Content

General Information

This device has been manufactured according to the latest technological standards and recognized safety regulations.

All persons involved in commissioning, operating, maintaining, or servicing the device must:
- be appropriately qualified,
- have knowledge of welding processes, and
- have fully read and strictly follow this manual.

The manual must be kept at the place of use at all times. In addition to this manual, general and local regulations for accident prevention and environmental protection must be observed.

All safety and hazard warnings on the device must:
- remain legible,
- not be damaged,
- not be removed, covered, or painted over.

Any faults that could compromise safety must be rectified before powering on the device.

Intended Use

This device is designed exclusively for measuring the speed of welding wire or similar applications. Any other use is considered improper, and the manufacturer accepts no liability for resulting damage.

Proper use includes:
- full reading and adherence to all instructions in this manual,
- observing all safety and hazard warnings,
- following maintenance and inspection schedules.

The device is intended for use in industrial and commercial environments only. The manufacturer does not accept liability for any damage resulting from use in residential settings.

The manufacturer also assumes no responsibility for poor or faulty measurement results.

Environmental Conditions

Operation or storage outside the specified limits is not considered intended use. The manufacturer accepts no liability for resulting damage.

Ambient temperature:
- During operation: –10 °C to +40 °C (14 °F to 104 °F)
- During transport and storage: –20 °C to +55 °C (–4 °F to 131 °F)

Relative humidity:
- Up to 50 % at 40 °C (104 °F), up to 90 % at 20 °C (68 °F)

Ambient air: Must be free of dust, acids, corrosive gases, or substances.
Altitude: Up to 2000 m (6562 ft) above sea level

Responsibilities of the Operator

The operator is responsible for ensuring that only individuals who meet the following criteria are permitted to work with the device:
- They are familiar with the basic regulations on occupational safety and accident prevention.
- They have been trained in handling the device.
- They have read and understood this manual and confirmed it by signature.
- They are qualified according to the requirements of the intended tasks and results.

The operator must regularly verify that personnel are working with due attention to safety.

Responsibilities of the Personnel

All personnel assigned to work with the device must, before starting their tasks:
- follow the fundamental rules for occupational safety and accident prevention,
- read this manual and confirm by signature that they have understood and will follow it.

Before leaving the workstation, ensure that no hazards or damage to persons or property can occur in your absence.

Stray Welding Currents

Failure to observe the following precautions may lead to the formation of stray welding currents, which can result in:
- fire hazards,
- overheating of components connected to the workpiece,
- destruction of protective ground conductors,
- damage to the device and other electrical equipment.

Ensure that the workpiece clamp is securely connected to the workpiece, and attach it as close as possible to the welding point.

Place the device on a surface with sufficient electrical insulation from conductive surroundings — for example, insulating it from a conductive floor or metal frames.

When using power distributors, dual torch mounts, etc., remember:
Even the electrode of an unused welding torch may be live.
Ensure that unused torches are stored with sufficient electrical insulation.

In automated MIG/MAG applications, the wire electrode must be isolated from the wire drum, spool, or wire container when feeding it to the drive unit.

EMC Measures

In special cases, even when adhering to standardized emission limits, interference may still occur depending on the application (e.g., sensitive equipment nearby or proximity to radio/TV receivers).
In such cases, the operator is responsible for implementing appropriate interference countermeasures.
The immunity of surrounding equipment should be assessed in accordance with national and international standards.

Examples of potentially susceptible equipment include:
- safety systems,
- power, signal, and data transmission lines,
- IT and telecommunication systems,

• measuring and calibration equipment.

Overview

The MIGAL.CO wire sensor MWS-1 is designed for measuring the feed speed of wire electrodes used in welding processes.
The measured values are made available via a built-in web interface and transmitted via MQTT over Ethernet to an MQTT broker (not included in delivery).

Connections

1. Power Supply
2. Network Interface (Ethernet)
3. Wire Sensor (Encoder) Connection

Wire sensor (Encoder)

The wire sensor connects to the sensor box using a 5-pin connector.
The welding wire is guided between two spring-loaded rollers through the connection elements.

Commissioning

Preparation

Ensure the following components are available and operational:
- Wire sensor
- Power supply (9–12 V DC via plug-in power supply or PoE adapter)
- Ethernet network with an active DHCP server
- PC or mobile device in the same networkAnschluss des Drahtsensors

ESTABLISHING THE NETWORK CONNECTION
- Connect the Ethernet port of the wire sensor to a free port on your router, switch, or PoE adapter using a network cable.
- Either connect a 9–12 V DC plug-in power supply to the DC input,
- or use Power-over-Ethernet (PoE) via the network cable (IEEE 802.3af).

The power LED lights up once the sensor is operational.

DETERMINING THE IP ADDRESS OF THE SENSOR
After powering on, the wire sensor obtains an IP address automatically via DHCP.

You can determine the IP address using one of the following methods:

Option A: Via the DHCP Client Table of your Router
- Log in to the web interface of your router or DHCP server.
- Look for a new device entry in the device list.
- Note the assigned IP address.

Option B: Using a Network Scanner

Use a tool such as Advanced IP Scanner, nmap, or a mobile network scanner app to view all active devices in the network.
The wire sensor should appear as a new device.

Accessing the Web Interface

Enter the determined IP address into the address bar of a web browser, e.g.:

http://192.168.0.42

The web interface of the wire sensor will be displayed.

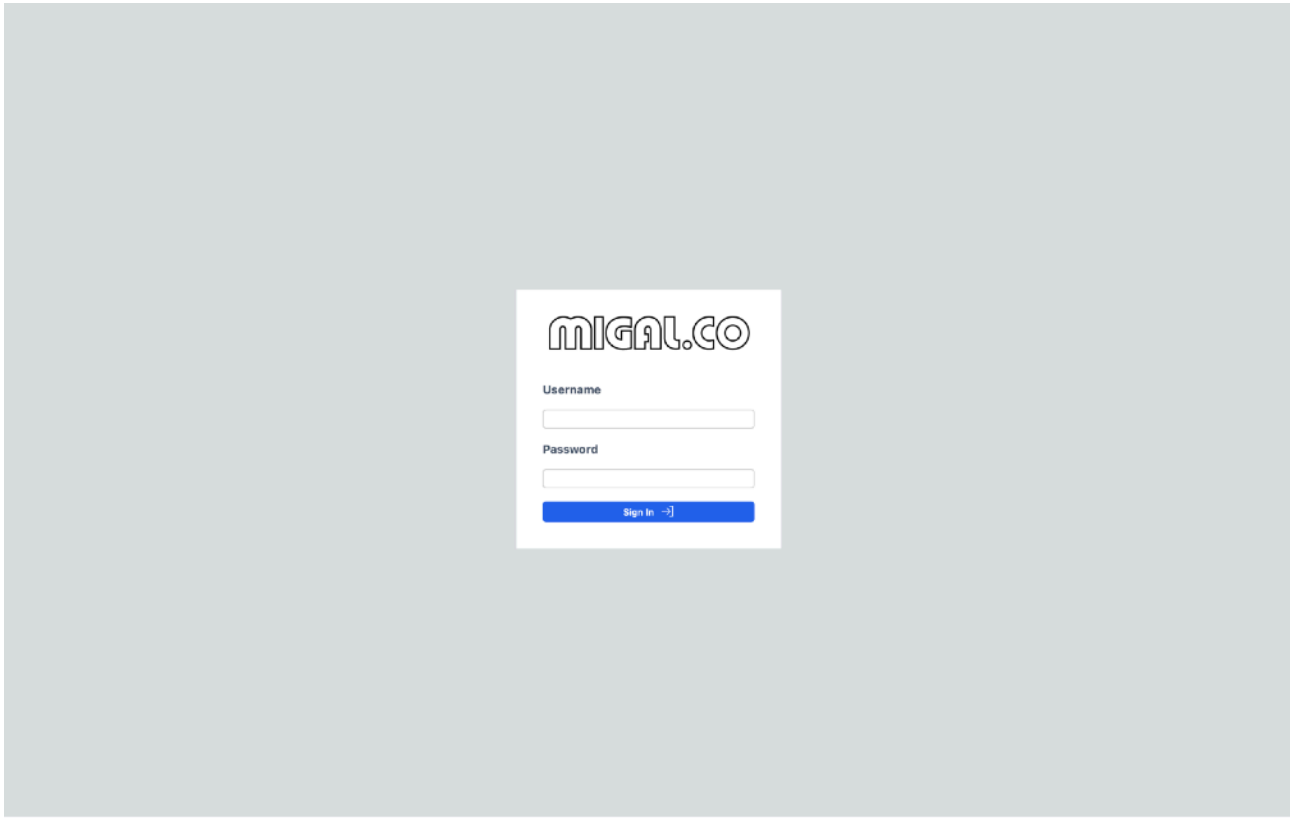
Webinterface

After entering the IP address in the browser, the login screen of the wire sensor appears.

Login

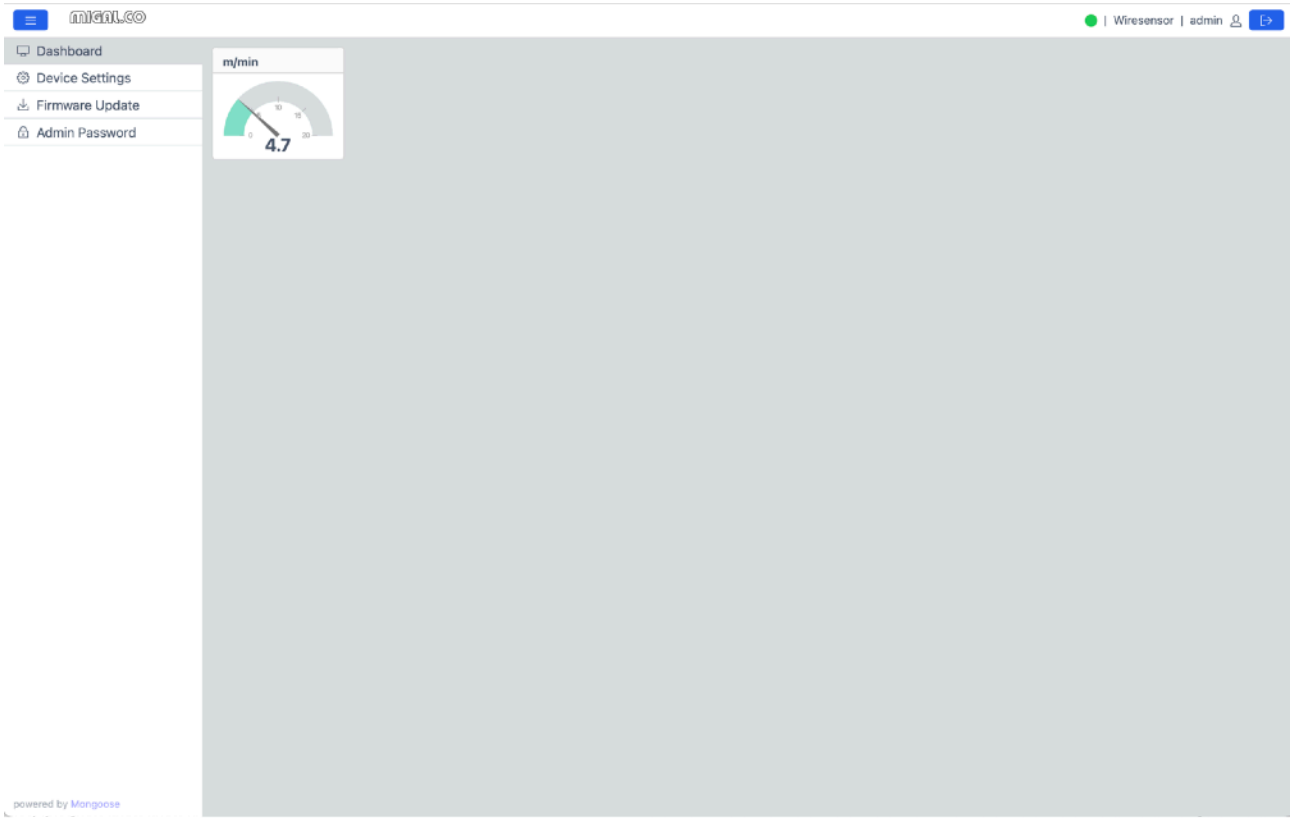
Default login credentials:

Username: admin
Password: admin

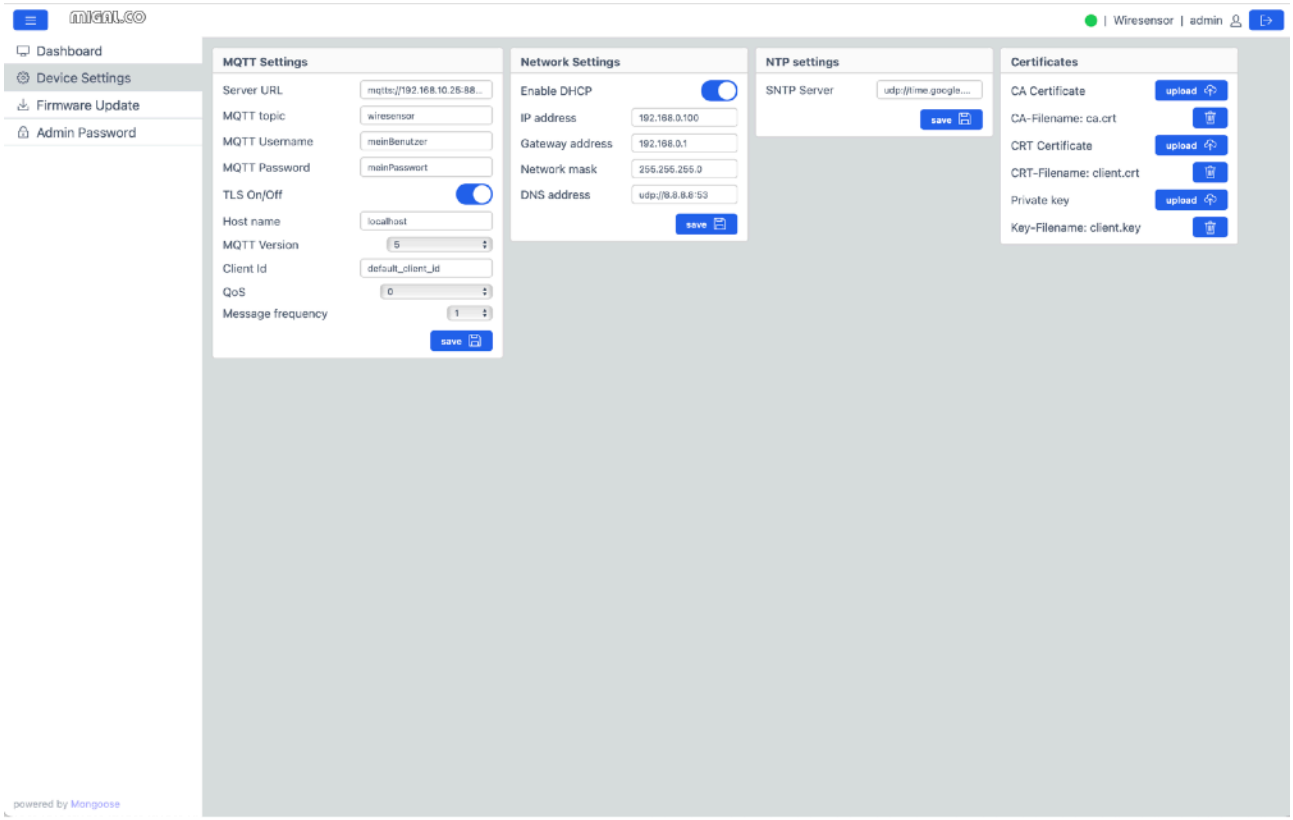


Dashboard

The dashboard displays the current wire feed speed.
The measurement interval is identical to the “Message frequency” defined in the MQTT settings.



Settings



MQTT SETTINGS

These parameters define how the wire sensor communicates with an MQTT broker:

Field	Description
Server URL	Address of the MQTT broker (e.g. mqtts:// 192.168.10.25:8883 for a TLS-secured connection).
MQTT Topic	Topic under which the sensor data is published (e.g. wiresensor).
MQTT Username	Username for broker authentication.
MQTT Password	Password for the above username.
TLS On/Off	Enables encrypted transmission (TLS). Should be enabled for security-relevant applications.
Host name	Device hostname in the network (e.g. localhost or wiresensor-001).
MQTT Version	MQTT protocol version (usually version 5; version 3.1.1 is set via “4”).
Client ID	Unique identifier for the MQTT client (e.g. default_client_id).

Field	Description
QoS	Quality of Service level (0, 1, or 2) – defines delivery reliability.
Message frequency	Interval in seconds at which MQTT messages are sent (also applies to the dashboard update rate).

⚠️ Changes must be saved via Save to take effect. A restart (short power cycle) may be required.

NETWORK SETTINGS

Configure the network parameters of the sensor here:

Field	Description
Enable DHCP	Enables automatic IP assignment via the network's DHCP server (default: enabled).
IP address	Static IP address (if DHCP is disabled).
Gateway address	Default gateway for network access (e.g. the router).
Network mask	Subnet mask (typically 255.255.255.0).
DNS address	DNS server for name resolution (e.g. 8.8.8.8 for Google DNS).

⚠️ Again, changes require a Save and possibly a restart.

NTP SETTINGS

Configure synchronization of the internal real-time clock via an NTP server:
This ensures correct time for timestamping MQTT messages.

Field	Description
SNTP Server	Address of the NTP server (e.g. udp://time.google.com).

CERTIFICATES

For secure TLS communication with the MQTT broker, the required certificate files can be uploaded here:

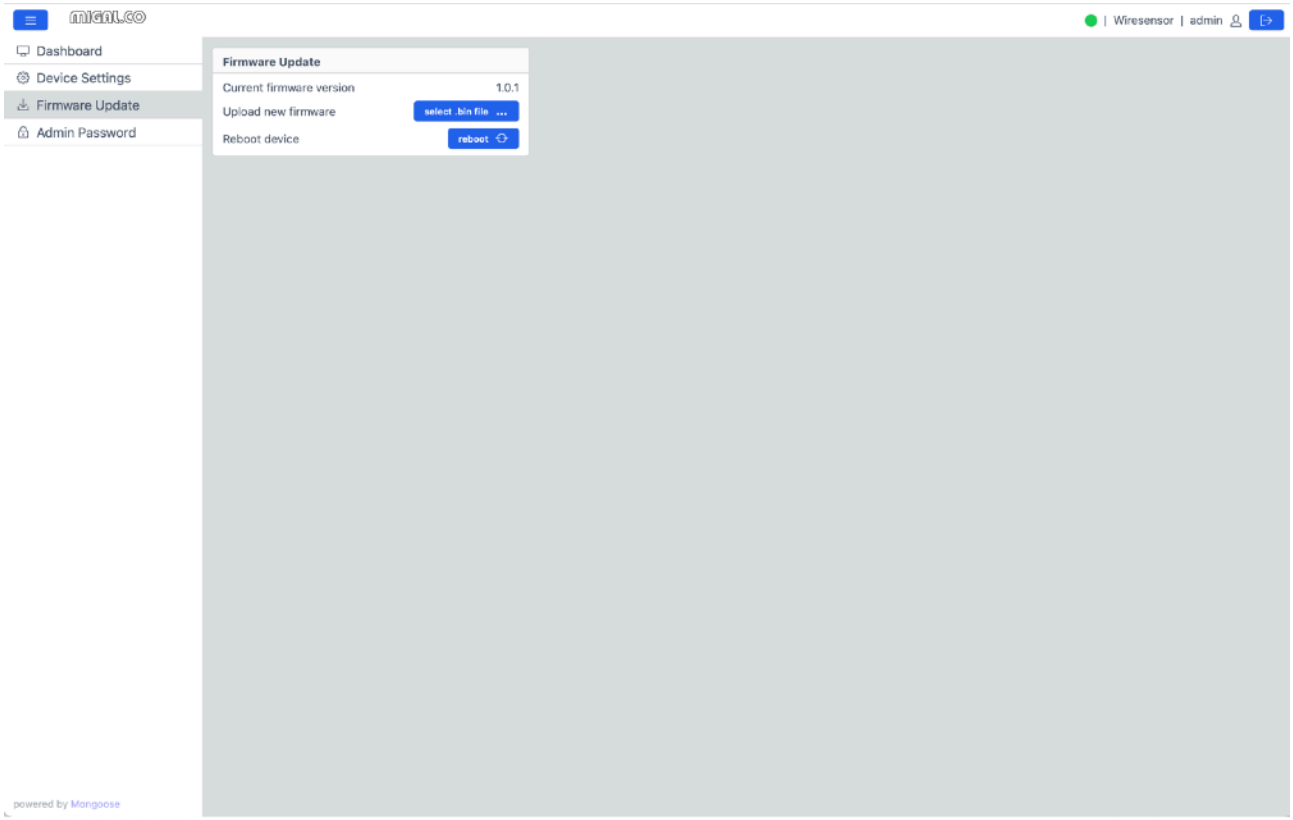
Certificate Type	Description
CA Certificate	Certificate Authority (e.g. ca.crt)
CRT Certificate	Device certificate (e.g. client.crt)
Private Key	Private key of the device (e.g. client.key)

Use the Upload buttons to select and upload the certificate files.
Uploaded files will be listed by name.

🔐 Note: Changes to certificates or communication settings may require a device restart.

Firmware-Update

The wire sensor includes an integrated web interface for easy firmware updates.
This allows improvements, bug fixes, and security updates without opening the device.



Current Firmware Information

The section Current firmware version displays the currently installed firmware (e.g. 1.0.1).

Uploading New Firmware
1. Click Select .bin file.
2. Choose the new firmware file in .bin format from your computer.
3. The upload will start automatically.

⚠️ Only use officially released firmware files to avoid malfunction.

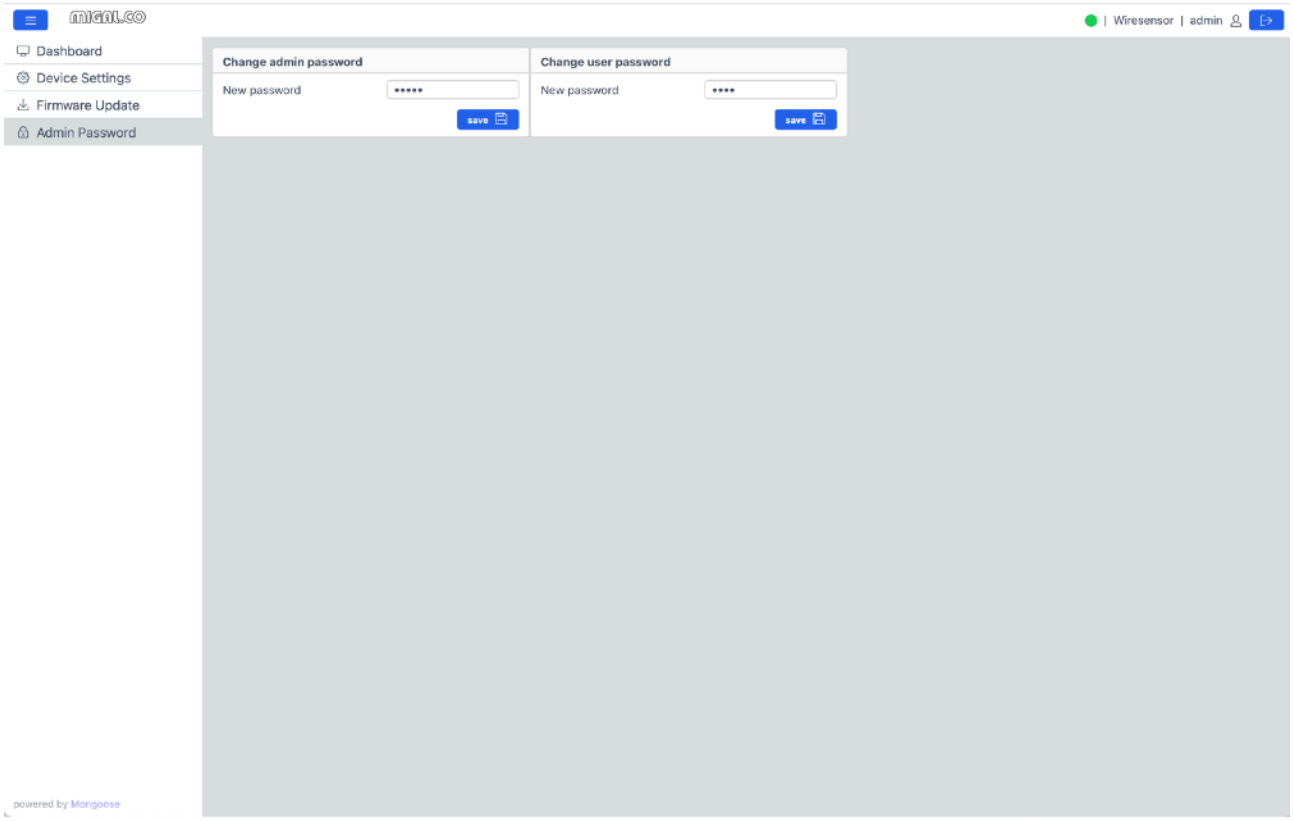
Restarting the Device

After a successful upload, a restart is required:
Click Reboot to restart the device and activate the new firmware.

The wire sensor will be ready for use after rebooting with the updated firmware.

🔐 Note: Device settings are usually retained during firmware updates.
Refer to the release notes of the respective firmware if in doubt.

Password Management



To protect access to the web interface and device settings, the wire sensor includes two user accounts:
- admin (administrator with full access)
- user (user with limited access)

Changing the Administrator Password
1. Enter a new, secure password in the left-hand field under Change admin password.
2. Click Save to apply the new password.

🔐 Use a strong password with at least 8 characters, ideally a combination of uppercase and lowercase letters, numbers, and special characters.

Changing the User Password
1. Enter the new password for the limited-access user in the right-hand field under Change user password.
2. Click Save to confirm the change.

📌 Note: Changes take effect immediately.
Store login credentials securely. If lost, restoring access may require a firmware reinstallation.

Factory Reset

To reset the wire sensor to factory settings, proceed as follows:
1. Disconnect the device from power completely.
2. Open the front panel to access the connectors and buttons (power and network).
3. Press and hold the blue USER button on the left side of the board.
4. While holding the button, reconnect the power supply.
5. Keep the button pressed for at least 10 seconds.

6. Release the button.
7. Reattach the front panel, ensuring no cables are pinched.

The device will now boot with factory settings.
All saved configurations (network, MQTT, security settings, etc.) will be deleted.

⚠️ Note: After the reset, the device returns to its default state.
It will again obtain an IP address via DHCP. Ensure that a DHCP server is active in the network.

Technical Data

Parameter	Value
Wire diameter range	0.8 mm – 1.6 mm (larger on request)
Encoder resolution	0.114 mm, 600 pulses per revolution
Accuracy	0.7 % at 10 m/min and 0.1 s sample interval
Interface	Ethernet (10/100 Mbit/s)
Data protocol	MQTT (v3.1.1 and v5)
Web interface	For configuration and real-time monitoring
Supply voltage	9–12 V DC
Network configuration	DHCP or static IP
Message frequency	0.1 to 5 messages per second
Encryption	TLS 1.3
Wire feed speed range	0–50 m/min
Sensor box dimensions	160 × 100 × 60 mm (L × W × H)
Sensor box weight	0.55 kg
Encoder weight	–
Protection class	IP20

Note on the MQTT Broker

The wire sensor transmits measured data using the MQTT protocol (Message Queuing Telemetry Transport) to an external MQTT broker.

The broker plays a central role in distributing and managing the data within the network.

What is an MQTT Broker?

An MQTT broker is a server that acts as a mediator between publishers (e.g., the wire sensor) and subscribers (e.g., a visualization tool or database).
It receives messages and distributes them to all authorized recipients.

REQUIREMENTS

To operate the wire sensor effectively, an MQTT broker must be available in the network.
The broker is not included with the device and must be provided by the user.

SUPPORTED MQTT VERSIONS

The wire sensor supports the following protocol versions:
- MQTT 3.1.1
- MQTT 5.0

Connections can be either unencrypted (TCP) or encrypted (TLS 1.3).

Example MQTT Broker Platforms

Platform	OS / Environment	Notes
Mosquitto	Linux, Windows	Open source, widely used, easy to configure
EMQX	Linux, Windows	Scalable, with integrated web interface
HiveMQ	Cloud, On-premises	Commercial, fully supports MQTT 5.0
Home Assistant Add-on	Raspberry Pi	Suitable for small local networks

EXAMPLE CONFIGURATION

An example configuration for a local MQTT broker:
- Server URL: mqtt://192.168.0.10:1883
- MQTT Topic: wiresensor/machine1/speed
- Username / Password: configurable by the operator
- TLS: optionally enabled by uploading certificates via the web interface

⚠️ Note: The MQTT broker must be set up and reachable before the wire sensor is put into operation, otherwise the device cannot transmit data.

MQTT Message Format

The wire sensor sends data in JSON format (JavaScript Object Notation) with the following fields:
- timestamp – String in ISO-8601 format (UTC): Time of the recorded measurement
- m/min – Floating-point number: Wire feed speed in meters per minute
- mm – Floating-point number: Wire length advanced since the last message (in millimeters)

EXAMPLE OUTPUT

timestamp: "2025-05-17T10:12:00Z"
m/min: 4.54
mm: 37.83

timestamp: "2025-05-17T10:12:01Z"
m/min: 7.34
mm: 61.14

timestamp: "2025-05-17T10:12:01Z"
m/min: 6.79
mm: 56.59

timestamp: "2025-05-17T10:12:02Z"
m/min: 6.02
mm: 50.13

EU Declaration of Conformity

Manufacturer:
MIGAL.CO GmbH
Wattstraße 2
94405 Landau a. d. Isar
Germany

Product:
Wire Feed Speed Sensor “WireSensor IoT”

Model:
MWS-1

Intended Use:
Measurement of wire feed speed in industrial welding applications.
Data transmission via MQTT/Ethernet to higher-level systems.

We hereby declare that the product listed above complies with the essential requirements and other relevant provisions of the following EU directives:

- 2014/30/EU – Electromagnetic Compatibility (EMC) Directive
- 2011/65/EU – RoHS Directive (Restriction of Hazardous Substances)
- 2014/35/EU – Low Voltage Directive (if applicable; typically not relevant below 50 V DC – included for reference)

Applied Harmonized Standards:

- EN 61000-6-2:2019 – EMC – Immunity for industrial environments
- EN 61000-6-4:2019 – EMC – Emissions for industrial environments
- EN 62368-1:2020 – Safety of AV, ICT equipment (relevant for PoE or power supply)

Additional Information:

- Power supply: 9–12 V DC or PoE (IEEE 802.3af)
- Data transmission: MQTT v3.1.1 / v5 via Ethernet
- Encryption: TLS 1.3
- Protection class: IP20
- Intended environment: Industrial use

Place, date:
Landau, 17 July 2025

Signature:
Robert Lahnsteiner
Managing Director
MIGAL.CO GmbH