Helmholz
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Cabinet Guard

Manual

Version 3 | 8.9.2026 | for firmware V1.01 and above

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Link to the latest version of the manual

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Quick start guide & structure of the manual

The Helmholz Cabinet Guard continuously monitors environmental conditions inside the cabinet, such as temperature, humidity, air pressure and status of the cabinet door (unauthorized access).

This manual contains all the information you need to install, commission and operate the Cabinet Guard.

Section 1 contains **general information and safety instructions**.

Section 2 refers to **security recommendations**.

Section 3 explains the **system overview and features** of the product.

To put the Cabinet Guard into operation, you must connect it correctly to the power supply, the network, and the desired sensors. See Section 4 "**Installation and Removal**" and Section 5 "**Set up the Cabinet Guard**".

Once the Cabinet Guard has been correctly assembled and wired, the next step is to access the Cabinet Guard's **web interface** to set the desired configuration. Accessing the web interface and the basic configuration are described in sections 6-11.

The **configuration and operation of the measuring sensors** are explained in sections 12-17.

The **technical data** for the Cabinet Guard is documented in Section 19.



NOTE

If you have any questions about the possible applications and configuration of the Cabinet Guard, please do not hesitate to contact us.

You can reach our support team at support@helmholz.de.

By phone at **+49 (9135) 7380-110**.

Further information on Helmholz Support can be found at Helmholz Service & Support.

The latest product information can be found at our Webpage Cabinet Guard.

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The information in this manual has been compiled with the utmost care. Nevertheless, errors cannot be completely ruled out. Technical changes, errors, and misprints are reserved. The current version of the manual is authoritative and can be found on the Internet at www.helmholz.de.

We welcome suggestions for improvement and comments.

Further legal information can be found in Chapter 1.

Revision Record:

Version	Date	Change
1	19.3.2026	First version with Firmware V1.00
2	8.4.2026	Various corrections
3	8.9.2026	Added notes for UL

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1 General

This operating manual applies only to devices, assemblies, software, and services of Helmholz GmbH & Co. KG.

1.1 Target audience for this manual

This manual is only intended for trained personnel qualified in control and automation engineering who are familiar with the applicable national standards. For installation, commissioning, and operation of the components, compliance with the instructions and explanations in this operating manual is essential.



Configuration, execution, and operating errors can interfere with the proper operation of the Cabinet Guard and result in personal injury, as well as material or environmental damage. Only suitably qualified personnel may operate the devices!

Qualified personnel must ensure that the application and use of the products described meet all the safety requirements, including all relevant laws, regulations, provisions, and standards.

1.2 Safety instructions

The safety instructions must be observed to prevent harm to living creatures, material goods, and the environment. The safety notes indicate possible hazards and provide information about how hazardous situations can be prevented.

1.3 Note symbols and signal words



HAZARD

If the hazard warning is ignored, there is an imminent danger to life and health of people from electrical voltage.



WARNING

If the warning is ignored, there is a probable danger to life and health of people.



CAUTION

If the caution note is ignored, people can be injured or harmed.



ATTENTION

Draws attention to sources of error that can damage equipment or the environment.



NOTE

Gives an indication for better understanding or preventing errors.

1.4 Intended use

The Cabinet Guard (hereinafter also referred to as "the device") can be used to monitor switch cabinets.

All components are delivered with factory-set hardware and software configurations. The user must carry out the hardware and software configuration for the conditions of use. Modifications to hardware or software configurations which are beyond the documented options are not permitted and nullify the liability of Helmholz GmbH & Co. KG.

The device may not be used as the only means for preventing hazardous situations on machinery and systems.

The Cabinet Guard cannot be used for a direct connection to the Internet. Always use a dedicated router with a sufficiently dimensioned Internet firewall for an Internet connection. Observe the recommendations on security during project planning, use and maintenance (see chapter 2).

Problem-free and safe operation of the device presumes proper transport, storage, setup, assembly, installation, commissioning, operation, and maintenance.

The ambient conditions provided in the technical specifications must be adhered to.

The device has a protection rating of IP20 and must be installed in an electrical operating room or a control box/cabinet to protect it against environmental influences. To prevent unauthorized access, the doors of control boxes/cabinets must be closed and possibly locked during operation.

1.5 Improper use



WARNING

The consequences of improper use may include personal injuries of the user or third parties as well as property damage to the control system, the product, or the environment. Use the device only as intended!

1.6 Liability

The contents of this manual are subject to technical changes resulting from the continuous development of products of Helmholz GmbH & Co. KG. If this manual contains technical or clerical errors, we reserve the right to make changes at any time without notice.

No claims for modification of delivered products can be asserted based on the information, illustrations, and descriptions in this documentation. Beyond the instructions contained in the operating manual, the applicable national and international standards and regulations must also be observed in any case.

1.6.1 Disclaimer of liability

Helmholz GmbH &Co. KG is not liable for damages if these were caused by use or application of products that was improper or not as intended.

Helmholz GmbH & Co. KG assumes no responsibility for any printing errors or other inaccuracies that may appear in the operating manual unless there are serious errors about which Helmholz GmbH & Co. KG was already demonstrably aware.

Beyond the instructions contained in the operating manual, the applicable national and international standards and regulations must also be observed in any case.

Helmholz GmbH & CO. KG is not liable for damage caused by software that is running on the user's equipment which compromises, damages, or infects additional equipment or processes through the remote maintenance connection and which triggers or permits unwanted data transfer.

1.6.2 Warranty

Report any defects to the manufacturer immediately after the discovery of the defect.

The warranty is not valid in case of:

- Failure to observe these operating instructions
- Use of the device that is not as intended
- Improper work on and with the device
- Operating errors
- Unauthorized modifications to the device

The agreements met upon contract conclusion under "General Terms and Conditions of Helmholz GmbH & Co. KG" apply.

1.7 Open Source

Among other things, our products contain open-source software. This software is subject to the relevant license terms. The relevant license terms, including a copy of the full license text, are downloadable from the product website. They are also provided in our download area of the respective products at www.helmholz.de.

Furthermore, we offer to send the complete corresponding source code of the respective open-source software to you and to any third party as a DVD upon your request for a contribution towards expenses of Euro 10.00. This offer is valid for a period of three years. This offer is valid for a period of three years, calculated from the delivery of the product.

2 Security recommendations

The Cabinet Guard is a part of an Industrial Control System (ICS), and thus an important element in the security considerations of a system or network. When using the device, please consider the following recommendations to prohibit unauthorized access to plants and systems.

Helmholz is guided by IEC 62443-4 in the development and maintenance of the Cabinet Guard.

General:

- Ensure at regular intervals that all relevant components fulfill these recommendations and possibly any other internal security guidelines.
- Evaluate your system holistically with a view to security. Use a cell protection concepts (“defense-in-depth”) with corresponding products, such as the WALL IE.
- Regularly inform yourself about security threats for all your components
- Train your employees regularly on the subject of security and the safe use of components

Physical access:

- Limit physical access to components of relevance to security to qualified personnel.

Security of the software:

- Always keep the firmware of all communications components up to date.
- Inform yourself regularly of firmware updates for the product.
- Only activate protocols and functions you really need
- If possible, always use those variants of protocols that provide more security

Passwords:

- Define rules and roles for usage of the devices and the awarding of passwords
- Change standard passwords
- Only use strong passwords. Avoid weak passwords like, for example, “password1”, “123456789”, or similar.
- Ensure that all passwords are inaccessible to unauthorized personnel.
- Don’t use one password for various users and systems.

Data protection:

- To avoid disclosure of sensitive data, always reset the device to factory settings before decommissioning it.
- Resetting to factory default settings will delete all configurations, users, passwords, log-data and certificates.

2.1 Information on security

Helmholz is a member of CERT@VDE and TeleTrust. Here you can obtain specific information on the subject of security in the industrial environment.

In addition to our technical newsletter, we communicate our security-relevant updates, patches and advisories to you as a user of Helmholz products via CERT@VDE. You can find the latest advisories for Helmholz products here: https://certvde.com/de/advisories/vendor/helmholz/

2.2 PSIRT

The Helmholz "**Product Security Incident Response Team**" **(PSIRT)** supports you proactively to protect your machines as best as possible in the context of industrial communication. Whenever new potential threats occur or are reported to us, we evaluate and process them immediately and provide you with recommended actions, patches and updates as quickly as possible to reduce the risk to a minimum. You can find more information about the Helmholz PSIRT here.

2.3 Reporting vulnerabilities

You can help too: Report any product incidents to our **Product Security Incident Response Team** at psirt@helmholz.de or support@helmholz.de or to CERT@VDE "Report a Vulnerability".

2.4 Further information about industrial security

You can find more information on the topic of security here:

- CERT@VDE
- TeleTrust
- Sichere-industrie.de
- Bundesamt für Sicherheit in der Informationstechnik (BSI)
- Allianz für Cyber-Sicherheit

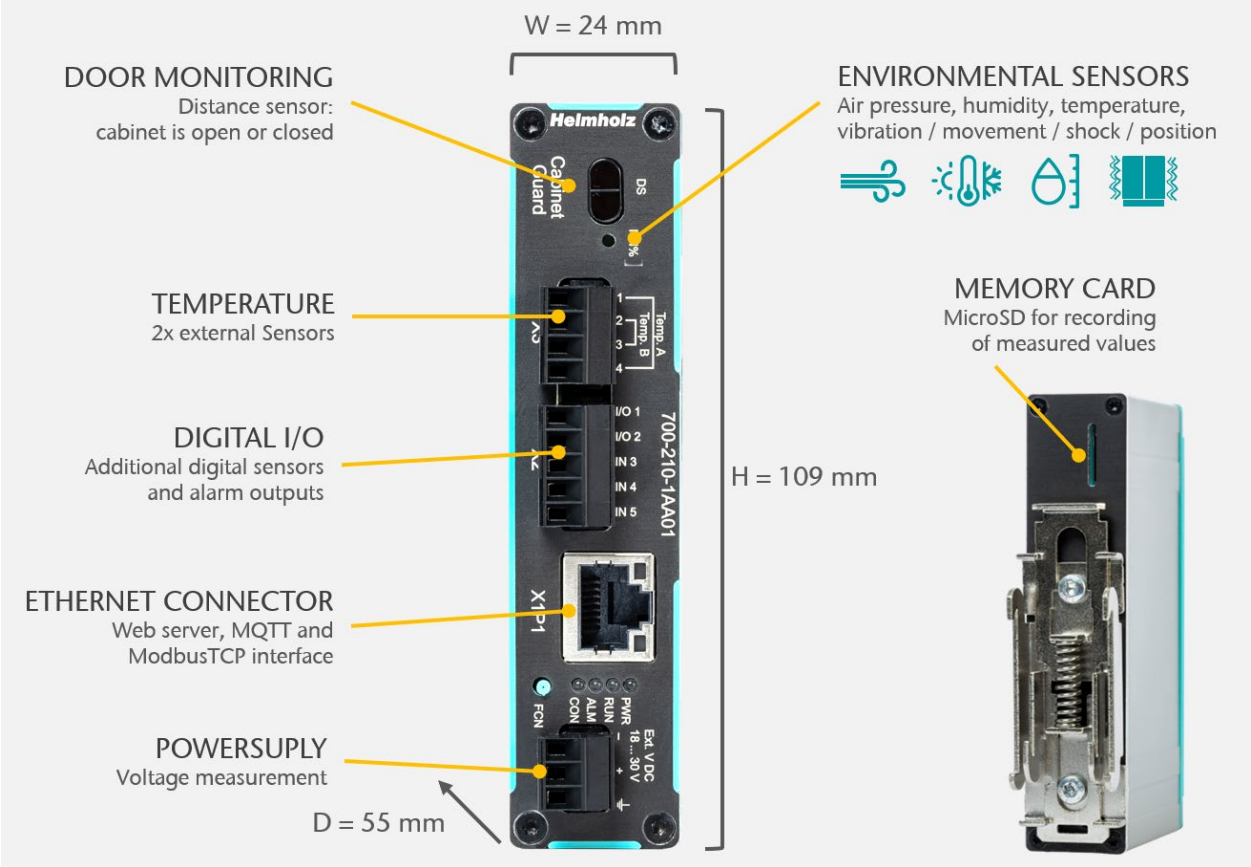
3 System overview

The Helmholz Cabinet Guard continuously monitors conditions inside the control cabinet, such as temperature, humidity, air pressure, and the status of the control cabinet door (unauthorized access).

By monitoring these environmental parameters, the CABINET GUARD can respond to potential problems at an early stage, trigger alarms, and thus prevent failures or damage. This contributes to maintaining system integrity and operational efficiency.

With a temperature range of -30° to +70°, it is well suited for monitoring the environmental parameters of the control cabinet. Configuration is conveniently carried out via a web interface.

Measured values can be stored on the SD card or easily forwarded to other components or higher-level systems via MQTT and ModbusTCP.



Measurements:

- Temperature, air pressure, humidity
- Movement, vibration, shock
- External temperature: 2x NTC (2-wire)
- Cabinet door opening via distance sensor or digital input
- General-purpose input(s) for digital signals
- Power supply

Communication:

- 1x RJ45 /100MBps
- Transmission of status/value information via MQTT
- ModbusTCP server for data provision
- Digital outputs for alarms
- Email notification in case of alarms *(in preparation)*

3.1 Structure of the Cabinet Guard



The Cabinet Guard has both built-in sensors and connection options for additional external sensors. The external sensors are optional.

The internal sensors for distance ("DS"), temperature, humidity, and air pressure ("RH%") are located at the top front of the device.

The internal sensors for detecting vibrations, shocks, and position are located inside the device at the back of the housing and should be firmly connected to the rear of the control cabinet via the DIN rail mount.

Up to 5 digital inputs, 2 digital outputs, and 2 analog temperature sensors can be connected as external sensors.

The power supply for the entire device is provided via a 24V DC connection. Communication with the Cabinet Guard is enabled via an Ethernet interface.

An SD memory card for optional long-term recording can be inserted on the rear of the device.

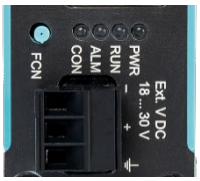
3.2 Button „FCN“

The "**FCN**" button can be used to acknowledge an alarm or perform a factory reset.

Do perform a factory reset press the FCN button when switching on the Cabinet Guard. Hold the button down until the RUN LED flashes yellow, then release the FCN button. The Cabinet Guard is now reset to its default settings.

3.3 Status LEDs

The "**PWR**", "**RUN**", "**ALM**" (alarm), and "**CON**" (connection) LEDs indicate the system status of the Cabinet Guard.



PWR	Off	No power supply or device defective
	On	Device is correctly supplied with power
RUN	Off	Device is not operational
	Green	Device is operational
	Orange	Sensor fault
	Orange flashing	Device performs a factory reset
ALM	Green	No alarms, system is OK
	Orange flashing	A sensor alarm is detected
CON	Off	MQTT and ModbusTCP are disabled
	Green	Active communication via MQTT or ModbusTCP
	Orange	MQTT connection cannot be established
	Orange flashing	MQTT connection terminated

The **PWR LED** is on as soon as the Cabinet Guard is connected to a power supply.

The **RUN LED** is on as soon as the Cabinet Guard is ready for operation. When a factory reset is triggered, the RUN LED flashes yellow.

The **ALM LED** flashes yellow as soon as a sensor alarm is triggered. If there are no alarms, the ALM LED is green.

The **CON LED** lights up green when communication via MQTT or ModbusTCP is active.

When using MQTT, the CON LED lights orange if the MQTT connection is faulty, or it flashes orange if the MQTT connection has been interrupted.

If the device no longer starts up correctly or is defective, the 3 RUN/ALM/CON LEDs flash orange. The device must be sent in.

4 Installation and removal

4.1 Access restriction

The device is an open operating equipment and must only be installed in electrical equipment rooms, cabinets, or housing.

Access to the electrical equipment rooms, cabinets, or housings must only be possible using a tool or key, and access should only be granted to trained or authorized personnel.

4.2 Mounting and minimum distances

The Cabinet Guard can be mounted on a DIN rail and installed in any position. It is recommended to keep minimum distances when mounting. By keeping the minimum distances

- the device can be mounted or dismantled without having to dismantle other parts of the system.
- there is enough space to connect all existing connections and contacting possibilities with commercially available accessories.
- There is space for any necessary cable route.



ATTENTION

Installation must be carried out in accordance with VDE 0100/IEC 364 and applicable national standards. The device has protection level IP20. If a higher degree of protection is required, it must be installed in an enclosure or a control cabinet.

4.3 Electrical installation

Observe the regional safety regulations.

4.4 Protection against electrostatic discharges

To prevent damage through electrostatic discharges, the following safety measures are to be followed during assembly and service work:

- Never place components and modules directly on plastic items (such as polystyrene, PE film) or in their vicinity.
- Before starting work, touch the grounded housing to discharge static electricity.
- Only work with discharged tools.
- Do not touch components and assemblies on contacts.

4.5 EMC protection

To ensure electromagnetic compatibility (EMC) in your control cabinets in electrically harsh environments, the known rules of EMC-compliant configuration are to be observed in the design and construction.

ATTENTION

Observe all standards, regulations and rules regarding shielding when setting up the system and laying the necessary cables. Errors in the shielding can lead to malfunctions or even failure of the system.

4.6 Operation

Operate the device only in flawless condition. The permissible operating conditions and performance limits must be adhered to.

Retrofits, changes, or modifications to the device are strictly forbidden.

The device is a piece of operating equipment intended for use in industrial plants. During operation, all covers on the unit, and the installation must be closed to ensure protection against contact.

4.7 Cleaning

For cleaning of the device use dry cloth. Using solvents during cleaning can make the device's labeling illegible.

4.8 Removal / Recycling / WEEE

Perform a factory reset of the device to delete all security-related data (user data, logging protocols, passwords, certificates) from the device. Before recycling, remove all cables from the connectors.

You can send the device to us for recycling at your own expense or take it to a certified disposal company yourself.

According to Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), they must not be disposed of by municipal waste disposal companies.

The company Helmholz GmbH & Co. KG is registered as a manufacturer with the HELMHOLZ brand and the device type "Small devices of information and telecommunications technology for exclusive use in households other than private households" as well as the following registration data:

Helmholz GmbH & Co. KG,
Location / Headquarters: 91091 Großenseebach,
Address: Hannberger Weg 2,
Name of authorized representative: Carsten Bokholt,

Registration number: **DE 44315750**



5 Set up the Cabinet Guard

5.1 Installation in the cabinet



The Cabinet Guard must be mounted on the DIN rail in the control cabinet.

The position in the control cabinet should be chosen in a way that the distance sensor has a direct "view" of the inside of the control cabinet door. If you are using a control cabinet with two doors, position the Cabinet Guard on the side of the control cabinet where the door must be opened first.

Ensure that the distance sensor is not obstructed by loose cables.



When mounting on the DIN rail, make sure that the DIN rail holder is correctly locked in place. The design is such that the best possible mechanical coupling is achieved for detecting vibrations and shocks. Poor mounting of the Cabinet Guard due to a loose connection to the switch cabinet housing will distort the measured values.

5.2 Memory card for recordings

If you want to use an SD memory card for long-term recording of measured values, insert it into the slot on the back of the housing before mounting the Cabinet Guard on the DIN rail. The position of the SD card was deliberately designed to prevent unauthorized removal or replacement.

The SD card can be up to 32 GB in size and must be formatted with FAT32.

5.3 Connecting the power supply



The Cabinet Guard requires a 24 V DC power supply via the wide-range connection "Ext. V DC 18–30 V."

NOTE

The Cabinet Guard housing is not grounded. Please connect the functional grounding terminal (FE) of the device properly to the reference potential.

Power is supplied via a screw terminal block. Please use a copper cable with a cross-section of 0.08 - 1.5 mm², AWG28 – AWG16. The maximum stripping length is 6 mm. Tightening torque 0.25 Nm.

ATTENTION

The device is intended to be supplied by an isolated Limited Energy Source according to clause 9.4 of UL/CSA 61010-1 (3rd ed) or Class 2 of UL1310 standard.

Minimum temperature rating of cables to be connected to the field wiring terminals is 80 °C.

5.4 Connecting the inputs and outputs (X2)

The use of the inputs and outputs is optional.



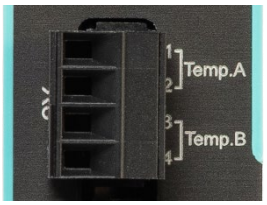
Pin 1	IO 1	Output or input 1
Pin 2	IO 2	Output or input 2
Pin 4	IN 3	Input 3
Pin 5	IN 4	Input 4
Pin 6	IN 5	Input 5

The inputs are designed as 24V Type 3 according to DIN EN 61131-2. The two outputs support 200mA, with an electronic fuse.

The IO1 and IO2 ports can be configured as outputs or inputs. If the ports are configured as outputs, the output is activated when an alarm is present.

5.5 Connecting the external analog sensors (X3)

Up to two NTC 10 kOhm, 2-wire analog sensors can be connected to the Cabinet Guard for measuring temperatures.



Connect sensor A to contacts 1+2 and sensor B to contacts 3+4.

The NTC sensors can be positioned in the control cabinet in climatically favorable locations to achieve a more accurate measurement of the climatic situation in the control cabinet in addition to the built-in temperature sensor.

NOTE

For UL: External sensors must not be directly connected to hazardous live parts without consideration of double or reinforced insulation providing separation from hazardous voltage.

5.6 Network connection (X1P1)

The Ethernet connection via the RJ45 socket supports transfer rates of up to 100 Mbit. Use a suitable Ethernet cable.



NOTE

For UL: Communication cables cannot be routed outside of the facility.

5.7 Internal sensors

To ensure that the internal sensors of the Cabinet Guard function correctly, please ensure that the device is securely locked onto the DIN rail and that no cables or other mechanical objects are blocking access to the device, either behind or in front of it.

This applies in particular to the position of the distance sensor ("DS") and the sensor for temperature, humidity, and air pressure ("RH%").



6 Accessing the web interface

6.1 Login

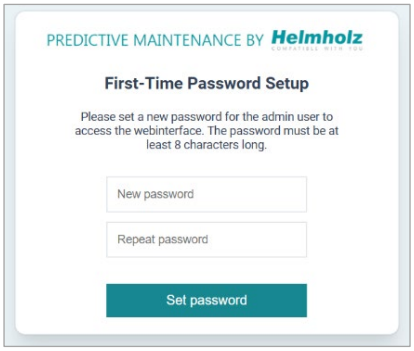
The Cabinet Guard can be configured and all measured values displayed via the web interface. Furthermore, a firmware update can be performed via the web interface.

By default the Cabinet Guard can be accessed via the **IP address 192.168.0.100**. Set your PC, laptop, or tablet to a free address in the range 192.168.0.x with the **subnet mask 255.255.255.0**. The IP address of the device must be entered as the URL.

By default device uses self-singed TLS certificate. Depending on the browser used, a message such as "This is not a secure connection" may appear. You can later store your own HTTPS certificate for the Cabinet Guard.

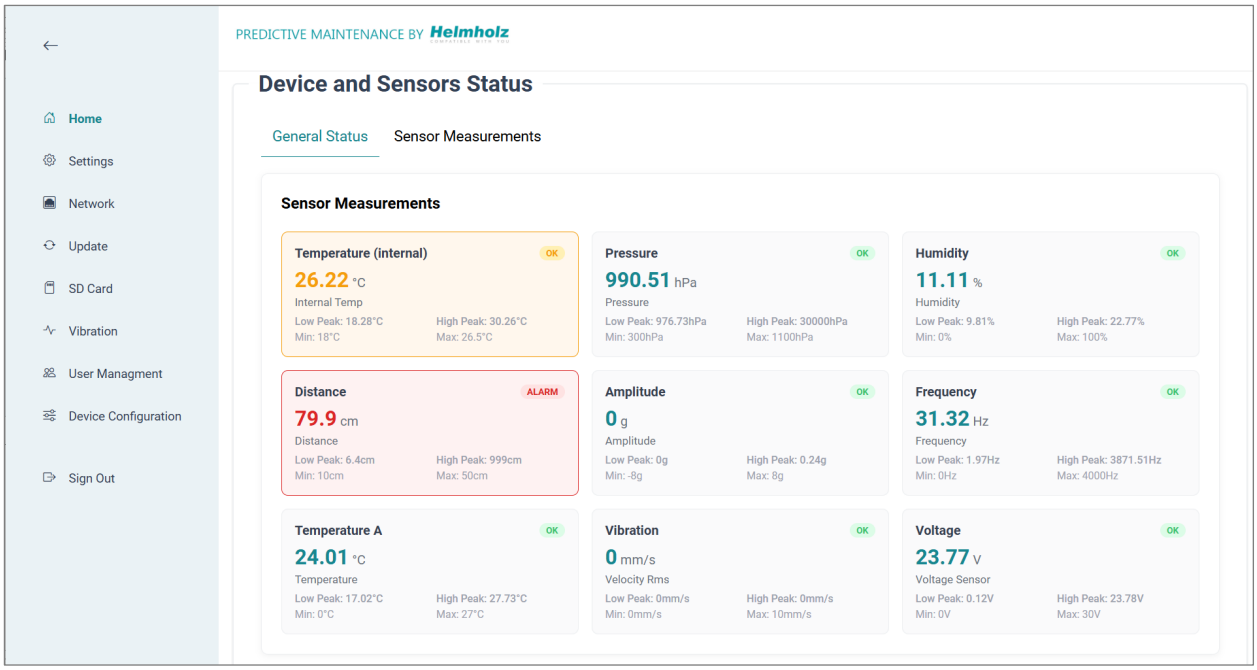
Allow access to the website in your browser.

When logging in for the first time, you must assign a password for the user "admin." You can change the password later and create additional users.



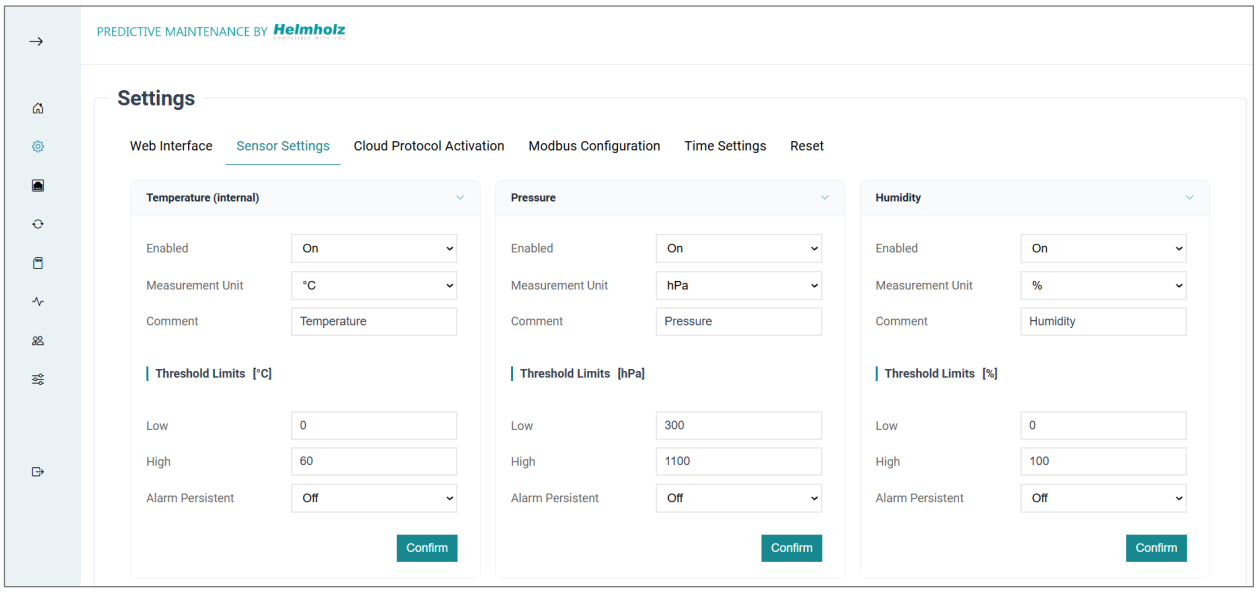
6.2 Structure of web navigation

Navigation on the Cabinet Guard website consists of two levels. The main menu is on the left-hand side. When a menu item is selected, the submenu items are displayed on the right-hand side in the form of tabs.



Sensor measurement displays in red indicate an active alarm. Sensor measurement displays in orange indicate a previous alarm that has not yet been acknowledged.

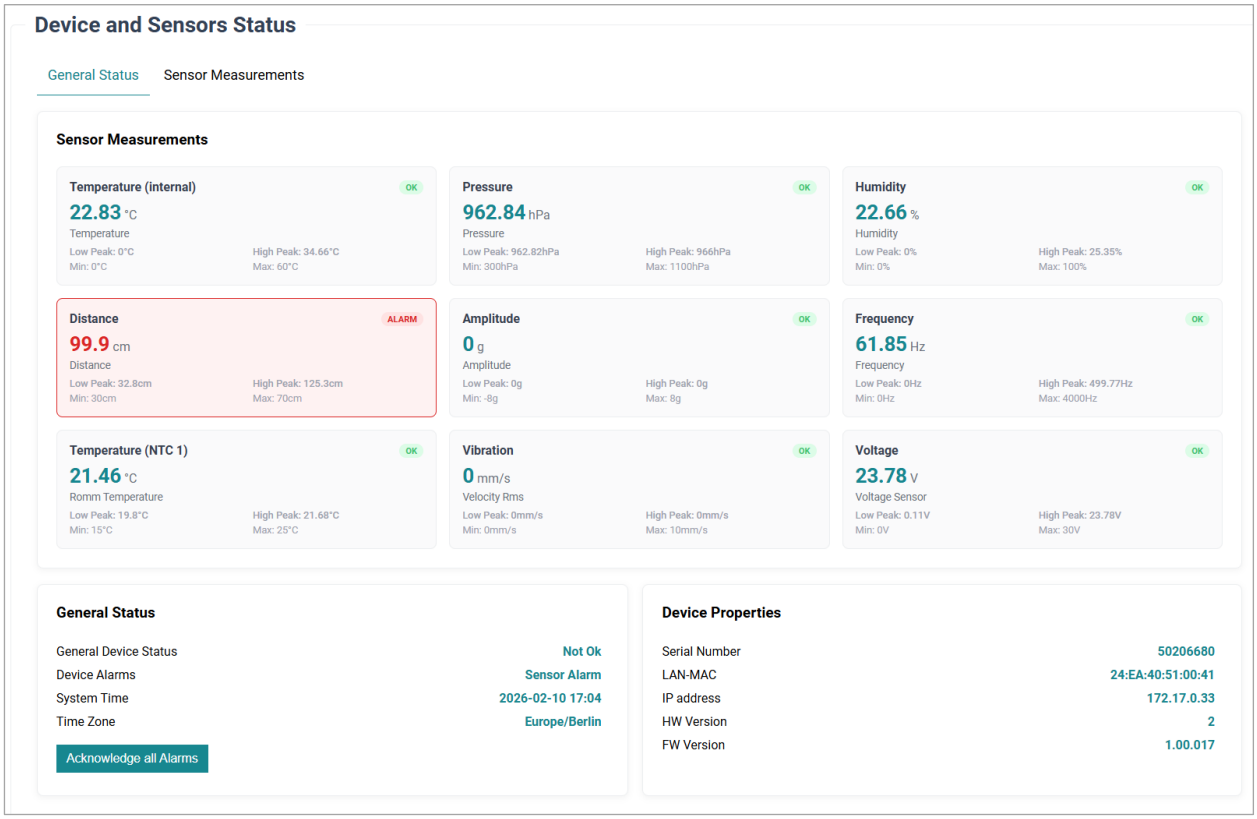
The text in the main menu can be hidden using the arrow in the top left corner. Only the main menu icons remain, leaving more space on the right for information or dialog boxes.



The web interface is also designed for use on tablets or mobile phones (responsive design).

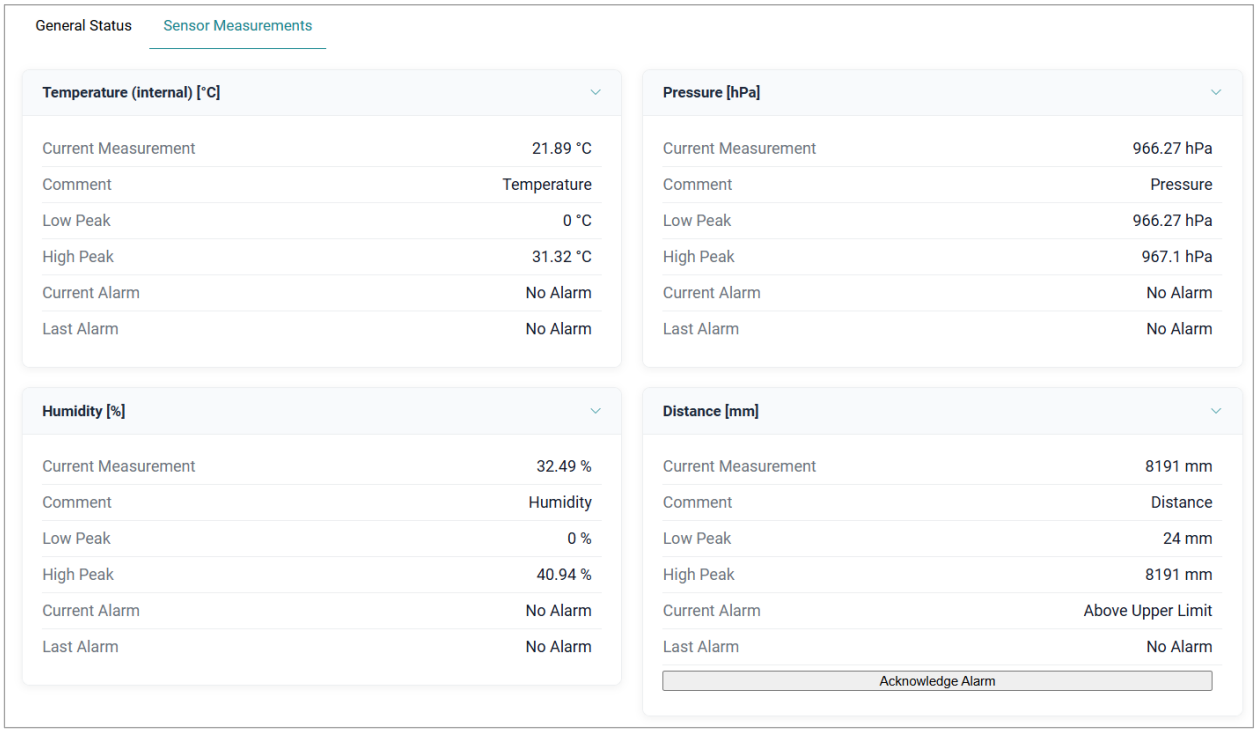
6.3 Home menu: Sensor readings and device status

The "Home" menu contains the current sensor values and device information for the Cabinet Guard.



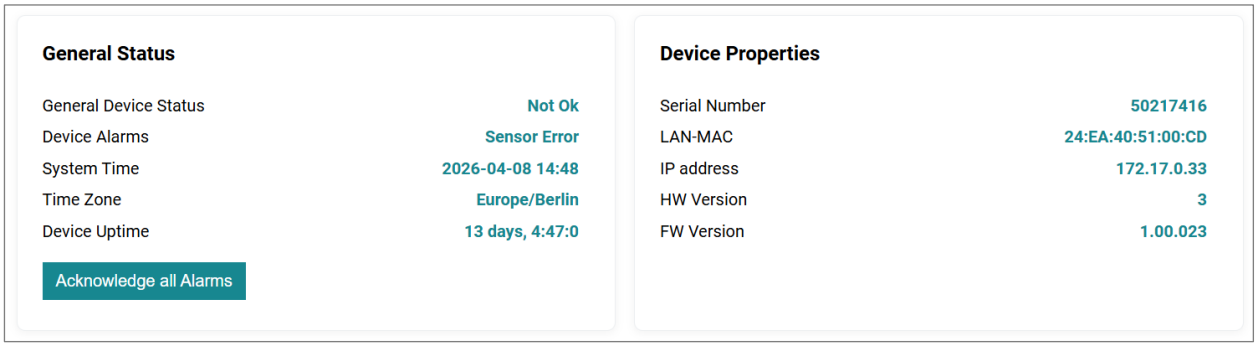
If there is an alarm for a sensor, it is highlighted in red and "ALARM" is displayed in the tile instead of "OK."

Alarms can be acknowledged in the "Sensor Measurements" submenu.



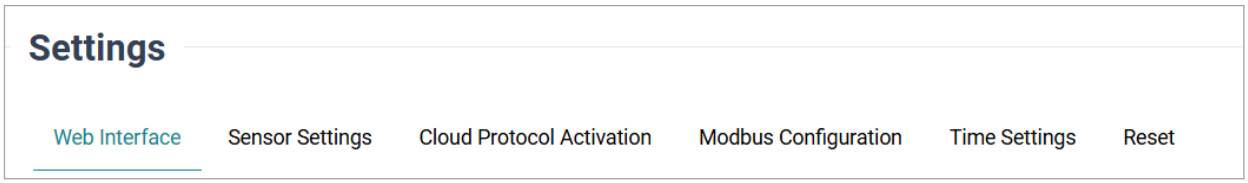
6.4 Device status and information

In addition to the sensor values, the Home menu also displays the general status and device properties.



7 System settings "Settings"

Settings for the functionality of the Cabinet Guard can be configured in the "Settings" menu. The behavior of the web interface, the sensor, and the transmission protocols (MQTT, ModbusTCP) can be configured. In addition, you will find the function for restarting and factory resetting the device here.

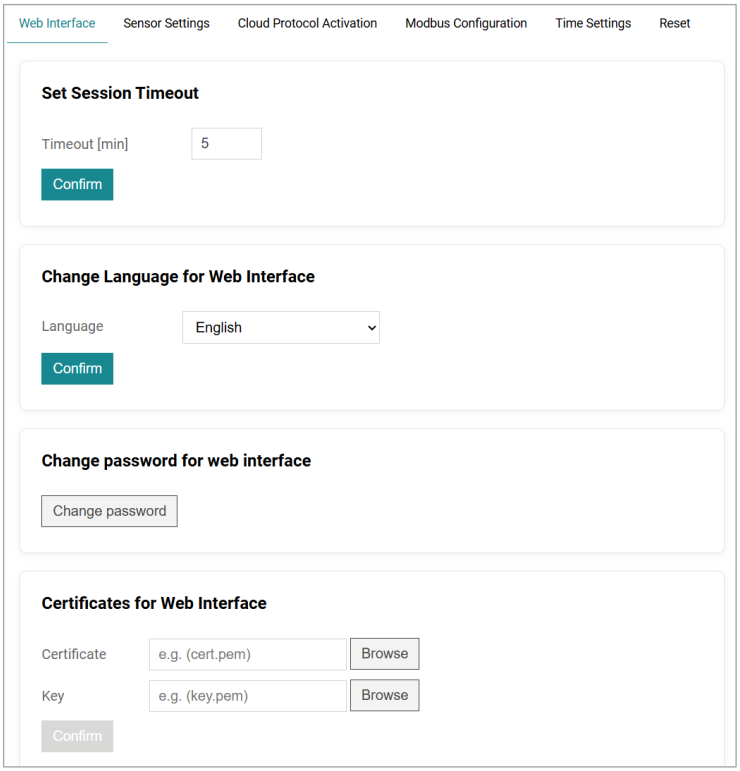


7.1 Web Interface settings

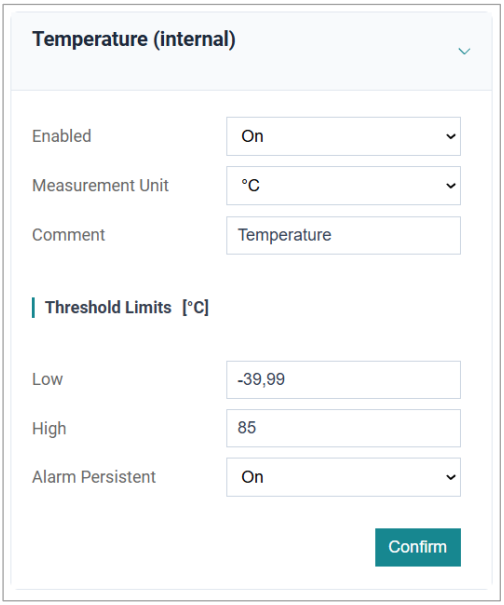
The web interface has a session timeout for security reasons. After the timeout period has expired, the active user is logged out of the session.

The language of the web interface can be selected and the password changed for the current user.

For secure access to the web interface, you can store your own HTTPS certificates.



7.2 Sensor Settings



The desired settings can be specified separately for each sensor on the "Sensor Settings" configuration page.

Most sensors allow you to set the measurement unit, e.g., "°C" or "Fahrenheit" for temperature, as well as the alarm limits for the sensor.

If internal sensors are not required or external sensors are not connected, they can be switched off. This prevents unwanted alarm messages or unnecessary recordings of unused values.

The text under "Comment" can be customized as desired and allows you to describe the sensor in more detail.

This text is displayed on the sensor, specified during logging, and sent via MQTT. A description can be particularly helpful for external sensors.

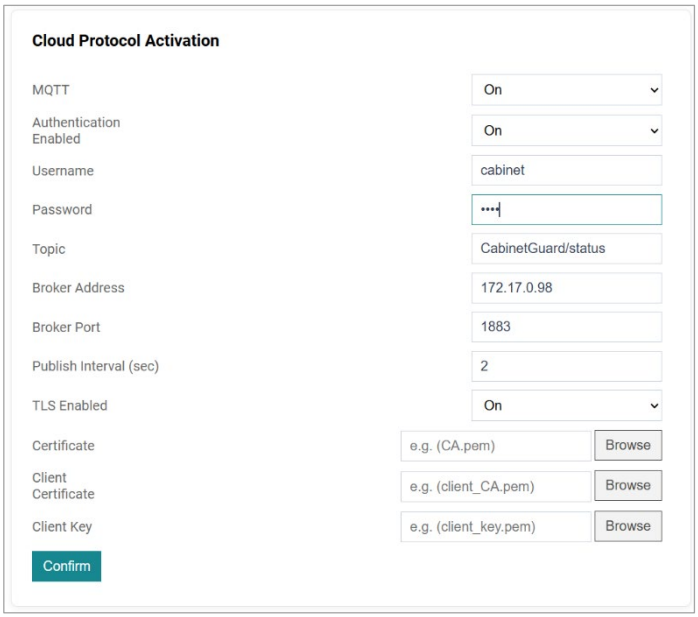
Details on setting the various sensors can be found in the following chapters.

7.3 MQTT configuration "Cloud Protocol"

The MQTT protocol enables values to be sent cyclically to higher-level data processing software. This can be either local or in the cloud.

Data is transferred in a readable form in JSON format.

The transmission to the MQTT broker can be secured by user authorization and TLS encryption.



7.3.1 Structure of an MQTT telegram

The Cabinet Guard sends all sensor values under a topic in JSON format. The name of the topic can be specified under "Topic."

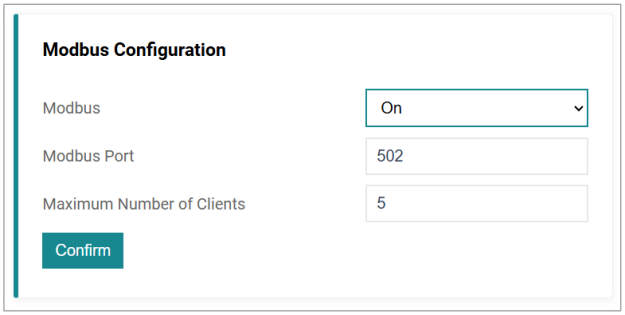
Here is an example of the first two sensors:


```
[   {   "Active":           1,
        "Comment":          "Temperature",
        "Value":            34.61,
        "Alarms":           0,
        "LastAlarm":        0,
        "AlarmPersistent":  1,
        "Type":             "Temperature (internal)",
        "UpperLimit":       85,
        "LowerLimit":       -39.99,
        "HigherPeak":       34.88,
        "LowerPeak":        0,
        "Unit":             "°C",
        "Time":             "2026-01-09T15:05:34+01:00",
        "TimeFormat":       "ISO-8601"
    },
    {   "Active":           1,
        "Comment":          "Pressure",
        "Value":            96055.4,
        "Alarms":           0,
        "LastAlarm":        0,
        "AlarmPersistent":  1,
        "Type":             "Pressure",
        "UpperLimit":       110000,
        "LowerLimit":       30000,
        "HigherPeak":       98353.36,
        "LowerPeak":        96045.33,
        "Unit":             "Pa",
        "Time":             "2026-01-09T15:05:34+01:00",
        "TimeFormat":       "ISO-8601"
    }, ...
```

7.4 ModbusTCP Configuration

Under "Settings / ModbusTCP," the ModbusTCP server can be activated and the port on which it should be accessible can be specified. For ModbusTCP, "502" is the default port.

To avoid overloading the device, the maximum number of simultaneously connected ModbusTCP clients can be limited.



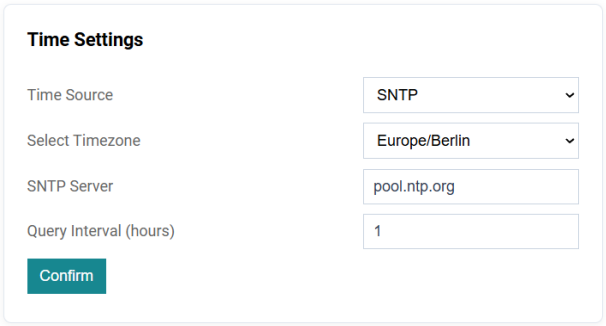
A list of ModbusTCP registers can be found in Chapter 18.

7.5 Time Settings

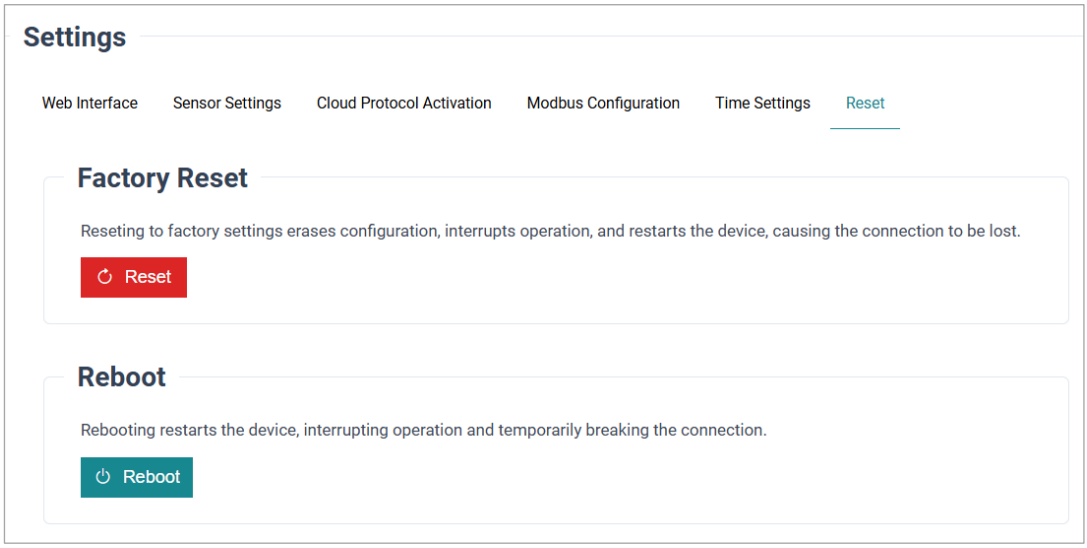
For logging, sensor recording, and sending sensor data via MQTT, Cabinet Guard should always have the current time.

The time can be synchronized via SNTP (Simple Network Time Protocol) from a time server on the Internet (e.g., "pool.ntp.org") or from a time server on the internal network (gateway).

If no time server is available, the time can also be set manually.



7.6 Factory Reset / Reboot



The **Factory Reset** function can be used to reset the Cabinet Guard to its factory settings. This resets all settings to their default values. Please note that this also resets the network settings and passwords to their default values. After performing a factory reset, you will need to reconnect to the device via the default address.

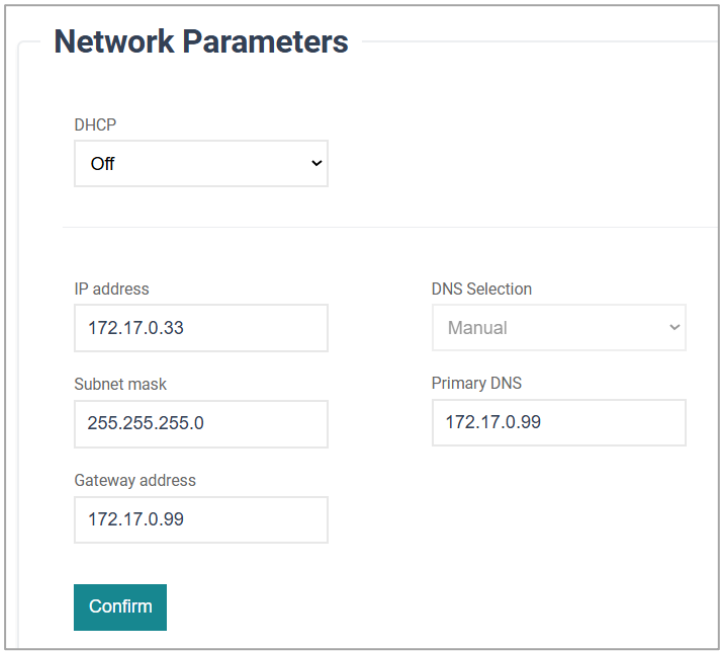
Alternatively, a factory reset can also be performed using the FCN button: Press the FCN button when switching on the Cabinet Guard. Hold the button down until the RUN LED flashes yellow, then release the FCN button.

The **Reboot** function triggers a restart of the Cabinet Guard. All settings are retained.

8 Network Parameters

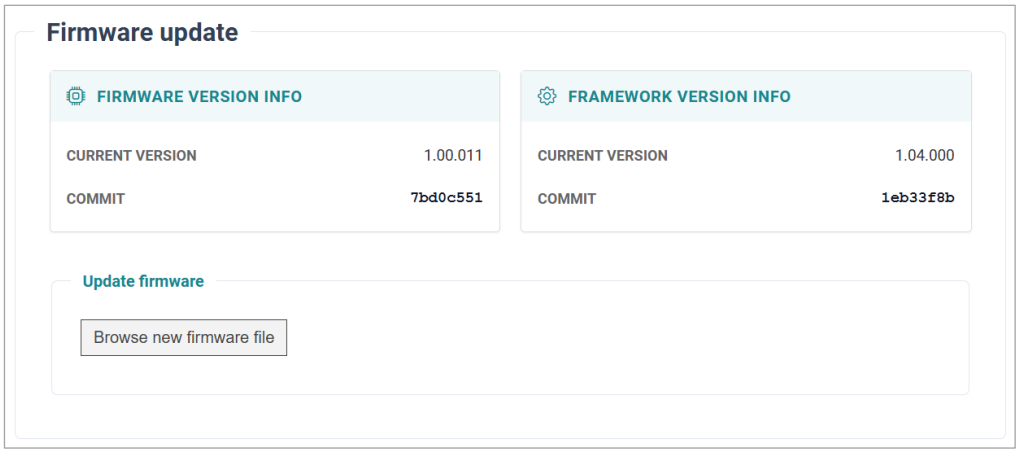
The Cabinet Guard is delivered with the default IP address 192.168.0.100.

To adapt the IP address to your network, you can assign your own IP address, subnet mask, gateway and DNS under "Network" or obtain the settings via DHCP.



9 Firmware Update

To update the firmware, use the "Update" menu. In this dialog box, you can check the current firmware version.



Select the new firmware file by clicking "Browse new firmware file." Once it has been loaded and checked, you can perform the update.

NOTE

The device configuration is retained after an update.

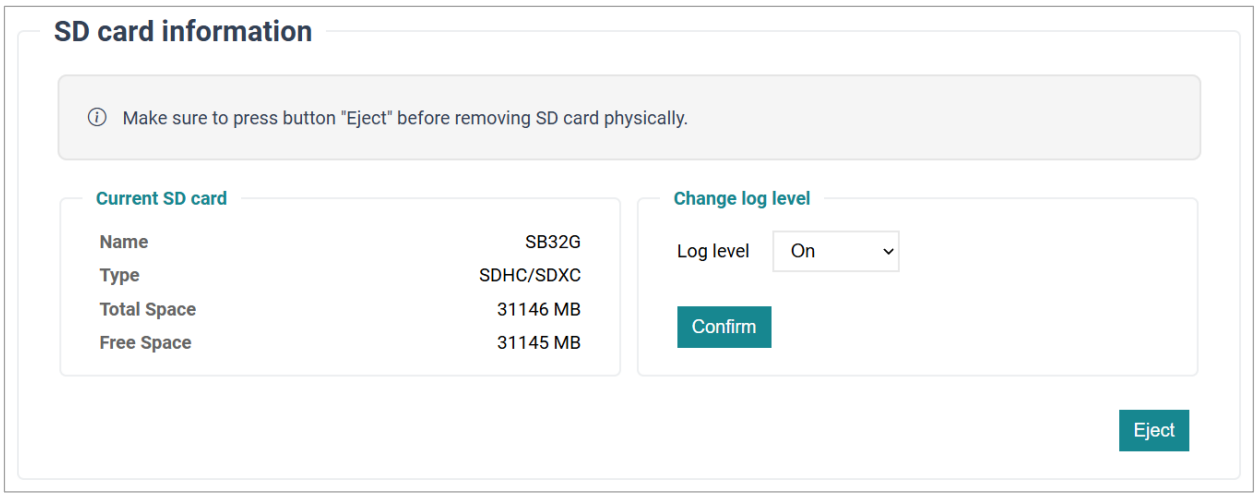
Alarms, data transmission via MQTT and ModbusTCP, and logging are interrupted during the firmware update!

10 Data storage with the SD card

An SD memory card can be used for long-term recording of measured values. Before mounting the device on the DIN rail, insert the SD card into the back of the housing. This position was deliberately designed to prevent unauthorized removal or replacement of the SD card.

To use logging, activate it in the "SD Card" menu under "Change Log Level" once the system has recognized a correctly formatted SD card.

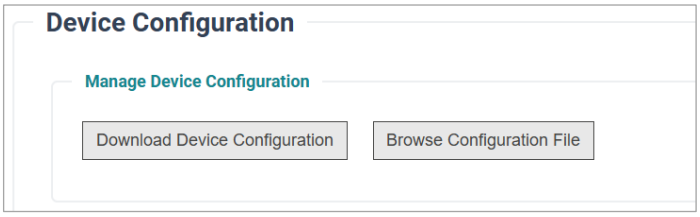
The SD card can be up to 32 GB in size and must be formatted with FAT32.



NOTE

The log function will be expanded in future firmware versions.
Sending logging data to a syslog server is also planned to be implemented.

11 Save and reload device Configuration



The configuration of the Cabinet Guard can be saved and imported via the web interface. This allows you to back up the current settings or transfer them to another device.

The saved configuration is in a readable and editable format and can therefore be adapted for use with other Cabinet Guard devices and deployed in production.

Saving the configuration:

To save the current configuration, open Device Configuration menu in the web interface and select "Download Device Configuration". The Configuration file is generated and stored locally on your PC.

Importing previously saved configuration:

A previously saved configuration file can be uploaded to the Cabinet Guard via the web interface.

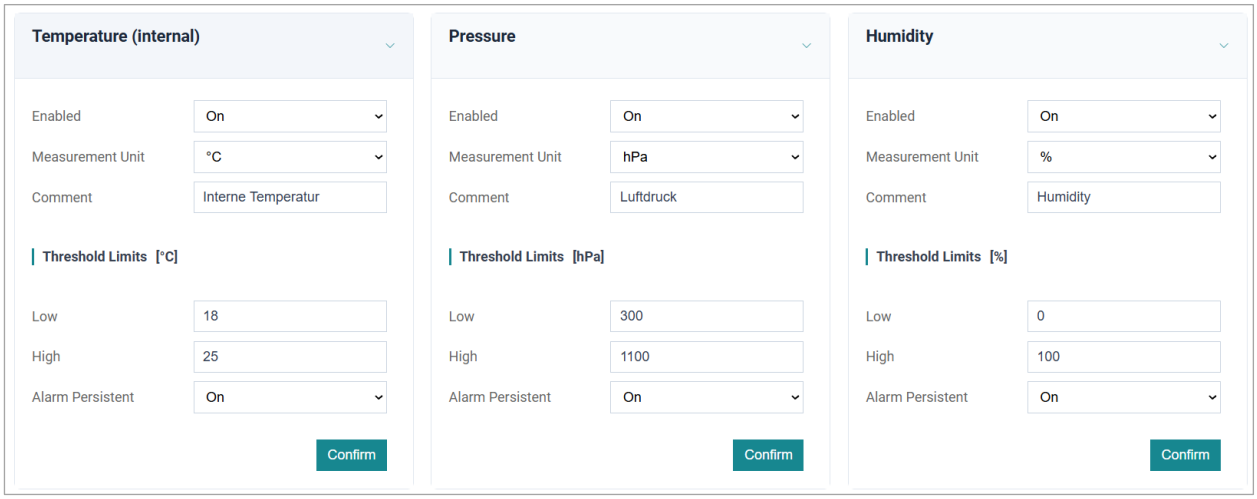
To import a configuration, open "Device Configuration" menu in the web interface and select "Browse Configuration File". Select the saved configuration file and start the upload process.

12 Climatic measurements (temperature, air pressure, humidity)

The Cabinet Guard can measure the following climatic values:

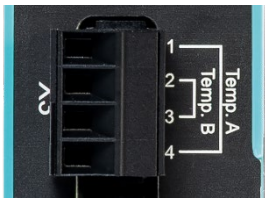
- Temperature at the device (internal sensor)
- Humidity (internal sensor)
- Air pressure (internal sensor)
- 2 external temperatures (via NTC sensor)

The internal sensors can be configured under "Sensor Settings".



In addition to the unit, a comment can be stored for each sensor, and the alarm limits can be set. If a sensor is not needed, it can also be switched off.

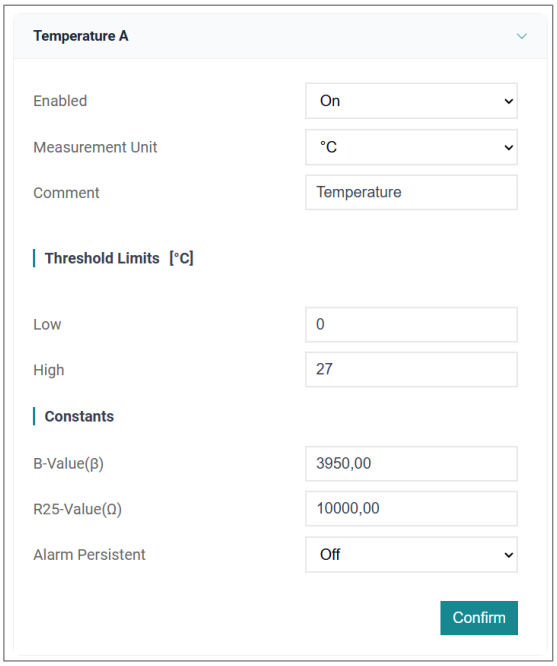
12.1 External temperature sensors



Up to 2 analog sensors for measuring temperatures of type NTC 10 kOhm, 2-wire can be connected to the Cabinet Guard.

The NTC sensors can be positioned in the control cabinet in climatically favorable locations to achieve a more accurate measurement of the climatic situation in the control cabinet in addition to the built-in temperature sensor. It is also possible to position the NTC sensors outside the control cabinet.

To use the NTC sensors, they must be activated in the "Sensor Settings."



13 Distance measurement



The Cabinet Guard has a TOF (Time of Flight) distance sensor at the top front of the housing ("DS").

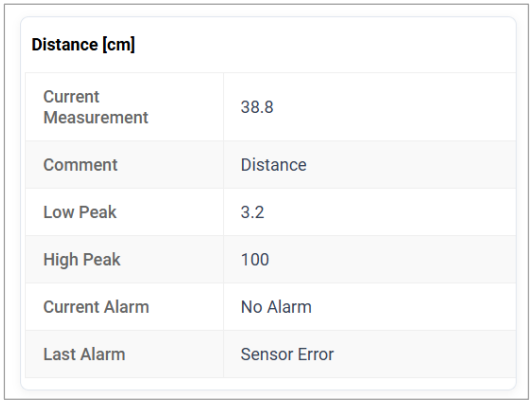
The position of the Cabinet Guard in the control cabinet should be chosen so that the distance sensor has a direct "view" of the inside of the control cabinet door. If the control cabinet has two doors, position the Cabinet Guard on the side of the control cabinet where the door must be opened first, usually the side with the handle or lock.

Ensure that the distance sensor is not obstructed by loose cables or other objects when measuring the distance to the door.

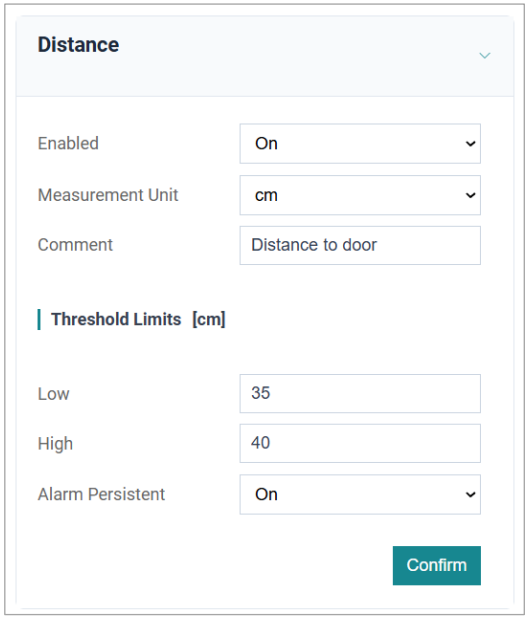
After correct installation during commissioning of the Cabinet Guard, use the distance to the closed control cabinet door as the base value. Use a value that is a few cm higher as the alarm value for opening the door to avoid false alarms.

If desired, you can set the lower limit to a value slightly smaller than the measured distance in order to detect cables or other objects that block the measurement to the door.

You can find the current measurement value under "Home / Sensor Measurements."

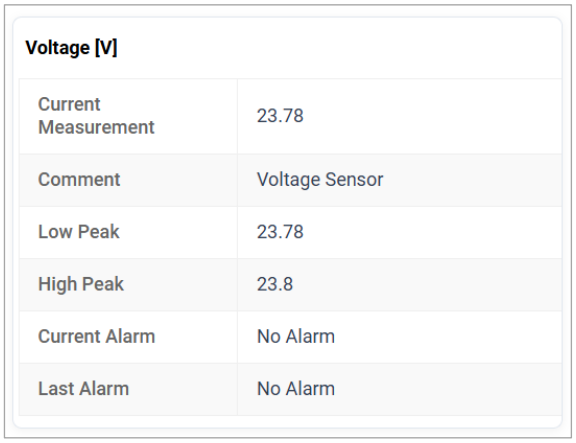


You can set the alarm value under "Settings / Sensor Settings."



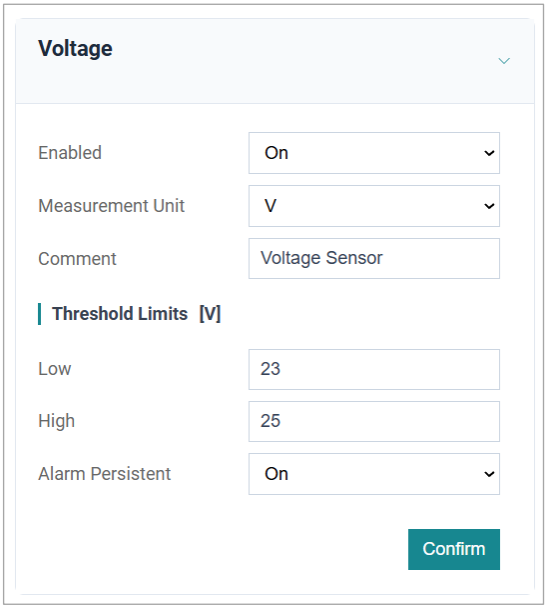
14 Voltage measurement

The Cabinet Guard includes a voltage measurement of the device's connected 24V power supply. The power supply can indicate faults in the power supply of the control cabinet.



Voltage [V]

Current Measurement	23.78
Comment	Voltage Sensor
Low Peak	23.78
High Peak	23.8
Current Alarm	No Alarm
Last Alarm	No Alarm



Voltage

Enabled	On
Measurement Unit	V
Comment	Voltage Sensor

Threshold Limits [V]

Low	23
High	25
Alarm Persistent	On

Confirm

15 Digital inputs and outputs

The Cabinet Guard has 2 digital inputs/outputs and 3 digital inputs.
The use of the inputs and outputs is optional.



Pin 1	IO 1	Output or input 1
Pin 2	IO 2	Output or input 2
Pin 4	IN 3	Input 3
Pin 5	IN 4	Input 4
Pin 6	IN 5	Input 5

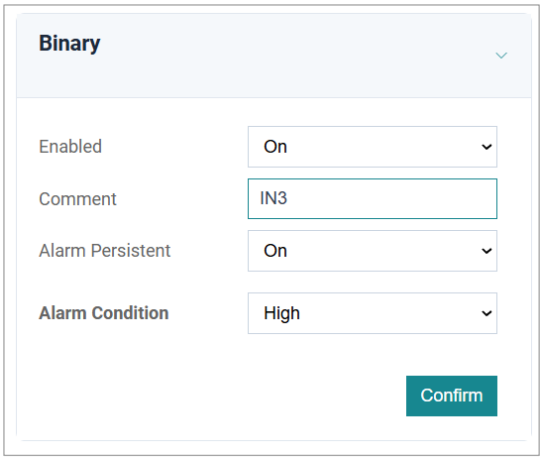
The inputs are designed as 24V Type 3 according to DIN EN 61131-2. The two outputs support 200mA, with an electronic fuse. The inputs can be logged (MQTT, ModbusTCP, log files) and can also send alarms.

The inputs can be used to record a wide variety of information in the control cabinet:

- Door opening switch
- Alarm outputs from fans or air conditioning units
- Alarm outputs from power supplies or UPS devices
- etc.

If one of the inputs is to be used, it must be activated in the "Sensor Settings."

For the alarm, select whether the alarm should be triggered by high or low input state.



If IO1 or IO2 are used as outputs, they are automatically set to high with any sensor alarm.

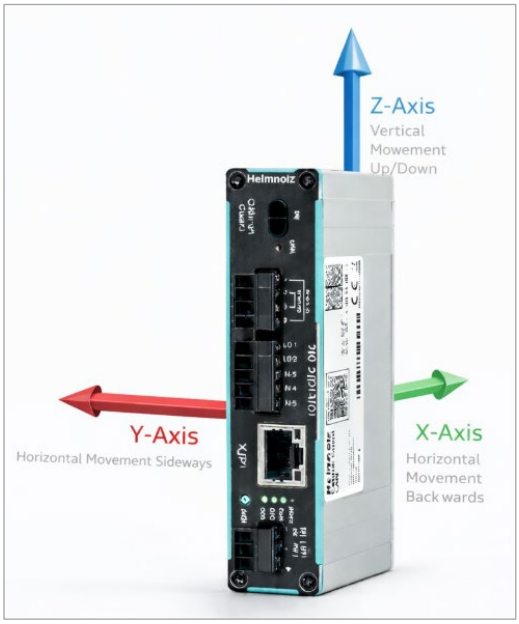
16 Vibration measurement

The vibration measurement of the Cabinet Guard can operate on all 3 axes X, Y, Z and consists of various evaluations.

The **X-axis** measures lateral movements or vibrations.

The **Y-axis** measures movements or vibrations forwards or backwards.

The **Z-axis** measures movements or vibrations upwards or downwards.



NOTE

When using vibration measurement, please ensure a solid mechanical connection between the Cabinet Guard via the DIN rail mounting bracket to the enclosure of the control cabinet.

16.1 Shock

The simplest vibration measurement is a check for "shock," i.e., mechanical impacts.

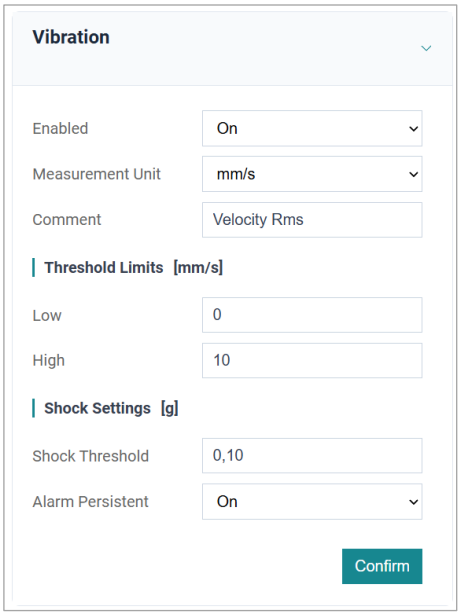
If the control cabinet detects a shock, it is displayed as an event under "Vibration/Shock History."



In the case of movable switch cabinets, e.g., on mobile platforms, this can also be used to detect a severe braking situation, e.g., a collision.

The threshold value for shock detection ("Shock Threshold") can be set under "Sensor Settings" for the vibration sensor.

The behaviour of the alarm can also be set here: „Alarm Persistent On/Off“

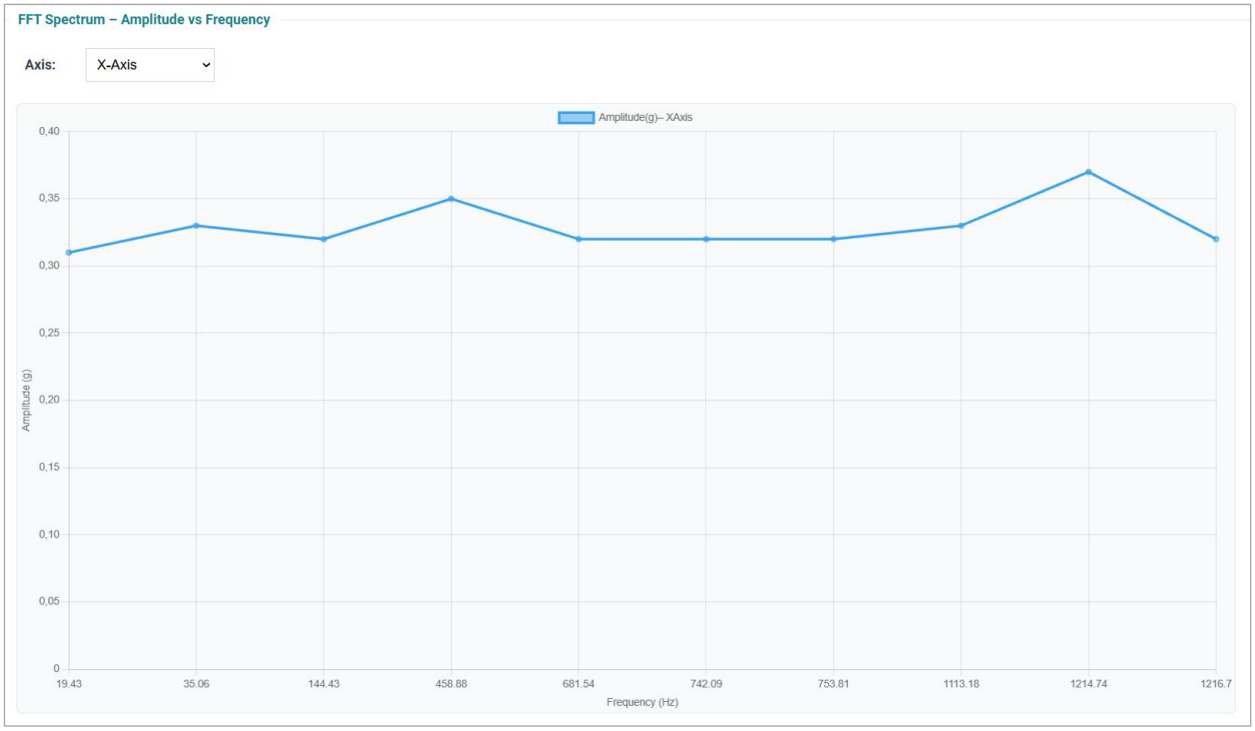


16.2 FFT Analysis

The Cabinet Guard measures movement and vibration as values that change over time. These raw values are well suited for detecting events, but they do not directly show which vibrations (frequencies) are contained in the signal.

FFT (Fast Fourier Transform) analysis converts the measured values from the time domain into a frequency representation. Put simply, FFT answers the question:

- What frequencies occur in the vibration?
- How strong is each of these frequencies?



The FFT graph shows the ratio of frequency to amplitude for each axis (X, Y, Z):

X-axis in the diagram (frequency, Hz): At which oscillation frequency a vibration occurs.

Y-axis in the diagram (amplitude): How strong the vibration is at this frequency.

A high value ("peak") means that this frequency is currently strongly represented in the signal.

The display is updated every second. Each update is a new snapshot of the currently measured vibration components.

How to interpret the spectrum:

1) Peaks in the diagram:

Narrow, clearly visible peaks indicate periodic, uniform vibrations (e.g., rotating components or regular oscillations).

Multiple peaks at regular intervals may indicate harmonics/overtones (common in mechanical systems).

2) Broadband components (broad "peaks" instead of narrow peaks):

If the amplitude is spread across many frequencies, this is more indicative of impact events or irregular influences (e.g., bumping into the control cabinet, jerky movements, loose parts).

3) Changes between the frames per second:

Since the spectrum is recalculated every second, changes over time are clearly visible.

- Peak remains in the same place over several updates: a stable, permanent vibration.
- Peak moves (frequency shifts): the cause changes its speed/characteristics (e.g., change in rotational speed).
- Peak appears only briefly: a short-term event (e.g., knocking, door movement).

Why is there one graph per axis?

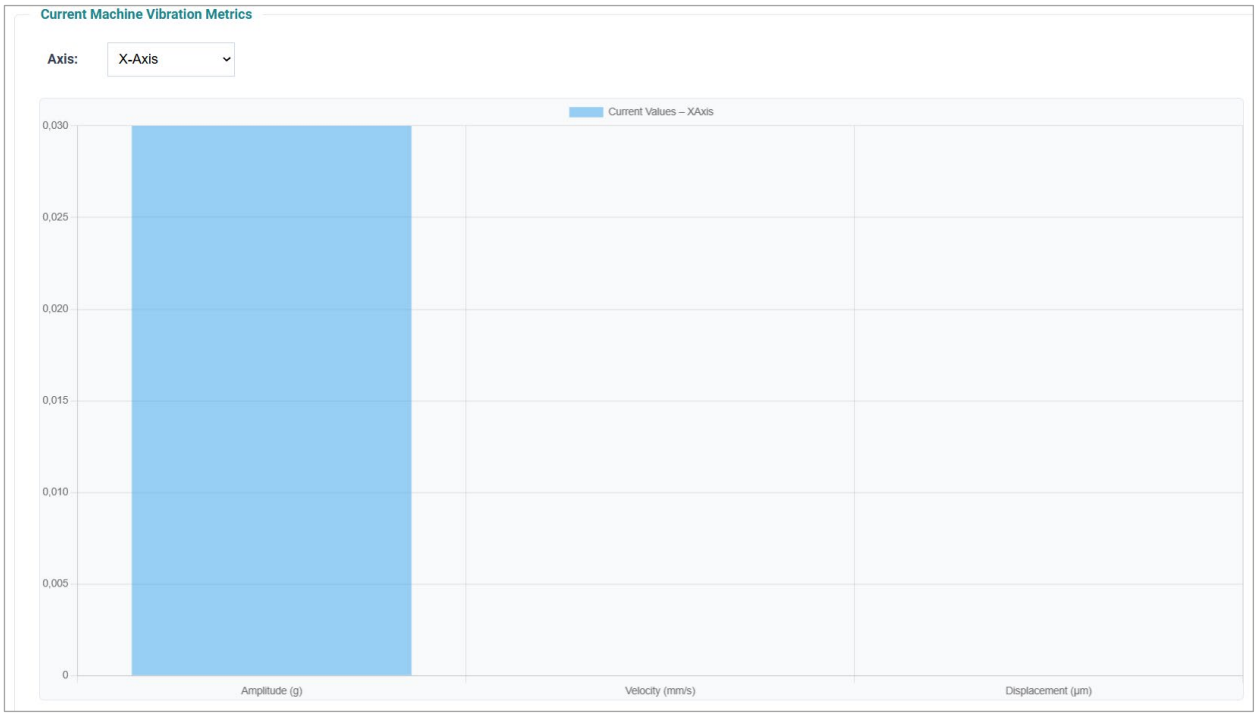
Vibrations can vary in intensity depending on their direction. For this reason, the FFT is displayed separately for each axis (X, Y, Z). This allows you to identify the direction in which the strongest vibration components occur.

Practical examples:

- Short impact/blow: often short-term increased amplitudes over a wider frequency range; then calm again. See also "Shock"
- Uniform vibration: one or more stable peaks that remain for several seconds.
- Resonance of the housing: noticeable peak in a specific frequency range, recurring frequently.

16.3 Vibration metrics

The "**Current Machine Vibration Metrics**" view displays the **current** vibration metrics for the selected measurement axis (X/Y/Z) as a snapshot. This gives you a quick overview of how strong the vibration currently is – without looking at the progression over time.



Display and operation:

Axis (X-Axis / Y-Axis / Z-Axis): Selection of the measurement direction.

The diagram shows the **current values** for three parameters: **amplitude (g), velocity (mm/s), and displacement (µm)**.

The values are updated regularly (according to the device's measurement and update rate) and represent the most recently calculated status.

Meaning of the characteristic values:

Amplitude (g):

- Describes the current vibration intensity as acceleration (in g).
- High amplitude values indicate strong acceleration components, e.g., in the case of rapid vibrations or short pulses.

Velocity (mm/s):

- Describes the vibration velocity.
- This value is well suited for assessing the "energy" of a vibration, especially for typical machine and housing vibrations in the mid-frequency range.

Displacement (µm)

- Describes the oscillation path/deflection (micrometers).
- Particularly meaningful at low frequencies, where larger mechanical movements can occur.

Note: Velocity and displacement are derived from sensor data and are used for the practical classification of mechanical vibration.

Interpretation in practice:

- All three values low: stable condition, no significant vibration.
- Amplitude high, velocity/displacement moderate: frequent rapid oscillations or impulse-like excitations.
- Displacement significantly increased: rather slow, larger movements (e.g., loose mounting, "rocking," resonance at low frequencies).
- Axis comparison: If only one axis shows significantly higher values, the vibration mainly acts in this direction (indication of installation position or excitation direction).

Difference from the Trend and FFT views:

- This view shows a snapshot of the current vibration parameters.
- For the trend (changes over time), use the "Frequency, Velocity & Displacement Trend" (see below).
- For root cause analysis by frequency components, use the FFT display (frequency/amplitude).

16.4 Frequency, Velocity & Displacement Trend

The graph "Frequency, Velocity & Displacement Trend" shows the dominant vibration per second and derives two common parameters for vibration intensity from this. This allows you to see not only that a vibration is present, but also how it changes over time.



What is being depicted?

- **X-Axis ("Time", HH:mm:ss):** Time progression. The values are updated every second.
- **Y-Axis ("Value"):** Value of the respective parameter.

Three curves are displayed in different colors (blue, green, purple) for the selected measurement axis (X/Y/Z):

1. **Frequency (Hz) [blue line]:** Frequency of the **strongest (dominant) vibration** component in this time window.
2. **Velocity (mm/s) [green line]:** Shows the **vibration velocity** associated with the dominant vibration. Velocity is a parameter frequently used in condition monitoring to evaluate the "sharpness" or energy of a vibration, especially at medium frequencies.
3. **Displacement (µm) [purple]:** Shows the deflection (oscillation path) associated with the dominant vibration. Displacement is particularly evident at low frequencies: large deflection means that the system continues to "move" mechanically.

Important: Velocity and displacement are quantities derived from the measured acceleration. They serve to better classify the vibration intensity.

How do I read the graph?

1) Stable operation (uniform vibration)

- Frequency remains relatively constant over time (smooth line).
- Velocity/displacement also remain at a similar level.

This indicates a uniform vibration source (e.g., continuously running fan/drive or constant environmental excitation).

2) Change in cause (e.g., change in speed)

- Frequency visibly increases or decreases.
- Velocity/displacement often changes as well.

This indicates that the vibration source is changing in speed or operating condition.

3) Short-term events (impact, bumping, door movement)

- Sudden changes in one or more curves within a few seconds.
- Often, there is a brief spike in intensity (velocity/displacement) and, in some cases, a brief change in the dominant frequency.

This is typical of impulse-like impacts.

4) Understand the difference between velocity and displacement

- At low frequencies, displacement can be more "noticeable" because slow movements lead to greater oscillation amplitude.
- At higher frequencies, velocity is often more meaningful because fast oscillations may have a small amplitude but are energetically relevant.

Axle selection (X/Y/Z):

With Axis, you select the direction of measurement. This allows you to determine whether a vibration is mainly:

- laterally (X or Y) or
- occurs vertically/axially (Z)

In practice, this helps to narrow down the cause spatially (e.g., impact from the side vs. vibration across the mounting surface).

Note on interpretation:

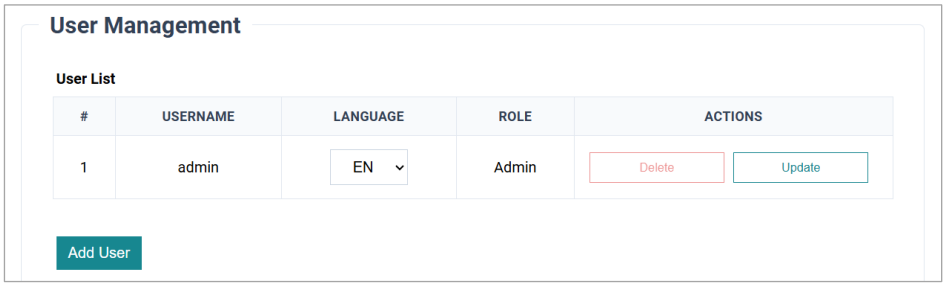
The trend graph shows the **dominant frequency** and the parameters derived from it for each update. If several oscillations occur simultaneously, the strongest component is displayed. For a complete breakdown of all frequency components, also use the FFT graph (frequency/amplitude).

17 User Management

The Cabinet Guard always has only one user, "admin," in its factory state. This user cannot be deleted. Please assign the admin user a password that is as secure as possible, as the admin role has all rights to make changes to the device and perform functions such as firmware updates and factory resets.

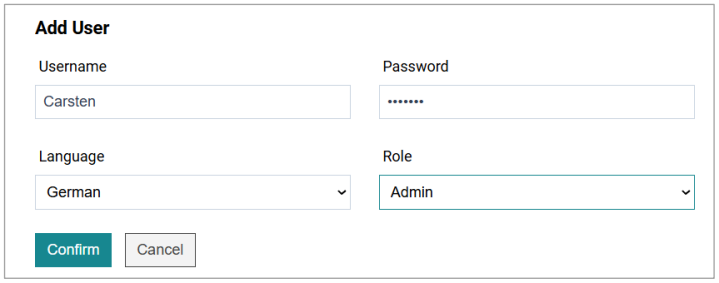
NOTE Only “admin” users are responsible for user management; only they can see and use the "User Management" menu.

Additional users can be created using "Add User." Future firmware versions will support multiple roles, and newly created users can have different roles than the administrator to increase the security of the device against unintended changes or attacks.

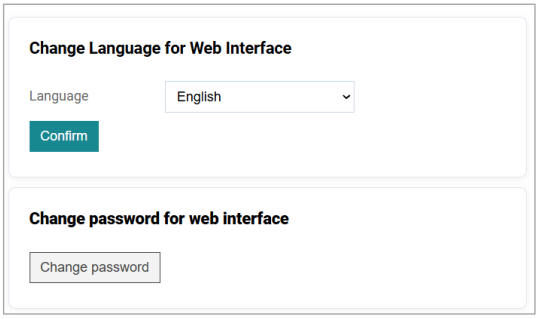


When you create a new user, you can specify an initial password, set the language of the web interface, and determine the user's role.

New users should change the pre-selected password themselves after their next login.



Users can customize the language of the web interface and their password in the "Settings / Web Interface" menu when they are logged in.



NOTE Currently, only the "admin" role is available. Advanced role management will be added in a later firmware version.

18 List of ModbusTCP registers

Many Cabinet Guard values have a higher precision, which is why ModbusTCP always uses two input registers together. In order to process the sensor value, the two registers must always be read together and interpreted as a 32-bit floating point value.

Modbus Register (hex)	Modbus Register (dec)	data type	Content
Temperature (internal)			
0x0000 + 0x0001	0 + 1	Float32	Sensor value
0x0002 + 0x0003	2 + 3	Float32	Maximum sensor value
0x0004 + 0x0005	4 + 5	Float32	Minimum sensor value
0x0006	6	2 characters ASCII	measuring unit „°C“, „F“, „K“
0x0008 -0x0011	8 – 17	10 characters ASCII	Sensor type
0x0012 + 0x0013	18 + 19	32 Bit	Sensor status
0x0014 + 0x0015	20 + 21	32 Bit	Sensor alarm
0x0016 - 0x0029	22 – 41	20 characters ASCII	Sensor comment
0x002A - 0x0031	42 - 49	-	Reserved
Air pressure			
0x0032 + 0x0033	50 + 51	Float32	Sensor value
0x0034 + 0x0035	52 + 53	Float32	Maximum sensor value
0x0036 + 0x0037	54 + 55	Float32	Minimum sensor value
0x0038	56	2 characters ASCII	Measuring unit „Pa“, „hp“
0x003A -0x0043	58 – 67	10 characters ASCII	Sensor Type
0x0044 + 0x0045	68 + 69	32 Bit	Sensor Status
0x0046 + 0x0047	70 + 71	32 Bit	Sensor Alarm
0x0048 - 0x005B	72 – 91	20 characters ASCII	Sensor comment
0x005C - 0x0063	92 - 99	-	Reserved
Humidity			
0x0064 + 0x0065	100 + 101	Float32	Sensor value
0x0066 + 0x0067	102 + 103	Float32	Maximum sensor value
0x0068 + 0x0069	104 + 105	Float32	Minimum sensor value
0x006A	106	2 characters ASCII	Measuring unit „%“
0x006C -0x0075	108 – 117	10 characters ASCII	Sensor Type
0x0076 + 0x0077	118 + 119	32 Bit	Sensor Status
0x0078 + 0x0079	120 + 121	32 Bit	Sensor Alarm
0x007A - 0x008D	122 – 141	20 characters ASCII	Sensor comment
0x008E - 0x0095	142 – 149	-	Reserved
Distance			
0x0096 + 0x0097	150 + 151	Float32	Sensor value
0x0098 + 0x0099	152 + 153	Float32	Maximum sensor value
0x009A + 0x009B	154 + 155	Float32	Minimum sensor value
0x009C	156	2 characters ASCII	Measuring unit „mm“, „cm“
0x009E -0x00A7	158 – 167	10 characters ASCII	Sensor Type
0x00A8 + 0x00A9	168 + 169	32 Bit	Sensor Status
0x00AA + 0x00AB	170 + 171	32 Bit	Sensor Alarm
0x00AC - 0x00BF	172 – 191	20 characters ASCII	Sensor comment
0x00C0 - 0x00C7	192 – 199	-	reserved

Amplitude			
0x00C8 + 0x00C9	200 + 201	Float32	Sensor value
0x00CA + 0x00CB	202 + 203	Float32	Maximum sensor value
0x00CC + 0x00CD	204 + 205	Float32	Minimum sensor value
0x00CE + 0x00CF	206 + 207	2 characters ASCII	Measuring unit „g“, „m/s2“
0x00D0 -0x00D9	208 – 217	10 characters ASCII	Sensor Type
0x00DA + 0x00DB	218 + 219	32 Bit	Sensor Status
0x00DC + 0x00DD	220 + 221	32 Bit	Sensor Alarm
0x00DE - 0x00F1	222 – 241	20 characters ASCII	Sensor comment
0x00F2 - 0x00F9	242 – 249	-	reserved
Frequency			
0x00FA + 0x00FB	250 + 251	Float32	Sensor value
0x00FC + 0x00FD	252 + 253	Float32	Maximum sensor value
0x00FE + 0x00FF	254 + 255	Float32	Minimum sensor value
0x0100 + 0x0101	256 + 257	2 characters ASCII	Measuring unit „Hz“, „kHz“
0x0102 -0x010B	258 – 267	10 characters ASCII	Sensor Type
0x010C + 0x010D	268 + 269	32 Bit	Sensor Status
0x010E + 0x010F	270 + 271	32 Bit	Sensor Alarm
0x0110 - 0x0123	272 – 291	20 characters ASCII	Sensor comment
0x0124 - 0x012B	292 – 299	-	reserved
Temperature A			
0x012C + 0x012D	300 + 301	Float32	Sensor value
0x012E + 0x012F	302 + 303	Float32	Maximum sensor value
0x0130 + 0x0131	304 + 305	Float32	Minimum sensor value
0x0132	306	2 characters ASCII	Measuring unit „°C“, „F“, „K“
0x0134 -0x013D	308 – 317	10 characters ASCII	Sensor Type
0x013E + 0x013F	318 + 319	32 Bit	Sensor Status
0x0140 + 0x0141	320 + 321	32 Bit	Sensor Alarm
0x0142 - 0x0155	322 – 341	20 characters ASCII	Sensor comment
0x0156 - 0x015D	342 – 349	-	reserved
Temperature B			
0x015E + 0x015F	350 + 351	Float32	Sensor value
0x0160 + 0x0161	352 + 353	Float32	Maximum sensor value
0x0162 + 0x0163	354 + 355	Float32	Minimum sensor value
0x0164	356	2 characters ASCII	Measuring unit „°C“, „F“, „K“
0x0166 -0x016F	358 – 367	10 characters ASCII	Sensor Type
0x0170 + 0x0171	368 + 369	32 Bit	Sensor Status
0x0172 + 0x0173	370 + 371	32 Bit	Sensor Alarm
0x0174 - 0x0187	372 – 391	20 characters ASCII	Sensor comment
0x0188 - 0x018F	392 – 399	-	reserved
Vibration			
0x0190 + 0x0191	400 + 401	Float32	Sensor value
0x0192 + 0x0193	402 + 403	Float32	Maximum sensor value
0x0194 + 0x0195	404 + 405	Float32	Minimum sensor value
0x0196 + 0x0197	406 + 407	2 characters ASCII	Measuring unit „mm/s“, „m/s“
0x0198 - 0x01A1	408 – 417	10 characters ASCII	Sensor Type
0x01A2 + 0x01A3	418 + 419	32 Bit	Sensor Status
0x01A4 + 0x01A5	420 + 421	32 Bit	Sensor Alarm
0x01A6 - 0x01B9	422 – 441	20 characters ASCII	Sensor comment

0x01BA - 0x01C1	442 – 449	-	reserved
Voltage			
0x01C2 + 0x01C3	450 + 451	Float32	Sensor value
0x01C4 + 0x01C5	452 + 453	Float32	Maximum sensor value
0x01C6 + 0x01C7	454 + 455	Float32	Minimum sensor value
0x01C8	456	2 characters ASCII	Measuring unit „V“, „mV“
0x01CA -0x01D3	458 – 467	10 characters ASCII	Sensor Type
0x01D4 + 0x01D5	468 + 469	32 Bit	Sensor Status
0x01D6 + 0x01D7	470 + 471	32 Bit	Sensor Alarm
0x01D8 - 0x01EB	472 – 491	20 characters ASCII	Sensor comment
0x01EC - 0x01F3	492 – 499	-	Reserved
Binary Input IN 1			
0x01F4 + 0x01F5	500 + 501	32 Bit	Sensor value (0 or 1)
0x01F6 + 0x01F7	502 + 503	32 Bit	Maximum sensor value (0 or 1)
0x01F8 + 0x01F9	504 + 505	32 Bit	Minimum sensor value (0 or 1)
0x01FA	506	2 characters ASCII	-
0x01FC - 0x0205	508 – 517	10 characters ASCII	Sensor Type
0x0206 + 0x0207	518 + 519	32 Bit	Sensor Status
0x0208 + 0x0209	520 + 521	32 Bit	Sensor Alarm
0x020A - 0x021D	522 – 541	20 characters ASCII	Sensor comment
0x021C - 0x0225	542 – 549	-	Reserved
Binary Input IN 2			
0x0226 + 0x0227	550 + 551	32 Bit	Sensor value (0 or 1)
0x0228 + 0x0229	552 + 553	32 Bit	Maximum sensor value (0 or 1)
0x022A + 0x022B	554 + 555	32 Bit	Minimum sensor value (0 or 1)
0x022C	556	2 characters ASCII	-
0x022E - 0x0237	558 – 567	10 characters ASCII	Sensor Type
0x0238 + 0x0239	568 + 569	32 Bit	Sensor Status
0x023A + 0x023B	570 + 571	32 Bit	Sensor Alarm
0x023C - 0x024F	572 – 591	20 characters ASCII	Sensor comment
0x0250 - 0x0257	592 – 599	-	Reserved
Binary Input IN 3			
0x0258 + 0x0259	600 + 601	32 Bit	Sensor value (0 or 1)
0x025A + 0x025B	602 + 603	32 Bit	Maximum sensor value (0 or 1)
0x025C + 0x025D	604 + 605	32 Bit	Minimum sensor value (0 or 1)
0x025E	606	2 characters ASCII	-
0x0260 - 0x0269	608 – 617	10 characters ASCII	Sensor Type
0x026A + 0x026B	618 + 619	32 Bit	Sensor Status
0x026C + 0x026D	620 + 621	32 Bit	Sensor Alarm
0x026E - 0x0281	622 – 641	20 characters ASCII	Sensor comment
0x0282 - 0x0289	642 – 649	-	Reserved
Binary Input IN 4			
0x028A + 0x028B	650 + 651	32 Bit	Sensor value (0 or 1)
0x028C + 0x028D	652 + 653	32 Bit	Maximum sensor value (0 or 1)
0x028E + 0x028F	654 + 655	32 Bit	Minimum sensor value (0 or 1)
0x0290	656	2 characters ASCII	-
0x0292 - 0x029B	658 – 667	10 characters ASCII	Sensor Type
0x029C + 0x029D	668 + 669	32 Bit	Sensor Status
0x029E + 0x029F	670 + 671	32 Bit	Sensor Alarm

0x02A0 - 0x02B3	672 – 691	20 characters ASCII	Sensor comment
0x02B4 - 0x02BB	692 – 699	-	Reserved
Binary Input IN 5			
0x02BC + 0x02BD	700 + 701	32 Bit	Sensor value (0 or 1)
0x02BE + 0x02BF	702 + 703	32 Bit	Maximum sensor value (0 or 1)
0x02C0 + 0x02C1	704 + 705	32 Bit	Minimum sensor value (0 or 1)
0x02C2	706	2 characters ASCII	-
0x02C4 - 0x02CD	708 – 717	10 characters ASCII	Sensor Type
0x02CE + 0x02CF	718 + 719	32 Bit	Sensor Status
0x02D0 + 0x02D1	720 + 721	32 Bit	Sensor Alarm
0x02D2 - 0x02E5	722 – 741	20 characters ASCII	Sensor comment
0x02E6 - 0x02ED	742 – 749	-	Reserved

19 Technical data

Order number	**700-210-1AA01**
Name	Cabinet Guard
Scope of delivery	Cabinet Guard with power supply plug
Dimensions (D x W x H)	55,6 x 25 x 109 mm
Weight	Ca. 180 g
Ethernet interface (X1)	
Connection	1 x RJ45
Transmission rate	10/100 Mbps
Protocol	HTTPS web server for configuration and diagnostics; ModbusTCP; MQTT
Digital IOs (X2)	
Inputs	5x Type 3 as of DIN EN 61131-2; 2 Inputs can optionally be used as outputs
Output	2x 200mA 24V DC, with electronic fuse
Analog inputs (X3)	
Count	2
Type	NTC 10 kOhm, 2-wire
Measuring range	-50°C ... +350°C / 0 ... 450 kOhm
Resolution	+-0,1°C + Sensor Tolerance at 25°C or +-25 Ohm at 10kOhm
Environmental sensor (intern)	
Temperature measurement	-20°C .. +80°C, +-2°C
Humidity	0% r.H. .. 100% r.H., Tol.: +-5% @25°C
Air pressure measurement	300 ... 1100 hPa, +-1,7 hPa
Distance sensor	
Type	Optical Time-of-flight (TOF), Infrared (940nm)
Distance / Resolution	Up to 100 cm / +-6% for white targets
Vibration sensor	
Function	3-axis accelerometer: vibration, shock, acceleration, orientation
Resolution	+-16g, bandwidth: 1,3kHz
Voltage measurement	
Resolution	18V ... 30V, accuracy: +-3%
Status indication	
Function status	4 LEDs (Power, Run, Connection, Alarm)
Ethernet status	2 LEDs (Connection, Traffic)
Power supply	
Voltage	DC 24 V, 18 ... 30 V DC
Current consumption	max. 85 mA at 24 V DC
Current consumption with load	max. 450mA at 24 V DC
power loss	max. 2 W
Connection type	Screw terminal block
Cable cross section	0.08 – 1.5 mm², AWG28 - AWG16
Stripping length	6.0 mm
Tightening torque	0.24 Nm

Ambient conditions	
Ambient temperature	-30°C ... +75°C
Transport and storage temperature	-40°C ... +85°C
Relative humidity	Up to 95 % without condensation
Protection rating	IP20
Mounting position	upright on DIN-rail
Approvals	CE, UL
RoHS, Reach	RoHS (2011/65/EU); DIN EN IEC 63000 2019-05
EMV	DIN EN IEC 61000-6-2 2019-11, DIN EN IEC 61000-6-4 2020-09
Vibration and Shock	DIN EN 60068-2-8:2008 “Vibration” DIN EN 60068-27:2010 “Shock“ DIN EN 60068-2-31:2009-04 “Free fall"

20 Dimensional drawings

