKNOWLEDGE	The addressee accepted the request and processed it, but it takes a long time
6	DEVICE BUSY	The addressee is busy processing the command. The client can retry the request later
8	MEMORY PARITY ERROR	The parity error was detected when the addressee has tried to read the extended memory
10	GATEWAY PATHS NOT AVAILABLE	The gateway cannot redirect the request, since there is no path (connection) to the addressee
11	TARGET DEVICE FAILED TO RESPOND TO GATEWAY	The gateway did not receive a response to the forwarded request, because the addressee did not respond in time

Configuration via Modbus

The MC251 can be configured using any Modbus TCP client.

1. **Connect**: Use the MC251's IP address (press R button on device to view) and Modbus ID (default 111).
2. **Enter Password**: Write the password (default on device label) into the password registers (see **Current Mode Parameters**).
3. **Verify Mode**: If the password is correct, the Mode register will read 1 (Setup Mode).

Managing Settings

In Setup Mode, you can modify the **Changeable Settings** registers.

- **Save Changes**: Write 2 to the Command Register. Verify by comparing changeable parameters with saved parameters.
- **Save & Apply**: Write 4 to the Command Register. Applies Modbus parameters immediately without restart.
- **Cancel Changes**: Write 9 to the Command Register. Reverts changeable parameters to saved values.
- **Factory Reset**: Write 444 to the Command Register. Resets all settings to defaults.
- **Restart Device**: Write 1 to the Command Register. Required for some settings to take effect.
- **Exit Setup Mode**: Write `0` to the first password register (`100`). This clears the password and command registers.

MC251 Parameters

Table 2 - Parameter Data Formats

Parameter	Range of values	Description	Number of occupied registers
Number	0 – 65535	Integer number (16 bit) in standard range of Modbus register values	1
Number	-32768 – +32767	Integer number (16 bit) in complementary arithmetic	1
Number	0 – 4294967295 in two registers, MSB part – first	Integer number, which value can exceed the limit for Modbus register (65535)	2
Number	-2147483648 – +2147483647 in two registers, the MSB part is the first	Integer number (32 bit) in complementary arithmetic	2
Character string	In every register – number of 0 to 255 - ASCII character code or 0 (the end of string)	A set of values, each of which is equal to the code of one character in the ASCII encoding. If the string is shorter than the maximum length, the code 0 is placed after the last character.	Max. length of string for this parameter
IP-address (IP-mask)	In every register – one byte (0 – 255)	Set of four byte of address IPv4, from left to right	4
MAC-address	In every register – one byte (0 – 255)	Set of six byte of address MAC-48, from left to right	6

Table 3 - Parameter Groups

Group	Description	Access	Address
Device description	Device and firmware identification	Any mode, read only	0 – 3
Current mode	Access and general commands controls	Password entry is available in any mode, command entry - only in setup mode (after password entry)	100 – 120
Current status	Interfaces and software modules operation, current time and statistics	Any mode, read only	121 – 295, 900 – 944, 2000–2023
Changeable settings	Interfaces and features selection and configuration	Only in setup mode, reading or writing	300 – 899,

Group	Description	Access	Address
Active settings	The configuration being used by the device at the moment	In any mode, read only	2300 – 2899,
Saved settings	This set is saved regardless the power of the device and is used at restart	Only in mode of setting, read only	3300 – 3899,
Clock setting	See Table 5.8.	Only in clock setting mode, for reading or writing	34817 – 34825

Device Description Parameters

Table 4 - Device Description Parameters

Parameter	Description	Address
Device type	The code that defines the Modbus device for the manufacturer (47 – MC251)	0
Firmware version	Firmware version of embedded software	1
Check code	CRC32 of firmware of embedded software	2 – 3

Current Mode Parameters

Table 5 - Current Mode Parameters

Parameter	Range of values	Initial value	Description	Address
Entered password	String of characters	0	When entering a valid password, the client is given the appropriate permission (see registers 710 - 749)	100 – 119
			When you enter an empty string, the client rights are reset to the rights level at the time of connection	
Control command	0 – 65397, writing in the configuration mode	0	See **Table 5.1** for the list of commands.	120

Table 5.1 - Control Commands (Register 120)

Value	Command	Description
0	No activity	No action performed
1	Restart	Restart the MC251 device

Value	Command	Description
2	Save	Save settings changes via Modbus
3	Apply	Apply settings without restarting (Modbus parameters only)
4	Save and apply	Execute “Save” then “Apply” commands
6	Export	Save settings to a file on the memory card (see Memory card)
7	Import	Read settings from a file on the memory card and save them
9	Cancel	Revert to saved settings
51	Apply for Modbus	Apply settings via Modbus and RS-485
81	Synchronize clock	Synchronize clock with NTP server
161	Test SMS	Send a test SMS to the main subscriber number
444	Factory Reset	Reset settings to factory defaults
35381	Start clock setting	Allow access to clock setting registers
35431	Cancel clock setting	Close access to clock setting registers without changes
40959	Update task memory	Erase the logic program (re-read if memory card is inserted)
64893	Download Updates	Download latest firmware from cloud to `MC251FW2.FUS`
65397	Update Firmware	Program firmware from file `MC251FW2.FUS`

Current Status Parameters

Table 6 - Current Status Parameters

Parameter	Description	Address
Mode (for details see reg. 122)	0: User’s mode;	121
	1: Setting mode	
Tabs of access	See **Table 6.1** for the list of access bits.	122
Time, min	Number of minutes since the moment of start-up	123 – 124
Number of TCP clients	Number of occupied connections of TCP	125
Limit of TCP clients	Number of prospective clients of TCP	126
Load of RS-485, query/s	Total number of query/s via RS-485	127

Parameter	Description	Address
Effective load of RS-485, query/s	Number of responds without errors via RS-485 per second	128
Load of RS-485 per second, %	Load of RS-485 for the last second considering the set rate of RS-485 and time of inactivity	129
Load of RS-485 per minute, %	Load of RS-485 for the last minute 130	
Load of RS-485 for 5 minutes, %	Load of RS-485 for the last 5 minutes	131
Load of Modbus TCP, query/s	The number of queries received from clients via Modbus TCP per second	132
Effective load of Modbus TCP, query/s	Number of responds without errors being sent to the client via Modbus TCP per second	133
Load of GSM, kB/s	Load of wireless channel with GSM being switched on	134
Load of Ethernet,100 kB/s	Load of wire channel with Ethernet being switched on	135
Max. number of clients of TCP	Maximal number of simultaneously connected clients via TCP – from the moment of start up	136
Max. load of Modbus TCP, query/s	Maximal number of queries received per second from the clients via Modbus TCP – from the moment of start up	137
Max. load of RS-485, %	Maximal load of RS-485 for 5 minutes – from the moment of start up	138
Max. load of GSM, kB/s	Maximal load of GPRS/LTE – from the moment of start up	139
Current IP-address of Ethernet	IP-address, by which MC251 device is accessible in Ethernet network[1]	140 – 143
Current MAC-address of Ethernet	MAC-address, by which MC251 is detected in Ethernet network	144 – 149
Unused parameter	The parameter is reserved for compatibility	150 – 164
Time to connect to the data collection server	0 – connection to the data collection server is set;	165
	1 – connection to the data collection server is performed;	
	2 – 65534: the number of seconds before reconnecting;	
	65535: connection to the server is not used	

Parameter	Description	Address
Number of programmed restarts	Number of restarts in accordance to the user setting – for total operational time	166
Number of critical errors	Number of noted errors (failures) causing the restart of the device – for total operational time	167
Total operation time, min	The number of minutes of operating time - for the total operational time	168 – 169
Current time	Number of seconds since 1st of January of specified year (see reg. 172)	170 – 171
Year of countdown	Year, since 1st of January which is taken for time counting	172
Time zone, min	Time zone, for the time count, number of minutes with sign as to UTC+00	173
Temperature, °C	Temperature inside MC251	174
Power voltage, mV	Bus voltage of 12 V	175
Time to connect to the first remote TCP server, s	0 – connection to the remote server is set;	
	1 – connecting to the remote server;	
	2 – 65534: the number of seconds before reconnecting;	
	65535: connection to the remote TCP server is not used	176
Interface for connecting to the first remote TCP server	0 – the connection is not set;	177
	1 – Ethernet connection is set;	
	2 – GSM connection is set	
DST increment, min	Effective day saving time increment	178
Unused parameter	The parameter is reserved for compatibility	179 – 209
IP-address of client 1	IP-address of client, 0.0.0.0 – not connected	180 – 183
Port of client 1	Port of client, 0 – not connected	184
IP-address of client 2	IP-address of client, 0.0.0.0 – not connected	185 – 188
Port of client 2	Port of client, 0 – not connected	189

Parameter	Description	Address
IP-address of client 3	IP-address of client, 0.0.0.0 – not connected	190 – 193
Port of client 3	Port of client, 0 – not connected	194
IP-address of client 4	IP-address of client, 0.0.0.0 – not connected	195 – 198
Port of client 4	Port of client, 0 – not connected	199
Unused parameter	The parameter is reserved for compatibility and is equal to 0	200 – 209
Year (current time)	Current year	210
Month (current time)	Current month	211
Day of the month (current time)	Current day of the month	212
Hour (current time)	Current hour	213
Minute (current time)	Current minute	214
Second (current time)	Current second	215
Day of week (current time)	Current day of week (1 – Monday)	216
Month (winter time)	Current month, excluding summer time	217
Day of the month (winter time)	Current day of the month, excluding summer time	218
Hour (winter time)	Current hour, excluding summer time	219
Unused parameter	The parameter is reserved for compatibility	220 – 229
Time of day, s	Number of seconds from midnight of the current day	230 – 231
Time of sunrise, s	0 – 86399: Number of seconds from midnight to sunrise;	232 – 233
	86400: Sunrise is not observed on this day	
Sunset time, s	-1: Sunset is not observed on this day;	234 – 235
	0 – 86399: Number of seconds from midnight to sunset;	
Time of day, ms	Number of milliseconds from midnight of the current day	236 – 237
Memory card occupancy, 0.01%	10000 – memory card is missing or full	238
Estimated time spent on 1% of the memory card, days	0 – less than one day;	239

Parameter	Description	Address
	1 – 9999 – days for 1% of the memory card capacity;	
	10,000 – more than 10,000 days;	
	65535 – unknown	
Time before connecting to the second remote TCP server, s	Similar to register 176	240
Connection interface to the second remote TCP server	Similar to register 177	241
Time before connection to the third remote TCP server, s	Similar to register 176	242
Connection interface to the third remote TCP server	Similar to register 177	243
Current IP-address of GSM[2]	IP-address obtained from GPRS[1] provider	900 – 903
Unused parameter	The parameter is reserved for compatibility	904 – 914
GSM signal level, %[2]	Signal level and quality of radio communication with GSM provider	915
Unused parameter	The parameter is reserved for compatibility	916 – 940
Memory card capacity, kB	0 – card missing or unformatted in FAT / FAT32	941 – 942
The amount of data that has not been written to the memory card since the start, bytes	0 – there were no data record losses	943 - 944
	4294967295 – more than 4 GB losses	
Firmware Download Status Bits	See **Table 6.2** for the list of status bits.	2004
	Firmware file download progress (x 0.01%) Proportion of downloaded data size to total file size.	2005
	10000 – File fully downloaded	
Loaded programming logic tasks number	The number of the tasks correctly loaded into the internal memory	2020
Code of the first illegal logic task error	The code of the first error met in the first taskfile that could not be loaded	2021

Parameter	Description	Address
Line number of the first illegal logic task error	The line number where the first error was met in the first taskfile that could not be loaded	2022
Loaded programming logic tasks memory usage, bytes	The amount of RAM reserved for the programming logic tasks execution	2023
Firmware File Header	The string identifier of the version, e.g., “MC251, ver.45”.	2030 – 2061
	A blank string indicates the file is either unverified or invalid	

Table 6.1 - Tabs of Access Bits (Register 122)

Bit	Description	Value 0	Value 1
0	Permission to obtain RS-485 reading rights (via password)	Cannot be obtained	Can be obtained
1	Current RS-485 reading permission	No permission	Permission granted
2	Permission to obtain RS-485 write/control rights (via password)	Cannot be obtained	Can be obtained
3	Current RS-485 write/control permission	No permission	Permission granted
4	Permission to obtain MC251 register access (via password)	Cannot be obtained	Can be obtained
5	Current MC251 register access permission	No permission	Permission granted
6	Reserved	-	Always 1
7	Permission to configure MC251	No permission	Permission granted
8	Reserved	Always 0	-
9	Connection right	-	Client has right (Always 1)
12	Permission to set the clock	No permission	Permission granted

Table 6.2 - Firmware Download Status Bits (Register 2004)

Bit	Status	Value 0	Value 1
1	Busy Status	Waiting for command	File download in progress
2	Update Download Error	No error	Download error occurred

Bit	Status	Value 0	Value 1
3	Server Connection	No connection	Connected to server
4	File Data Reception	No data received	File data received
6	File Download Completion	File not downloaded	File fully downloaded
7	File Validity	Not confirmed	File is valid

Settings Parameters

Table 7 - Settings Parameters

> **Note**
>
> The internal structure of all sets of settings is similar to the structure of the set described, except for the initial address.

Parameter	Range of values	Factory setting	Description	Address
Ethernet network				
Static IP-address	IP-address	192.168.0.111	If the dynamic addressing is switched off or not available, IP-address of the device in Ethernet network is equal to this value	300 – 303
Subnetwork mask	IP-mask	255.255.255.0	It is used only with static IP-address	304 – 307
Gateway	IP-address	192.168.0.1	It is used only together with static IP-address for communication with other networks, or as an address of DNS/DHCP servers	308 – 311
Switch on the dynamic addressing with a help of DHCP	0 – 1	1	0 – for addressing in Ethernet, the specified values of the IP address, mask and gateway are used;	312
			1 – If DHCP server is available in the network, then IP address, mask and gateway are received from the server	
Unused parameter	0	0	Should be 0 for compatibility	313
Switch on the use of server gateway DNS	0 – 1	1	It is used if DHCP is not available (switched off):	314

Parameter	Range of values	Factory setting	Description	Address
			0 – DNS of gateway is not used;	
			1 – The gateway DNS is used to determine the IP addres-ses of other servers, if they are specified by host names	
IP-address of DNS server	IP-address	8.8.8.8	It is used if DHCP is not available (switched off);	315 – 318
			When the server of DNS gateway is used, it sets IP-address of additional DNS server	
IP-address of additional DNS server	IP-address	0.0.0.0	It is used if DHCP is not available (switched off);	319 – 322
			0.0.0.0 – it is not used	
Unused parameter	0	0	Should be 0 for compatibility	323 - 329
GSM network				
PIN-code of SIM-card	0 – 65535	65535	0 – 9999: this code is used for the SIM card if it demands the PIN code;	330
			Other values: the code isn't used; SIM card and GSM are unavailable if the card demand a code	
Enable automatic detection of GSM operator's APN	0 – 1	1	0 – connection is established by manually specified APN parameters;	331
			1 – APN is automatically determined for the operator by SIM card ICCID code	
Enable roaming exchange	0 – 1	1	0: GPRS/LTE is blocked in roaming;	332
			1: GPRS/LTE may be used in roaming	
Activate SMS in roaming	0 – 1	0	0 – SMS can be only received in roaming;	333

Parameter	Range of values	Factory setting	Description	Address
			1 – SMS can be received and sent in roaming	
Connection port via GSM	0 – 65535	0	It is used for external connection to the device via GSM with static IP, for communication using the Modbus TCP protocol or in tunnel mode.	334
			0 – it is disabled	
Parameter is not used	0	0	It is not used; it should be equal to 0 for compatibility	335 – 351
APN log-in of GPRS/LTE service	Character string		Provided by the GSM service provider; up to 40 characters	352 – 391
APN password of GPRS/LTE service	Character string		Provided by the GSM service provider; up to 24 characters	392 – 415
APN address of host	Character string		Provided by the GSM service provider; up to 34 characters; there cannot be spaces in a string	416 – 449
TCP Server				
Connection port via Ethernet	1 – 65535	502	It is used for external connection to MC251 via Ethernet for exchange via Modbus TCP protocol or in tunnel mode	450
Disconnect inactive clients	0 – 1	1	0 – incoming TCP connection is kept regardless of the time between requests from the client;	451
			1 – disconnect clients that did not send requests for longer than a specified time	
Max. request waiting time, s	0 – 600 000	90	Used if disconnection of inactive clients is selected	452 – 453
Unused parameter	0	0	Should be 0 for compatibility	454 - 456
Own Modbus-identifier of MC251	0 – 247	111	0 – all queries are sent via Modbus to the Modbus network, the device registers are unavailable by Modbus;	457

Parameter	Range of values	Factory setting	Description	Address
			1 - 247 – the device responds Modbus queries with this Modbus identifier without forwarding them on	
RS-485 network				
Bit rate via RS-485, bit/sec	75 – 230 400	9 600	It is used in case of data exchange between the devices via RS-485, the same value for the devices on the same RS-485 bus cable	458 – 459
Quotient for Modbus RTU silence time between frames	0 – 5	1	It is used for transmissions via RS-485 in Modbus RTU mode. During response reception, if the pause between the bytes is longer than the silence time, the frame is considered complete.	460
			0 - standard silence time (depends on the transmission speed and is equal to the transmission time of 3.5 bytes, or 1.75 ms for speeds above 19200 bps)	
			1 - 5: N quotient for a prolonged silence time multiplied by 2^N	
Byte format when transmitting via RS-485	0 – 5	5	It is used in case of data exchange between the devices via RS-485. See **Table 7.1** for formats.	461
Waiting time for starting the Modbus RTU response, ms	0 – 60 000	200	It is used for transmissions via RS-485 in Modbus RTU mode. After transmission of query, if the first byte of the response was not received within this time interval, the waiting for the response is terminated. The response is always waited for at least the silence time between frames	462
Enable ASCII exchange mode in Modbus network	0 – 1	0	Exchange mode via RS-485, the same value for all units on the same RS-485 bus cable.	463
			0 – RTU exchange mode (format: 1 start bit, 8 data bits, 2 stop-bits, parity bit, and stop bit or only 1 stop bit – total from 10 to11 bits);	

Parameter	Range of values	Factory setting	Description	Address
			1 – ASCII exchange mode (format: 1 start bit, 7 data bits, 2 stop-bits or parity bit and stop bit - total is 10 bits). The non-standard byte formats (register 461, values 4 and 5) are not available in this case, format 3 (2 stop bits) is used instead	
Response time for subsequent Modbus ASCII character, ms	0 – 60 000	1 000	It is used in case of data transfer via RS-485 in Modbus ASCII mode. If you receive a response, if the next byte of the response was not received within this time interval, then the response waiting is stopped. Waiting is always not less than the transmission time of one character (depends on the transmission speed)	464
Connection to the cloud server				
Mode of connection to the cloud server	0 – 8	0	See **Table 7.2** for connection modes.	465
Cloud server connection port	0 – 65535	20502	The port to which the party is addressed, making connection between MC251 and the server (see reg. 465)	466
Time of waiting for response from the cloud server, s	0 – 3 600	120	0 – the server silence time is not limited;	467
			1–3600 – max. time of server silence after which the connection will be stopped and must be remade again	
Delay time before reconnecting to the cloud server, s	0 – 30 000	15	It is used when connecting to the server. After losing connection to the server, the reconnection will be performed after the specified waiting time	468
Unused parameter	0	0	Should be 0 for compatibility	469 - 473

Parameter	Range of values	Factory setting	Description	Address
Cloud server address	Character string	modbus.overvis.com	It is used when connecting to the server, if the server address setting is turned on with text string. Address of the remote server with which the connection is supported.	474 - 509
			The string of up to 36 characters can be indicated as address. This string should not have any spaces	
Protection				
Password for setup mode access	Character string	specified on the device label	It is used to access the configuration mode. The string of 5 to 10 characters in length can be indicated as password. This string should not have any spaces	510 – 519
Parameter is not used	0	0	It is not used; it should be equal to 0 for compatibility	520 – 529
Password for writing permission using incoming SMS	Character string	specified on the device label	It is used to verify the authenticity of incoming SMS with request for record or with acknowledgment of the fault. The string of 3 to 10 characters in length can be specified as password. This string should not have any spaces	530 – 539
Password for reading permission using incoming SMS	Character string	specified on the device label	It is used to verify the authenticity of incoming SMS with request for reading or with acknowledgment of the fault. The string of 3 to 10 characters in length can be specified as password. This string should not have any spaces	540 – 549
Password for writing permission via Modbus to the other devices	Character string		It is used to access devices connected to the MC251, to request write or control functions that can change the status of these devices. The string up to 10 characters in length can be specified as password. This string should not have any spaces	550 – 559
Password for reading permission via Modbus	Character string		It is used to access devices connected to the MC251, to request read functions, or to access the MC251 registers, except for registers of	560 – 569

Parameter	Range of values	Factory setting	Description	Address
			version, password, mode and tabs. The string up to 10 characters in length can be indicated as password. This string should not have any spaces	
Enable the protection mode against writing via SMS	0 – 1	0	0 – Protection against recording is regulated with help of other parameters (password);	570
			1 – Blocking of queries via SMS for function of writing	
Enable the protection mode against reading via SMS	0 – 1	0	0 – Protection against reading is regulated with help of other parameters (password);	571
			1 – Blocking of queries via SMS for function of reading	
Enable the protection mode against writing via Modbus	0 – 1	0	0 – Protection against recording is regulated with help of other parameters (password) or deactivated;	572
			1 - Blocking of any queries for functions, excepting functions of Modbus 1, 2, 3, 4, 7, 17, 20	
Enable the protection mode against reading via Modbus	0 – 1	0	0 – Protection against reading is regulated with help of other parameters (password) or deactivated;	573
			1 – Blocking of queries for functions of Modbus 1, 2, 3, 4, 7, 17, 20, excepting reading using function 3 of registers of version, mode and tabs	
Parameter is not used	0	0	It is not used; it should be equal to 0 for compatibility	574
Miscellaneous				
Parameter is not used	0	0	It is not used; it should be equal to 0 for compatibility	575 – 630

Parameter	Range of values	Factory setting	Description	Address
Restart time, min	5 – 7 200	120	Used when automatic restart is enabled.	631
Automatic restart mode	0 – 2	2	It is used when automatic restart is enabled:	632
			0 – the automatic restart is disabled;	
			1 – the device is restarted after a specified period of time since the start;	
			2 – the device is restarted after a specified period of time since the last transmission via Ethernet or GSM networks.	
Modbus exception code generated when access is denied	0 – 255	1	0 – if the access to Modbus registers is denied, the response to the client is not returned;	633
			1 – 255 – if you deny access to the client who sent the request, this exception code is returned	
Modbus exception code generated when there is no response	0 – 255	11	0 – if there is no response from the addressee (Gateway Timeout), the response to the client is not returned;	634
			1 - 255 – if there is no response from the request recipient, this exception code is returned to the client	
Parameter is not used	0	0	It is not used; it should be equal to 0 for compatibility	635
Modbus exception code generated if there is no connection to query addressee	0 – 255	10	0 – If there is no connection to the query addressee (Gateway Path Unavailable), response is not returned to the client;	636
			1 – 255 – if there is no connection to the query addressee, this exception code is returned to the client	

Parameter	Range of values	Factory setting	Description	Address
RS-485 transmission mode	0 – 2	0	0 – Master mode (Modbus Master): RS-485 is used to send queries;	637
			1 – Slave mode (Modbus Slave): RS-485 is used to receive queries from additional client;	
			2 – tunnel mode, used to transmit data “as is”, without protocol verification	
First Modbus-identifier of RS-485	1 – 255	1	Two parameters define a range of Modbus identifiers used for RS-485.	638
			In the master mode the queries with addresses in this range (and also the broadcast ones with address 0) are sent via RS-485.	
			In the slave mode the queries with addresses in this range	
			(and also the broadcast ones and the queries to MC251 address) are received via RS-485	
Last Modbus-identifier of RS-485	1 – 255	255	same as above	639
**Connection to the first remote TCP server				
IP-address of remote server	IP-address	192.168.0.112	It is used when enabling redirection of queries to TCP remote server. IP-address of the remote server wherewith connection is maintained	640 – 643
Port of the remote server connection	0 – 65535	502	Port of the remote server to which the TCP connection will be established	644
Time to wait for response from remote server, ms	0 – 60 000	1 000	It is used during redirection of queries to the remote server. After the query transfer, if the correct response failed to be received within this time interval, response waiting is stopped	645

Parameter	Range of values	Factory setting	Description	Address
Standby time to repeated connection to the remote server, s	0 – 240	20	It is used during redirection of queries to the remote server. After connection with the server is lost, the repeated connection will be performed after preset standby time	646
Remote server connection mode	0 – 12	0	See **Table 7.3** for connection modes.	647
First Modbus-identifier of the remote server	1 – 255	1	It is used during redirection of queries to the remote server.	648
			Two parameters define the range of Modbus identifiers used on the remote server.	
			Queries with addresses in this range (and also the broadcast ones with address 0) are sent to the remote Modbus TCP server	
Last Modbus-identifier of the remote server	1 – 255	255	same as above	649
Parameter is not used	0	0	It is not used; it should be equal to 0 for compatibility	650 – 699
Daylight saving time				
Daylight saving time transition mode	0 – 200	12	See **Table 7.4** for transition modes.	700
Preset month for transition to day-light saving time	1 – 12	3	It is used if you selected the automatic transition to daylight saving time on the specified days. The month when the clock will be set one hour ahead	701
Preset week of the month for transition to daylight saving time	1 – 10	10	It is used if you selected the automatic transition to daylight saving time on the specified days. Week of the month when the clock will be set one hour ahead.	702

Parameter	Range of values	Factory setting	Description	Address
			1 – 5 – week of the month, including the part weeks;	
			other values – the last week of the month	
Preset day of the week for transition to daylight saving time	1 – 7	7	It is used if you selected the automatic transition to daylight saving time on the specified days. The day of the week when the clock will be set one hour ahead	703
Preset hour for transition to day-light saving time	0 – 22	2	It is used if you selected the automatic transition to daylight saving time on the specified days. The hour of the day at which the clock will be set one hour ahead	704
Preset month to revert to standard time	1 – 12	10	It is used if you selected the automatic transition to daylight saving time on the specified days. The month when the clock will be set one hour back	705
Preset week of the month to revert to standard time	1 – 10	10	It is used if you selected the automatic transition to daylight saving time on the specified days. Week of the month when the clock will be set one hour back.	706
			1 – 5 – week of the month, including the part weeks;	
			other values – the last week of the month	
Preset day of the week to revert to standard time	1 – 7	7	It is used if you selected the automatic transition to daylight saving time on the specified days. The day of the week when the clock will be set one hour back	707
Preset hour to revert to standard time	1 – 23	3	It is used if you selected the automatic transition to daylight saving time on the specified days. The hour of the day at which the clock will be set one hour back	708

Parameter	Range of values	Factory setting	Description	Address
Sunrises and sunsets calculation				
Sun day	0 – 3	1	0 – official;	709
			1 – civil;	
			2 - nautical;	
			3 - astronomical;	
Latitude, degree	0 – 89	46	The absolute value of the latitude	710
Latitude, minute	0 – 59	29		711
Latitude, second	0 – 59	10		712
Longitude, degree	0 – 179	30	The absolute value of the longitude	713
Longitude, minute	0 – 59	43		714
Longitude, second	0 – 59	40		715
Quadrant	0 – 3	0	0 – N latitude, E longitude;	716
			1 – N latitude, W longitude;	
			2 - S latitude, E longitude;	
			3 - S latitude, W longitude	
Connection to the service servers				
NTP server connection mode	0 – 4	0	0 – clock synchronization with the server is not used;	717
			1 – to connect to the servers using Ethernet or GSM, preferably via Ethernet;	
			2 – to connect to the servers using Ethernet or GSM, preferably via GSM;	
			3 – to connect to the servers only via Ethernet;	
			4 – to connect to the servers only via GSM	

Parameter	Range of values	Factory setting	Description	Address
Time period of connection to NTP servers, h	1 – 240	24	It is used if you have enabled synchronization of clocks with the server clock. The time interval over which the server time is received	718
Minimum shift of clock for synchronization, s	1 – 180	2	It is used if you have enabled synchronization of clocks with the server clock. The synchronization is performed after receiving the server time, if the difference between the clocks is no less than this value	719
Firmware update server connection mode	0 – 4	0	0 – firmware download is not used;	720
			1 – to connect to the servers using Ethernet or GSM, preferably via Ethernet;	
			2 – to connect to the servers using Ethernet or GSM, preferably via GSM;	
			3 – to connect to the servers only via Ethernet;	
			4 – to connect to the servers only via GSM	
Parameter is not used	0	0	Not used, must be equal 0 for compatibility	721 – 723
Parameter logging				
Minimum supply voltage for safe removal of memory card, mV	0 – 24 000	9 000	If the supply voltage is below the specified value, the memory card will be removed safely. The card can be used again after the supply voltage exceeds the minimum plus 0.5 V.	724
			0 – do not remove the memory card, including in a case if the supply voltage is unknown	
Format for logging parameters in task files	0 – 4	1	Used if there is a memory card and logging actions in task files.	725

Parameter	Range of values	Factory setting	Description	Address
			0 – not used	
			1 – compact file of data bytes;	
			2 – CSV table with text separator ″;″;	
			3 – similar 2 with a separator ″,″;	
			4 – similar to 2 with delimiter - tab character	
Maximum limited size of log files, kV	0 – 65535	65535	Used if there is a memory card present, logging actions in task files, and logging is enabled.	726
			The size of the generated files is limited to the specified size plus 1 kV	
Minimum stored period in recorder mode, days	0 – 184	30	Used if there is a memory card present, logging actions in task files, and logging is enabled.	727
			0-183 – the oldest files (older than the specified number of days ago) can be deleted to write new data;	
			Other values – old files are saved, new data recording is suspended when the memory card is full	
Parameter is not used	0	0	Not used, must be equal to 0 for compatibility	728 – 739
Abonents				
Main abonent phone number	Character string		Can be used to send SMS. Up to 20 characters. There can be no spaces in the line	740 – 759
Connection to the second remote TCP server				
Remote server IP address	IP address	192.168.0.113	Similar to 640–643	760 – 763
Remote server connection port	0 – 65535	502	Similar to 644	764

Parameter	Range of values	Factory setting	Description	Address
Waiting time for a response from a remote server, ms	0 – 60 000	1 000	Similar to 645	765
Waiting time before reconnect-ting to a remote server, ms	0 – 240	20	Similar to 646	766
Remote server connection mode	0 – 8	0	Similar to 647	767
First Modbus identifier of the remote server	1 – 255	1	Similar to 648	768
Last Modbus ID of the remote server	1 – 255	255	Similar to 649	769
Connection to the third remote TCP server				
Remote server IP address	IP address	192.168.0.113	Similar to 640–643	770 – 773
Remote server connection port	0 – 65535	502	Similar to 644	774
Waiting time for a response from a remote server, ms	0 – 60 000	1 000	Similar to 645	775
Waiting time before reconnect-ting to a remote server, ms	0 – 240	20	Similar to 646	776
Remote server connection mode	0 – 8	0	Similar to 647	777
First Modbus identifier of the remote server	1 – 255	1	Similar to 648	778
Last Modbus ID of the remote server	1 – 255	255	Similar to 649	779

Parameter	Range of values	Factory setting	Description	Address
Parameter not used	0	0	Not used, must be 0 for compatibility	780 – 799
Preset password for access to the first remote Modbus TCP server	Character string		Used only if connection to a remote server is selected and its ID is set (reg. 730). If a password is set, it will be entered immediately after connecting to the server. Obtained access rights depend on the settings of the remote server. A string up to 10 characters long can be specified as a password. No spaces can be in the string	800 – 809
Preset password for access to the second remote Modbus TCP server	Character string		Similar to 800 – 809	810 – 819
Preset password for access to the third remote Modbus TCP server	Character string		Similar to 800 – 809	820 – 829
Parameter not used	0	0	Not used, must be 0 for compatibility	830 – 849
Protocol for incoming Ethernet connections	0 – 1	0	0 – Modbus TCP protocol;	850
			1 – tunnel mode, used for data transmission “as is”, without protocol verification	
Protocol for incoming GSM connections	0 – 1	0	0 – Modbus TCP protocol;	851
			1 – tunnel mode, used for data transmission “as is”, without protocol verification	
Clock settings [3]				
Day-light saving time offset, min	-1440 – +1440		Current gain. It is set during manual transition to the daylight saving time, when selecting the automatic mode it	34817

Parameter	Range of values	Factory setting	Description	Address
			will be adjusted within 5 minutes. The value must be a multiple of 15	
Time zone offset, min	-1440 – +1440	120	It is used during synchronization of the clock with the server clock. The value must be a multiple of 15	34818
Second	0 – 59		The time is to be set at the clock	34819
Minute	0 – 59			34820
Hour	0 – 23			34821
Day	1 – 31			34822
Month	1 – 12			34823
Year	0 – 65534			34824
Set the clock	0 – 65535	0	It is used to set the clock. When recording to this register with any value, the new clock settings in registers 34817 - 34824 will be set	34825

Table 7.1 - RS-485 Byte Formats (Register 461)

Value	Format	Description
0	EVEN	1 parity bit, 1 stop bit
1	ODD	1 parity bit, 1 stop bit
2	0 (SPACE)	1 zero bit, 1 stop bit
3	1 (MARK)	1 unit bit, 1 stop bit (similar to 2 stop bits)
4	ABSENT	No parity bit, 1 stop bit
5	AUTO-STOP	No parity bit, 2 stop bits (tx), 1 stop bit (rx)

Table 7.2 - Cloud Server Connection Modes (Register 465)

Value	Description
0	Connection to server is not used
1	Connect via any interface (prefer Ethernet)

Value	Description
2	Connect via any interface (prefer GSM)
3	Connect only via Ethernet
4	Connect only via GSM
5	Connect to VPN server via any interface (prefer Ethernet)
6	Connect to VPN server via any interface (prefer GSM)
7	Connect to VPN server only via Ethernet
8	Connect to VPN server only via GSM

Table 7.3 - Remote Server Connection Modes (Register 647)

Value	Description
0	TCP remote server is not used
1	Connect via Ethernet or GSM (prefer Ethernet)
2	Connect via Ethernet or GSM (prefer GSM)
3	Connect only via Ethernet
4	Connect only via GSM
5	Similar to 1 with virtual identifiers [4]
6	Similar to 2 with virtual identifiers [4]
7	Similar to 3 with virtual identifiers [4]
8	Similar to 4 with virtual identifiers [4]
9	Similar to 1 in tunnel mode
10	Similar to 2 in tunnel mode
11	Similar to 3 in tunnel mode
12	Similar to 4 in tunnel mode

Table 7.4 - Daylight Saving Time Transition Modes (Register 700)

Value	Country/Mode
0	Automatic transition not used (manual setting)

Value	Country/Mode
1	Brazil
2	Great Britain
3	Germany
4	Greece
5	Jordan
6	Italy
7	Namibia
8	Poland
9	Portugal
10	USA
11	Turkey
12	Ukraine
13	Finland
14	France
15	According to preset days

FAQ

Q: What is the default Modbus TCP port and device address?

A: MC251 listens on TCP port **502** (configurable in register 450) and uses Modbus address **111** by default (configurable in register 457). You can view the current IP address by pressing the R button on the device.

Q: How do I enter Setup Mode to change configuration?

A: Write the password (found on the device label) to registers 100-119. If correct, register 121 will read 1 (Setup Mode). You can then modify settings in the Changeable Settings registers (300-899).

Q: I have saved the new settings, how do I restart MC251 remotely?

A: Write command 1 to register 120 to restart. MC251 will reboot and usually be available again in half a minute. You may need to reconnect then.

Q: How do I save my configuration changes?

A: Write command 2 to register 120 to save (then restart MC251 for the changes to take effect), or 4 to save and apply immediately (only for Modbus settings). Write 9 to cancel unsaved changes.

Q: How do I configure RS-485 communication parameters?

A: Key registers are:

- **458-459**: Baud rate (default 9600)
- **461**: Byte format/parity (see Table 7.1)
- **463**: Protocol mode (0=RTU, 1=ASCII)
- **637**: Transmission mode (0=Master, 1=Slave, 2=Tunnel)

Q: What is the difference between Master and Slave RS-485 modes?

A: In **Modbus Master mode** (default), MC251 sends queries to RS-485 devices. In **Modbus Slave mode**, MC251 receives queries from an external Modbus Master on RS-485. Use Slave mode when MC251 should act as a slave device on an existing RS-485 network.

**Q: I have configured RS-485 and set MC251 modbus device ID parameter to match my RS-485 device address. But I still get errors like `Illegal address`.

A: This can happen because MC251 (configured this way) reads its own virtual Modbus device registers instead of redirecting the requests to your RS-485 device. Do not set virtual Modbus ID in the `Modbus server` parameters to any of your devices addresses. However, reading registers of any device with ID other than this virtual ID (111 by default) should work.

Q: How can I connect the RS-485 device if its protocol differs from Modbus?

A: Select **Tunnel mode** for RS-485. You may also need to select the tunnel for either the MC251 server or one of the remote servers connections.

Q: How do I send Modbus commands via SMS?

A: Format: `[Password] [R/W][DeviceID][H/I/D/C][Address] [Value]`. Example: `abc r1h100` reads holding register 100 from device 1 (password “abc”). The response SMS contains the request command without the password, and result data or error code.

Q: How do I set the device clock via Modbus?

A: First, write command 35381 to register 120 to enter Clock Setting Mode. Then write time values to registers 34819-34824 (second, minute, hour, day, month, year). Finally, write any value to register 34825 to apply. Write command 35431 to register 120 to cancel.

Q: How can I connect MC251 to multiple remote Modbus TCP servers?

A: MC251 supports up to 3 remote TCP servers. Configure each in registers 640-649 (first), 760-769 (second), and 770-779 (third). The main parameters are the connection mode and the server IP address. Also, set Modbus ID range for each server to avoid extra traffic and delays.

Q: What does the “virtual identifiers” option do for remote servers?

A: When enabled (register 647 for the first remote server, values 5-8), MC251 remaps Modbus addresses before forwarding. The range is renumbered starting from 1. For example, if range is 15-17, address 16 becomes 2 on the remote server. This helps to avoid address conflicts, when multiple gateways share address space, or when multiple Modbus TCP devices of the same model are connected.

Q: How do I reset the device to factory defaults?

A: Enter Setup Mode by writing the password, then write command 444 to register 120. All settings will be reset to factory defaults, including passwords. Restart MC251 for the changes to take effect.

Q: Why can't I read certain status registers?

A: Some registers (like GSM IP address, register 900-903) are only available after the authentication. Enter the password first. Also, the clock setting registers (34817-34825) require Clock Setting Mode.

Q: How do I check the current firmware version?

A: Read register 1 for the firmware version number.

Need Help?

For technical support and assistance:

- Email: support@overvis.com
- Support portal: www.overvis.com/support

1. The IP address of the device in the GSM network is commonly a dynamic one. To access the device via GSM using its IP address, please contact the GSM operator. ↩ ↩[2]
2. The content of these registers is available only in Setting Mode. ↩ ↩[2]
3. Registers for clock setting are available only in Clock Setting Mode (see registers 120, 122). ↩
4. In virtual identifier mode, before forwarding the request to the remote server, the virtual identifier of the addressee in the request is replaced by the real one so that numbering in the server range starts from 1. For example, for the range 15-17, virtual identifier 16 will be replaced with real 2. Broadcast identifier 0 is processed without changes. ↩ ↩[2] ↩[3] ↩[4]

Memory Card Data Saving

The Overvis MC251 supports microSD compatible memory cards formatted as FAT/FAT32. Only the first volume of the card is used (the maximum usable capacity on the card is 32 GB). The card can be inserted before powering the device or while the device is in operation.

> **Data Loss Warning**
>
> Removing a memory card while the device is in operation may result in partial or complete loss of information on it.

> **Tip**
>
> The card can be removed safely when unmounted after the reset (while the device title is displayed) .

MC251 uses a memory card for the following actions:

- taskfiles operations;
- logging of collected data;
- diagnostic logging;
- export and import of settings;
- firmware updates;
- navigation on the memory card, downloading and uploading files through the WEB-interface.

When the device is started or when a memory card is inserted, its parameters are checked (it may take up to 3 seconds). After that, the card can be used for other actions.

When the device is restarted, or when the supply voltage drops below the value specified in the settings (see Modbus Register Map, register 724), MC251 safely ejects the memory card. Before unmounting, temporary data is saved and files are closed.

Taskfiles operations

MC251 performs several operations with taskfiles in the TASKS folder:

```
▼ TASKS/
    .txt   (Source taskfiles)
    .MAP   (Token lists created at compilation)
    .OBJ   (Compiled bytecode)
    .CNF   (Taskfiles parameters)
```

- **Reading:** MC251 reads text taskfiles from the TASKS folder (and its subfolders).
- **Compilation:**
  - Stores taskfiles found token lists into MAP text files.
  - Stores taskfiles compiled bytecode into `.OBJ` binary files.

- **Execution:** Reads and writes taskfiles parameters into `.CNF` text files.

See Logic Programming for details on files in the `TASKS` folder.

Logging of collected data

MC251 saves the collected data to the log in the `LOGS\TASKS` folder on the memory card. The order of data collection and conditions for logging are specified in the taskfiles (see Logic Programming).

```
▼ LOGS/
  ▼ TASKS/
    ▼ YYYY_MM/
        YYMMDDII.EEE    (Log files)
```

If the folder is missing, it will be created. For each month, a subfolder is created with a name in the format `YYYY_MM`, where:

- `YYYY` – year;
- `MM` – month.

In this subfolder, for each day of the month, a file is created with the name in the format `YYMMDDII.EEE`, where:

- `YY` – the last two digits of the year;
- `MM` – month;
- `DD` – day of the month;
- `II` – index;
- `EEE` – file extension `CSV` or `DAT` (depending on the settings, see Modbus Register Map, register 725).

The data is appended to the end of the current file. A new file with the next index is created when one or more of the following conditions are met:

- the file is filled up to the maximum size (specified in the settings, from 1 KB to 64 MB, see Modbus Register Map, register 726);
- an error occurs while writing to the log file,
- the card is unmounted or removed, or the device is restarted.

File Indexing

Before creating the file, the presence of files in the subfolder with names for the given day of the month is checked, and the maximum occupied index is found. Files are numbered starting from `01`.

1. Numeric indices: `01` … `99`
2. Alphanumeric indices: `A0` … `A9`, `AA` … `AZ`, `B0` … `ZZ`

In total, up to 1035 indexes can be used for one day of the month. After that, recording is suspended until the date changes.

> **Note**
>
> In the event of write errors, data remains in the write queue in temporary memory. Write attempts continue for up to 10 minutes. After that, data is removed from the queue, and the number of lost bytes is summed for later reporting.

Log Formats

Binary Data (.DAT) Text Table (.CSV)

When the binary log format is selected, the MC251 saves the collected data in a compact form into files with the DAT extension. Records of a fixed size of 24 bytes are appended to the files. Each record can contain the value of one parameter or a service message.

Table 1 - Format of the service record in the log data bytes file

Bytes	Field	Range of values	Description
0 – 3	Timestamp	0 – 4294967295	Time in Epoch format: number of seconds since midnight 1.01.1970 UTC+00
4 – 7	Service record code	4294967295	Indicator for distinguishing from other types of records
8 – 15	Message type	0	0 – losses due to repetitive errors
16 – 23	Message	0 – 4294967295	For loss reporting – the number of bytes

Table 2 - Format of parameter recording in the log data bytes file

Bytes	Field	Range of values	Bits	Description
0 – 3	Timestamp	0 – 4294967295		Time in Epoch format: number of seconds since midnight 1.01.1970 UTC+00
4	Parameter type	0 - 49, 128 – 177	0 – 6	Parameter type index: 6 – parameter is the bit (Modbus coil or digital input) other values – parameter is in the registers (Modbus holding or input) (see Parameter Types)
			7	0 – parameter is from read/write table (Modbus coil or holding register) 1 – parameter is from the read-only table (Modbus discrete input or input register)
5	Device ID	1 – 255		address of the Modbus device
6 – 7	Parameter address	0 – 65535		starting address of the parameter on the Modbus device
8 – 15	Parameter value	-9223372036854775808 – +9223372036854775807		The value converted to a signed 64-bit integer

Bytes	Field	Range of values	Bits	Description
16 – 23		0 - 18446744073709551615		Data read from the device before being converted to a parameter value

Filling the memory card

The time it takes for an empty memory card to be filled, can be calculated using the formula:

```
Tfull ≈ (Vfree * Tupd) / (Npar * Lsiz)
```

, where: `Tfull` – the time till the card is full; `Vfree` – free space on the memory card; `Tupd` – task run (parameters update) period; `Npar` – the number of parameters to be logged (if the log record is made with each task run); `Lsiz` – the size of the log entry (depends on its format).

Examples:

1. **Binary data format:** Writing 7 parameters every 20 seconds. A 2 GB card will be filled in ~383,479,222 s (or more than 12 years).
2. **Text table format:** Writing 3 parameters 10 times per second (without comments). A 32 GB card can be filled in ~16,361,780 s (or more than 6 months).

> **Tip**
>
> When the **recorder mode** is used (see Modbus Register Map, register 727), after the free space on the memory card is exhausted, the oldest files can be deleted before writing new data. When the **recorder mode is off**, new data logging will be paused until space becomes available.

Diagnostic logging

MC251 can be configured to store diagnostic logs into the `LOGS` folder.

```
▼ LOGS/
    ATM.LOG    (GSM AT-modem exchange log)
    SYS.LOG    (System events log)
```

Export and import settings

MC251 can export the saved settings from the internal memory to the `SETTINGS\MC251SET.DAT` file, or import the settings from this file and save them to the internal memory.

```
▼ SETTINGS/
    MC251SET.DAT    (Settings file, up to 16 kB)
```

Firmware updates

MC251 can update the firmware (see Firmware Update) with one of three files:

```
UPGRADES/
    MC251FW1.FUS
    MC251FW2.FUS
    MC251FW3.FUS
```

The file size can be up to 10 MB each in size.

FAQ

Q: What type of memory card does MC251 support?

A: MC251 supports microSD compatible memory cards formatted as FAT or FAT32. Only the first volume is used, with a maximum usable capacity of 32 GB.

Q: Can I insert or remove the memory card while the device is running?

A: You can insert the card while the device is running. However, removing the card during operation may result in data loss. To safely remove the card, wait until after a device reset while the device title is displayed on screen.

Q: What happens if the power supply drops while the card is in use?

A: MC251 monitors supply voltage and safely unmounts the memory card when voltage drops below a configurable threshold (register 724). Before unmounting, temporary data is saved and files are closed to prevent corruption. A high-capacitive power supply is recommended to give enough time for this feature.

Q: Which log format should I use — binary (.DAT) or text (.CSV)?

A:

- **Binary (.DAT)**: More compact (24 bytes per record), better for long-term logging with limited card space, but requires parsing tools to read.
- **Text (.CSV)**: Human-readable, can be opened directly in spreadsheet software, but takes more space (up to 200 bytes per record with comments).

Q: How long will it take to fill my memory card with log data?

A: Use the formula: `Tfull ≈ (Vfree * Tupd) / (Npar * Lsiz)`. For example, logging 7 parameters every 20 seconds in binary format on a 2 GB card takes over 12 years to fill. Logging 3 parameters 10 times per second in CSV format on a 32 GB card takes about 6 months.

Q: What happens when the memory card is full?

A: It depends on the **recorder mode** setting (register 727). When enabled, the oldest files are automatically deleted to make room for new data. When disabled, logging pauses until you manually free up space.

Q: How much data can be logged per day?

A: The file size limit is configurable (up to 64Mb). And up to 1035 files per day can be created in the day folder. After all file indices are used, recording is suspended until the date changes.

Q: What happens if a write error occurs during logging?

A: Data remains in a temporary write queue and the device retries for up to 10 minutes. If writing still fails, the data is removed from the queue and the number of lost bytes is recorded for reporting in subsequent log entries.

Q: Can I use the same memory card for multiple MC251 devices?

A: Yes, but be careful with taskfiles — each device will try to load and execute taskfiles from the `TASKS` folder. Settings export/import files are also shared. Consider using separate cards or carefully managing folder contents if moving cards between devices.

Q: Where are taskfile compilation results stored?

A: In the same `TASKS` folder alongside your source files:

- `.MAP` files contain token lists from compilation
- `.OBJ` files contain compiled bytecode
- `.CNF` files store taskfile runtime parameters

Q: How do I back up my MC251 settings to the memory card?

A: Export settings to the `SETTINGS\MC251SET.DAT` file using Modbus commands. This file (up to 16 KB) can be imported later to restore settings or transfer them to another device.

Q: Why does the SD card take up to 3 seconds to become available after insertion?

A: MC251 performs parameter checks on the card after insertion or device startup. This verification ensures the card is properly formatted and usable.

Need Help?

For technical support and assistance:

- Email: support@overvis.com
- Support portal: www.overvis.com/support

HTTP API

This HTTP API provides an interface for interacting with the Overvis MC251 device. All requests are made to paths starting with `/api`. The API supports `GET` and `POST` methods, some of which require authorization.

General Principles

- All data is transferred in JSON format.
- Successful responses use the `200 OK` status.
- Errors are handled with appropriate HTTP statuses (`400 Bad Request`, `404 Not Found`, `503 Service Unavailable`, etc.).
- API request errors additionally contain a JSON object: `{ "error": "error code", "message": "error text" }`.
- HTTP keep-alive is supported.
- Access to the API uses **3** access levels:
  - 🟩 **0** - Guest
  - 🟨 **1** - Power User
  - 🟥 **2** - Administrator

Authorization

Authorization via API

To perform protected requests, you must complete the authorization procedure:

1. Get a `salt` at `/api/login/salt/`.
2. Log in via `/api/login/` by sending a SHA1 password hash: `login + password + salt`.
3. All subsequent requests must include the session token `Bearer xxxxxxxxxx` in the `Authorized` header.

Logout is performed via `/api/cmd/logout/`. After successful authorization, the user receives access level 🟨 **1** (Power User).

Authorization via Front Panel Button

Press the button on the front panel of the MC251 device once. After this, a user with **Guest** rights temporarily receives access level 🟨 **1** (Power User) **for 10 minutes**.

Authorization via VPN Cloud

All requests coming from the **VPN cloud** automatically receive access level 🟥 **2** — Administrator.

Endpoints Summary

GET Requests

Path	Purpose	Access Level
`/api/version/`	Device firmware version	🟩 **0**

Path	Purpose	Access Level
`/api/login/salt/`	Get `salt` for password hashing	🟩 0
`/api/identify/`	Physical device identification	🟨 1
`/api/state/get/?key&...`	Get current device state by key (or all)	🟨 1
`/api/settings/saved/get/?key&...`	Get current settings by key (or all)	🟨 1 / 🟥 2
`/api/modbus/resp/?tid=...`	Get Modbus response by `tid`	🟥 2
`/api/modbus/find/result/?list`	Get Modbus device search result	🟥 2
`/api/modbus/class-find/result/`	Get Modbus template search result	🟥 2

POST Requests

Path	Purpose	Access Level
`/api/login/`	User authentication	🟩 0
`/api/cmd/logout/`	End session	🟨 1
`/api/cmd/memory/card_eject/`	Safe SD card ejection	🟨 1
`/api/cmd/time/sync/`	Time synchronization	🟨 1
`/api/cmd/time/set/`	Set time	🟥 2
`/api/cmd/reboot/`	Reboot device	🟨 1
`/api/cmd/callback/reconnect/`	Reconnect to cloud server via Modbus	🟨 1
`/api/cmd/updates/download/`	Download available updates	🟨 1
`/api/cmd/updates/program/`	Apply update	🟨 1
`/api/cmd/settings/reset/`	Reset settings to factory defaults	🟨 1
`/api/cmd/settings/import/`	Import configuration	🟥 2
`/api/cmd/settings/export/`	Export current settings	🟥 2
`/api/cmd/gsm/sms-test/`	Send test SMS	🟥 2
`/api/activation/`	License or device activation	🟥 2
`/api/card/file/info/`	Get file info on SD card	🟨 1
`/api/card/file/read/`	Read file from SD card	🟨 1
`/api/card/file/write/`	Write file to SD card	🟥 2

Path	Purpose	Access Level
`/api/card/remove/`	Remove file from SD card	🟥 2
`/api/card/dir/`	Get list of files and directories	🟨 1
`/api/settings/saved/set/`	Change configuration parameters	🟨 1
`/api/modbus/req/`	Send Modbus request	🟥 2
`/api/modbus/find/start/`	Start Modbus device search on RS-485	🟥 2
`/api/modbus/find/stop/`	Stop/cancel Modbus device search on RS-485	🟥 2
`/api/modbus/class-find/search-meta-info/`	Get meta info from search template	🟥 2
`/api/modbus/class-find/start/`	Start template Modbus device search	🟥 2
`/api/modbus/class-find/stop/`	Stop/cancel template Modbus device search	🟥 2

Authentication

Get Salt for Password Hashing

Provides a unique `salt` string used by the client to hash the password before authentication.

GET `/api/login/salt/`

Response:

Field	Type	Description
`salt`	string	Unique `salt` string for password hashing.

Example Response:

```
{
    "salt": "sFtqKto6hnaURPGQLJOCT1QMx7myDEGLBsCz3a2L"
}
```

User Authentication

Allows a user to authenticate and receive an access token.

POST `/api/login/`

Request Parameters:

Field	Type	Description
`username`	string	Username.
`password`	string	SHA1 hash of the password in hex format.

Note: SHA1 password hash is calculated as SHA1(`username` + `password` + `salt`).

Example Request:

```
{
    "username": "admin",
    "password": "90d54ed4126a0924528810aa5673a6d616d5f274"
}
```

Response:

Upon successful authentication, a token and its expiration time are returned.

Field	Type	Description
`authType`	string	Authentication type (`Bearer`).
`token`	string	Access token.
`ttlSec`	integer	Token time-to-live in seconds.

```
{
    "authType": "Bearer",
    "token": "ej5k2pVg4Pd8yBdUqFPq8bdaStpeAZhyelpmkhtOivdK8r7E",
    "ttlSec": 60
}
```

Logout

Ends the current user session and invalidates the token.

POST `/api/cmd/logout/`

Example Request:

```
{}
```

Response:

Empty JSON upon successful command execution.

```
{}
```

System Information

Physical Device Identification

Returns unique information about the current device, including model, firmware version, MAC address, and public key.

GET `/api/identify/`

Access Level: 🟨 1

Response:

Field	Type	Description
`manufacturer`	string	Device manufacturer.
`device`	string	Device model name.
`deviceId`	integer	Device identifier.
`firmwareType`	integer	Firmware type (e.g., basic, extended, etc.).
`firmwareVer`	integer	Firmware version.
`releaseDate`	string	Release date and time in ISO 8601 format.
`mac`	string	Ethernet interface MAC address.
`uniqueMac`	boolean	Flag indicating if the device MAC address is unique.
`pubKey`	string	Device public key for cryptographic authentication.

Example Response:

```
{
    "manufacturer": "Novatek-Electro Ltd.",
    "device": "MC-251",
    "deviceId": 46,
    "firmwareType": 1,
    "firmwareVer": 46,
    "releaseDate": "2025-05-26T00:00:00",
    "mac": "d8:80:39:69:0e:6d",
    "uniqueMac": true,
    "pubKey": "WB2dxH7Jk+tmW2TDwOmWxtBKjkKf4siJi42bDyCLLXQ="
}
```

Firmware Version

GET `/api/version/`

Access Level: 🟩 **0**

Response:

Field	Type	Description
`device`	string	Manufacturer's device model.
`deviceId`	integer	Manufacturer's device identifier.
`firmwareType`	integer	Firmware modification.
`firmwareVer`	integer	Firmware version.
`releaseDate`	string	Release date and time in ISO 8601 format.

Example Response:

```
{
    "device": "MC-251",
    "deviceId": 46,
    "firmwareType": 1,
    "firmwareVer": 46,
    "releaseDate": "2025-05-14T00:00:00"
}
```

Get Device State

Retrieves the current state of the device by key (or all states).

GET `/api/state/get/?key&...`

Access Level: 🟨 **1**

Available Keys:

- `ethernet`: Ethernet interface state
- `gsm`: GSM interface state
- `vpn`: VPN interface state
- `mbTcpCallback`: Modbus TCP cloud connection state
- `activation`: Device activation state
- `fwUpdate`: Update state
- `mbTcpServer`: TCP server state
- `mbTcpClients`: TCP client state
- `inputs`: Inputs state
- `outputs`: Outputs state

- `statistics`: General statistics
- `memTaskfiles`: Task files state
- `memCard`: SD card state
- `settings`: Settings state
- `time`: Device time
- `misc`: Miscellaneous states

ethernet

Returns information about the current Ethernet connection state.

Response Fields:

Field	Type	Description
`ip`	string / null	Current IP address assigned to the device, or `null` if not assigned.
`mac`	string	Ethernet interface MAC address.
`linkUp`	boolean	Indicates if there is an active link.

gsm

Returns information about the current GSM module state.

Response Fields:

Field	Type	Description
`signalLevel`	integer / null	GSM signal level in %, or `null` if GSM is not connected.
`ip`	string / null	IP address assigned to the GSM interface, or `null` if not assigned.
`imei`	string / null	Modem IMEI, or `null` if undefined.
`simState`	integer	SIM card state: 0 — not inserted, 1 — inserted and active.
`pinState`	integer	PIN code state:
		`0` - Unknown state;
		1 - PIN not required;
		2 - PIN required, attempts unknown;
		3 - PIN required, 0 attempts left;
		4 - PIN required, 1 attempt left;
		5 - PIN required, 2 attempts left;

Field	Type	Description
		6 - PIN required, 3 attempts left;
		7 - PIN required, >3 attempts left;
		8 - Other auth required (PUK, etc.).
`ccid`	string / null	SIM card CCID, or `null` if undefined.
`provider`	string / null	SIM card operator name, or `null` if undefined.
`radioBand`	string / null	GSM standard: `2g`, `3g`, `4g`, or `null` if undefined.
`isTcpIpBusy`	boolean	Indicates if the GSM interface TCP/IP stack is busy.
`isGsmRegistered`	boolean	Indicates registration in the operator's network.
`isGsmRoaming`	boolean	Indicates roaming status.
`isGprsStarted`	boolean	Indicates active GPRS connection.
`traficTotal`	integer	Total data transferred via GSM interface (in bytes).

vpn

Returns information about the current VPN (WireGuard) connection state.

Response Fields:

Field	Type	Description
`linkState`	string	Connection state:
		`disabled` - VPN disabled in settings;
		`netifCreated` - Network interface created;
		`peerConfigured` - Peer connection configured;
		`peerConnected` - Connection to peer established;
		`peerUp` - VPN tunnel is up and running.
`configServerReached`	boolean / null	Configuration server availability.
`lastPeerUp`	string / null	Time of last peer connection (ISO 8601), or `null`.
`netifIp`	string / null	VPN interface IP address, or `null`.
`netifMask`	string / null	VPN interface subnet mask, or `null`.
`peerIp`	string / null	Remote peer IP address, or `null`.

Field	Type	Description
`peerPort`	integer	Remote peer port.
`interface`	string / null	Connection interface: `eth`, `gsm`, or `null`.
`configState`	string	Configuration state:
		`errorKey` - Error: invalid key;
		`errorMem` - Error: insufficient memory;
		`disabled` - VPN disabled in settings;
		`pause` - Delay between configuration attempts;
		`serverHostnameResolving` - Resolving config server hostname;
		`serverConnecting` - Connecting to config server;
		`serverConnected` - Connected, receiving peer config;
		`peerHostnameResolving` - Resolving peer hostname;
		`ready` - Configuration received and ready.
`ownPubKey`	string	Device's own public key.

mbTcpCallback

Modbus TCP cloud connection state.

Response Fields:

Field	Type	Description
`state`	string	Current connection state (`disabled`, `waiting`, `connecting`, `connected`).
`waitingTimeSec`	integer / null	Time waiting for connection, in seconds.
`interface`	string / null	Connection interface: `eth`, `gsm`, `wg`, or `null`.
`remoteIp`	string / null	Server IP address, or `null`.
`remotePort`	integer	Server remote port.
`connectionTimeSec`	integer	Time since connection established, in seconds.
`idleTimeSec`	integer	Connection idle time, in seconds.
`activationWithCode`	string / null	Activation state:
		`unused` - Device has not received activation code;

Field	Type	Description
		`activated` - Device is activated and bound to network;
		`set` - Device received code and awaits binding;
		`null` - No connection or error.
`activationCode`	string	8-digit device activation code.

activation

Returns information about the current device activation state.

Response Fields:

Field	Type	Description
`infrastructureName`	string	Infrastructure name.
`infrastructureShortUrl`	string	Short URL to infrastructure site.
`domain`	string	Server address used for activation.
`endpointId`	string	Unique device identifier.
`endpointName`	string	Device name.
`propertyId`	string	Organization identifier.
`propertyName`	string	Organization name.
`pin`	string	8-digit device PIN code.
`hasBonusesEur`	string	Bonus amount on organization account.
`activeTill`	string / null	Activation expiration date (ISO 8601), or `null` if expired.
`supportEmail`	string	Support service email.

fwUpdate

Firmware update process state.

Response Fields:

Field	Type	Description
`updateState`	string	Update state:
		`SAVED_FILE_UNKNOWN` - Update file not found;

Field	Type	Description
		`CARD_ABSENT` - SD card not installed;
		`CARD_NOT_READY` - SD card not ready;
		`CARD_FILES_CHECKING` - Checking update files on SD card;
		`CARD_FILE_UPDATED_READY` - Update file on SD card ready;
		`FILE_VERSION_MATCHES_ACTIVE` - File version matches current.
`downloadState`	string	Download state:
		`SERVER_FILE_UNKNOWN` - File on server not determined;
		`DOWNLOADER_BUSY` - Downloader busy;
		`CARD_ABSENT` - SD card not installed;
		`CARD_NOT_READY` - SD card not ready;
		`CARD_FILES_CHECKING` - Checking files on SD card;
		`SERVER_FILE_UPDATED_READY` - File on server ready for download;
		`SERVER_FILE_DOWNLOADING` - Downloading file;
		`DOWNLOADED_FILE_CHECKING_INTEGRITY` - Checking integrity;
		`DOWNLOADED_FILE_CHECKING_APPLICABILITY` - Checking compatibility;
		`DOWNLOADED_FILE_SAVING` - Saving file to SD card;
		`SERVER_FILE_VERSION_MATCHES_SAVED` - Server version matches saved.
`url`	string / null	Firmware file URL or `null`.
`progress`	string / null	Download progress percentage (`0.00` – `100.00`) or `null`.
`errorCode`	string / null	Error code if any, or `null`. Common codes:
		`ERROR_FR_DISK_ERR` - Low-level disk error;
		`ERROR_FR_INT_ERR` - Internal file system error;
		`ERROR_FR_NOT_READY` - Media not ready;
		`ERROR_FR_NO_FILE` - File not found;
		`ERROR_FR_DENIED` - Access denied;
		`ERROR_FR_EXIST` - File already exists;

Field	Type	Description
		`ERROR_FR_WRITE_PROTECTED` - Write protected;
		`ERROR_FR_NOT_ENOUGH_CORE` - Not enough memory;
		`ERROR_HTTP_RESPONSE` - General HTTP error;
		`ERROR_CONNECT` - TCP connection error;
		`ERROR_RESPONSE_TIMEOUT` - Server timeout.
`availableVersion`	integer / null	Firmware version available for download, or `null`.
`savedVersion`	integer / null	Firmware version saved on SD card, or `null`.
`currentVersion`	integer	Currently installed firmware version.

mbTcpServer

List of active Modbus TCP server connections.

Response Fields:

Field	Type	Description
`isActive`	boolean	Indicates if the server is running.
`listenPortEth`	integer	Port for Ethernet clients.
`listenPortGsm`	integer	Port for GSM clients.
`clients`	array	Array of client objects (`interface`, `remoteIp`, `remotePort`, etc.).

mbTcpClients

State of Modbus TCP clients.

Response Fields:

Field	Type	Description
`state`	string	Current state (`waiting`, `connected`, `connecting`).
`waitingTimeSec`	integer / null	Time waiting for connection, in seconds.
`interface`	string / null	Connection interface.
`remoteIp`	string	Client IP address.
`remotePort`	integer	Client remote port.

Field	Type	Description
`connectionTimeSec`	integer	Time since connection established, in seconds.
`idleTimeSec`	integer	Connection idle time, in seconds.

inputs

Example Request:

```
GET /api/state/get/?inputs
```

Example Response:

```
{
    "inputs": {
        // TODO: Not implemented
    }
}
```

outputs

Example Request:

```
GET /api/state/get/?outputs
```

Example Response:

```
{
    "outputs": {
        // TODO: Not implemented
    }
}
```

statistics

Device operation statistics.

Response Fields:

Field	Type	Description
`serialAvgPerSecReq`	integer	Average RS-485 request rate (req/sec).
`serialAvgPerSecResp`	integer	Average RS-485 response rate (resp/sec).
`serialAvgPerSecLoad`	integer	Average RS-485 load (%/sec).
`mbAvgPerSecReq`	integer	Average Modbus request rate (req/sec).

Field	Type	Description
`ethAvgPerSecKb`	string	Average Ethernet data rate (KB/sec).
`gsmAvgPerSecKb`	string	Average GSM data rate (KB/sec).
`mbTcpServerMaxClients`	integer	Maximum number of clients on Modbus TCP server.
`runTimeMin`	integer	Uptime since last reboot (minutes).
`totalRunTimeMin`	integer	Total device uptime (minutes).

memTaskfiles

Example Request:

```
GET /api/state/get/?memTaskfiles
```

Example Response:

```
{
    "memTaskfiles": {
        // TODO: Not implemented
    }
}
```

memCard

SD card state information.

Response Fields:

Field	Type	Description
`capacityKb`	integer / null	Total SD card capacity in KB, or `null`.
`freeKb`	integer / null	Free space on SD card in KB, or `null`.
`isMounted`	boolean	Mount status (`true` — mounted).
`isInserted`	boolean	Insertion status (`true` — inserted).

settings

Settings state information.

Response Fields:

Field	Type	Description
`modifyOn`	string / null	Last settings modification time (ISO 8601), or `null`.
`isUserModified`	boolean	Indicates if settings are modified but not applied.
`isDefault`	boolean	Indicates if current settings are defaults.

time

Current device time information.

Response Fields:

Field	Type	Description
`timeLocal`	integer	Current local time (ISO 8601).
`timeUtc`	integer	Current UTC time (ISO 8601).
`isDst`	boolean	DST flag.
`sunriseLocalSec`	integer / null	Sunrise time in seconds from start of day, or `null`.
`sunsetLocalSec`	integer / null	Sunset time in seconds from start of day, or `null`.
`polarDay`	boolean	Indicates polar day.
`polarNight`	boolean	Indicates polar night.

misc

Additional diagnostic data.

Response Fields:

Field	Type	Description
`voltage`	string / null	Current supply voltage, or `null`.
`temperature`	string / null	Current temperature in Celsius, or `null`.

Settings

Get Settings

Read settings from `active` or `saved` area.

- `Active area`: Current settings the device is working with.
- `Saved area`: Settings saved in non-volatile memory, applied at next startup.

GET `/api/settings/active/get/?key1&key2...` **GET** `/api/settings/saved/get/?key1&key2...`

Access Level: 🟨 1 / 🟥 2

Example Response:

```
{
    "key1": "value1",
    "key2": "value2"
}
```

Set Settings

Write settings to the `saved` area.

POST `/api/settings/saved/set/`

Access Level: 🟥 2

Example Request:

```
{
    "key": "value"
}
```

Response:

Empty JSON upon success.

```
{}
```

Available Settings Keys

The following keys can be used with `GET` and `POST` requests for settings.

Key	Description	Access Level
`timeGmt`	GMT time offset correction	🟨 1
`ethernet`	Ethernet interface settings	🟨 1
`gsm`	GSM module settings	🟨 1
`ownSrv`	Connection to own server	🟥 2
`wgCloud`	Cloud VPN connection settings	🟨 1
`wgManual`	Custom WireGuard VPN parameters	🟥 2
`cbCloud`	Cloud Modbus connection settings	🟨 1
`areset`	Automatic reset settings	🟨 1
`protect`	Device protection parameters	🟥 2
`download`	File server settings	🟨 1
`firmware`	Firmware management	🟨 1
`httpd`	Built-in HTTP server parameters	🟨 1
`language`	Interface language	🟨 1
`serial`	Serial port settings	🟥 2
`astro`	Astronomical settings (sunrise/sunset)	🟥 2
`ntp`	NTP time synchronization settings	🟨 1
`tsMode`	Daylight saving time mode	🟨 1
`tsManual`	Manual daylight saving time settings	🟨 1
`logFlags`	Logging flags	🟨 1
`rmSrv`	Remote control server	🟥 2
`bodVoltage`	Brown-Out Detect voltage	🟨 1
`forwarding`	Port forwarding table	🟥 2

timeGmt

Time zone management (GMT offset).

Request Parameters:

Parameter	Type	Description
`timeGmt`	integer	GMT offset in 15-minute intervals (from –96 to +96).

Example Request:

```
{
    "timeGmt": 8
}
```

Note: 8 means +2 hours offset (8 × 15 minutes).

ethernet

Ethernet interface settings.

Request Parameters:

Parameter	Type	Description
`ethernet`	object	
`dhcpEnable`	boolean	`true` — enable DHCP on Ethernet interface; `false` — disable.
`macManualEnable`	boolean	`true` — use custom MAC address.
`dnssGateEnable`	boolean	`true` — use gateway address as primary DNS.
`ip`	string	**Ethernet** interface IP address.
`mask`	string	**Ethernet** interface subnet mask.
`gate`	string	**Ethernet** interface gateway.
`ipDnss`	array	Array of **DNS** server IP addresses for **Ethernet**.
`macManual`	string	Custom **MAC address** for **Ethernet** interface.

Example Request:

```
{
    "ethernet": {
        "dhcpEnable": true,
        "macManualEnable": false,
        "dnssGateEnable": true,
        "ip": "192.168.0.115",
        "mask": "255.255.255.0",
        "gate": "192.168.0.1",
        "ipDnss": ["8.8.8.8", "8.8.4.4"],
        "macManual": "01:02:03:04:05:06"
    }
}
```

gsm

GSM module settings.

Request Parameters:

Parameter	Type	Description
`gsm`	object	
`apnAutodetectEnable`	boolean	`true` — automatically configure APN settings based on SIM card code.
`tcpInRoamingEnable`	boolean	`true` — allow TCP/UDP data transfer in roaming.
`smsInRoamingEnable`	boolean	`true` — allow SMS sending in roaming. (SMS reception is always allowed).
`pinCode`	integer / null	PIN code (`0000`-`9999`), or `null` if not set.
`apnHost`	string	APN host name for manual configuration (max 34 chars).
`apnLogin`	string	APN login for manual configuration (max 40 chars).
`apnPassword`	string	APN password for manual configuration (max 24 chars).
`balanceUssdReq`	string	USSD request for balance check (max 12 chars, e.g., ∗111#).
`phones`	array	Array of 4 phone number strings.

Example Request:

```
{
    "gsm": {
        "apnAutodetectEnable": true,
        "tcpInRoamingEnable": true,
        "smsInRoamingEnable": false,
        "pinCode": null,
        "apnHost": "",
        "apnLogin": "",
        "apnPassword": "",
        "balanceUssdReq": "*111#",
        "phones": ["+48123456789", "", "", ""]
    }
}
```

ownSrv

Connection to own server.

Request Parameters:

Parameter	Type	Description
`ownSrv`	object	
`vUid`	integer / null	Virtual Modbus device address (1-255), or `null` to disable.
`mbeRo`	integer / null	Modbus exception code for access denied (1-255), or `null` to disable response.
`mbeTo`	integer / null	Modbus exception code for timeout (1-255), or `null` to disable response.
`mbePu`	integer / null	Modbus exception code for send error (1-255), or `null` to disable response.
`ethListenPort`	integer	TCP server port on Ethernet interface (1-65535).
`delayForKeepaliveSec`	integer / null	TCP server **keep-alive** time (`0-36000` sec), or `null` to disable.
`atmListenPort`	integer / null	TCP server port on GSM interface (1-65535), or `null` to disable.
`ethClientsProtocol`	integer	Data protocol for Ethernet TCP server: 1 - RAW, 2 - ModbusTCP.
`atmClientsProtocol`	integer	Data protocol for GSM TCP server: 1 - RAW, 2 - ModbusTCP.

Example Request:

```
{
    "ownSrv": {
        "vUid": 111,
        "mbeRo": 1,
        "mbeTo": 11,
        "mbePu": 10,
        "ethListenPort": 502,
        "delayForKeepaliveSec": 90,
        "atmListenPort": null,
        "ethClientsProtocol": 2,
        "atmClientsProtocol": 2
    }
}
```

wgCloud

Cloud VPN connection settings.

Request Parameters:

Parameter	Type	Description
`wgCloud`	object	
`hostname`	string	VPN server hostname (max 46 chars).
`connPort`	integer	VPN server TCP port (`1-65535`).
`connMode`	integer / null	Connection mode: `null` (disabled), 1 (Eth pref), 2 (GSM pref), 3 (Eth only), 4 (GSM only).
`delayForKeepaliveSec`	integer	VPN server **keep-alive** time (`0-36000` sec).
`delayForConnSec`	integer	Delay between connection attempts (`1-30000` sec).

Example Request:

```
{
    "wgCloud": {
        "hostname": "",
        "connPort": 34967,
        "connMode": 1,
        "delayForKeepaliveSec": 20,
        "delayForConnSec": 5
    }
}
```

wgManual

Custom WireGuard VPN settings.

Request Parameters:

Parameter	Type	Description
`wgManual`	object	
`hostname`	string	VPN server hostname (max 46 chars).
`connPort`	integer	VPN server TCP port (1-65535).
`connMode`	integer / null	Connection mode: `null` (disabled), 1 (Eth pref), 2 (GSM pref), 3 (Eth only), 4 (GSM only).
`ip`	string	Device IP address in VPN network.
`mask`	string	Device subnet mask.
`deviceKey`	string	Device private key (base64).
`peerPublicKey`	string	Remote peer public key (base64).

Example Request:

```
{
    "wgManual": {
        "hostname": "",
        "connPort": 34967,
        "connMode": 1,
        "delayForKeepaliveSec": 20,
        "delayForConnSec": 5,
        "deviceIp": "10.0.0.111",
        "deviceMask": "255.255.255.0",
        "deviceKey": "AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA=",
        "peerPublicKey": "AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA="
    }
}
```

cbCloud

Cloud Modbus connection settings.

Request Parameters:

Parameter	Type	Description
`cbCloud`	object	
`hostname`	string	Server hostname (max 46 chars).
`connPort`	integer	Server TCP port (`1`-`65535`).
`connMode`	integer / null	Connection mode: `null` (disabled), `1` (Eth pref), `2` (GSM pref), `3` (Eth only), `4` (GSM only).
`delayForKeepaliveSec`	integer	Server **keep-alive** time (`0`-`36000` sec).
`delayForConnSec`	integer	Delay between connection attempts (`1`-`240` sec).

Example Request:

```
{
    "cbCloud": {
        "hostname": "",
        "connPort": 8502,
        "connMode": 1,
        "delayForKeepaliveSec": 120,
        "delayForConnSec": 5
    }
}
```

areset

Automatic reset settings.

Request Parameters:

Parameter	Type	Description
`areset`	object	
`delayMin`	integer	Time before automatic restart (`5`-`7200` min).
`mode`	integer / null	`null` - Disabled; `1` - Reset after `delayMin` uptime; `2` - Reset after `delayMin` of no Modbus activity.

Example Request:

```
{
    "areset": {
        "delayMin": 120,
        "mode": 2
    }
}
```

protect

Device protection parameters.

Request Parameters:

Parameter	Type	Description
`protect`	object	
`smsWriteEnable`	boolean	`false` - disable SMS write.
`smsReadEnable`	boolean	`false` - disable SMS read.

Parameter	Type	Description
`mbGateWriteEnable`	boolean	`false` - disable write to connected Modbus devices.
`mbGateReadEnable`	boolean	`false` - disable Modbus read.
`wgCloudAdminAuthEnable`	boolean	`true` - grant Admin (🟥 2) access to all **Cloud** requests.
`wgManualAdminAuthEnable`	boolean	`true` - grant Admin (🟥 2) access to all **WireGuard VPN** requests.
`passwordAdmin`	string	Device administrator password (5-10 ASCII chars, no spaces).
`passwordMbGateWrite`	string	Password for writing to connected Modbus devices (0-10 chars). "" disables check.
`passwordMbRead`	string	Password for Modbus read (0-10 chars). "" disables check.
`passwordSmsWrite`	string	Password for SMS write (3-10 chars).
`passwordSmsRead`	string	Password for SMS read (3-10 chars).

Example Request:

```
{
    "protect": {
        "smsWriteEnable": true,
        "smsReadEnable": true,
        "mbGateWriteEnable": true,
        "mbGateReadEnable": true,
        "wgCloudAdminAuthEnable": true,
        "wgManualAdminAuthEnable": false,
        "passwordAdmin": "11111",
        "passwordMbGateWrite": "",
        "passwordMbRead": "",
        "passwordSmsWrite": "gap",
        "passwordSmsRead": "gap"
    }
}
```

download

File server settings.

Request Parameters:

Parameter	Type	Description
`download`	object	
`connMode`	integer / null	Connection mode: `null` (disabled), 1 (Eth pref), 2 (GSM pref), 3 (Eth only), 4 (GSM only).
`loadRatio`	integer	Download speed limit (`1`-`50` % of max bandwidth).
`delayForConnSec`	integer	Delay between connection attempts (`1`-`30000` sec).

Example Request:

```
{
    "download": {
        "connMode": 1,
        "loadRatio": 15,
        "delayForConnSec": 60
    }
}
```

firmware

Firmware management.

Request Parameters:

Parameter	Type	Description
`firmware`	object	
`checkPeriodSec`	integer / null	Update check period (`1`-`1000000` sec), or `null` to disable.
`downloadPeriodHr`	integer / null	Automatic download period (`0`-1439 hours), or `null` to disable.
`updateHour`	integer / null	Hour of day for automatic update (`0`-23), or `null` to disable.
`url`	string	Update source URL (1-96 ASCII chars, no spaces).

Example Request:

```
{
    "firmware": {
        "checkPeriodSec": 900,
        "downloadPeriodHr": 6,
        "updateHour": 3,
        "url": "static.mcdownloads.com/firmware/mc251-6-1-current.fus"
    }
}
```

httpd

Built-in HTTP server parameters.

Request Parameters:

Parameter	Type	Description
`httpd`	object	
`port`	integer	Web interface port (1-65535).
`freeAccessSec`	integer	Open access time after button press (5-3600 sec).

Example Request:

```
{
    "httpd": {
        "port": 80,
        "freeAccessSec": 600
    }
}
```

language

Interface language code.

Note: If the display does not support the specified code, English will be used.

Request Parameters:

Parameter	Type	Description
`language`	string	Language code: en - English; ua - Ukrainian.

Example Request:

```
{
    "language": "en"
}
```

serial

Serial interface settings.

Request Parameters:

Parameter	Type	Description
`serial`	object	
`uidRange`	string	Modbus UID address range (e.g., 112–255).
`hdxMode`	integer	Half-duplex mode: `0` - slave; 1 - master; 2 - raw mode.
`charFormat`	integer	Byte format: `0`-5 (see Modbus section).
`baudRate`	integer	Baud rate (75-`230400` bps).
`frameMode`	integer	Frame format: `0` - RTU, 1 - ASCII.
`delayForRtuQ`	integer	RTU character delay multiplier (2^n): `0`-5.
`delayForRtuMs`	integer	RTU response delay (`0`-`60000` ms).
`delayForAsciiMs`	integer	ASCII character delay (`0`-`60000` ms).

Example Request:

```
{
    "serial": {
        "baudRate": 38400,
        "charFormat": 3,
        "frameMode": 1,
        "delayForRtuMs": 200,
        "delayForAsciiMs": 1000,
        "hdxMode": 1,
        "uidRange": "112–255",
        "delayForRtuQ": 1
    }
}
```

astro

Astronomical settings (sunrise/sunset).

Request Parameters:

Parameter	Type	Description
`astro`	object	
`longDeg`	integer	Longitude degrees (`0`-`179`).
`longMin`	integer	Longitude minutes (`0`-`59`).
`longSec`	integer	Longitude seconds (`0`-`59`).
`latDeg`	integer	Latitude degrees (`0`-`179`).
`latMin`	integer	Latitude minutes (`0`-`59`).
`latSec`	integer	Latitude seconds (`0`-`59`).
`quadrant`	integer	Quadrant: `0` - N/E; `1` - N/W; `2` - S/E; `3` - S/W.
`sunZenithType`	integer	Zenith type: `0` - Official; `1` - Civil; `2` - Nautical; `3` - Astronomical.

Example Request:

```
{
    "astro": {
        "longDeg": 30,
        "longMin": 19,
        "longSec": 0,
        "latDeg": 59,
        "latMin": 57,
        "latSec": 0,
        "quadrant": 0,
        "sunZenithType": 2
    }
}
```

ntp

NTP time synchronization settings.

Request Parameters:

Parameter	Type	Description
`ntp`	object	
`hostnames`	array	Array of NTP server hostnames (max 20 chars each).

Parameter	Type	Description
`connMode`	integer / null	Connection mode: `null` (disabled), 1 (Eth pref), 2 (GSM pref), 3 (Eth only), 4 (GSM only).
`syncPeriodHr`	integer	Synchronization period (`0`-`240` hours).
`syncDiffSec`	integer	Synchronization threshold (`0`-`180` sec).

Example Request:

```
{
    "ntp": {
        "hostnames": ["ntp.time.in.ua", "ntp2.stratum1.ru"],
        "connMode": 1,
        "syncPeriodHr": 24,
        "syncDiffSec": 1
    }
}
```

tsMode

Daylight saving time mode.

Request Parameters:

Parameter	Type	Description
`tsMode`	integer / null	DST Mode: `null` (Disabled), 1 (Brazil), 2 (UK), 3 (Germany), 4 (Greece), 5 (Jordan), 6 (Italy), 7 (Namibia), 8 (Poland), 9 (Portugal), `10` (USA), 11 (Turkey), 12 (Ukraine), 13 (Finland), 14 (France), 15 (Manual - see `tsManual`).

Example Request:

```
{
    "tsMode": 12
}
```

tsManual

Manual daylight saving time settings.

Request Parameters:

Parameter	Type	Description
`tsManual`	object	
`bwdDow`	integer	Winter time transition day of week (1-7, Mon-Sun).
`bwdHour`	integer	Winter time transition hour (0-23).
`bwdMonth`	integer	Winter time transition month (1-12).
`bwdWeek`	integer	Winter time transition week (1-5, 6=last).
`fwdDow`	integer	Summer time transition day of week (1-7, Mon-Sun).
`fwdHour`	integer	Summer time transition hour (0-23).
`fwdMonth`	integer	Summer time transition month (1-12).
`fwdWeek`	integer	Summer time transition week (1-5, 6=last).

Example Request:

```
{
    "tsManual": {
        "bwdDow": 7,
        "bwdHour": 2,
        "bwdMonth": 10,
        "bwdWeek": 6,
        "fwdDow": 7,
        "fwdHour": 2,
        "fwdMonth": 3,
        "fwdWeek": 6
    }
}
```

logFlags

Logging settings.

Request Parameters:

Parameter	Type	Description
`logFlags`	object	
`atm`	boolean	GSM interface logging (`true`/`false`).
`system`	boolean	System event logging (`true`/`false`).

Parameter	Type	Description
`lwip`	boolean	LWIP protocol logging (`true`/`false`).
`forwarding`	boolean	Port forwarding logging (`true`/`false`).
`wireguard`	boolean	WireGuard logging (`true`/`false`).

Example Request:

```
{
    "logFlags": {
        "atm": true,
        "system": true,
        "lwip": false,
        "forwarding": false,
        "wireguard": true
    }
}
```

rmSrv

TCP client settings (Remote Servers).

Request Parameters:

Parameter	Type	Description
`rmSrv`	array	Array of 3 server objects.
`ip`	string	Server IP address.
`connPort`	integer	Connection port (`1-65535`).
`delayForRcvMs`	integer	Receive delay (`1-60000` ms).
`delayForConnSec`	integer	Delay between connections (`1-30000` sec).
`connMode`	integer / null	Connection mode: `null` (disabled), 1 (Eth pref), 2 (GSM pref), 3 (Eth only), 4 (GSM only).
`gateUid`	integer / null	MC-251 compatible gateway UID (`1-255`), or `null` if unknown.
`uidRange`	string	UID range (e.g., `1–110`).
`password`	string	Password for MC-251 compatible gateway.

Parameter	Type	Description
`protocol`	integer	Protocol: 1 - RAW, 2 - ModbusTCP.
`virtualUids`	boolean	Virtual UIDs (`true`/`false`).

Example Request:

```
{
    "rmSrv": [
        {
            "ip": "192.168.0.102",
            "connPort": 502,
            "delayForRcvMs": 1000,
            "delayForConnSec": 20,
            "connMode": 3,
            "gateUid": 112,
            "uidRange": "1-110",
            "password": "11111",
            "protocol": 2,
            "virtualUids": false
        },
        {
            "ip": "192.168.0.113",
            "connPort": 502,
            "delayForRcvMs": 1000,
            "delayForConnSec": 20,
            "connMode": null,
            "gateUid": null,
            "uidRange": "1-255",
            "password": "",
            "protocol": 2,
            "virtualUids": false
        },
        {
            "ip": "192.168.0.114",
            "connPort": 502,
            "delayForRcvMs": 1000,
            "delayForConnSec": 20,
            "connMode": null,
            "gateUid": null,
            "uidRange": "1-255",
            "password": "",
            "protocol": 2,
            "virtualUids": false
        }
    ]
}
```


bodVoltage

Minimum supply voltage (Brown-Out Detect). If voltage drops below this value, the SD card will be safely unmounted.

Request Parameters:

Parameter	Type	Description
`bodVoltage`	integer	Voltage in mV (e.g., `9000`).

Example Request:

```
{
    "bodVoltage": 9000
}
```

forwarding

Port forwarding settings (Ethernet to GSM only).

Request Parameters:

Parameter	Type	Description
`fwd`	array	Array of 4 forwarding objects.
`listenPort`	integer / null	Local listening port (`null` to disable, or 1-65535).
`isUdp`	boolean	`true` for UDP, `false` for TCP.
`serverAddr`	string	Remote server host address. (If `listenPort: 53` & `isUdp: true` & `serverAddr: ""`, uses DNS settings).
`serverPort`	integer	Remote server port (1-65535).

Example Request:

```
{
    "fwd": [
        {
            "serverAddr": "www.cameronsworld.net",
            "serverPort": 443,
            "listenPort": 443,
            "isUdp": false
        },
        {
            "serverAddr": "",
            "serverPort": 0,
            "listenPort": null,
            "isUdp": false
        },
        {
            "serverAddr": "",
            "serverPort": 0,
            "listenPort": 53,
            "isUdp": true
        },
        {
            "serverAddr": "time.google.com",
            "serverPort": 123,
            "listenPort": 123,
            "isUdp": true
        }
    ]
}
```


Export Settings

Saves settings to a file in the root folder / of the SD card.

POST `/api/cmd/settings/export/`

Request Parameters:

Field	Type	Description
`filename`	string	Filename in FAT-32 DOS (8.3) format.

Example Request:

```
{
    "filename": "sgs.bin"
}
```

Import Settings

Loads settings from a file in the root folder / of the SD card.

POST `/api/cmd/settings/import/`

Request Parameters:

Field	Type	Description
`filename`	string	Filename in FAT-32 DOS (8.3) format.

Example Request:

```
{
    "filename": "sgs.bin"
}
```

Reset Settings

Resets all device settings to default values.

POST `/api/cmd/settings/reset/`

Example Request:

```
{}
```

System Commands

Reboot Device

Initiates a delayed device reboot.

POST `/api/cmd/reboot/`

Request Parameters:

Field	Type	Description
`rebootSec`	integer	Delay before reboot, from `0` to `180` seconds.

Example Request:

```
{
    "rebootSec": 3
}
```

Set Time

Sets the device time immediately.

POST `/api/cmd/time/set/`

Request Parameters:

Field	Type	Description
`time`	string	Time in ISO 8601 format relative to UTC0.

Example Request:

```
{
    "time": "2025-05-15T16:50:27"
}
```

Sync Time

Immediately synchronizes device time with NTP servers specified in settings.

POST `/api/cmd/time/sync/`

Example Request:

```
{}
```

Activate License

Sends an activation request via WireGuard interface. Supported **only** with active WireGuard connection.

POST `/api/activation/`

Request Parameters:

Field	Type	Description
`activation`	object	Activation data object.
`infrastructureName`	string	Infrastructure name.
`infrastructureShortUrl`	string	Short URL to infrastructure site.
`domain`	string	Server address used for activation.
`endpointId`	string	Unique device identifier.
`endpointName`	string	Device name.
`propertyId`	string	Organization identifier.
`propertyName`	string	Organization name.
`pin`	string	8-digit device PIN code.
`hasBonusesEur`	string	Bonus amount on organization account.
`activeTill`	string / null	Activation expiration date (ISO 8601, UTC), or `null` to reset activation.
`supportEmail`	string	Support service email.

Updates

Check for Updates

Initiates a check for available updates (firmware) on the server.

POST `/api/cmd/updates/check/`

Example Request:

```
{}
```

Download Updates

Initiates download of available updates (firmware). SD card must be installed.

POST `/api/cmd/updates/download/`

Example Request:

```
{}
```

Program Update

Initiates installation of a previously downloaded update (firmware) from the SD card.

POST `/api/cmd/updates/program/`

Example Request:

```
{}
```

GSM

Send Test SMS

Sends a test SMS message to the specified phone number via the GSM modem.

POST `/api/cmd/gsm/sms-test/`

Request Parameters:

Parameter	Type	Description
phone	string	Phone number in international format (`+48...`).

Example Request:

```
{
    "phone": "+48..."
}
```

Modbus

Find Modbus Devices

Starts searching for Modbus devices on the RS-485 bus.

POST `/api/modbus/find/start/`

Request Parameters:

Parameter	Type	Description
`baudRate`	integer	Baud rate (bps: `75` to `230400`).
`charFormat`	integer	Byte format:
		`0` - E1S;
		1 - O1S;
		2 - SPACE (0P1S);
		3 - MARK (1P1S / NP2S);
		4 - NP1S;
		5 - AUTO STOP (Rx: NP1S / Tx: NP2S).
`frameMode`	integer	Frame format: `0` - RTU, `1` - ASCII. Optional.
`fastSearch`	boolean	Enable fast search (`true`/`false`). Optional.

Example Request:

```
{
    "baudRate": 9600,
    "charFormat": 3,
    "frameMode": 0,
    "fastSearch": false
}
```

Stop Search

Stops the active Modbus device search.

POST `/api/modbus/find/stop/`

Response:

Parameter	Type	Description
`status`	string	Status: `DONE` - search stopped successfully; `BUSY` - unable to stop search (try again later).

```
{
    "status": "DONE"
}
```

Get Search Result

Returns the list of found devices.

GET `/api/modbus/find/result/?list`

Request Parameters:

Parameter	Description
`list`	If specified, the response includes the list of found devices `foundDevices`.

Response:

Parameter	Type	Description
`foundDevices`	array	List of found devices.
`uid`	integer	Device UID.
`baudRate`	integer	Baud rate (bps: `75` to `230400`).
`charFormat`	integer	Byte format:
		`0` - E1S;
		1 - O1S;
		2 - SPACE (0P1S);
		3 - MARK (1P1S / NP2S);
		4 - NP1S;
		5 - AUTO STOP (Rx: NP1S / Tx: NP2S).
`frameMode`	integer	Frame format: `0` - RTU, 1 - ASCII.

```
{
    "foundDevices": [
        {
            "uid": 1,
            "baudRate": 9600,
            "charFormat": 0,
            "frameMode": 0
        }
    ]
}
```

Template Search and Identification

Get META Info from Template

POST `/api/modbus/class-find/search-meta-info/`

Request Parameters:

Parameter	Type	Description
`filePath`	string	Path to template file on SD card.

Example Request:

```
{
    "filePath": "/templates/em-481.txt"
}
```

Response:

Parameter	Type	Description
`status`	string	Status: `DONE` (success), `ERROR` (failed).
`errorCode`	string / null	Error code if failed. See Error Codes.

Start Search by Template

POST `/api/modbus/class-find/start/?search-meta-info`

Request Parameters:

Parameter	Type	Description
`filePath`	string	Path to template file on SD card.

Parameter	Type	Description
`baudRate`	integer	Baud rate.
`charFormat`	integer	Byte format.
`frameMode`	integer	Frame format: `0` - RTU, `1` - ASCII.
`uid`	integer	Device UID (1-254).

Example Request:

```
{
    "filePath": "/templates/em-481.txt",
    "baudRate": 9600,
    "charFormat": 3,
    "frameMode": 0,
    "uid": 111
}
```

Response:

Parameter	Type	Description
`status`	string	Status: `DONE` (started), `ERROR` (failed).
`errorCode`	string / null	Error code if failed. See Error Codes.

Stop Template Search

POST `/api/modbus/class-find/stop/`

Response:

Parameter	Type	Description
`status`	string	Status: `DONE` (stopped), `BUSY` (cannot stop).

Get Search Result

GET `/api/modbus/class-find/result/`

Response:

Parameter	Type	Description
`mbReqPassed`	integer	Number of completed Modbus requests.
`checksPassed`	integer	Number of executed template commands.

Parameter	Type	Description
`linesPassed`	integer	Number of read template lines.
`mbUid`	integer	Device UID.
`deviceClass`	string / null	Identified device class, or `null`.
`scriptTime`	string / null	Template file creation time (ISO 8601), or `null`.
`scriptVersion`	string / null	Template file version, or `null`.
`status`	string	Status: `DONE` (success), `BUSY` (searching), `ERROR` (failed).
`errorCode`	string / null	Error code if failed. See Error Codes.

Template Search Error Codes

Code	Description
File System Errors	
`ERROR_FR_DISK_ERR`	Low-level disk error
`ERROR_FR_INT_ERR`	Internal file system error
`ERROR_FR_NOT_READY`	Storage device not ready
`ERROR_FR_NO_FILE`	File not found
`ERROR_FR_NO_PATH`	Path not found
`ERROR_FR_INVALID_NAME`	Invalid file or path name
`ERROR_FR_DENIED`	Access denied
`ERROR_FR_EXIST`	File already exists
`ERROR_FR_INVALID_OBJECT`	Invalid file object
`ERROR_FR_WRITE_PROTECTED`	Write protected
`ERROR_FR_INVALID_DRIVE`	Invalid drive
`ERROR_FR_NOT_ENABLED`	File system not mounted
`ERROR_FR_NO_FILESYSTEM`	No file system
`ERROR_FR_MKFS_ABORTED`	Formatting aborted
`ERROR_FR_TIMEOUT`	Timeout
`ERROR_FR_LOCKED`	File locked

Code	Description
ERROR_FR_NOT_ENOUGH_CORE	Not enough memory
ERROR_FR_TOO_MANY_OPEN_FILES	Too many open files
ERROR_FR_INVALID_PARAMETER	Invalid parameter
Search Engine Errors	
ERROR_META	Template structure error
ERROR_LABEL	Invalid or missing label
ERROR_CONDITION	Condition expression error
ERROR_CHECK_TYPE	Unknown check type
ERROR_MODIFIER_PARAMETER	Modifier parameter error
ERROR_DATA_SOURCE	Data source error
ERROR_DATA_SOURCE_FUNCTION	Unknown data source function
ERROR_DATA_SOURCE_ADDRESS	Invalid data source address
ERROR_CHECK_PARAMETERS	Check parameters error
ERROR_ACTION	Action error
ERROR_ACTION_TYPE	Unknown action type
ERROR_UNSUPPORTED_UTF_FORMAT	Unsupported UTF format
ERROR_FILE_NOT_READ	Failed to read template file
ERROR_LINE_OUTOFBOUND	Line out of bound
ERROR_UID_HIDDEN_BY_VDEVICE	UID hidden by virtual device
ERROR_ARG	General argument error
ERROR_MEM	Memory allocation error
ERROR_BUSY	Resource busy
ERROR_SERIAL_IS_SLAVE	Device is in slave mode
ERROR_EOF	End of file reached

Modbus Request/Response

Send Modbus Request

POST `/api/modbus/req/`

Request Parameters:

Parameter	Type	Description
`reqData`	string	Hexadecimal string of Modbus request (without CRC).

Example Request:

```
{
    "reqData": "010300000002"
}
```

Response:

Parameter	Type	Description
`tid`	integer	Transaction ID assigned to the packet.

Get Modbus Response

GET `/api/modbus/resp/?tid=...`

Request Parameters:

Parameter	Type	Description
`tid`	integer	Transaction ID.

Response:

Parameter	Type	Description
`respData`	string	Hexadecimal string of Modbus response.
`status`	string	Status: `DONE` (received), `BUSY` (pending).

Reconnect to Cloud via Modbus

Disconnects and reconnects to the cloud server.

POST `/api/cmd/callback/reconnect/`

Request Parameters:

Field	Type	Description
`requestNewCode`	boolean	Request new activation code upon reconnection.

Example Request:

```
{
    "requestNewCode": true
}
```

SD Card

List Files and Directories

Returns a list of files and subdirectories.

POST `/api/card/dir/`

Request Parameters:

Field	Type	Required	Description
`path`	string	Yes	Absolute path to directory.
`fromIdx`	integer	No	Start index (default `0`).
`toIdx`	integer	No	End index.

Example Request:

```
{
    "path": "/logs",
    "fromIdx": 0
}
```

Response:

Field	Type	Description
`fromIdx`	integer / null	Index of first returned element.
`toIdx`	integer / null	Index of last returned element.
`total`	integer	Total items in directory.
`items`	array	Array of file/directory objects.

Each item in `items` contains:

Field	Type	Description
`name`	string	File or directory name.
`attrib`	string	Attributes: `d` (dir), `r` (read), `w` (write).
`size`	integer	File size in bytes.
`datetime`	string	Last modification time (ISO 8601).

Example Response:

```
{
    "fromIdx": 0,
    "toIdx": 0,
    "total": 1,
    "items": [
        {
            "name": "ATM.LOG",
            "attrib": "-rw",
            "size": 5768906,
            "datetime": "2025-04-16T16:07:38"
        }
    ]
}
```

Get File Info

Returns metadata about a file.

POST `/api/card/file/info/`

Request Parameters:

Parameter	Type	Description
`path`	string	Absolute path to file.

Example Request:

```
{
    "path": "/sgs.bin"
}
```

Response:

Field	Type	Description
`name`	string	File name.
`attrib`	string	File attributes in POSIX format (`drw`).
`size`	integer	File size in bytes.
`datetime`	string	Last modification date (ISO 8601 format).

Example Response:

```
{
    "name": "SGS.BIN",
    "attrib": "-rw",
    "size": 860,
    "datetime": "2025-04-16T15:12:52"
}
```

Read File

Returns file data block in base64 encoding.

POST `/api/card/file/read/`

Request Parameters:

Field	Type	Description
`path`	string	Absolute path to file.
`blockIdx`	integer	Block number (starting from `0`).

Example Request:

```
{
    "path": "/sgs.bin",
    "blockIdx": 0
}
```

Response:

Field	Type	Description
`blockIdx`	integer	Current block number.
`blockCount`	integer	Total number of blocks in the file.
`data`	string	Base64 encoded data of the current block (1024 bytes).

Example Response:

```
{
    "blockIdx": 0,
    "blockCount": 2,
    "data":
"63sM/2R3ki8uAC4AAQBMA9AHCAQBAAEBAAEAAAEBAW8FAQELAw8DPFAAWAJuZf//9gGXiHgAyADoAxQABQAA
AFoAAACAJQAAgIwo2MCoAHP///8AwKgAAQgICAgICAQE2IA5aQ5tZ2FwAAAAAAAAAAAAZ2FwAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAKAAH/AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAB4TADs5AAAC
bnRwLnRpbWUuaW4udWEAAAAAAAAAAG50cDIuc3RyYXR1bTEucnUAAAAAAABGAEMAwoHAgoKBwIAABMAKjExM
SMAAAAAAAAAAAAAAMCoAHD2AegDFAAAAAAAAf8AAAAAAAAAAAAAADAqABx9gHoAxQAAAAAAH/AAAAAAAAA
AAAAAAwKgAcvYB6AMUAAAAAAAB/wAAAAAAAAAAAAAAMCoAHP2AegDFAAAAAAAAf8AAAAAAAAAAAAAADAqAB
09gE="
}
```


Write File

Uploads file data to SD card.

POST `/api/card/file/write/`

Request Parameters:

Field	Type	Description
`path`	string	Absolute path to file (e.g., `/file.bin`).
`blockIdx`	integer	Block number to write (starting from `0`).
`blockCount`	integer	Total number of blocks to write.
`data`	string	Base64 encoded data to write (1024 bytes per block).

Note: Data in blocks must be strictly 1024 bytes, except for the last block.

Example Request:

```
{
    "path": "/file.bin",
    "blockIdx": 0,
    "blockCount": 2,
    "data":
"63sM/2R3ki8uAC4AAQBMA9AHCAQBAAEBAAEAAAEBAW8FAQELAw8DPFAAWAJuZf//9gGXiHgAyADoAxQABQAA
AFoAAACAJQAAgIwo2MCoAHP///8AwKgAAQgICAgICAQE2IA5aQ5tZ2FwAAAAAAAAAAAAZ2FwAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAKAAH/AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAB4TADs5AAAC
bnRwLnRpbWUuaW4udWEAAAAAAAAAAG50cDIuc3RyYXR1bTEucnUAAAAAAAABGAEMAwoHAgoKBwIAABMAKjExM
SMAAAAAAAAAAAAAAMCoAHD2AegDFAAAAAAAf8AAAAAAAAAAAAAADAqABx9gHoAxQAAAAAAH/AAAAAAAAAA
AAAAAwKgAcvYB6AMUAAAAAAAB/wAAAAAAAAAAAAAAMCoAHP2AegDFAAAAAAAf8AAAAAAAAAAAAAADAqAB
09gE="
}
```


Response:

Empty JSON on success.

```
{}
```

Remove File

Removes a file from the SD card.

POST `/api/card/remove/`

Request Parameters:

Field	Type	Description
`path`	string	Absolute path to file.

Example Request:

```
{
    "path": "/1.pdf"
}
```

Response:

Empty JSON on success.

```
{}
```

Eject SD Card

Prepares SD card for safe removal.

POST `/api/cmd/memory/card_eject/`

Example Request:

```
{}
```

Response:

Empty JSON on success.

```
{}
```

HTTP Status Codes

HTTP Status	Meaning
200	OK
204	No Content
400	Bad Request
401	Unauthorized
403	Forbidden
404	Not Found
405	Method Not Allowed
408	Request Timeout

Operations Logic Programming Reference

After running, Overvis MC251 starts execution of the operations logic program, if it was placed earlier in the internal memory.

If there is no program in the internal memory, and a memory card is present (formatted as FAT or FAT32), MC251 may load the taskfiles automatically. Such a reading runs once after startup or after installing a new memory card, but only if the internal memory does not contain a program. MC251 searches for and checks the taskfiles placed in the folder TASKS on the memory card. The found correct files are read into the internal memory and they form the operations logic program.

The internal logic memory can be cleared along with the settings reset to factory defaults. To preserve the settings and clear the internal logic memory via Modbus, you should enter setup mode and write command 40959 to register 120.

> **Note**
>
> The program in the internal memory may be deleted when updating the embedded software. If the memory card with the task files remains installed in the MC251, the program will be automatically read again after the update.

The Modbus registers (see Modbus Register Map, registers 2020-2023) indicate the result of reading the folder TASKS, including the number of read files and the amount of used memory. If during reading and verifying the program errors were detected, then the type of error and line number are indicated. If the program consisted of several files in the folder “TASKS”, then the internal memory will read all files except those in which errors are detected. Therefore, during error correction you should check the number of read files. After corrections were made, the internal memory should be cleared so that the program would be re-read. Files can have arbitrary names and extensions (except `.OBJ`, `.MAP`, `.CNF`) and placed in subfolders of the folder “TASKS”.

Taskfile

Taskfile describes set of actions repeated at a specified time interval. The actions can include gathering data, processing and comparing the values and special actions after fulfillment of the preset conditions (according to the processing results).

File consists of lines. Each line can be one of the following:

- empty;
- option;
- definition;
- action.

Lines can include `comments` preceded by `;` or `#`. The text after these symbols is ignored. Lines can start from `labels`, followed by `:`. Labels are used for `action` references (e.g. `CALL function1` … `function1: RETURN`). Line parts are separated by or TAB symbols.

> **Tip**
>
> Lines are processed case-insensitive, so `CALL`, `Call` and `cAlL` are the same action name.

Taskfile options

Options configure taskfile compilation or execution.

Options start with @ followed by option kind. Then comes the option value.

Compilation options

PROTOCOLVERSION

Checked at compile time. If version is out of compiler supported versions range, taskfile compilation error occurs.

Examples:

```
@PROTOCOLVERSION 10
```

VARBITS

Sets the variable type size. Greater values allow for more available parameter cast types, and handle correctly bigger values, but take more memory.

> **Note**
> The compiler may support only one option value. Controller firmware change may be required to change this option. The option can be used to specify the variable type size the taskfile is intended to be used with.

- 32 - use 32 bit (4 bytes) signed integer variables.
- 64 - use 64 bit (8 bytes) signed integer variables.

Examples:

```
@VARBITS 64
```

Execution options

UPDATE

This option is a set interval between two consequtive runs of the task. Actual interval depends on the controller load and overall taskfiles complexity (some actions such as parameter read/write or SMS sends can prolong the run execution). If the next run time comes before the other run has been finished, the new one is delayed and will be executed as soon as possible.

> **Note**
> If more than one run was delayed, they would be skipped, which could affect some calculations (e.g. counters). In this case long operations should be revised, or 'UPDATE' interval increased.

Option value is seconds integer in range `0`..`2000000`.

`0` - no interval, immediate re-runs.

Default is `60`.

Examples:

```
@UPDATE 10 ; rerun task every 10 seconds
```

`UPDATEDIVISOR`

This options is a modifier for the set interval between two consequtive runs of the task. If set to non-zero value, set interval is managed with subsecond precision and equals '`UPDATE`' / '`UPDATEDIVISOR`'.

Option value is hertz integer in range `0`..`500`.

`0` - intervals calculation precision in seconds.

Default is `0`.

Examples:

```
@UPDATE 2
@UPDATEDIVISOR 3 ; the interval between runs will be 2/3 or about 667 ms
```

`PARAMLOADRATIO`

This option defines forced wait delays between device parameter read/write operations (this does not affect memory parameters, see Parameter definition below). This allows more time for the other clients requests processing. The delay is proportional to the time taken by the previous parameter operation.

Option value is percents integer in range `0`..`100`.

- `100` - no forced delays.
- `50` - delay time equals the previous operation time.
- `25` - delay time is 3 times greater than the operation time.

Default is `25`.

Examples:

```
@PARAMLOADRATIO 50 ; parameters operations are separated with delays of equal
length
```

PARAMTIMEOUT

Wait limit for device parameter read/write operations (this does not affect memory parameters, see Parameter definition below). After timeout expires, operation results in error.

Option value is milliseconds integer in range `0..5000`.

Default is `5000`.

Examples:

```
  @PARAMTIMEOUT 1000    ; wait no more than 1 second for the parameter operation
completion
```

RESETDATA

Determines whether task holding items (variables and conditions) are reset before each run.

- `0` - variables and conditions retain their values in RAM, and are reset at powerdowns or controller reset.
- `1` - variables and conditions are reset before each run.

Default is `0`.

Examples:

```
  @RESETDATA 1    ; holding items values left after the run are not used in the
subsequent runs
```

Taskfile definitions

Definitions declare logical links, strings and Modbus register mapping, or holding items types.

Definition lines start with `DEF` followed by new defined name. Then comes the definition type which can be one of the following groups:

- string;
- Modbus device;
- parameter;
- variable(s);
- condition(s).

> ⚠ **Caution**
> If the definition references the other defined items, these should be defined earlier in the taskfile.

String definition

String definition is marked by " pair, with the string inside. String can include special references, enclosed in ∗ (the escape character ∗ should be doubled to be included into the string itself).

Special references include:

- `VAR(variable)` - for a numeric value out of a `variable`. `lasterror` variable may be also used here;
- `ERR(variable)` - for a literal representation of an error code name out of a `variable`. `lasterror` variable may be also used here;
- `PHONE(index)` - for a number out of a list of GSM abonents in the device settings. Index is a number in range `0` to `4`.

Examples:

```
DEF my_string1 "2 ** 2 = *VAR(var_mul_result)*"             ; this string
template may produce a "2 * 2 = 4" string
DEF e_msg "Handled error #*VAR(lasterror)*: *ERR(lasterror)*"      ; this string
template may produce a "Handled error #1: FUNCTION_ILLEGAL" string
```

Modbus device definition

Modbus device can be used as a parameter source or storage.

Modbus device is defined by one of the following types:

- `MBWRDENIED` - only reading functions may be used;
- `MBWRSINGLE` - single register/coil write functions can be used;
- `MBWRMULTI` - multiple register/coil write functions can be used;
- `MBWRANY` - both single/multiple register/coil write functions can be used.

The type is followed by 2 or 3 arguments:

1. Modbus unit address - one of the following: fixed ID in range `1..255`, own Controller virtual device ID as ∗, or indirect ID as a variable plus integer value (e.g. `some_variable+10`);
2. read registers/coils per one Modbus request limit, in range `1..125`;
3. the argument is present only for `MBWRMULTI`, `MBWRANY` types - write registers/coils per one Modbus request limit, in range `1..125`.

Examples:

```
DEF mc_252 WRHANY * 125 125 ; own controller virtual device
```

Parameter definition

Parameters are used to access external data: get data to or from variables.

Parameter is defined by one of the data types.

> **Note**
>
> `type` is used to cast value when reading from or writing to the parameter, the value is always casted to/from the default type set in the taskfile options.

Table 1 - Parameter types available for any variable type size

No.	Type	Description
0	`UINT16`	unsigned (non-negative) 16-bit (2 bytes) integer, serialized as Big Endian (most significant byte first, e.g. 258 is stored as 0x01, 0x02);
1	`INT16`	signed 16-bit (2 bytes) integer, serialized as Big Endian;
2	`INT16BLE`	signed 16-bit (2 bytes) integer, serialized as Little Endian (least significant byte first, e.g. 258 is stored as 0x02, 0x01);
3	`INT32`	signed 32-bit (4 bytes) integer, serialized as Big Endian (most significant byte first, e.g. 66051 is stored as 0x00, 0x01, 0x02, 0x03);
4	`INT32BLE`	signed 32-bit (4 bytes) integer, with bytes serialized as Little Endian (least significant byte first, e.g. 66051 is stored as 0x03, 0x02, 0x01, 0x00);
5	`INT32WLE`	signed 32-bit (4 bytes) integer, with words serialized as Little Endian (least significant word first, e.g. 66051 is stored as 0x02, 0x03, 0x00, 0x01);
6	`BIT`	1-bit integer (used for example to access Modbus coils and discrete inputs);
7	`INT32BE`	same as `INT32`
8	`F32EP0R`	IEEE 754 single precision (4 bytes) floating-point, serialized as Big Endian;
9	`F32BLEEP0R`	IEEE 754 single precision (4 bytes) floating-point, with bytes serialized as Little Endian;
10	`F32WLEEP0R`	IEEE 754 single precision (4 bytes) floating-point, with words serialized as Little Endian;
11	`F32EP1R`	single precision (4 bytes) floating-point, serialized as divided by 10 Big Endian;
12	`F32BLEEP1R`	same as `F32BLEEP0R`, but divided by 10 before serializing;
13	`F32WLEEP1R`	same as `F32WLEEP0R`, but divided by 10 before serializing;
14	`F32EP2R`	single precision (4 bytes) floating-point, serialized as divided by 100 Big Endian;
15	`F32BLEEP2R`	same as `F32BLEEP0R`, but divided by 100 before serializing;

No.	Type	Description
16	F32WLEEP2R	same as F32WLEEP0R, but divided by 100 before serializing;
17	F32EP3R	single precision (4 bytes) floating-point, serialized as divided by 1000 Big Endian;
18	F32BLEEP3R	same as F32BLEEP0R, but divided by 1000 before serializing;
19	F32WLEEP3R	same as F32WLEEP0R, but divided by 1000 before serializing;
20	UINT16BLE	unsigned (non-negative) 16-bit (2 bytes) integer, serialized as Little Endian;
21	UINT8	unsigned (non-negative) 8-bit (1 byte) integer;
22	INT8	signed 8-bit (1 byte) integer;

Table 2 - Parameter types available for 64-bit variable type

No.	Type	Description
23	UINT32	unsigned (non-negative) 32-bit (4 bytes) integer, serialized as Big Endian (most significant byte first, e.g. 66051 is stored as 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0x02, 0x03);
24	UINT32BLE	unsigned (non-negative) 32-bit (4 bytes) integer, with bytes serialized as Little Endian (least significant byte first, e.g. 66051 is stored as 0x03, 0x02, 0x01, 0x00, 0x00, 0x00, 0x00, 0x00);
25	UINT32WLE	unsigned (non-negative) 32-bit (4 bytes) integer, with words serialized as Little Endian (least significant word first, e.g. 66051 is stored as 0x02, 0x03, 0x00, 0x01, 0x00, 0x00, 0x00, 0x00);
26	INT64	signed 64-bit (8 bytes) integer, serialized as Big Endian (most significant byte first, e.g. 66051 is stored as 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0x02, 0x03);
27	INT64BLE	signed 64-bit (8 bytes) integer, with bytes serialized as Little Endian (least significant byte first, e.g. 66051 is stored as 0x03, 0x02, 0x01, 0x00, 0x00, 0x00, 0x00, 0x00);
28	INT64WLE	signed 64-bit (8 bytes) integer, with words serialized as Little Endian (least significant word first, e.g. 66051 is stored as 0x02, 0x03, 0x00, 0x01, 0x00, 0x00, 0x00, 0x00);
29	F64EP0R	IEEE 754 double precision (8 bytes) floating-point, serialized as Big Endian;
30	F64BLEEP0R	IEEE 754 double precision (8 bytes) floating-point, with bytes serialized as Little Endian;
31	F64WLEEP0R	IEEE 754 double precision (8 bytes) floating-point, with words serialized as Little Endian;
32	F64EP1R	double precision (8 bytes) floating-point, serialized as divided by 10 Big Endian;

No.	Type	Description
33	F64BLEEP1R	same as F64BLEEP0R, but divided by 10 before serializing;
34	F64WLEEP1R	same as F64WLEEP0R, but divided by 10 before serializing;
35	F64EP2R	double precision (8 bytes) floating-point, serialized as divided by 100 Big Endian;
36	F64BLEEP2R	same as F64BLEEP0R, but divided by 100 before serializing;
37	F64WLEEP2R	same as F64WLEEP0R, but divided by 100 before serializing;
38	F64EP3R	double precision (8 bytes) floating-point, serialized as divided by 1000 Big Endian;
39	F64BLEEP3R	same as F64BLEEP0R, but divided by 1000 before serializing;
40	F64WLEEP3R	same as F64WLEEP0R, but divided by 1000 before serializing;
41	F64EP4R	double precision (8 bytes) floating-point, serialized as divided by 10000 Big Endian;
42	F64BLEEP4R	same as F64BLEEP0R, but divided by 10000 before serializing;
43	F64WLEEP4R	same as F64WLEEP0R, but divided by 10000 before serializing;
44	F64EP5R	double precision (8 bytes) floating-point, serialized as divided by 100000 Big Endian;
45	F64BLEEP5R	same as F64BLEEP0R, but divided by 100000 before serializing;
46	F64WLEEP5R	same as F64WLEEP0R, but divided by 100000 before serializing;
47	F64EP6R	double precision (8 bytes) floating-point, serialized as divided by 1000000 Big Endian;
48	F64BLEEP6R	same as F64BLEEP0R, but divided by 1000000 before serializing;
49	F64WLEEP6R	same as F64WLEEP0R, but divided by 1000000 before serializing;

The type is followed by 1 or 3 arguments:

1. source - one of the following: `MEMTEMP`, `MEMBAT`, `MEMFILE`, `MEMFLASH` (for memory areas) or a Modbus device defined earlier.

2. For Modbus device source it is the Modbus data table: one of the following `C`, `D`, `H`, `I` for coils, discrete inputs, holding registers or input registers respectively. For memory sources it is optional - if specified, it maps the memory parameter to own controller virtual device addresses.
3. For Modbus device source it is the starting address (either fixed in range `0..65535`, or indirect as a variable plus integer value, e.g. `some_variable+0`). For memory sources it is optional - if specified, it maps the memory parameter to own controller virtual device addresses. Parameter may occupy several addresses depending on its type and size.

Memory sources for the parameters allow to read presets or store settings and temporary values to be processed at consequtive runs.

- `MEMTEMP` - RAM space, data is lost at powerdown or controller reset, small area size but excellent write speed;
- `MEMBAT` - memory area powered by internal clock battery, very limited size but good write speed;
- `MEMFLASH` - controller settings area, data retains at reset, small size and usually read-only;
- `MEMFILE` - extendable file area, requires memory card with the taskfiles to be present, average speed but excellent area size.

> **Tip**
>
> If several memory sourced parameters of the same size (other than `MEMFILE`) are mapped to the same Modbus address, they would share the same memory area. This can be used for the parameters in different taskfiles, to transfer data between the tasks. In that case only one taskfile can write to this shared parameter (being the `write r`). The other taskfiles can only read this shared parameter (being the `readers` of the data written by the `writer`). `MEMFILE` parameters are not stored in the memory area and do not use this feature.

Examples:

```
DEF local_time UINT32 mc_251 H 170 ; own controller registers 170..171
DEF alg_mode UINT32 MEMTEMP H 5000 ; RAM value, mapped to own holding register 5000
```

Variable definition

Variables are used to operate integer values. All variables have the same type, which is set in taskfile options.

Variables can be mostly defined automatically when first mentioned. Some operations though (like '`ISKNOWN`', copying, or array items assignment) require the variable to be defined earlier.

Variables are defined with `VAR` type. Variable arrays are defined with `VARS` type followed by array size in range `1..65535` (array of a single variable is effectively the same as a simple variable).

There is one pre-defined variable: `lasterror`. Error occurances write the error code to it. It cannot be written like the other variables, but `RAISE` command effectively writes to it. This variable can be used in error handlers for error-specific actions.

Examples:

```
DEF variable_1 VAR
DEF array_with_5_items VARS 5
```

Condition definition

Conditions are used to operate boolean values.

Conditions can be mostly defined automatically when first mentioned. Some operations though (like 'ISKNOWN', copying or array items assignment) require the condition to be defined earlier.

Conditions are defined with `COND` type. Condition arrays are defined with `CONDS` type followed by array size in range `1..65535` (array of a single condition is effectively the same as a simple condtion).

Examples:

```
DEF is_temperature_high COND
```

Taskfile actions

Actions form iterative logic algorythm. Actions can be one of the following:

- assertion;
- check;
- command.

Actions are executed consequtively with these exceptions:

- check actions would skip a single action, if their condition is not `TRUE`;
- command actions like `GO`, `CALL`, `RETURN` would jump to a label or return from the function call;
- command action `RAISE` or any error occurance would either jump to the error handler or stop this execution run due to an unhandled error;
- command action `EXIT` stops this execution run.

There are 2 labels used as the main taskfile function definition:

- `run` - each time the taskfile run is executed, the action labelled `run` is performed first (if there is no such label, the first action in the taskfile is the first to be performed);
- `onerror` - if an error occurs with no other handlers specified, a handler labelled `onerror` is used (if there is no such label, the error would be unhandled, see Error handling below).

The action may in some cases reference the other items which were not defined earlier in the taskfile:

- variable arrays and condition arrays should be defined before they are referenced;
- evalutions which can take arguments of different types (like direct copying), require arguments to be defined earlier;

- ohter variables and conditions can be referenced without pre-definition;
- labels can be referenced by `CALL`, `TRYCALL` or `GO` before they are defined;
- strings can be referenced by `SENDSMS`, `SMSRCVD`, `NOSMSRCVD`, `SYSLOG` or `PARAMCOMMENT` before they are defined;
- in all the other cases the referenced item should be defined earlier in the taskfile.

Assertion action

Assertions are actions producing some result data, which they store in one of the holding items (variable or condition).

Assertions start with a `PUT` followed by result target item name. Then comes the function with the proper result type for this target (see Variable evalution, Condition evalution below). If no function is specified, the argument is directly copied into target (this can also be used to get the items from the array indexed by the variable, or put them back).

Examples:

```
DEF numbers VARS 3
PUT numbers[0] 0
PUT numbers[1] 1
PUT numbers[2] 2        ; numbers contains [0, 1, 2]
PUT index 2
PUT x numbers[index]      ; x contains 2
PUT var_mul_result MUL x 2    ; var_mul_result contains 4
```

Check actions

Checks are actions used for branching. They skip the next action if their function (with condition result, that is boolean) produces `FALSE` or an unknown value.

Checks start with `IF` followed by the function with the condition result type (see Condition evalution below). If no function specified, the argument should be a condition name.

Examples:

```
PUT lesser 5
PUT greater 3
IF LE lesser greater  ; LE 5 3 produces FALSE, for 5 <= 3 is not true
GO then_section      ; this command will not be executed
; else section
PUT tmp lesser      ; lesser and greater variables values exchange
PUT lesser greater
PUT greater tmp
GO endif_section
then_section:
; two variables already sorted, nothing to do
endif_section:
; two variables are sorted now, lesser <= greater
```

Command actions

Commands are actions producing no result data or discarding it.

Commands are one of the following:

- `EXIT` - stops taskfile execution. Has 1 argument: error name, `OK` (if no error) or `lasterror`.
- `RAISE` - forces an error occurance. Has 1 argument: error name, or `lasterror` (for raising the same error higher).
- `GO` - next action will not be performed, execution will continue from the specified label. Has 1 argument: label name.
- `CALL` - starts some user function execution. Next action execution is postponed, execution will now continue from the specified label. Has 1 argument - function entry label name.
- `TRYCALL` - starts some user function with its own error handling. Next action execution is postponed, execution will now continue from the specified label. Has 2 arguments - function entry label label name and error handler label name.
- `RETURN` - ends user function execution. Next action will not be performed, execution will continue from the previously postponed action (by the previously met '`CALL`').
- `WRITE` - outputs data to the parameter. Has 2 arguments: parameter name, then variable name or an integer value.
- `PARAMLOG` - writes the parameter to the data log. Has 1 argument: parameter name. The parameter must be in Modbus registers or otherwise mapped to Modbus, as its address is used in logs.
- `PARAMCOMMENT` - writes the parameter to the data log with a comment. Has 2 arguments: parameter name, then string name. The parameter must be in Modbus registers or otherwise mapped to Modbus, as its address is used in logs.
- `SYSLOG` - writes the string to the system log. Has 1 argument: the string name.
- `SENDSMS` - sends the string as an SMS. Has 2 arguments: the addressee string, then the SMS text string name. If the addressee strings results in no other characters than `0`, the SMS would not be sent.

Examples:

```
WRITE param_hysteresis 5
EXIT OK
```

Variable evalution

Variable evalution functions are used in assertion action (`PUT`) to calculate a new variable value.

They can produce numeric value or an `unknown` result (see Unknown values below).

Arithmetic evalutions

Most of the following functions take 2 arguments (e.g. `a` and `b`) and perform an operation.

- `ADD` - addition (`a + b`). The first argument is variable, the second can be either variable or an integer value.
- `SUB` - subtraction (`a - b`). The first argument is variable, the second can be either variable or an integer value.
- `MUL` - multiplication (`a * b`). The first argument is variable, the second can be either variable or an integer value.
- `DIV` - division (`a / b`, integer result). The first argument is variable, the second can be either variable or an integer value.
- `MOD` - remainder of division (`a - (a / b * b)`). The first argument is variable, the second can be either variable or an integer value.
- `SQRT` - square root (integer). Takes a single variable or an integer value argument.
- `VAL` - direct copy. Takes a single argument: variable or an integer value. As with the other direct copying evalutions, function name `VAL` can be omitted.

Bits evalutions

Most of the following functions take 2 arguments (e.g. `a` and `b`) and perform an operation.

- `BITSAND` - logical `AND` of every bit of `a` with the corresponding bit of `b`. The first argument is variable, the second can be either variable or an integer value.
- `BITSOR` - logical `OR` of every bit of `a` with the corresponding bit of `b`. The first argument is variable, the second can be either variable or an integer value.
- `SHR` - arithmetic shift to the right of the bits of `a`, `b` times right. The first argument is variable, the second can be either variable or an integer value.
- `SHL` - shift to the left of the bits of `a`, `b` times left. The first argument is variable, the second can be either variable or an integer value.
- `BITSBIT` - bit `b` copy out of the bits of `a`. Is equivalent to `SHR a b` followed by `BITSAND a 1`. The first argument is variable, the second can be either variable or integer value.

- `BITSNOT` - bits inversion. Takes a single variable or an integer value argument.

Parameter input evalution

- `READ` - takes parameter as an argument, and reads then casts its value to the variable default type.

Array items evalutions

- `MAX` - maximal item of the array. Takes a single argument: array of variables.
- `MAXIDX` - index of the maximal item of the array in range of 0 to array size minus 1. Takes a single argument: array of variables.
- `MIN` - minimal item of the array. Takes a single argument: array of variables.
- `MINIDX` - index of the minimal item of the array in range of 0 to array size minus 1. Takes a single argument: array of variables.
- `SUM` - sum of the array items. Takes a single argument: array of variables.
- `SELECTBY` - takes 2 arguments: array of variables and array of conditions of the same size, and selects the variable corresponding to the first condition which is `TRUE`.

Examples:

```
PUT square MUL x x
```

Condition evalution

Condition evalution functions are used in either assertions (`PUT` actions) or checks (`IF` actions) to determine a condition value.

They can produce `TRUE`, `FALSE` or an `unknown` result (if referring the other unknown item values, see Unknown values below).

All functions come in direct or inversed form, which differ only in result being inverted or not before use. The functions are listed in both forms, e.g. '`EQ`' / '`NE`' for equality and non-equality (inverted `EQ`) checks.

Comparison checks

- `EQ` / `NE` - equal / non-equal (`a = b` / `a != b`). The first argument is variable, the second can be either variable or an integer value.
- `GE` / `LS` - greater-or-equal / lesser (`a >= b` / `a < b`). The first argument is variable, the second can be either variable or an integer value.
- `GR` / `LE` - greater / lesser-or-equal (`a > b` / `a <= b`). The first argument is variable, the second can be either variable or an integer value.

Logical checks

- `AND` / `NAND` - logical `AND` / inverted logical `AND` (`a && b` / `!(a && b)`). Takes 2 condition arguments.
- `OR` / `NOR` - logical `OR` / inverted logical `OR` (`a || b` / `!(a || b)`). Takes 2 condition arguments.
- `VAL` / `NOT` - direct copy / inverted copy (`a` / `!a`). Takes a single argument: condition or boolean value (`TRUE` or `FALSE`). As with the other direct copying evalutions, function name `VAL` can be omitted.

SMS checks

- `SMSRCVD` / `NOSMSRCVD` - checks whether a new SMS starting with a specified text came from a number starting with specified digits. The first argument is a phone number start, the second is an SMS text start. If the phone number is an empty string, SMS from any abonents are checked.

Error checks

- `ISKNOWN` / `ISNOTKNOWN` - checks whether the holding item value is known. Takes a single argument: variable or condition (the values are unknown if they are read from an uninitialized parameters or evaluted from the other unknown items, see Unknown values below).

Examples:

```
PUT c_equal EQ x 5
IF c_equal
EXIT OK

; the same function can be used in check directly
IF EQ x 5
EXIT OK
```

Fractional values and fixed point calculations

Data processing is performed by variable evalutions which store values of integer type.

However, parameters read and write can cast data types from and to fractional values of single and double precision as defined in IEEE 754 standard. This casting can be done with a multiplier (depending on the parameter type used), to preserve a certain number of decimal digits of the value fractional part. Some connected devices may also have integer parameters representing a fractional value (pre-multiplied in a similar way as above).

This allows to operate fractional values as integers.

> **Note**
>
> Simple arithmetics like addition or subtraction do not affect fixed decimal point position.

A care should be taken using operations like multiplication, division or square root.

For example, `MUL 2 2` = 4, but if the first argument represents `0.2` value multiplied by `10`, and the second - `0.02` value multiplied by `100` (fixed point values with 1 and 2 digit precision respectively), the result represents `0.004` multiplied by `1000` (`10*100`, as the multipliers were also multiplied).

A square root of the previous value (4 standing for a value `0.004` multiplied by `1000`), `SQRT 4` produces 2, which is a wrong result, because of the multiplier `1000`. For `SQRT 1000` is not an integer. To get a correct result, this value multiplier should be adjusted to a nearest multiplier with even number of zeroes, that is `10000`. So 4 should be pre-multiplied by `10` (producing `40` for `0.004` multiplied by `10000`). Then the `SQRT 40` produces 6 which is a correct result (standing for `0.06` multiplied by `100`).

Arrays

Holding items can be organized in arrays of fixed size. Arrays should be defined before referencing them in evalutions (e.g. `DEF some_array VARS 5` or `DEF the_other_array CONDS 2`).

There are 3 ways of using the arrays:

- array items with an integer value index can be used in most of the functions and assertions instead of a single item name as an argument (or an assertion result, e.g. `PUT some_array[3] MUL some_array[2] some_array[1]`).
- array items with variable index can be used: a) either in assertions as a result for a direct copying or a single-argument functions (e.g. `PUT some_array[ar_idx] SQRT distance`), b) or as an argument for a direct copying (including `NOT` function which is just an inverted copying of a condition, e.g. `IF NOT c_array[counter]`).
- certain array evalution functions take arrays as arguments, performing searching or digesting and producing a single variable result.

Error handling

Errors can occur during actions execution.

Some commands like `CALL` or `RETURN` result in error due to misusage, which requires program correction. The other commands or functions result in error due to either wrong argument values (square root of a negative variable) or external reasons (e.g. parameter could not be read or written).

Error occurance in the function causes execution to interrupt and jump to the function error handler. This can happen once per function call: if no handler has been provided, or another error occurs in the error handler itself, the execution continues at the caller function handler. For the main taskfile function, `onerror` label is used as a default taskfile error handler.

A pre-defined variable `lasterror` can be used to read error code and perform error-specific actions.

If no caller handler is availbale, the error is considered unhandled - the default handler is performed similar to this:

```
SYSLOG default_err_msg
EXIT lasterror
;
DEF default_err_msg "Unhandled error #*VAR(lasterror)*: *ERR(lasterror)*"
```

Unknown values

Error during the assertion usually causes the result target to have an `unknown` value. `Unknown` values can also appear without an actual error, e.g. when reading an unitialized parameter or using the variable which has not been asserted.

`Unknown` values tend to spread, as most functions referring an unknown variable or condition value will result in an `unknown` value themselves. Some functions may still determine the result, notwithstanding of `unknown` items in their arguments. `SELECTBY` array function can get the result early (before reaching any of the `unknown` items later). `AND` logical check can result in `FALSE` if any of its arguments is `FALSE` (while the other one can have any value), `OR` can likewise result in `TRUE`, etc.

Critical commands may require additional checks (`ISKNOWN` / `ISNOTKNOWN`) and direct variable assertions, or parameter initializations, to guard against `unknown` states.

`IF` check action treat `unknown` function result as `FALSE`, and would skip the next command. This allows to choose between direct and inverted check function to guard the branch against executing in `unknown` states.

Taskfiles examples

Below there are examples of finished programs, each consists of a single task file. To run the sample on the MC251 it is necessary to:

1. Create a text file (e.g. having the `.txt` extension) with program text.
2. Put the file in the folder `TASKS`.
3. Put the prepared folder onto the microSD memory card, formatted as FAT or FAT32.
4. Put the memory card into the MC251.

Example 1

This example describes a program that, in the event of fault of the device, will send SMS with warning.

In the taskfile text:

- `3` is Modbus ID of the device `OM-310`;
- `240` is the register address which is monitored for the fault.

```
# SMS sending when bit 0 of register 240 of device 3 is set

#10th version of Protocol
@PROTOCOLVERSION 10
#task rerun interval will be every 3 seconds
@UPDATE 3
#limit of response waiting for Modbus query is 1000 msec = 1 sec
@PARAMTIMEOUT 1000
#after each query the delay is added, equal to the response waiting time,
#so the other clients can perform their queries
@PARAMLOADRATIO 50

#MC251 can read and write no less than 120 registers per one query
#note the * character - it is Modbus ID of the MC251 own virtual Modbus device
DEF mc251 MBWRANY * 120 120
#OM-310 has Modbus ID equal to 3 and allows reading 4 registers per one query,
#but writing of only one register per one query
DEF om310 MBWRSINGLE 3 4

#during each update, it is required to read
#the holding register with address 240 from OM-310
#UINT16 - means that the 16-bit value is unsigned (it can't be less than 0)
DEF alarms UINT16 om310 H 240

#each run starts here
PUT alarm READ alarms

#copy zero bit of the register 240
PUT alarm BITSBIT alarm 0
#now the variable holds the parameter 240.0 value 0 or 1

#variable is compared with 1, the condition produces `TRUE`, if alarm = 1
PUT is_alarm EQ alarm 1
#condition is met, if the previous condition is not fulfilled, and vice versa
PUT no_alarm NOT is_alarm

#if the condition is_alarm is met (if 240.0 = 1), then send one SMS
IF is_alarm
SENDSMS technician_number alarm_msg

#program end
EXIT OK

#SMS text
```

```
DEF alarm_msg "OM-310 (3) - avaria"

#the phone to receive the SMS can be specified below
DEF technician_number "01234567"
```

Example 2

In this example, the program controls the hysteresis value on the second channel of the TR-101 device, depending on the temperature of the sensor on the first channel.

The program uses clock battery-powered memory as a storage of the temperature limits and corresponding hysteresis parameters. These parameters are mapped to the MC251 own registers to simplify program configuration.

In the taskfile text:

- `16` is Modbus ID of the device TR–`101`;
- `4` is the address of the channel 1 temperature register;
- `47` is the address of the channel 2 hysteresis reguster;
- `5500` is the address for the lower temperature limit;
- `5501` is the address for the upper temperature limit;
- `5502` is the address for the hysteresis at crossing the lower temperature limit;
- `5503` is the address for the hysteresis at crossing the upper temperature limit.

```
@PROTOCOLVERSION 10
@UPDATE 20       #program will run every 20 seconds
@PARAMLOADRATIO 50

DEF mc251 MBWRANY * 120 120
#TR-101 has Modbus ID 16 and can read no less than 100 registers per a query,
#but write one register per one query
DEF tr101 MBWRSINGLE 16 100

#INT16 – registers with signed integers, as the temperature can be less than 0
DEF t_lower INT16 MEMBAT H 5500
DEF t_upper INT16 MEMBAT H 5501
DEF t_chan1 INT16 tr101 H 4
#UINT16 – as the hysteresis is no less than 0
DEF h_at_lower UINT16 MEMBAT H 5502
DEF h_at_upper UINT16 MEMBAT H 5503
DEF h_chan2 UINT16 tr101 H 47

DEF temperatures VARS 3
DEF hysteresi VARS 3
DEF checks CONDS 3

#program start
run:

#lower and upper temperature limits, as well as its current value
PUT temperatures[0] READ t_lower
PUT temperatures[1] READ t_upper
PUT temperatures[2] READ t_chan1

# hysteresis for temperatures that are below (or above) than the limits
PUT hysteresi[0] READ h_at_lower
PUT hysteresi[1] READ h_at_upper
# current hysteresis value
PUT hysteresi[2] READ h_chan2

# was the temperature out of the limits?
PUT checks[0] LE temperatures[2] temperatures[0]
PUT checks[1] GE temperatures[2] temperatures[1]
# in other cases – do not change the hysteresis (current value)
PUT checks[2] TRUE

# the desired hysteresis is selected from hysteresi array
# according to the conditions of checks array
```

```
PUT hysteresis SELECTBY hysteresi checks

# is hysteresis not set to the desired value yet?
IF NE hysteresis hysteresi[2]
# write a new hysteresis to TR-101
WRITE h_chan2 hysteresis

EXIT OK
```

Example 3

In this example, a program is described that monitors the temperature measured by OB-215. When the temperature exceeds -15 degrees for more than 10 minutes, it sends an SMS and starts logging the temperature values.

In the taskfile text:

- 11 is Modbus ID of the OB-215 device;
- 6 is the address of the register from which the temperature is read.

```
@PROTOCOLVERSION 10
# the program will run every 15 seconds
@UPDATE 15
DEF controller MBWRANY * 120 120
DEF ob215 MBWRSINGLE 11 4
DEF temperature INT16 ob215 H 6
# alarm flag - temperature rise for more than 10 minutes
DEF alarm_temp_high UINT16 MEMTEMP H 5000
# counter for a delay of 10 minutes (600 seconds)
DEF counter UINT16 MEMTEMP

PUT v_temp READ temperature
PUT v_alarm READ alarm_temp_high
# v_alarm is auto-defined above as a variable
# (by a PUT v_alarm READ construction)
IF ISNOTKNOWN v_alarm
 PUT v_alarm 0
PUT v_counter READ counter
IF ISNOTKNOWN v_counter
 PUT v_counter 0
PUT temp_limit -150

run:
IF GR v_temp temp_limit
 GO noticed_temp_high
WRITE alarm_temp_high 0
WRITE counter 0
EXIT OK

noticed_temp_high:
PUT counter_limit MUL 60 10
IF GE v_counter counter_limit
 GO temp_high_too_long
PUT v_counter ADD v_counter 15
WRITE counter v_counter
EXIT OK

temp_high_too_long:
# SMS should be send only once -
# (the flag v_alarm will become 1 at the next run)
IF EQ v_alarm 0
 SENDSMS phone1 txt
WRITE alarm_temp_high 1
PARAMCOMMENT temperature txt
```

```
EXIT OK

DEF txt "OB-215 (11) - avaria, tmp *VAR(v_temp)* > *VAR(temp_limit)*"
DEF phone1 "01234567" ; phone number for the SMS can be specified here
```

FAQ

Q: Where should I place my taskfiles on the SD card?

A: Place your taskfiles in the `TASKS` folder in the root of the SD card. The SD card must be formatted as FAT or FAT32. Files can have any name and extension except `.OBJ`, `.MAP`, `.CNF` (e.g., `task.txt`), and can also be organized in subfolders.

Q: How do I know if my taskfile has syntax errors?

A: When MC251 loads taskfiles, it checks them for errors. If errors are detected, the file won't be loaded. You can check the loading status via Modbus registers (see Modbus Register Map, registers 2020-2023). The system will indicate the error type and line number where the error was found.

Q: Will my program survive a power cycle or firmware update?

A: The program stored in internal memory is retained at power downs or restarts. It may be deleted during firmware updates, due to data formats of the logic execution engine updates. However, if you keep the SD card with taskfiles installed, the program will be automatically reloaded after the update.

Q: How do I clear the program from internal memory without resetting all settings?

A: Enter setup mode via Modbus and write command `40959` to register `120`. This clears only the internal logic memory while preserving your device configuration. If the SD card with the taskfiles is installed, the program will be automatically reloaded.

Q: What happens if my task takes longer than the `UPDATE` interval?

A: If the next run is scheduled before the current one finishes, it will be delayed and executed as soon as possible. If multiple runs are delayed, they will be skipped, which could affect the calculations (like counters). In this case, consider optimizing long operations, splitting the task in two or increasing the `UPDATE` interval.

Q: Can I share data between multiple taskfiles?

A: Yes. Use memory-sourced parameters (like `MEMTEMP` or `MEMBAT`) mapped to the same Modbus address in different taskfiles. Only one taskfile should write to the shared parameter (the "writer"), while others can read from it.

Q: How do I handle decimal/fractional values if variables are integers?

A: Use fixed-point arithmetic by multiplying fractional values by a power of 10. For example, to work with 2 decimal places, multiply values by 100. Parameter types like `F32EP2R` automatically handle this conversion when reading/writing. However, be careful with multiplication, division and root operations as they affect the decimal point position.

Q: What's the difference between `MEMTEMP`, `MEMBAT`, `MEMFLASH`, and `MEMFILE`?

A:

- `MEMTEMP` - RAM space, data is lost at powerdown or controller reset, small area size but excellent write speed;

- `MEMBAT` - memory area powered by internal clock battery, very limited size but good write speed;
- `MEMFLASH` - controller settings area, data retains at reset, small size and usually read-only;
- `MEMFILE` - extendable file area, requires memory card with the taskfiles to be present, average speed but excellent area size.

Q: Why does my `IF` check skip the command even when the condition seems true?

A: The `IF` check treats `unknown` values as `FALSE`. If your variable hasn't been initialized or a `READ` operation failed, the value may be `unknown`. Use `ISKNOWN` to verify the variable state before checking it.

Q: How do I debug my taskfile program?

A: Use `SYSLOG` commands to write diagnostic messages to the system log. You can also map intermediate values to Modbus registers using memory parameters (e.g., `MEMTEMP H 5000`) and read them via Modbus.

Q: Can I use the same Modbus address for different parameter types?

A: Yes, for the parameters of the same size with the same address. Memory-stored parameters in that case will share the same memory area. This is useful for transferring data between taskfiles. However, `MEMFILE` parameters (stored on SD card) don't support the sharing feature.

Q: What happens when an error occurs during program execution?

A: Execution jumps to the error handler. If `TRYCALL` was used, it jumps to the specified handler label. Otherwise, it looks for the nearest upper-level handler, and at last, for the `onerror` label in the taskfile. If no handler is available, the error is logged and the run exits with the error code.

Q: How do I send SMS only once when an alarm condition is triggered?

A: Use a flag variable stored in persistent memory (like `MEMBAT`) to track whether the SMS was already sent. Check the flag before sending. Set it after sending and clear the flag after the alarm condition ends. See Example 3 for a working implementation.

Q: How do I check the time interval which the event is active for?

A: Either use a counter (memory-stored parameter to increment at each update period while the event continues and to reset to 0 after the event stops) or a timestamp (variable to store a clock from the MC251 registers at the event start and to be cleared at the event end).

Q: How do I check if the task is run for the first time after reset or after the power-off?

A: A `MEMTEMP` flag, if checked (and then set to 1 in case it was not set), can tell whether the task run is the first after the power cycle. A `MEMBAT` or a `MEMFILE` flag can similarly tell if it is the very first run.

Q: How do I scan an array? How do I make a code part executed a set number of times?

A: Use a variable as a loop index. Check before or after the cycle code. Use 1 or more `GO` operators to continue the cycle or to end/break it. Do not forget to increment or decrement the index variable inside.

Q: Can I make a repeated code part execution with a complex loop end condition?

A: Yes, using `IF` and `GO`. However, it is not recommended without explicit timeouts. The loop which is not limited by a constant can turn infinite or in other way exceed the task configured update time. It could cause this task update skips or other task lags.

Q: Can I call a function from a function? How many nesting levels are there?

A: Yes, you can `CALL` or `TRYCALL` a function, which in turn calls some other function. The nesting stack size equals the number of `RETURN` operators in the taskfile. Because of the limited stack size, the recursion is not recommended.

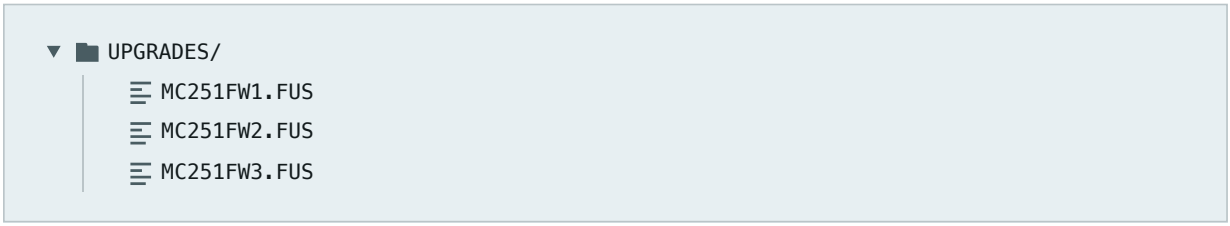
Need Help?

For technical support and assistance:

- Email: support@overvis.com
- Support portal: www.overvis.com/support

Firmware Update

To update the firmware, Overvis MC251 uses the `MC251FW1.FUS`, `MC251FW2.FUS` or `MC251FW3.FUS` file in the `UPGRADES` folder on the memory card formatted in FAT or FAT32 format.



Before you start

Data Safety

- Automatic firmware update **does not** erase your device configuration or Modbus settings.
- Manual update to a newer version in most cases retains the settings, unless specifically warned so in the firmware description.
- Automation tasks, settings, logs and historical data stored on the SD card **are not** erased by an update.

Power Supply

Ensure the device has a stable power supply during the update process. Do not power off the device while the update is in progress (usually 2-4 minutes).

Recoverability

The update process faults (e.g. caused by power losses or memory card failure) are recoverable, by repeating the update until it is complete. The update file passes multi-stage check before the update starts. In case of memory card failure and file damage, the update can be completed by replacing the card with the file manually.

Checking current version

Before updating, check your current firmware version to see if an update is necessary. You can find the version number:

- At the bottom of the **Web Interface** pages, or on the `Firmware` panel of the `Administration` tab.
- On the device display during the startup sequence.
- By reading Modbus register 1.

Updating from the file can be done in the firmware update mode.

Getting the update file into MC251

The update files can be written to the MC251 memory card in 4 ways:

1. **Automatically via Internet**

   MC251 is by default configured to periodically check the updates server and download the newer firmware, when Internet connection is available.

   > **Note:** Ensure your device has a valid Internet Gateway and DNS server configured in the Ethernet settings, or has a GSM/LTE Internet access.

2. **Using WEB interface**

   1. Access the device using the browser (see Web Interface);
   2. If the newer firmware is available on the server, and the download has not started automatically, the `Download Update` button will appear at the bottom of the the page;
   3. Press the `Download Update` button to start the download process;
   4. The download progress will be displayed on the page;
   5. After the download completion, the file will be checked. This may take a minute;
   6. After the file check, the update prompt with `Install Update` button will be displayed, confirming that the file suits.

3. **Using Modbus commands**

   - Connect to the device via Modbus and enter the setup mode (see Configuration via Modbus);
   - To verify the version of the downloaded update file, read the header line in registers `2030` - `2061` (ASCII string);
   - To download the newer version from the cloud server, write the value `64893` into the control command register `120`;
   - Control file download by reading registers `2004` - `2005`;
   - After download completion, double-check the version of the downloaded file.

4. **Write files to SD card**

   Download the latest firmware from the Firmware Downloads page.

   1. Ensure the SD card is formatted in **FAT** or **FAT32**.
   2. Create a folder named `UPGRADES` in the root of the card.
   3. Rename the downloaded firmware file to one of the following names (must be uppercase):
      - `MC251FW1.FUS`
      - `MC251FW2.FUS`
      - `MC251FW3.FUS`
   4. Copy the file into the `UPGRADES` folder.
   5. Insert the card into the MC251 (see below for instructions on updating from a file).

Updating MC251 from the file

MC251 firmware can be updated from the file on the memory card in 4 ways:

1. **Automatically**

   MC251 is by default configured to start update from the newer firmware file at a night hour (default is 03:00 AM).

2. **Using WEB interface**

    1. Access the device using the browser (see Web Interface);
    2. If the newer firmware file is available on the memory card, the `Install Update` button will appear at the bottom of the page;
    3. Press the `Install Update` button to start the firmware update process.

3. **Using Modbus commands**

    - Connect to the device via Modbus and enter the setup mode (see Configuration via Modbus);
    - To verify the version of the downloaded update file, read the header line in registers `2030` - `2061` (ASCII string);
    - If the required file is loaded, write the value `65397` into the control command register `120` to start the update.

4. **Manually**

    By entering the firmware update mode and selecting the firmware update (see below).

At the update command the device will automatically restart and enter update mode. Wait for the firmware update, the process may take 2 to 4 minutes.

Firmware update mode

MC251 can be put into firmware update mode during device power up or restart.

The firmware update mode may be entered automatically (e.g. by a web-interface command or in case of updating failure) or manually (or if the button R has been pressed during startup. The R button is the recessed button located on the front panel of the device).

Table 1 - Manually entering the firmware update mode

No.	Step	R button	Display	Time	Remark
1	Initialization	Pressed		1.5 s	To cancel entering the update mode, release R button
2	Notification about entering the update mode	Pressed	`Entering upgrade mode`	5 s	To cancel entering the update mode, release R button
3	Offer to enter the update mode	Pressed	`To enter upgrade mode release button`	2 s	Release the button at this step in order to enter the update mode
4	Protection against incidental pressing	Pressed			Holding the button pressed will cancel entering the update mode

After entering this mode manually, the update file has to be selected. To cancel the updating, cut off the power supply of MC251 or wait until the update mode is exited automatically due to file selection absence.

Table 2 – Update file selection

No.	Step	R button	Display	Time	Remark
1	Finding the available files		`Searching for upgrade files…`	(depends on the files found)	
2	Offering of the update file	Released	(name and version of the update file)	5 s	To select a file, press and release R button at this step
3	Offering all the update files	Released		(depends on the found files)	Step 2 is repeated for each update file
4	Repeating the offer	Released		(depends on time of step 3)	Steps 2 - 3 are repeated 3 times
5	Protection against unintentional update mode entrance	Released			The absence of selection causes the update mode exit

At automatic update mode entrance (or after the manual selection of the file), the firmware update is started.

Table 3 – Firmware update

No.	Step	R button	Display	Time	Remark
1	Update start		`Firmware upgrade`	2 – 10 s	
2	Update process		(progress bar shows the process of updating)	(depends on the update file)	
3	Updating is successfully completed		`Firmware upgrade success`	3 s	
4	Startup of the firmware				

The errors and warnings during the updating process are shown on the display.

> **ATTENTION**
>
> IN CASE OF A CRITICAL ERROR DURING THE UPDATE, THE OPERATION OF THE MC251 DEVICE IS NOT POSSIBLE. REPLACEMENT OF MEMORY CARD AND/OR FILE AND MANUAL UPDATE PROCESS REPEAT ARE REQUIRED TO RECOVER THE DEVICE. IN CASE THE PROBLEM REPEATS, PLEASE CONTACT THE MANUFACTURER.

If the critical error is met, the indication of a critical error is made during an hour, after that the MC251 device automatically restarts. If an error is a result of an incidental event, the firmware will be restored from the file on the memory card.

Table 4 – Firmware update mode warning and error codes

Code	Warning	Automatic actions	Remark
2	Firmware cannot be started	Initialization of emergency update mode: autostart updating from the selected file or from the first available file (if any)	The warning is a result of other errors and is automatically corrected using the available update files
3	Error during the firmware update process	Similar to No.2, but the file with an error has less priority.	The error is automatically corrected using the available update files
4	The update files are not available	Escape from the update mode and start the available firmware	MC251 can continue operation, but the update file should be put into the UPGRADES folder on the memory card in order to update firmware
5	Emergency - firmware cannot be started	Waiting for manual restart of the device or restart automatically in 1 hour	The error is met after a triple emergency mode entrance as a result of other errors. The correct firmware update file should be put into the UPGRADES folder on the memory card. If the error is repeated, contact the manufacturer
6	Emergency - error during the firmware update process	Waiting for manual restart of the device or restart automatically in 1 hour	The error is met after a triple emergency mode entrance as a result of other errors. The correct firmware update file should be put into the UPGRADES folder on the memory card. If the error is repeated, contact the manufacturer
7	Emergency - no available update files, and the firmware cannot be started	Waiting for manual restart of the device or restart automatically in 1 hour	The error is met after a triple emergency mode entrance as a result of other errors. The correct firmware update file should be put into the UPGRADES folder on the memory card. If the error is repeated, contact the manufacturer

Troubleshooting & FAQ

Q: Will I lose my configuration or data during an update?

A: No, the firmware update to a newer version process is designed to preserve your device configuration, Modbus settings, and historical data. However, downgrading the firmware may revert the settings to factory defaults. In either case, backing up critical data is always recommended.

Q: The “Download Update” button is not appearing in the Web Interface.

A: This can happen if:

- The device is already running the latest firmware.
- The device does not have Internet access. Check your Gateway and DNS settings.

- The update server is temporarily unreachable.
- The memory card is absent/full/faulty.

Q: The firmware does not update automatically.

A: This can happen if:

- The device is already running the latest firmware.
- The device does not have Internet access. Check your Gateway and DNS settings.
- The update server is temporarily unreachable.
- The memory card is absent/full/faulty.
- The device is not powered on at an update hour (at nighttime by default)

Q: The device does not see the manually written file on the memory card.

A: The file should be named `MC251FW2.FUS` and placed into the `UPGRADES` folder on the FAT32 microSD memory card. Check also the following:

- The file is the correct MC251 update file downloaded from the Firmware Downloads.
- The memory card is inserted.

Q: The update process seems to hang.

A: The update process typically takes 2-4 minutes. If it takes significantly longer:

- Do not power off the device immediately.
- Check the device display for any error codes (see Table 4).
- If the device is unresponsive for over 10 minutes, try a manual restart. If the internal firmware is corrupted, the device should enter the emergency update mode from the file automatically.

Q: Can I downgrade the firmware?

A: Yes, you can install an older firmware version by manually placing the older firmware file (renamed to `MC251FW1.FUS`) in the `UPGRADES` folder on the SD card and initiating the update. However, the device settings are not always retained and may be reverted to factory defaults after firmware upgrade.

Need Help?

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- Email: support@overvis.com
- Support portal: www.overvis.com/support

Firmware Downloads

Latest Version

Version	Release Date	MD5	Download
45 (Latest)	2025-10-31	N/A	Coming soon

Changelog

Version 45

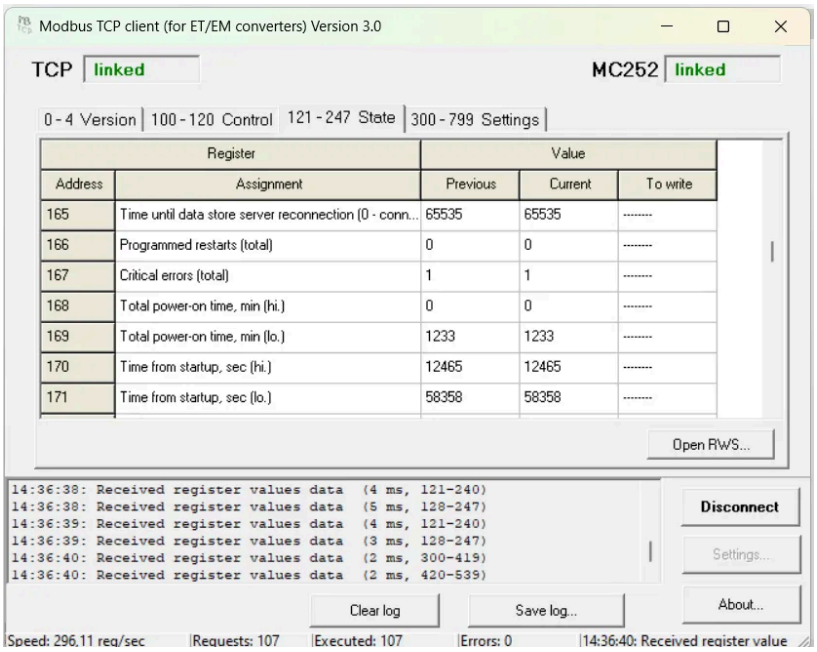
2025-10-31

- **New Feature**: Initial demo release.

Additional Software

This page lists available software utilities for the Overvis MC251 RS-485 Modbus gateway. These tools are designed to help with device configuration, testing, and Modbus TCP communication.

Windows Modbus TCP Client Software (Novatek-Electro)



The Modbus TCP Client is a Windows application designed for basic communication and testing with network devices that support the Modbus TCP protocol. It enables reading and writing to device holding registers.

This application can also connect to other devices on the network, by using bridge and gateway devices (such as EM-482, EM-483, ET-485 converters, and MC251, MC252, EM-480, EM-481, EM-486 controllers).

Key features include:

- **Simple Interface:** Fast connection to devices for viewing registers and modifying values.
- **Configuration Management:** Save device configurations, including register mappings to a file.
- **Reusable Write Sets:** Save sets of register write operations for repeated use.
- **Event Logging:** Connection logs, data transfers, and errors, which can be exported to a file.

System Requirements

- **OS:** Windows 98/ME/2000/XP/Server 2003/2008/Vista/7/8/10/11
- **Network:** Network adapter
- **Storage:** 2 MB free disk space

Download: Setup_MBTCP_Client(ver3.0).exe