control solutions
TERACOM


# TCW241 Ethernet I/O module

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# USER MANUAL

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Measurement and data acquisition solutions

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# Ethernet I/O module TCW241

## 1. Introduction

The TCW241 is an Ethernet I/O module designed for applications in factory automation and distributed process control. It features 4 digital inputs, 4 analog inputs, and 4 relays with both normally open (NO) and normally closed (NC) contacts.

This Ethernet I/O module supports up to eight Teracom 1-Wire sensors, which can monitor parameters such as temperature, humidity, CO2 levels, current, 4/20mA signals, and galvanically isolated analog voltage.

The relays can be controlled remotely via interfaces such as web (HTTP), SNMP, HTTP API, and Modbus TCP/IP, or locally, based on the status of a monitored parameter (1-Wire sensor, analog voltage, or dry contact input).

The module can periodically upload an XML or JSON file containing all monitored parameters to a designated server via HTTP/HTTPS. The server, in turn, can send control commands for the relays, enabling integration into a SCADA system. Alarms and notifications for each parameter can be sent via email or SNMP traps to up to five recipients. Additionally, alerts can be transmitted using HTTP/HTTPS POST requests with XML/JSON status files.

An embedded real-time clock allows for scheduled control of specific outputs. These tasks can be configured as one-time events or as recurring weekly events.

## 2. Features

- 10/100 Mb Ethernet connectivity with Auto-MDIX support
- Password-protected, web-based configuration and control
- 4 digital "dry contact" inputs
- 4 analog inputs with a 0 to 60VDC range, including multiplier and offset adjustments
- 4 relays with both normally open (NO) and normally closed (NC) contacts
- 1-Wire interface supporting up to 8 Teracom sensors, including temperature (TST1XX), temperature/humidity (TSH2xx), and others
- SNMPv2 support
- SNMP traps and email alerts for monitoring conditions
- SMTP with SSL/TLS security
- Support for TLS 1.0, 1.1, and 1.2
- Configurable HTTP and SNMP ports
- HTTP API command support
- Periodic HTTP/HTTPS POST of XML/JSON status files for client-server systems
- Modbus TCP/IP support
- Dynamic DNS support (DynDNS, No-IP, DNS-O-Matic)
- NTP protocol support for time synchronization
- Real-time clock for scheduled control tasks
- Extended operating temperature range
- Wide input power supply voltage range
- Remote firmware update capability.

## 3. Applications

The TCW241 Ethernet I/O module is well-suited for environmental monitoring and local control of electrical and non-electrical parameters. It is ideal for use in industrial and building automation, data acquisition systems, and general remote control and monitoring tasks.

TCW241 can function as a standalone device controlled via a web browser or as part of small to medium-sized SCADA (Supervisory Control and Data Acquisition) systems for industrial control.

Example applications include:

- Temperature and humidity control in data centers
- Building management systems
- Industrial cooling and heating control
- Home automation
- Alarm systems
- Automation of mushroom cultivation facilities
- Process monitoring systems.

## 4. Specifications

- Physical characteristics
  Dimensions: 145 x 90 x 40 mm
  Weight: 230 g

- Environmental limits
  Operating temperature range: -20 to 55°C
  Storage temperature range: -25 to 60°C
  Operating relative humidity range: 5 to 85% (non-condensing)

- Warranty
  Warranty period: 3 years

- Power supply
  Operating voltage range (including -15/+20% according to IEC 62368-1): 10 to 28 VDC
  Current consumption: 350 mA @ 12 VDC (with all relays ON)

- Digital inputs
  Isolation: Non isolated
  Mode: Dry contact
  Maximum input voltage: +5.5VDC
  Sampling rate: 10mS
  Digital filtering time interval: 30mS

- Analog inputs
  Isolation: Non isolated
  Type: Single-ended
  Resolution: 10 bits
  Mode: Voltage
  Input range: 0 to 60 VDC
  Accuracy: ±1%
  Sampling rate: 500mS per channel (averaged value of 250 samples)
  Input impedance: 1 mega-ohms (min.)

- Relay outputs
  Type: Form C (N.O. and N.C. contacts)
  Contact current rating: 3 A @ 24 VDC/30 VAC (resistive load)
  Initial insulation resistance: 100 mega-ohms (min.) @ 500 VDC
  Mechanical endurance: 10 000 000 operations
  Electrical endurance: 100 000 operations @ 3 A resistive load
  Contact resistance: 50 milli-ohms max. (initial value)
  Minimum pulse output: 1 Hz at rated load

  ⚠ **Caution:** The device does not contain any internal overcurrent protection facilities on the relay's contact lines. External fuses or short circuit current limiting circuit breakers, rated to 3 Amps, are to be used for overcurrent protection of the connecting lines.

- 1-Wire interface
  Output voltage (+VW): 5.0 ± 0.3 VDC
  Maximum output current (+VW): 0.2 A

- Internal FLASH memory
  Endurance: 100 000 cycles (Every settings change is a memory cycle.)

- Lithium battery
  Type: CR1220

  ⚠ **Caution:** Replacing the battery with an incorrect type may result in an explosion.

## 5. LED indicators

The TCW241 controller includes the following LED indicators to display its status:

- **Relay1-Relay4** (green) – Illuminates when the corresponding relay is activated (NO contact closed, NC contact open);
- **PWR** (red) – Steady ON in normal operation; blinks in sync with the STS LED in the event of a hardware error;
- **STS** (yellow) – Flashes to indicate that the controller's main program is running;
- **NET** (orange) – Indicates network status; remains ON when a network link is established, and blinks to show network activity.

# 6. Installation and setup

Qualified personnel must install the device. It shouldn't be installed outside directly.

The installation process involves mounting the device, connecting it to an IP network, attaching inputs and outputs, supplying power, and configuring it through a web browser.

## 6.1. Mounting

TCW241 must be installed in a clean, dry, and non-flammable location. Ventilation is recommended for high ambient temperature environments.

To mount the device, use two plastic dowels (e.g. Würth GmbH 0912 802 002) and two dowel screws (e.g. Würth GmbH 0157 06 70) to secure it to a wall. Refer to fig.1 in Appendix A for mechanical details.

Leave 50 mm of space on all sides for ventilation and electrical isolation. Refer to fig.2 in Appendix A.

The device can also be attached to a standard DIN rail (35mm by 7.55mm) by hooking the back of the enclosure onto the rail and snapping the bottom into place.

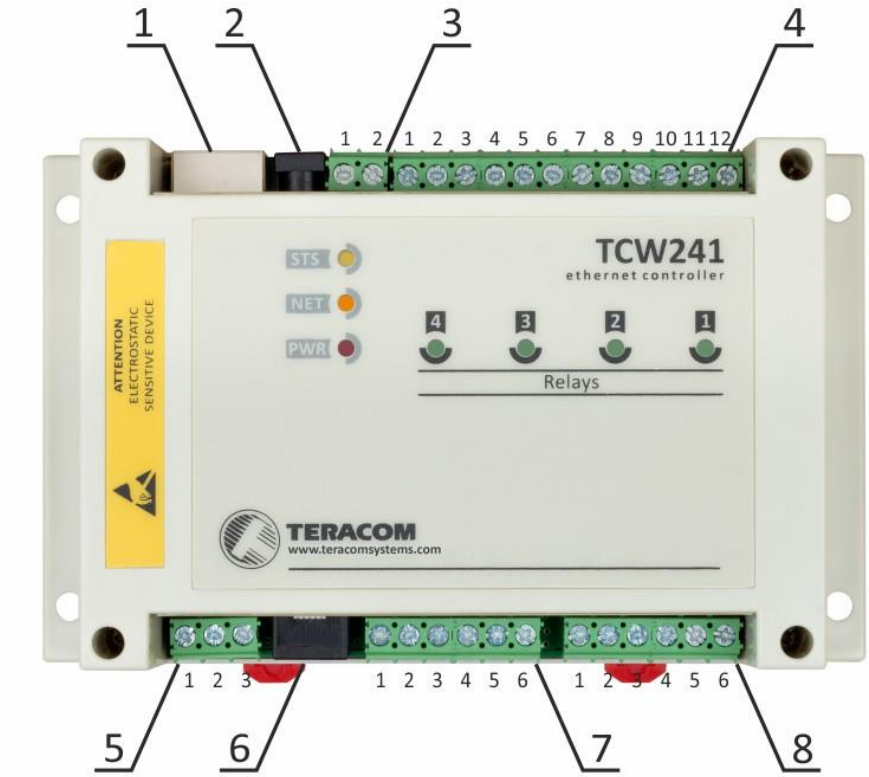
## 6.2. Connection

**Warning! Power off before wiring.**

Follow these steps for correct wiring:

- Turn off power;
- Connect wires to terminals;
- Turn on the power.

Ensure that wires are securely attached to terminals and tightened. Improper wiring or configuration can cause permanent damage to TCW241 or connected equipment.




| | | | |
|---|---|---|---|
| **Connector 1** | Ethernet - RJ45 | **Connector 6** | **Pin1** – GND (most left) |
| **Connector 2** | Power - 2.1x5.5mm connector, central positive | | **Pin2** – GND |
| **Connector 3** | **Pin1** – Power positive | | **Pin3** – 1-Wire Data |
| | **Pin2** – Power negative | | **Pin4** – 1-Wire GND |
| **Connector 4** | **Pin1** – NC Relay4 | | **Pin5** – 1-Wire +VDD |
| | **Pin2** – COM Relay4 | | **Pin6** – 1-Wire +VDD (most right) |
| | **Pin3** – NO Relay4 | **Connector 7** | **Pin1** – Digital In 1 |
| | **Pin4** – NC Relay3 | | **Pin2** – GND |
| | **Pin5** – COM Relay3 | | **Pin3** – Digital In 2 |
| | **Pin6** – NO Relay3 | | **Pin4** – Digital In 3 |
| | **Pin7** – NC Relay2 | | **Pin5** – GND |
| | **Pin8** – COM Relay2 | | **Pin6** – Digital In 4 |
| | **Pin9** – NO Relay2 | **Connector 8** | **Pin1**– Analog In 1 |
| | **Pin10** – NC Relay1 | | **Pin2** – GND |
| | **Pin11** – COM Relay1 | | **Pin3** – Analog In 2 |
| | **Pin12** – NO Relay1 | | **Pin4** – Analog In 3 |
| **Connector 5** | **Pin1** – 1-Wire GND | | **Pin5** – GND |
| | **Pin2** – 1-Wire Data | | **Pin6** – Analog In 4 |
| | **Pin3** – 1-Wire +VDD | | |

### 6.2.1. Power supply connection

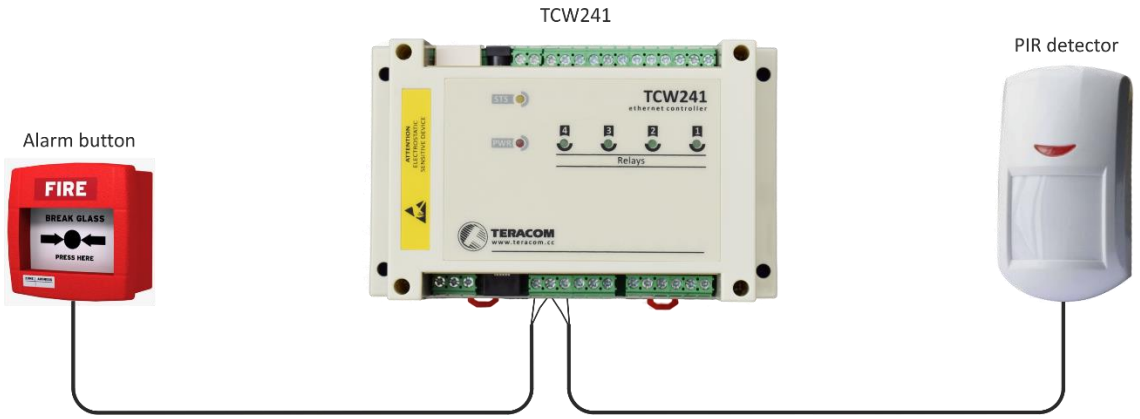
TCW241 must be powered by the adapter SYS1308(N)-2412-W2E or equivalent, suitable for overvoltage category II and certified for safety compliance. The power supply device should be able to withstand short circuits and secondary circuit overloads. Ensure the equipment is easily accessible for disconnecting from the power supply during use.

### 6.2.2. Digital inputs connection

Note that all inputs are not isolated from the power supply.

These inputs are designed for monitoring devices with "dry contact" outputs, such as door contact switches, push buttons, and PIR detectors.

The diagram below demonstrates how to connect a dry contact switch to the TCW241 input. One side of the contact is connected to the "Digital In" terminal, while the other side is connected to the "GND" terminal.




The maximum cable length should not exceed 30 meters.

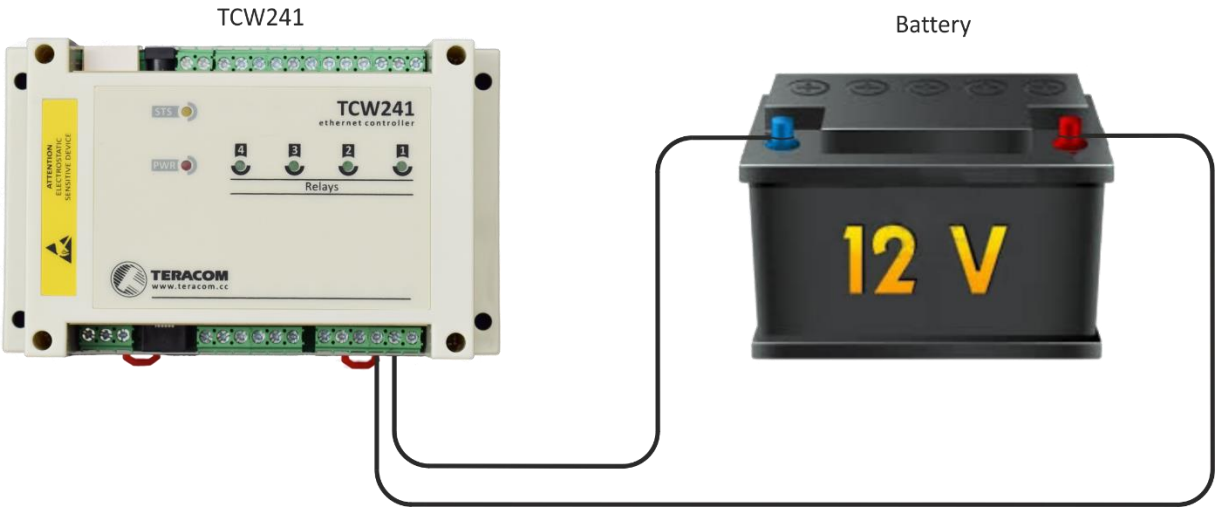
### 6.2.3. Analog inputs connection

Note that all inputs are not isolated from the power supply.

These inputs can monitor DC voltages up to 60VDC and can be connected directly to batteries, solar panels, power supplies, and similar devices.

Each analog input supports built-in functionality for "Multiplier", "Offset", and "Dimension", allowing users to monitor sensors with analog outputs and directly view the measured parameter. Additionally, higher voltages (over 60VDC) can be monitored using external resistive dividers.

The diagram below demonstrates how to connect a battery to the TCW241 analog input, with the positive terminal connected to "Analog In" and the negative terminal connected to "GND".




The maximum cable length should not exceed 30 meters.

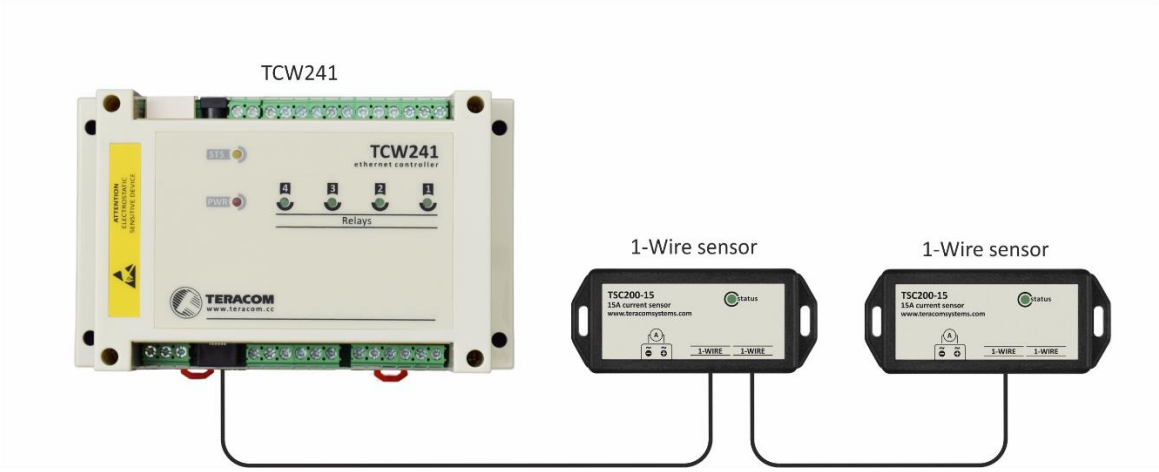
### 6.2.4. Sensor connection

The TCW241 supports the connection of up to eight 1-Wire sensors. Compatible sensors include those for temperature, temperature/humidity, CO2, DC current, AC current, 4/20mA signals, galvanically isolated analog voltage, barometric pressure, and more. Connected sensors are automatically detected, and the appropriate measurement units are assigned.

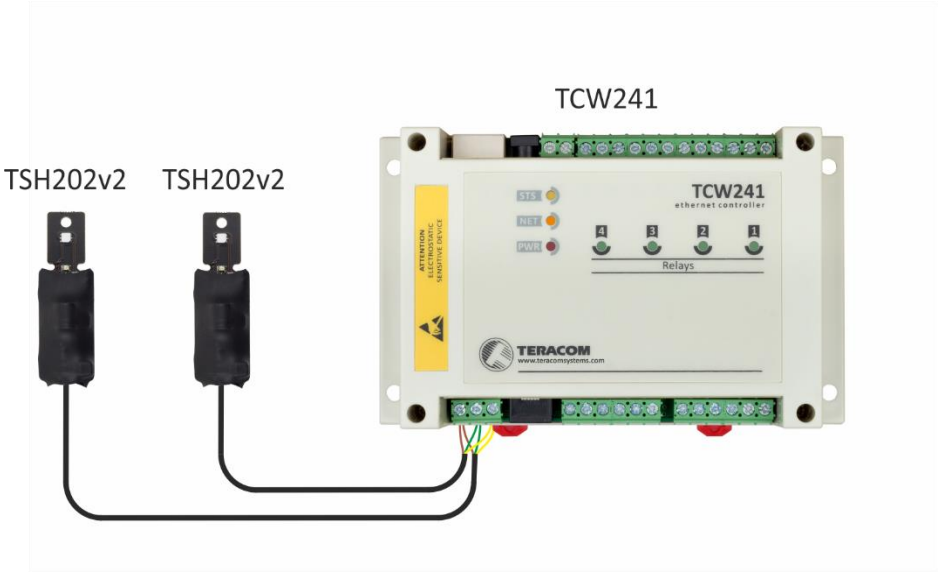
1-Wire, a registered trademark of Analog devices Inc., is designed for connecting multiple sensors over short wiring distances. It is not suitable for long distances or environments with significant electromagnetic interference (EMC). For best practices, refer to the Guidelines for Reliable Long-Line 1-Wire Networks.

The sensors typically have three wires: positive voltage (+VDD), ground (GND), and bidirectional data (Data). The specific wire colors for each sensor are provided in the sensor's user manual.

For reliable operation with multiple sensors, it is strongly recommended to use a "daisy-chained" (linear) topology:




A "star" topology should only be used as a last resort, supporting a maximum of 4 sensors and a total cable length of up to 10 meters:

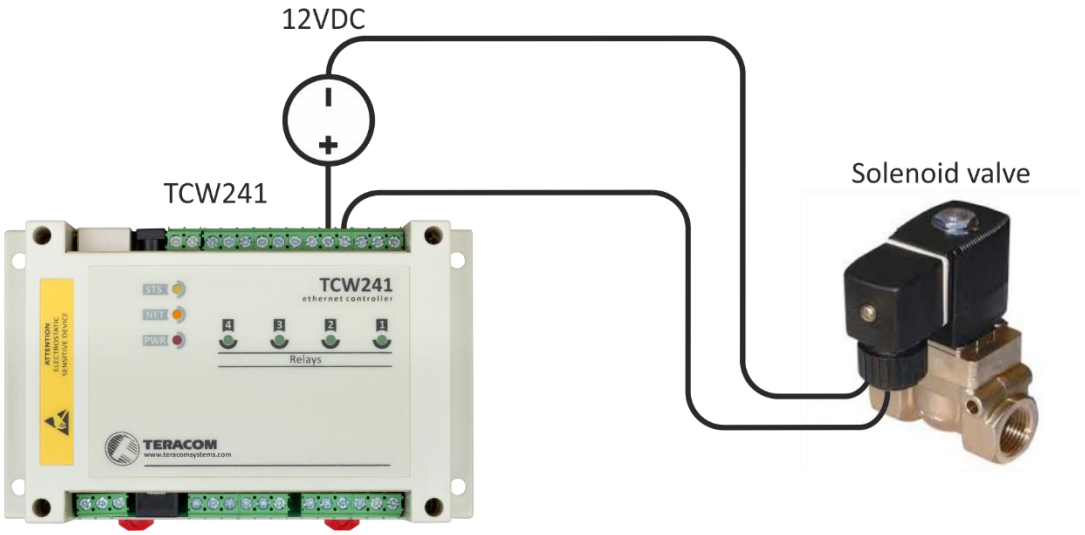



Connections can be made using either the screw terminal connector or a standard RJ-11 connector. Several factors influence the maximum wire length, including the type of cable, the number of sensors, ambient electromagnetic interference, and the sensor network topology.

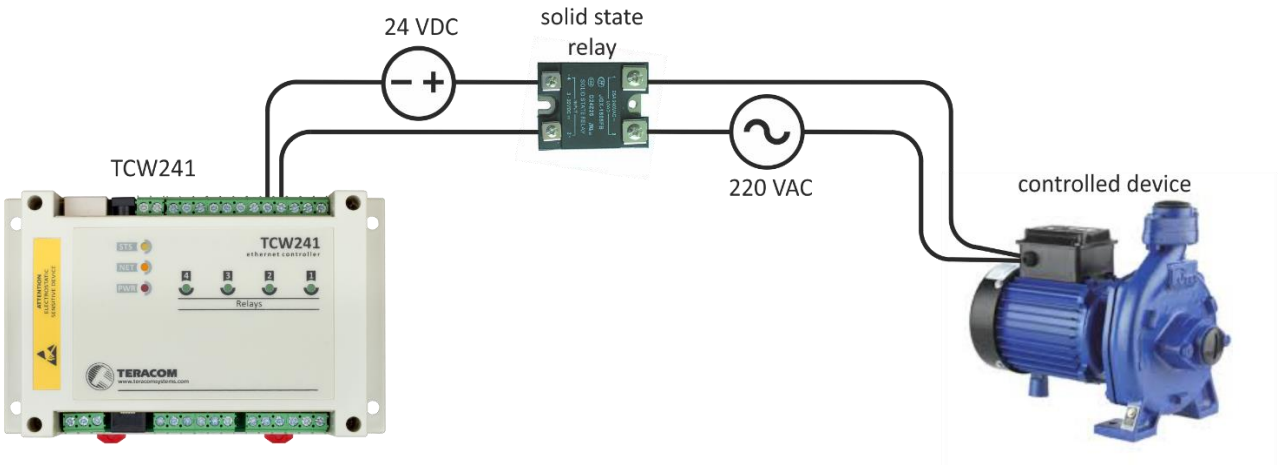
It is strongly recommended to use only UTP or FTP cables and to limit the total cable length to 30 meters. Although successful operation has been achieved with longer cables, error-free performance cannot be guaranteed beyond this length.
Guaranteed operation is only assured when using Teracom 1-Wire sensors.

### 6.2.5. Relay connection

The relay contacts are directly connected to the terminal connectors. Each relay provides normally open (NO), normally closed (NC), and common (COM) contacts for easy integration.



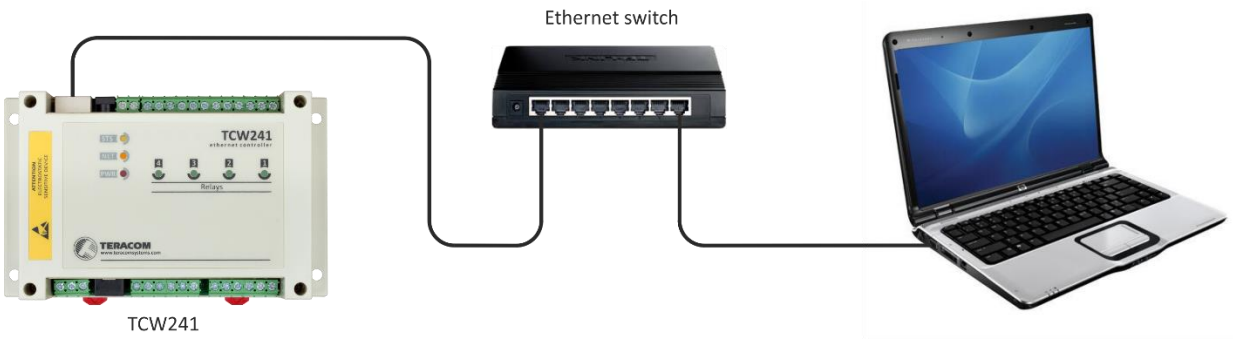

For loads that exceed the specified current or voltage limits, an external relay should be used.




When switching inductive loads, such as motors, transformers, or other relays, mechanical relays are subject to contact arcing each time the contacts open. This can lead to wear and reduced relay lifespan. To mitigate this, it is recommended to use relay contact protection devices when switching inductive loads.

### 6.2.6. Network connection

The Ethernet port of the TCW241 should be connected to a 10/100 Base-T Ethernet hub, switch, or router.



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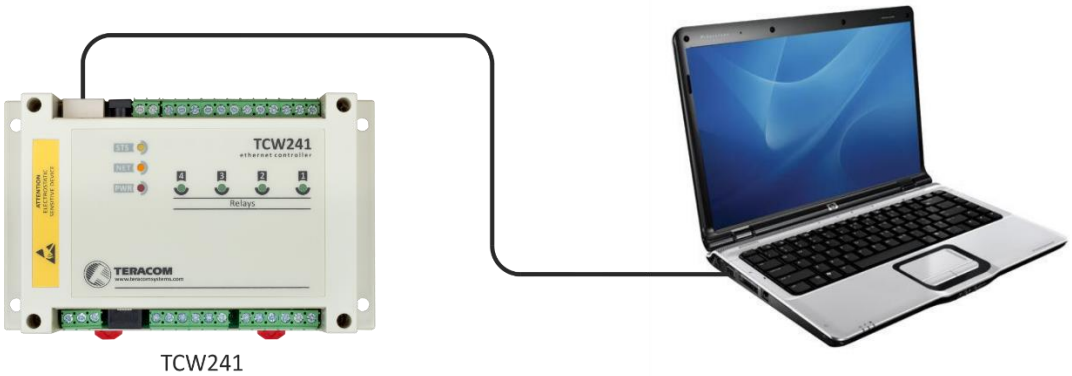
For configuration purposes, the TCW241 can be directly connected to the Ethernet port of a computer. The device supports Auto-MDIX, so either a standard "straight-through" cable or a "crossover" cable can be used.



TCW241

TCW241 can also be integrated into a wireless network by connecting it through a wireless router.

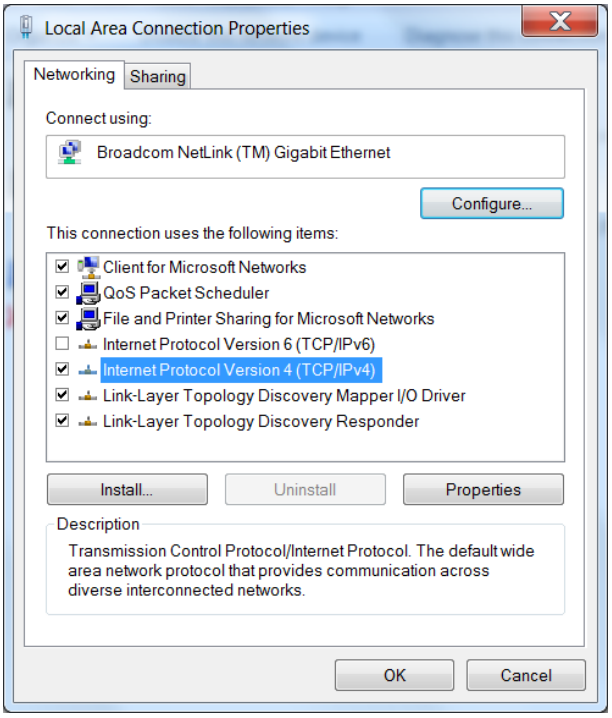
TCW241

## 6.3. Communication setup

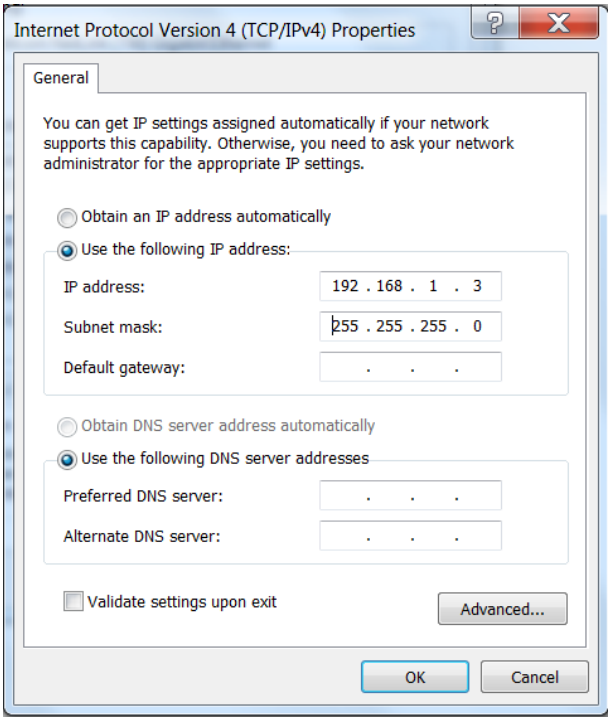
The TCW241 is shipped with the following default network settings:

- IP Address: 192.168.1.2
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.1.1

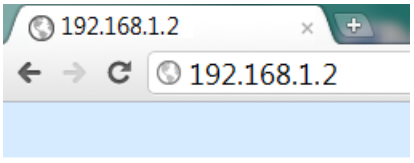
To establish communication with the TCW241, you can assign a temporary IP address to your computer. For computers running Windows OS, this can be done through the “Local Area Connection Properties”:



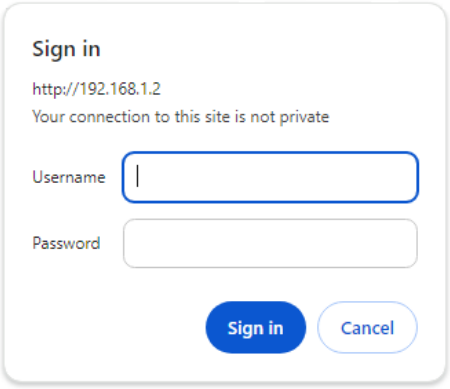

The temporary IP address should be on the same network; for example, you can use 192.168.1.3:




To access the web interface, enter http://192.168.1.2 into your browser's address bar.



If the network settings are configured correctly, a login pop-up window will appear:




The default authorization credentials are as follows: username: admin and password: admin.

It is highly recommended to change both the username and password to prevent unauthorized access.

All TCWxxx controllers connected to the LAN can be easily located using the free tool “TCW Discoverer.” This tool is available for both Windows and Mac operating systems and can be downloaded from www.teracomsystems.com.

# 7. Web interface

The web interface enables configuration, monitoring, and control of the TCW241. All pages are UTF-8 encoded. Please note that the device supports HTTP only; HTTPS is not available.

The controller supports multiple active sessions simultaneously.

## 7.1. Monitoring page

The Monitoring page displays the current status of the TCW241. It consists of four sections: “Sensors”, “Digital Inputs”, “Analog Inputs”, and “Relays.” Each section can be independently added or removed from the Monitoring page through the appropriate settings found in the “Setup-System-Display” section.

For every parameter (sensor, input, relay), a description of up to 15 characters is provided. Default descriptions can be modified in the “Setup-Input/Output” section.

The Monitoring page can be set to refresh automatically at intervals ranging from 0 to 253 seconds, where a value of zero indicates no automatic refresh. This interval can be configured in the “Setup-System-Monitoring Page Automatic Refresh” section. By default, the refresh interval is set to 1 second.

### 7.1.1. Sensors section

All detected 1-Wire sensors are displayed in this section. Detection can occur either upon powering on the device or by clicking the “Scan for New Sensors” button. The found sensors are listed in ascending order based on their unique ID numbers.

For each sensor, information is provided, including a description, value, and ID. The readings from Teracom 1-Wire sensors are shown in the Value 1 column. For dual sensors, such as the TSH2xx temperature/humidity sensors, the second parameter is displayed in the Value 2 column.

It is possible to lock sensors in a specific position. To do this, each sensor must be added individually. After adding a sensor, a new scan should be performed, and the newly detected sensor should be locked in its position. Once all sensors are locked, removing one from the middle will not affect the positions of the other sensors after a reset. This feature is particularly useful when the TCW241 is integrated into a monitoring and control system managed via SNMP or HTTP API commands.

For certain sensors, options for “Unit”, “Multiplier”, and “Offset” can be configured in the “Setup-Input/Output” section.

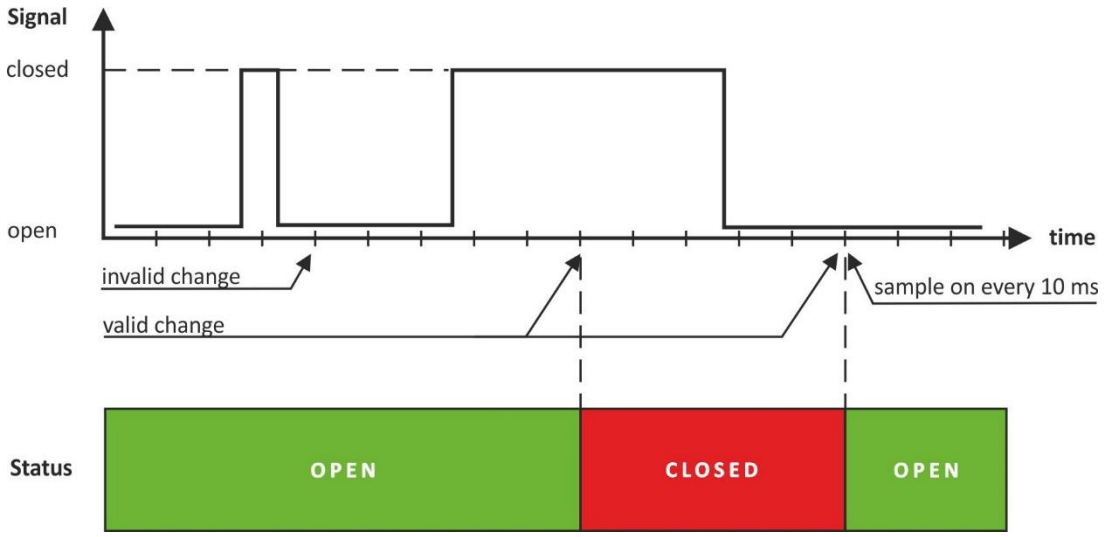
| Pos | Description | Value 1 | Value 2 | ID | Lock |
|---|---|---|---|---|---|
| 1 | S1:TST1xx | 23.188°C | ------ | [2867895F07000058] | ☐ |
| 2 | S2:TSH2xx | 24.375°C | 33.313%RH | [015225B71700FF45] | ☐ |
| 3 | S3 | ------ | ------ | [0000000000000000] | ☐ |
| 4 | S4 | ------ | ------ | [0000000000000000] | ☐ |
| 5 | S5 | ------ | ------ | [0000000000000000] | ☐ |
| 6 | S6 | ------ | ------ | [0000000000000000] | ☐ |
| 7 | S7 | ------ | ------ | [0000000000000000] | ☐ |
| 8 | S8 | ------ | ------ | [0000000000000000] | ☐ |

Scan for new sensors

### 7.1.2. Digital inputs section

Digital inputs can be utilized to monitor the status of discrete devices, such as motion sensors, door contacts, relay contacts, and alarm outputs. Please note that all digital inputs are not galvanically isolated.

Each contact is connected to the "Digital In" pin on one side and the "GND" pin on the other. Digital inputs are sampled every 10 milliseconds. An input status change is considered valid if the same value is recorded in three consecutive samples (30 milliseconds), provided that the low-to-high and high-to-low delays (configured in Setup -> Conditions) are set to zero.




The status of each input is indicated by both text and color, with red representing an alarm condition.

| Digital input | Status | Digital input | Status |
|---|---|---|---|
| Digital Input 1 | CLOSED | Digital Input 2 | OPEN |
| Digital Input 3 | OPEN | Digital Input 4 | OPEN |

Default descriptions can be modified on the “Setup -> Input/Output” page.

### 7.1.3. Analog inputs section

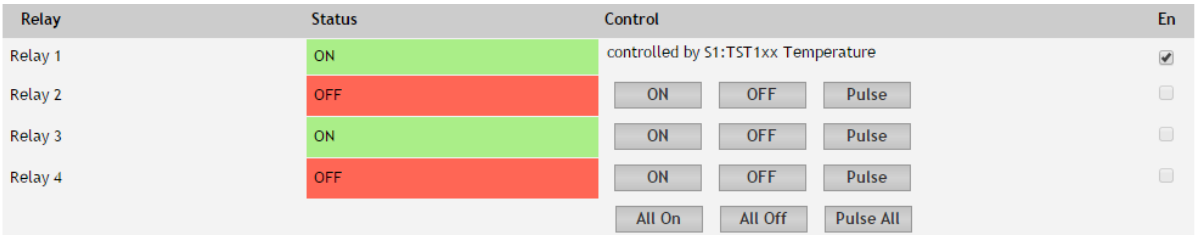
Analog inputs can be utilized to monitor analog outputs within a voltage range of 0 to 60 volts.

| Analog input | Value | Analog input | Value |
|---|---|---|---|
| Analog Input 1 | 5.043V | Analog Input 2 | 4.988V |
| Analog Input 3 | 12.051V | Analog Input 4 | 12.152V |

For each analog input, three variables can be configured in the “Setup -> Input/Output” section: “Unit”, “Multiplier”, and “Offset”.

### 7.1.4. Relay section

This section displays the current status of the relays and provides buttons to change their states.




Each relay can be activated remotely via the web interface, HTTP API, or SNMP, or locally based on the status of a monitored parameter (such as a 1-Wire sensor, analog voltage, or dry contact). Local control of the relay can be configured using either a single parameter or any "alarm" condition.

For web control, each relay features “On”, “Off”, and “Pulse” buttons. Additionally, there are “All On”, “All Off”, and “Pulse All” buttons for collective control of the relays. The pulse duration, in seconds, can be configured individually for each relay in the “Setup -> Input/Output -> Relay Outputs” section.

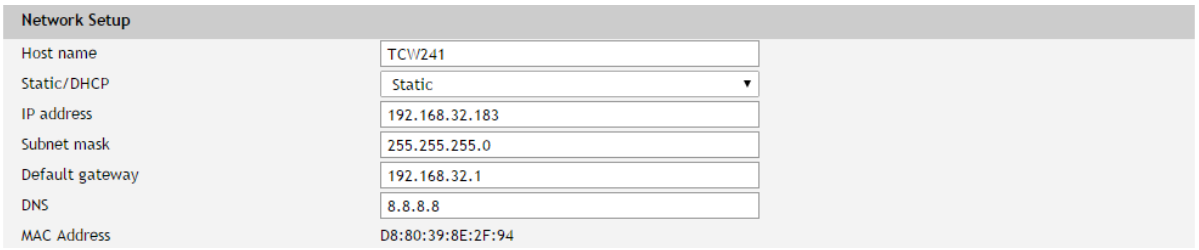
For relays activated locally, a text description of the controlling parameter is displayed instead of buttons. The parameters for local relay activation can be set in the “Setup -> Input/Output -> Relay Outputs” section. Relay control adheres to the conditions established in the “Setup -> Alarm Conditions” section.

Each locally activated relay features an "En" checkbox, which allows for the temporary disabling of automatic control. This enables manual adjustments via buttons, after which the system can return to automatic control. By default, this checkbox is turned off.

## 7.2. Setup page

### 7.2.1. Network

Network parameters are configured in this section.




The controller supports both static and dynamic IP addresses. It is advisable to change the default IP address of the controller immediately after the first power-on to prevent potential IP address conflicts when multiple devices are connected to the same network.

Each time a new device is connected to the network, it may be necessary to clear the ARP cache. This can be done by entering arp -d in the command prompt on the computer.

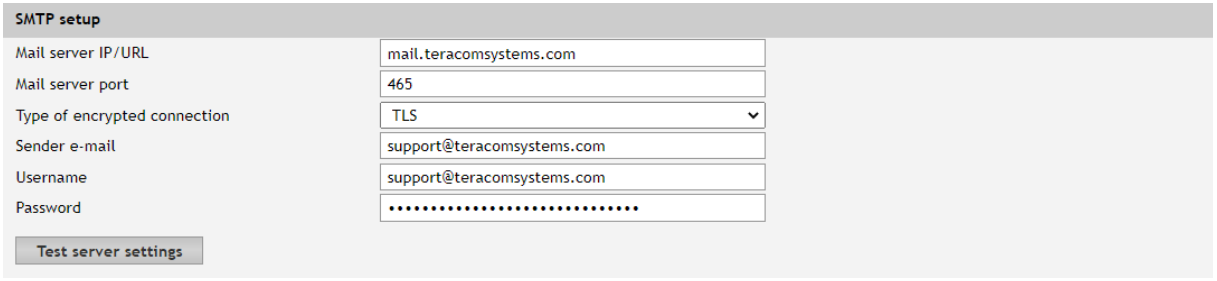
The “Hostname” can be up to 15 characters long and will appear in the search results of the TCW Discoverer tool.

Public DNS servers (such as 8.8.8.8 or 8.8.4.4) can be used instead of the default gateway.

### 7.2.2. SMTP

This page allows you to input the valid SMTP settings for email alerts and specify the recipients' addresses.

### 7.2.2.1. SMTP setup




The mail server address can be configured using either a hostname (e.g., mail.teracomsystems.com) or an IP address. By default, the SMTP port is set to 25 for non-encrypted connections. If the default port does not work, please consult your Internet Service Provider (ISP).

The sender's email, username, and password are standard authentication details, each allowing for up to 128 characters in length.

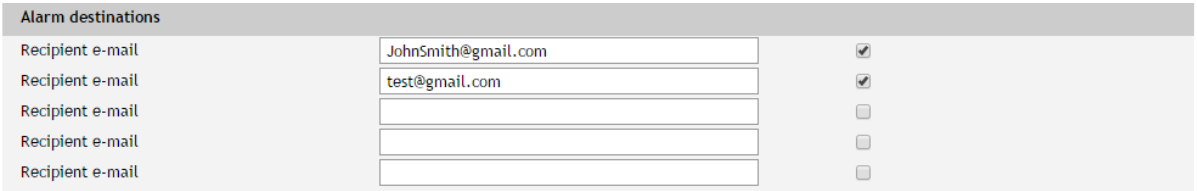
A button is available to test the server settings, providing feedback on the results. In this test, the sender and recipient email addresses are the same.

For secure communication with mail servers, the Transport Layer Security (TLS) protocol is employed. The TCW241 supports TLS versions 1.0, 1.1, and 1.2, using RSA for key exchange, agreement, and authentication. This ensures compatibility with nearly all public servers.

Please note that STARTTLS is not supported.

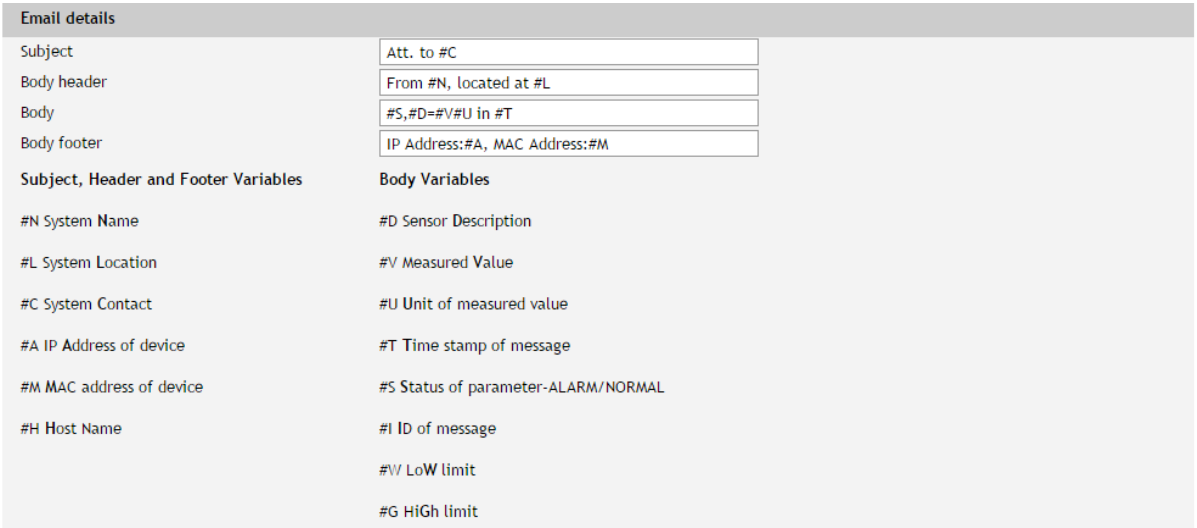
### 7.2.2.2. Alarm destination

You can configure up to five email recipients, each of whom can be activated independently using a checkbox.




### 7.2.2.3. E-mail details

The subject, body header, body, and footer of the email can be customized using a predefined set of keys. All available keys are described on the page.



## 7.2.3. Input/Output

### 7.2.3.1. 1-Wire sensors

A description of up to 15 characters can be assigned to each 1-Wire sensor.

The "Offset" field is available for all sensors, enabling simple adjustments to the displayed value. Furthermore, for specific sensors (such as TSA200, TSV200, etc.), the "Unit" and "Multiplier" fields are also accessible.

**Sensors**

| Sensor # | Description | Unit | Multiplier | Offset |
|---|---|---|---|---|
| S1 | S1:TST1xx | °C | 1.000000 | 0.000000 |
| | | --- | | |
| S2 | S2:TSH2xx | °C | 1.000000 | 0.000000 |
| | | %RH | 1.000000 | 0.000000 |
| S3 | S3 | --- | | |
| | | --- | | |
| S4 | S4 | --- | | |
| | | --- | | |
| S5 | S5 | --- | | |
| | | --- | | |
| S6 | S6 | --- | | |
| | | --- | | |
| S7 | S7 | --- | | |
| | | --- | | |
| S8 | S8 | --- | | |
| | | --- | | |

### 7.2.3.2. Digital inputs

Each digital input can be assigned a description of up to 15 characters. The text entered in the "Low Level" and "High Level" fields will be displayed on the monitoring page for that input, with each field also allowing up to 15 characters.

**Digital inputs**

| Input # | Description | Low level | High level |
|---|---|---|---|
| DI1 | Digital Input 1 | CLOSED | OPEN |
| DI2 | Digital Input 2 | CLOSED | OPEN |
| DI3 | Digital Input 3 | CLOSED | OPEN |
| DI4 | Digital Input 4 | CLOSED | OPEN |

### 7.2.3.3. Analog inputs

Each analog input can have a description of up to 15 characters assigned to it.

**Analog inputs**

| Input # | Description | Unit | Multiplier | Offset |
|---|---|---|---|---|
| AI1 | Server room | %RH | 31.740 | 0.8260 |
| AI2 | Analog Input 2 | V | 1.000 | 0.0000 |
| AI3 | Analog Input 3 | V | 1.000 | 0.0000 |
| AI4 | Analog Input 4 | V | 1.000 | 0.0000 |

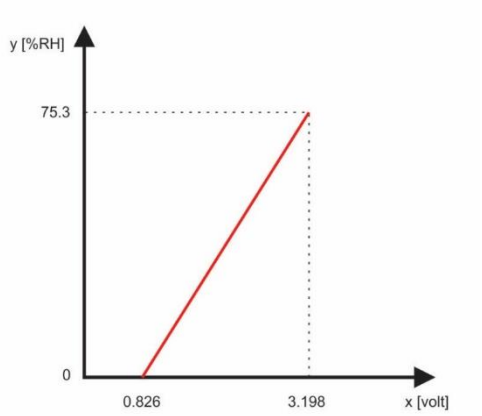
For every analog input, the "Unit", "Multiplier", and "Offset" fields are available to convert the raw voltage or current into meaningful engineering units. The scaled value is calculated using the following formula:

SV[Un] = (RV - OF) * MU
Where:
SV – scaled (displayed) value;
Un – unit;
RV – raw voltage from the source;
MU – multiplier;
OF – offset.

Example:

For the humidity sensor HIH-4000-003, the following data is available from the datasheet:

VOUT = 0.826 at 0% RH
VOUT = 3.198 at 75.3% RH




The sensor outputs raw voltage values, but our goal is to convert these into corresponding relative humidity (RH) values. To achieve this, we use a multiplier and an offset. These parameters enable us to calculate the relative humidity for any voltage within the sensor's operational range.

Calculation of the multiplier (MU)

The multiplier (MU) is determined by the ratio of the change in relative humidity (ΔRH%) to the change in voltage (ΔV). Geometrically, this resembles finding the slope of a line. For this sensor, the line is represented by the equation ΔRH%/ΔV. We can calculate the multiplier as follows:

MU = (75.3 - 0) / (3.198 - 0.826) = 75.3 / 2.372 = 31.745 %RH/V

Calculation of the offset (OF)

The offset (OF) is calculated using the multiplier and one of the known points. By substituting the scaled value (SV) and the corresponding raw value (RV) into the equation SV = (RV - OF) * MU, we can solve for the offset:

OF = RV - SV/MU

Using the point where SV = 0 and RV = 0.826, we find:

OF = 0.826 - (0 / 31.745) = 0.826 - 0 = 0.826

We can also calculate the offset using the other known point, where SV = 75.3 and RV = 3.198:

OF = 3.198 - (75.3 / 31.745) = 3.198 - 2.372 = 0.826

Final formula

Thus, the formula for this sensor become:

SV = (RV – 0.826) * 31.745

Verification

To verify the accuracy of this formula, let's check the case where VOUT = 0.826 V (0%RH):

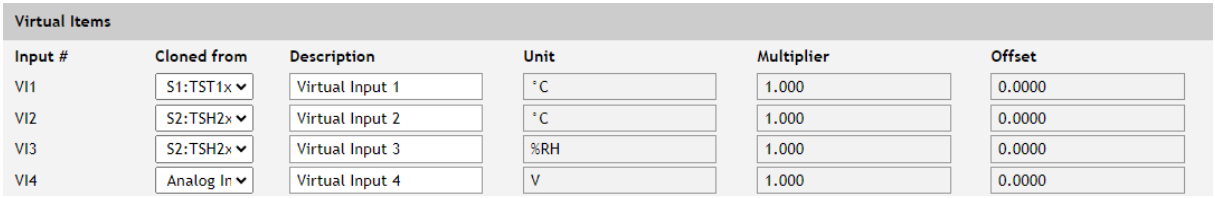
SV = (0.826 – 0.826) * 31.745 = 0 *31.745 = 0 %RH

This confirms that the formula accurately converts voltage readings to their corresponding relative humidity values.

By default, and following the “Factory Default Settings” procedure, the settings are as follows:

Unit - V
Offset - 0.00
Multiplier - 1.00

### 7.2.3.4. Virtual items



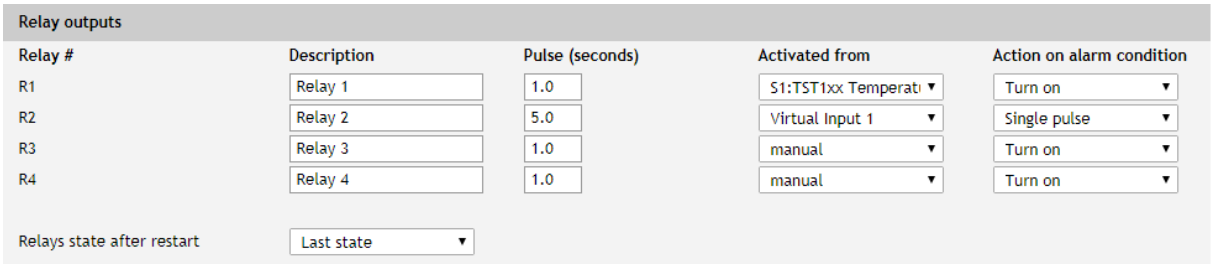

A virtual item is a useful feature that allows you to clone a monitored parameter, such as an analog input or a 1-Wire sensor. You can set different alarm thresholds for the virtual item compared to the original, enabling you to establish multiple alarm notifications for the same parameter.

The values for Unit, Multiplier, and Offset are displayed for informational purposes only. They are inherited from the original parameter and cannot be modified.

Virtual items can be utilized for alarm notifications, incorporated into functions, and used for local relay activation.

### 7.2.3.5. Relay outputs

For every relay, a description up to 15 characters can be set.




You can configure a different pulse duration for each relay, with a resolution of 0.1 seconds. Relays can be activated either remotely or locally, based on the value of a monitored parameter. By default, all relays are activated remotely, indicated by the "Activated from" field showing "manual."

For local activation, alarm conditions from various sources are utilized and can be set up in the “Setup-Alarm Conditions” section. You can assign parameters to relays with the following options:

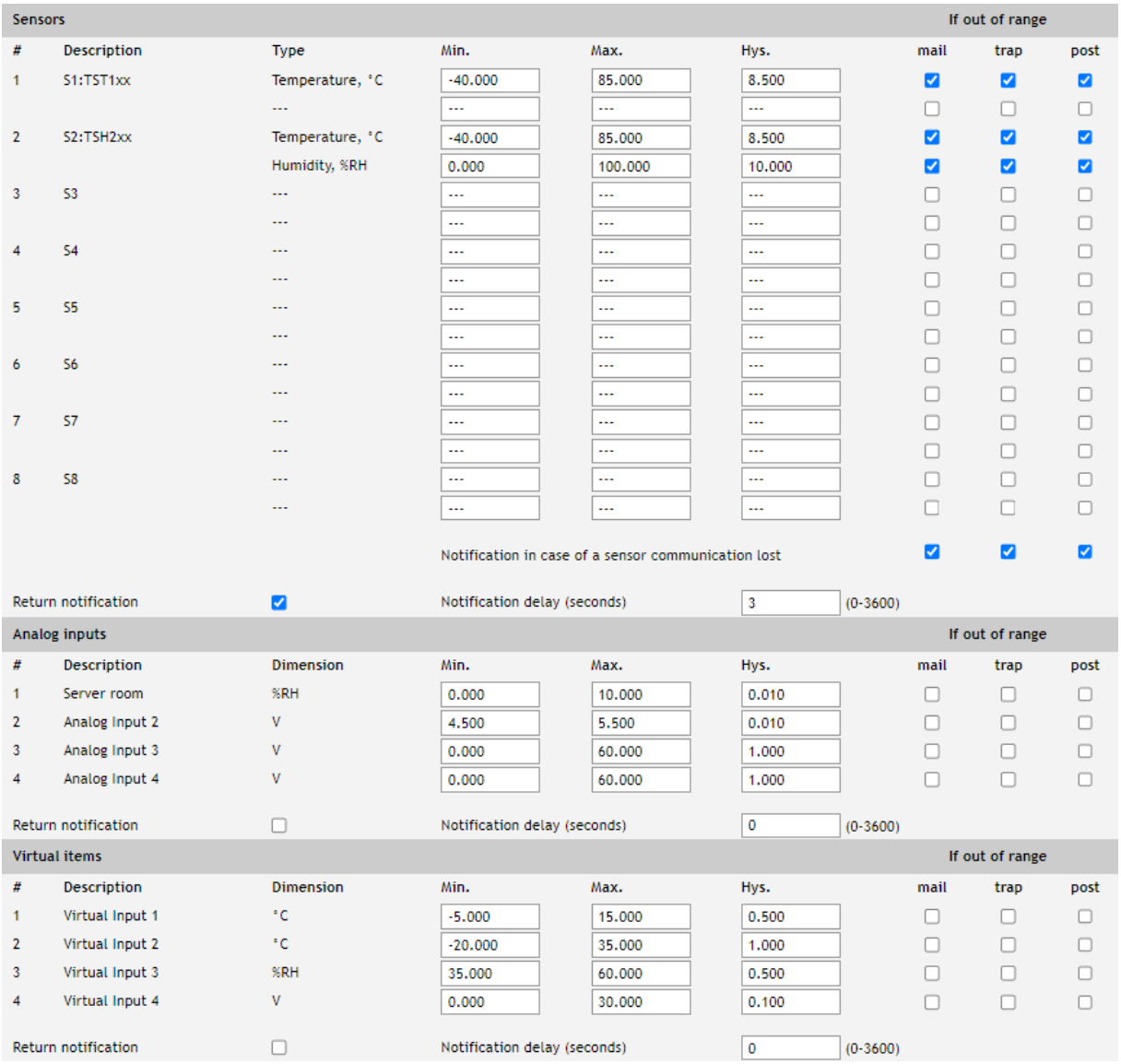
- Sxy – “S” represents a “1-Wire Sensor”, “x” is a number from 1 to 8, and “y” is a number from 1 to 2. The relay activates based on the value measured from the specified 1-Wire sensor, following the rules defined in “Setup->Alarm Conditions”;
- “Analog input z” - The relay activates from the value measured by the specified analog input, with rules based on the ranges defined in “Setup->Alarm Conditions”. Here, “z” is a number from 1 to 4;
- “Virtual input z” - The relay activates from the value of the specified virtual item (a cloned analog input or 1-Wire sensor), governed by the rules established in “Setup->Alarm Conditions”. Again, “z” is a number from 1 to 4;
- “Digital input z” - The relay follows the state of the specified digital input, where “z” is a number from 1 to 4;
- Any alarm - The relay activates based on any of the defined alarm conditions.

## 7.2.4. Conditions

This section is dedicated to configuring the trigger and alert conditions for 1-Wire sensors, analog inputs, virtual items, and digital inputs.

### 7.2.4.1. 1-Wire sensors, analog inputs and virtual items

For each sensor, there are two types of fields: one for setting trigger conditions (“Min”, “Max”, and “Hys.”) and another for alert notifications (“If out of range”).



| Sensors | | | | | | If out of range | | |
|---|---|---|---|---|---|---|---|---|
| # | Description | Type | Min. | Max. | Hys. | mail | trap | post |
| 1 | S1:TST1xx | Temperature, °C | -40.000 | 85.000 | 8.500 | ☑ | ☑ | ☑ |
| | | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| 2 | S2:TSH2xx | Temperature, °C | -40.000 | 85.000 | 8.500 | ☑ | ☑ | ☑ |
| | | Humidity, %RH | 0.000 | 100.000 | 10.000 | ☑ | ☑ | ☑ |
| 3 | S3 | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| | | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| 4 | S4 | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| | | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| 5 | S5 | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| | | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| 6 | S6 | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| | | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| 7 | S7 | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| | | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| 8 | S8 | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| | | --- | --- | --- | --- | ☐ | ☐ | ☐ |
| | | | Notification in case of a sensor communication lost | | | ☑ | ☑ | ☑ |
| Return notification | ☑ | | Notification delay (seconds) | | 3 (0-3600) | | | |

| Analog inputs | | | | | | If out of range | | |
|---|---|---|---|---|---|---|---|---|
| # | Description | Dimension | Min. | Max. | Hys. | mail | trap | post |
| 1 | Server room | %RH | 0.000 | 10.000 | 0.010 | ☐ | ☐ | ☐ |
| 2 | Analog Input 2 | V | 4.500 | 5.500 | 0.010 | ☐ | ☐ | ☐ |
| 3 | Analog Input 3 | V | 0.000 | 60.000 | 1.000 | ☐ | ☐ | ☐ |
| 4 | Analog Input 4 | V | 0.000 | 60.000 | 1.000 | ☐ | ☐ | ☐ |
| Return notification | ☐ | | Notification delay (seconds) | | 0 (0-3600) | | | |

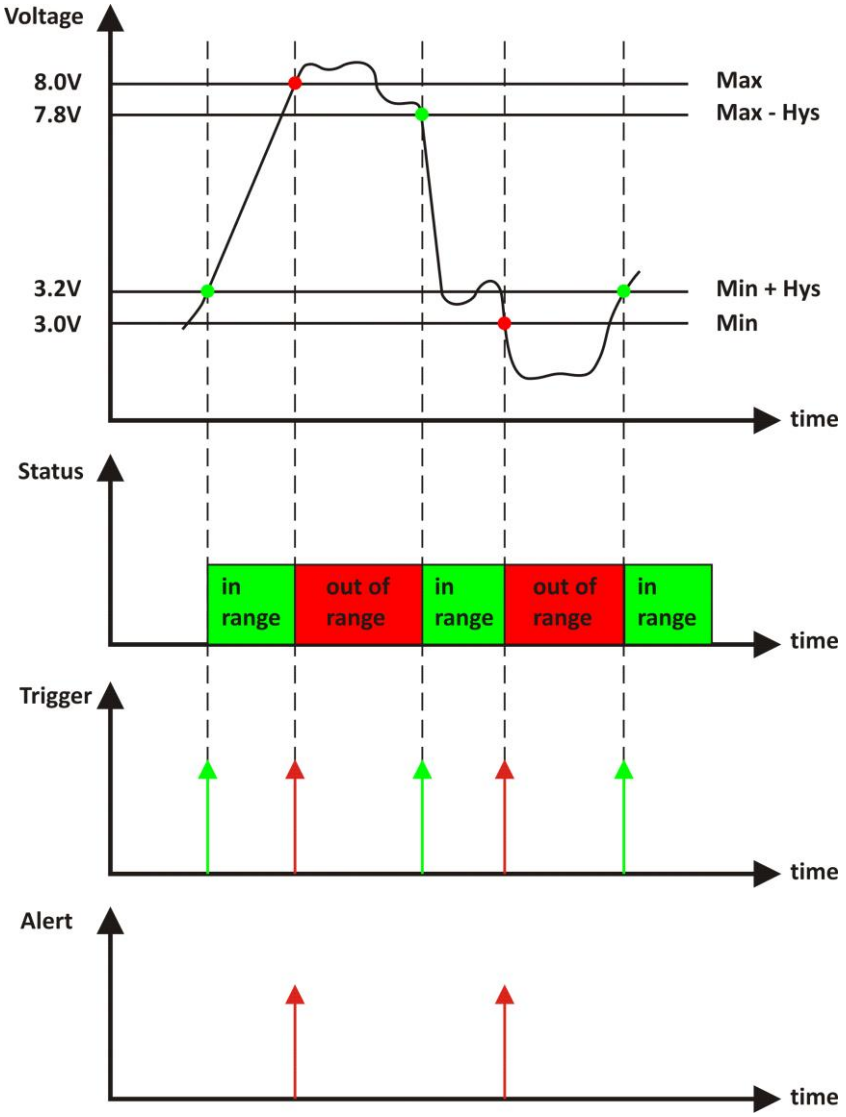
| Virtual items | | | | | | If out of range | | |
|---|---|---|---|---|---|---|---|---|
| # | Description | Dimension | Min. | Max. | Hys. | mail | trap | post |
| 1 | Virtual Input 1 | °C | -5.000 | 15.000 | 0.500 | ☐ | ☐ | ☐ |
| 2 | Virtual Input 2 | °C | -20.000 | 35.000 | 1.000 | ☐ | ☐ | ☐ |
| 3 | Virtual Input 3 | %RH | 35.000 | 60.000 | 0.500 | ☐ | ☐ | ☐ |
| 4 | Virtual Input 4 | V | 0.000 | 30.000 | 0.100 | ☐ | ☐ | ☐ |
| Return notification | ☐ | | Notification delay (seconds) | | 0 (0-3600) | | | |

“Min” and “Max” define the operational range for the monitored parameter.

A “Max” trigger condition is activated when the value exceeds the specified upper limit.

A “Min” trigger condition is activated when the value falls below the specified lower limit. In both instances, the monitored parameter is considered out of range.

Returning to the operational range is recognized when the value exceeds (Min + Hys) or falls below (Max – Hys). The hysteresis (“Hys”) is implemented to minimize unnecessary triggering caused by fluctuations around the trigger points.




Example:

In this scenario, a TCW241 controller, a TST100 sensor, and an appropriate heater are used to manage room temperature. The desired minimum temperature is set at 19°C, while the initial temperature is 17°C. The TST100 sensor is assigned as the first 1-Wire sensor.

Local activation for Relay1 is configured based on Sensor1 with the following parameters:

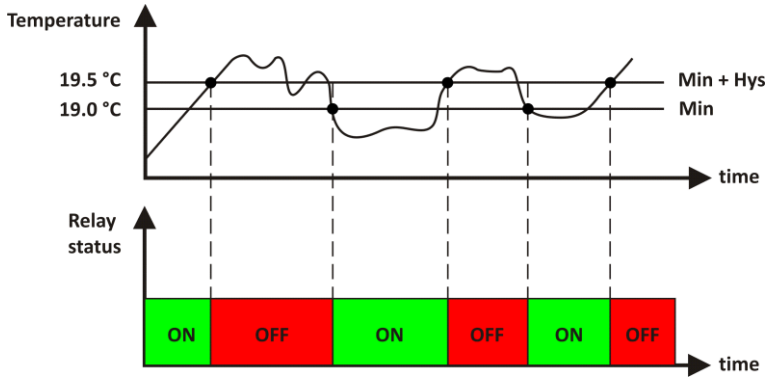
Min = 19, Max = 85, and Hys = 0.5.

| Sensors | | | | | | If out of range | | |
|---|---|---|---|---|---|---|---|---|
| # | Description | Type | Min. | Max. | Hys. | mail | trap | post |
| 1 | S1:TST1xx | Temperature, °C | 19.000 | 85.000 | 0.500 | ☑ | ☑ | ☑ |

When the controller is powered on, Relay1 is immediately activated because the monitored temperature is below the acceptable range. This action turns on the heater, causing the temperature to rise.

As the temperature increases and reaches 19.5°C (19.0 + 0.5), it falls within the defined range (trigger condition), and Relay1 is deactivated, turning the heater off.

However, as the temperature begins to drop and reaches 19°C, it goes out of range (trigger and alert conditions), which reactivates the relay, turning the heater back on. Additionally, an email notification is sent to alert about the temperature change.



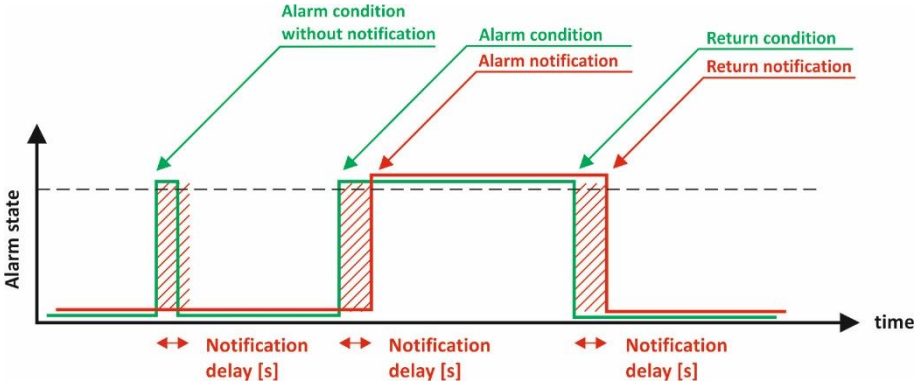

The “Max” value should be set sufficiently high above the desired temperature to prevent unnecessary trigger and alert conditions.

Each sensor or analog input has three independent alert methods available when an alarm condition occurs: email notifications, SNMP traps, and HTTP/HTTPS POSTs (XML file). Each method can be activated via a checkbox.

The “Max” value should be set sufficiently high above the desired temperature to prevent unnecessary trigger and alert conditions. Each sensor or analog input has three independent alert methods available when an alarm condition occurs: email notifications, SNMP traps, and HTTP/HTTPS POSTs (XML file). Each method can be activated via a checkbox.

There is a global checkbox labeled “Return notification” for all sensors and analog inputs. When selected, notifications will also be sent when a parameter returns to within the defined range.

Additionally, a “Notification delay” parameter is available globally for all sensors and analog inputs. This feature acts as a filter for short alarm conditions, helping to reduce false alerts.




### 7.2.4.2. Digital inputs

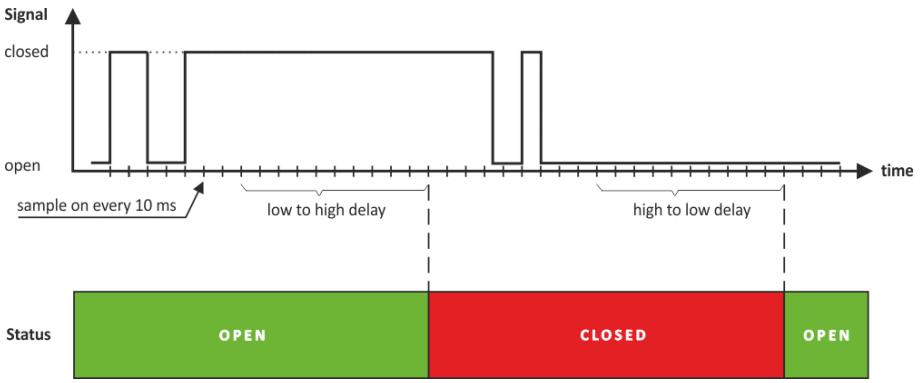
For each digital input, you need to select the alarm state—either Open or Closed. When the input transitions to an alarm state, three independent alert methods can be activated: email notifications, SNMP traps, and HTTP/HTTPS POSTs (XML file).

There is a global checkbox labeled “Return notification” for all digital inputs. When selected, notifications will also be sent when the parameter returns to its normal state. Additionally, a “Notification delay” parameter is available globally for all digital inputs, which serves as a filter for short alarm conditions.

| Digital inputs | | | | | | On active alarm | | |
|---|---|---|---|---|---|---|---|---|
| # | Description | Current state | Select alarm state | Low to high delay | High to low delay | mail | trap | post |
| 1 | Digital input 1 | OPEN | CLOSED | 0.0 (0-3600) | 0.0 (0-3600) | ☑ | ☑ | ☑ |
| 2 | Digital input 2 | OPEN | CLOSED | 0.3 (0-3600) | 0.4 (0-3600) | ☑ | ☑ | ☑ |
| 3 | Digital input 3 | OPEN | CLOSED | 0.3 (0-3600) | 0.4 (0-3600) | ☑ | ☑ | ☑ |
| 4 | Digital input 4 | OPEN | OPEN | 0.3 (0-3600) | 0.4 (0-3600) | ☑ | ☑ | ☑ |
| Return notification | | ☑ | Notification delay (seconds) | | 1 (0-3600) | | | |

When an input is in an alarm state, the corresponding input on the Monitoring page will be highlighted in red.

There are two delay settings for changes in digital inputs: low-to-high and high-to-low. These delays are added to the standard delay of 30 milliseconds, with a resolution of 100 milliseconds and a default setting of zero. These options can be used to provide additional debouncing.



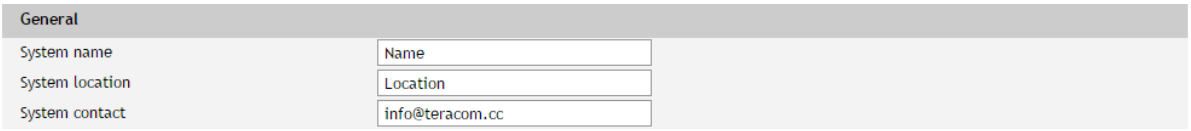

In the example shown above, both the low-to-high and high-to-low delays are set to 0.1 seconds.

## 7.2.5. System

This page allows you to configure various general settings for the system.

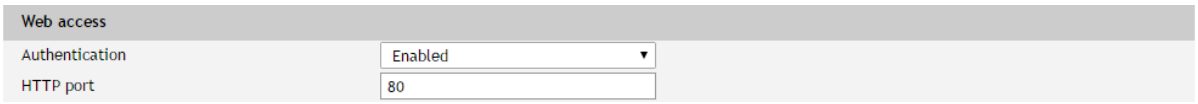
### 7.2.5.1. General

This section allows you to configure general parameters for device identification.




### 7.2.5.2. WEB access

This section allows you to deactivate WEB access authentication, which is enabled by default with the credentials of admin/admin. You can also change the HTTP port for WEB access, which can be useful for certain routers that do not support separate outside/inside ports for port forwarding. The default HTTP port is set to 80.




### 7.2.5.3. HTTP API

This section allows you to activate or deactivate HTTP API access authentication, which is enabled by default.


The authentication details are the same as for WEB access. The controller supports two types of authentications; refer to the explanation for HTTP API below for more information.

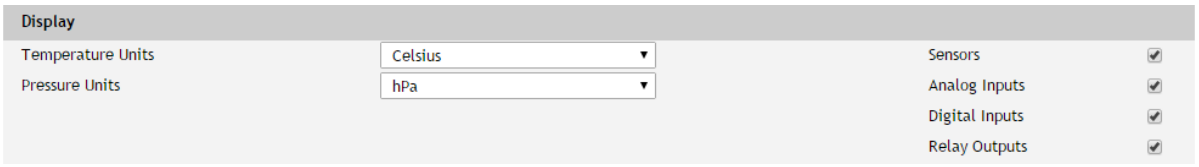
### 7.2.5.4. Monitoring page automatic refresh

The refresh interval for the monitoring page can be configured to range from 0 to 253 seconds. A setting of zero indicates that automatic refresh is disabled.

#### 7.2.5.5. Display

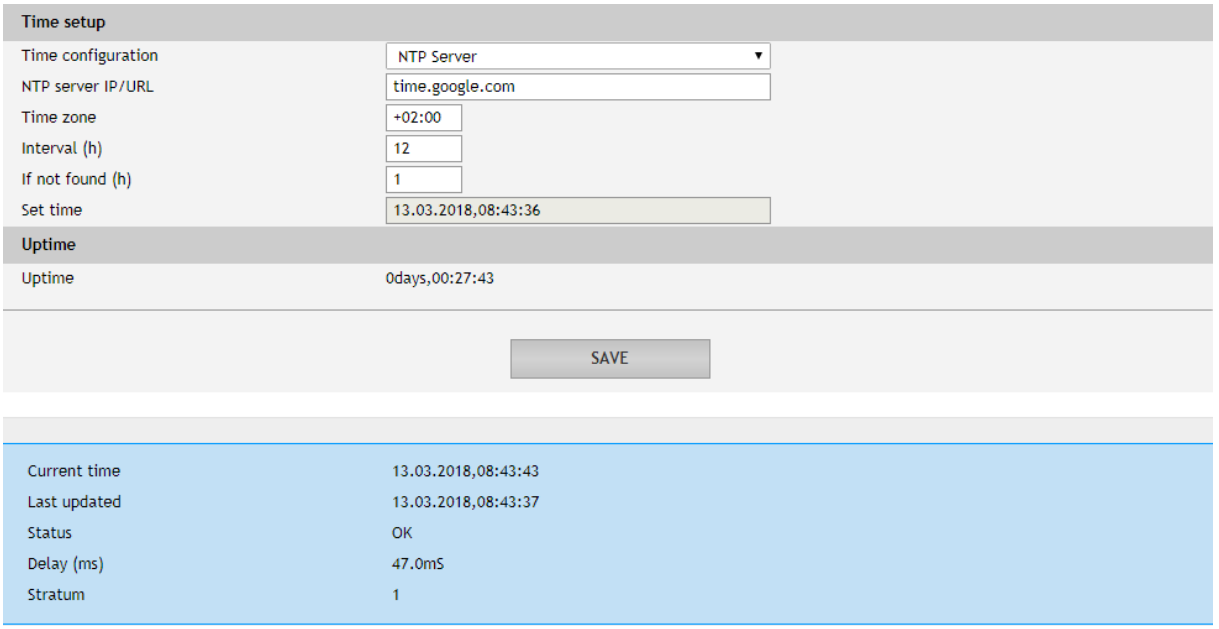
In this section, you can select the working units for temperature (Celsius or Fahrenheit) and pressure (hPa, mbar or mmhg).

Each section of the Monitoring Page has a checkbox; when checked, the corresponding section will be displayed.




### 7.2.6. NTP

The internal real-time clock (RTC) of the controller can be configured either manually or automatically.




For automatic clock synchronization, the controller supports NTP (Network Time Protocol), and all necessary parameters for this synchronization are available in this section.

By default, NTP synchronization is disabled, with the server set to time.google.com, a time zone of +00:00, and an interval of 12 hours.

## 7.3. Services

### 7.3.1. Modbus TCP/IP

TCW241 supports Modbus TCP/IP via the Ethernet interface.

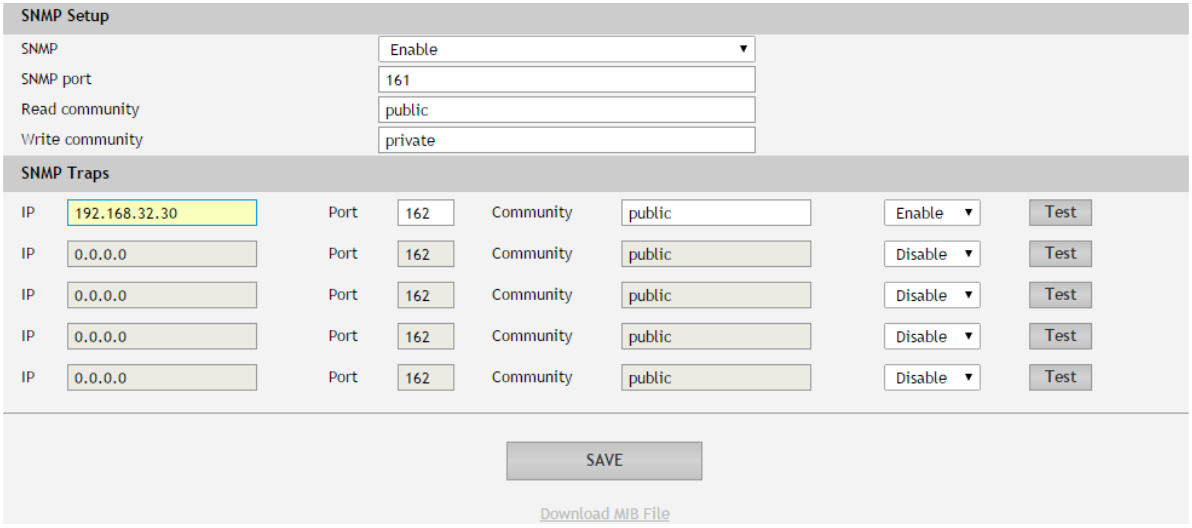

By default, Modbus functionality is disabled. The standard port for this protocol is 502.

A table containing the register addresses can be found in section 8.3, titled "Modbus TCP/IP".

### 7.3.2. SNMP

The TCW241 supports SNMP V2, allowing the device to integrate into monitoring and control systems using the SNMP protocol.

This section allows you to configure all necessary parameters for the proper operation of SNMP.




By default, SNMP is disabled, with the port set to 161. The read community is set to "public", and the write community is set to "private." In the event of an alarm condition, SNMP traps can be sent to up to five independent recipients, each capable of having different ports and communities. A dedicated button is available for testing the SNMP trap functionality.

SNMP traps can be triggered under the following conditions:

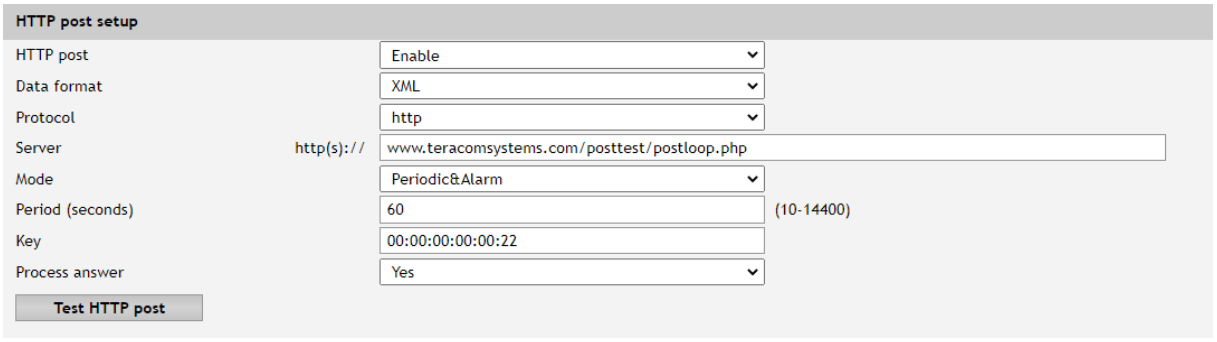
- An event occurs (status change) on Digital Inputs.
- A measured parameter on Analog Inputs falls outside the specified range.
- A measured parameter on the 1-Wire bus exceeds the defined limits.
- A restart condition is initiated.

An SNMP trap will be sent following a reset.

The current MIB file can be downloaded from here.

### 7.3.3. HTTP POST

TCW241 can periodically upload a file to a designated server using HTTP or HTTPS POST. The HTTPS connection utilizes TLS 1.0, TLS 1.1, and TLS 1.2 for secure key exchange and authentication via RSA. The posting interval can be set between 10 seconds and 14,400 seconds, and the supported file formats include XML and JSON.



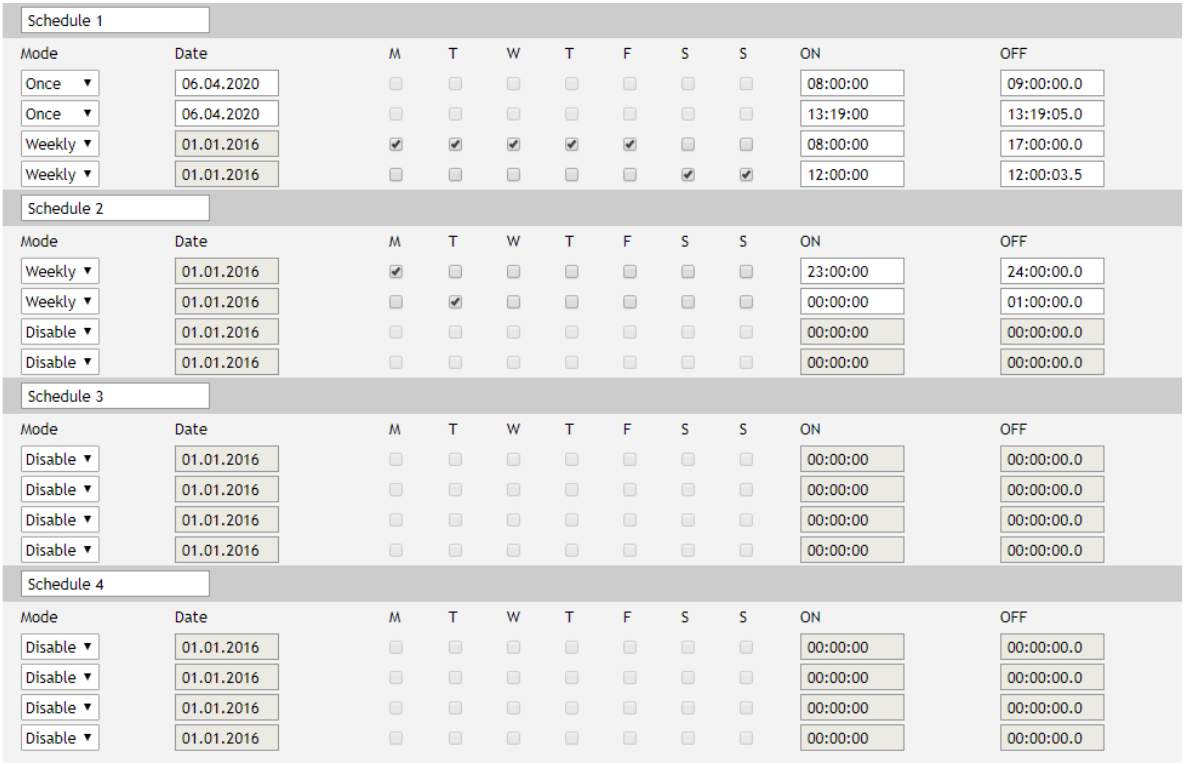

By default, the mode is set to "Periodic & Alarm." This allows for both periodic uploads and additional uploads during any alarm condition. If the "Periodic Only" mode is selected, only regular uploads will occur without any alarm-triggered POSTs. Conversely, if "Alarm Only" is chosen, only POSTs related to alarms will be executed, excluding periodic uploads.

The value in the "Key" field is included in the XML/JSON payload and can be utilized for device identification. If the "Process Answer" option is enabled, the TCW241 will handle responses from the remote server, with a list of valid commands available in the section on "HTTP API commands".

### 7.3.4. Schedule

The TCW241 supports four distinct schedules, each capable of accommodating up to four different tasks.

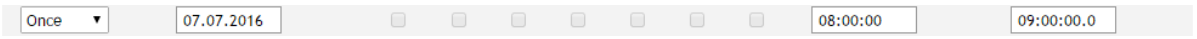
These schedules are particularly useful for tasks that need to vary based on calendar dates. For instance, it is possible to combine two relays to control a single device—one relay can track a monitored parameter, while the other follows the predefined schedule, allowing for more complex control arrangements.




There are two types of schedules based on repetition and duration: single tasks and weekly tasks.

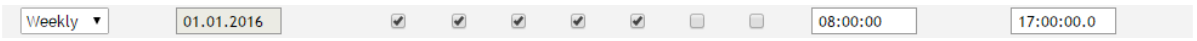
Examples:

- Single task for a time period:




With this configuration, an event will occur on April 6, 2020, starting at 08:00 and ending at 09:00. The resolution for the “OFF time” is set to 0.1 seconds, enabling support for very brief pulses.

- Weekly task for a time period:



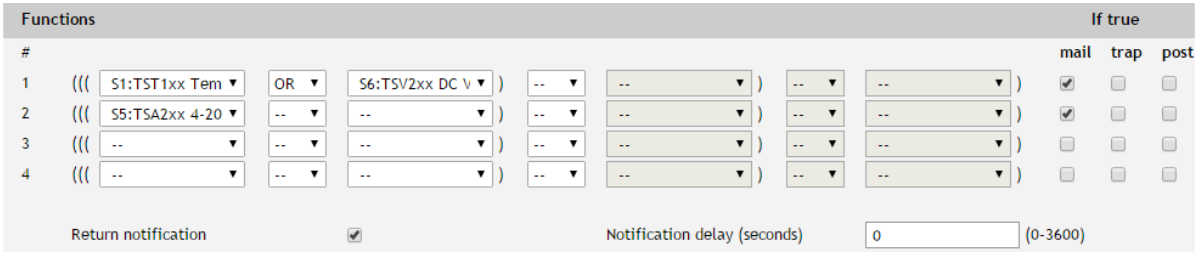

In this setup, an event will take place every weekday, starting at 08:00 and concluding at 17:00.

- Weekly task for a time period that includes the midnight:


With this configuration, an event will be triggered for two hours between Monday at 23:00 and Tuesday at 01:00.

### 7.3.5. Functions

This section allows for the configuration of four independent functions. Each function can combine up to four monitored parameters using logically operators “AND” and “OR”. The use of brackets helps define the order of execution.




These functions are accessible via a drop-down menu for local relay activation.

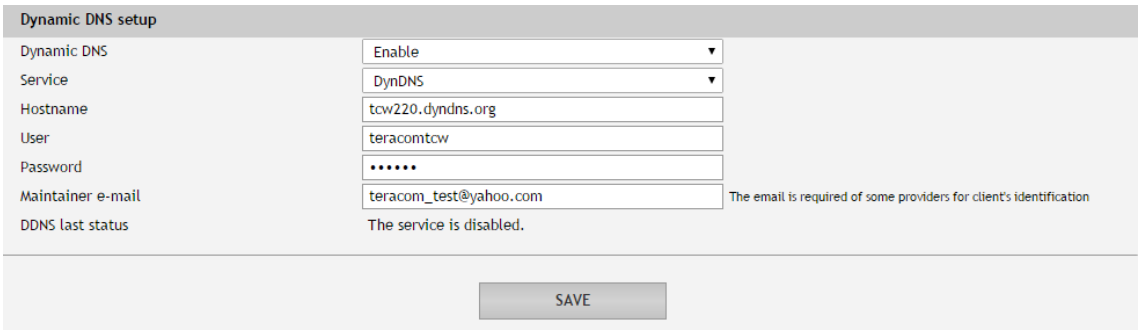
In addition to relay activation, these functions can also be utilized for sending notifications.

For all functions, there are two global parameters: “Notification delay” and “Return notification”.

### 7.3.6. Dynamic DNS

With dynamic DNS, the TCW241 can be accessed from the public Internet without the need for a broadband account with a static IP address.

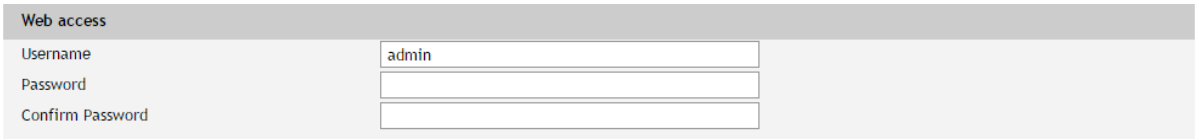
The TCW241 supports the following DNS services: DynDNS, No-IP, and DNS-O-Matic.




## 7.4. Administration

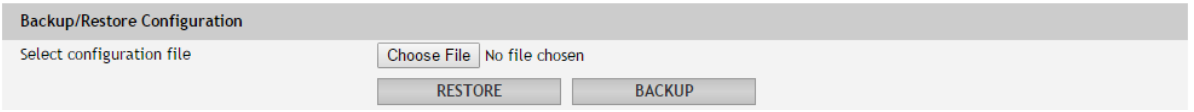
### 7.4.1. User/Password

The TCW241 supports a single user with administrative rights. Both the username and password can be up to 31 characters in length.



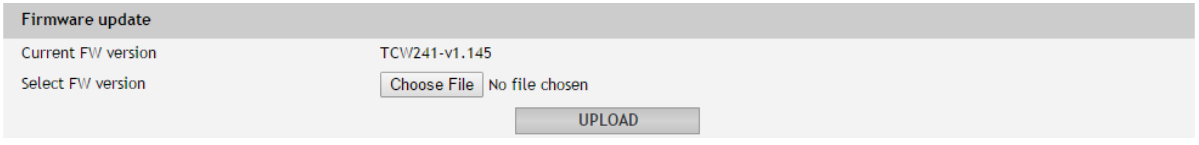

### 7.4.2. Backup/Restore

The TCW241 allows for the backup and restoration of all user settings. These settings are saved in an XML backup file, which can be utilized for restoring configurations on multiple devices. This feature is particularly useful for applying similar settings across a batch of controllers.




### 7.4.3. FW update

The TCW241 can be updated through the web interface.




To update the device, follow these steps:

- Go to www.teracomsystems.com and download the latest firmware;
- From Administration->FW update select downloaded .cod file and click “Upload” button;

- Once the firmware update is complete, the Login page will appear.

**Important:** Do not turn off the power supply during the update process, as this can damage the device.

### 7.5. Logout

The TCW241 supports multi-session access; however, it is recommended to log out after completing your tasks for security and best practices.

## 8. Protocols and API

### 8.1. SNMP

The Simple Network Management Protocol (SNMP) is a standard internet protocol used for managing devices on IP networks. In typical SNMP implementations, one or more administrative computers, referred to as managers, monitor and control devices on a Local Area Network (LAN). Each managed device continuously runs a software component known as an agent, which reports information via SNMP to the manager.

The TCW241 can be configured and monitored using SNMP. This can be achieved with any SNMP v.2 compatible program. The parameters that can be modified are organized by function in the tables below. To obtain a valid Object Identifier (OID) number, replace the “x” symbol with “1.3.6.1.4.1.38783.” To save the changes, set configurationSaved (OID x.2.3.5.0) to "1".

**product**

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.1.1.0 | name | read-only | Device name | DisplayString |
| x.3.1.2.0 | version | read-only | Firmware version | DisplayString |
| x.3.1.3.0 | date | read-only | Release date | DisplayString |

**setup -> network**

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.1.1.0 | deviceID | read-only | Device ID (default MAC address) | MacAddress |
| x.3.2.1.2.0 | hostName | read-only | Hostname | DisplayString |
| x.3.2.1.3.0 | deviceIP | read-only | Device IP address | IpAddress |

**setup -> io -> sensorsSetup -> sensor1setup**

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.1.1.0 | s1description | read-write | Sensor 1 description | DisplayString |
| x.3.2.2.1.1.2.1.0 | s11MAXInt | read-write | S11 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.1.2.2.0 | s11MINInt | read-write | S11 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.1.2.3.0 | s11HYSTInt | read-write | S11 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.1.3.1.0 | s12MAXInt | read-write | S12 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.1.3.2.0 | s12MINInt | read-write | S12 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.1.3.3.0 | s12HYSTInt | read-write | S12 hysteresis value x1000 in Integer format | Integer32 |

**setup -> io -> sensorsSetup -> sensor2setup**

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.2.1.0 | s2description | read-write | Sensor2 description | DisplayString |
| x.3.2.2.1.2.2.1.0 | s21MAXInt | read-write | s21 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.2.2.2.0 | S21MINInt | read-write | S21 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.2.2.3.0 | S21HYSTInt | read-write | S21 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.2.3.1.0 | S22MAXInt | read-write | S22 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.2.3.2.0 | S22MINInt | read-write | S22 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.2.3.3.0 | S22HYSTInt | read-write | S22 hysteresis value x1000 in Integer format | Integer32 |

### setup -> io -> sensorsSetup -> sensor3setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.3.1.0 | S3description | read-write | Sensor 3 description | DisplayString |
| x.3.2.2.1.3.2.1.0 | S31MAXInt | read-write | S31 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.3.2.2.0 | S31MINInt | read-write | S31 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.3.2.3.0 | S31HYSTInt | read-write | S31 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.3.3.1.0 | S32MAXInt | read-write | S32 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.3.3.2.0 | S32MINInt | read-write | S32 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.3.3.3.0 | S32HYSTInt | read-write | S32 hysteresis value x1000 in Integer format | Integer32 |

### setup -> io -> sensorsSetup -> sensor4setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.4.1.0 | S4description | read-write | Sensor 4 description | DisplayString |
| x.3.2.2.1.4.2.1.0 | S41MAXInt | read-write | S41 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.4.2.2.0 | S41MINInt | read-write | S41 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.4.2.3.0 | S41HYSTInt | read-write | S41 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.4.3.1.0 | S42MAXInt | read-write | S42 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.4.3.2.0 | S42MINInt | read-write | S42 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.4.3.3.0 | S42HYSTInt | read-write | S42 hysteresis value x1000 in Integer format | Integer32 |

### setup -> io -> sensorsSetup -> sensor5setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.5.1.0 | S5description | read-write | Sensor 5 description | DisplayString |
| x.3.2.2.1.5.2.1.0 | S51MAXInt | read-write | S51 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.5.2.2.0 | S51MINInt | read-write | S51 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.5.2.3.0 | S51HYSTInt | read-write | S51 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.5.3.1.0 | S52MAXInt | read-write | S52 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.5.3.2.0 | S52MINInt | read-write | S52 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.5.3.3.0 | S52HYSTInt | read-write | S52 hysteresis value x1000 in Integer format | Integer32 |

### setup -> io -> sensorsSetup -> sensor6setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.6.1.0 | S6description | read-write | Sensor 6 description | DisplayString |
| x.3.2.2.1.6.2.1.0 | S61MAXInt | read-write | S61 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.6.2.2.0 | S61MINInt | read-write | S61 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.6.2.3.0 | S61HYSTInt | read-write | S61 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.6.3.1.0 | S62MAXInt | read-write | S62 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.6.3.2.0 | S62MINInt | read-write | S62 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.6.3.3.0 | S62HYSTInt | read-write | S62 hysteresis value x1000 in Integer format | Integer32 |

### setup -> io -> sensorsSetup -> sensor7setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.7.1.0 | S7description | read-write | Sensor 7 description | DisplayString |
| x.3.2.2.1.7.2.1.0 | S71MAXInt | read-write | S71 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.7.2.2.0 | S71MINInt | read-write | S71 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.7.2.3.0 | S71HYSTInt | read-write | S71 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.7.3.1.0 | S72MAXInt | read-write | S72 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.7.3.2.0 | S72MINInt | read-write | S72 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.7.3.3.0 | S72HYSTInt | read-write | S72 hysteresis value x1000 in Integer format | Integer32 |

### setup -> io -> sensorsSetup -> sensor8setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.1.8.1.0 | S8description | read-write | Sensor 8 description | DisplayString |
| x.3.2.2.1.8.2.1.0 | S81MAXx10Int | read-write | S81 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.8.2.2.0 | S81MINx10Int | read-write | S81 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.8.2.3.0 | S81HYSTx10Int | read-write | S81 hysteresis value x1000 in Integer format | Integer32 |
| x.3.2.2.1.8.3.1.0 | S82MAXx10Int | read-write | S82 maximum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.8.3.2.0 | S82MINx10Int | read-write | S82 minimum value x1000 in Integer format | Integer32 |
| x.3.2.2.1.8.3.3.0 | S82HYSTx10Int | read-write | S82 hysteresis value x1000 in Integer format | Integer32 |

### setup -> io -> analogSetup -> analog1setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.2.1.1.0 | voltage1description | read-write | Voltage 1 description | DisplayString |
| x.3.2.2.2.1.2.0 | voltage1max | read-write | Voltage 1 maximum | Integer32 |
| x.3.2.2.2.1.3.0 | voltage1min | read-write | Voltage 1 minimum | Integer32 |
| x.3.2.2.2.1.4.0 | voltage1hyst | read-write | Voltage 1 hysteresis | Integer32 |

### setup -> io -> analogSetup -> analog2setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.2.2.1.0 | voltage2description | read-write | Voltage 2 description | DisplayString |
| x.3.2.2.2.2.2.0 | voltage2max | read-write | Voltage 2 maximum | Integer32 |
| x.3.2.2.2.2.3.0 | voltage2min | read-write | Voltage 2 minimum | Integer32 |
| x.3.2.2.2.2.4.0 | voltage2hyst | read-write | Voltage 2 hysteresis | Integer32 |

### setup -> io -> analogSetup -> analog3setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.2.3.1.0 | voltage3description | read-write | Voltage 3 description | DisplayString |
| x.3.2.2.2.3.2.0 | voltage3max | read-write | Voltage 3 maximum | Integer32 |
| x.3.2.2.2.3.3.0 | voltage3min | read-write | Voltage 3 minimum | Integer32 |
| x.3.2.2.2.3.4.0 | voltage3hyst | read-write | Voltage 3 hysteresis | Integer32 |

### setup -> io -> analogSetup -> analog4setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.2.4.1.0 | voltage4description | read-write | Voltage 4 description | DisplayString |
| x.3.2.2.2.4.2.0 | voltage4max | read-write | Voltage 4 maximum | Integer32 |
| x.3.2.2.2.4.3.0 | voltage4min | read-write | Voltage 4 minimum | Integer32 |
| x.3.2.2.2.4.4.0 | voltage4hyst | read-write | Voltage 4 hysteresis | Integer32 |

### setup -> io -> digitalSetup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.3.1.0 | digitalInput1description | read-write | Digital Input 1 description | DisplayString |
| x.3.2.2.3.2.0 | digitalInput2description | read-write | Digital Input 2 description | DisplayString |
| x.3.2.2.3.3.0 | digitalInput3description | read-write | Digital Input 3 description | DisplayString |
| x.3.2.2.3.4.0 | digitalInput3description | read-write | Digital Input 4 description | DisplayString |

### setup -> io -> relaysSetup -> relay1setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.4.1.1.0 | relay1description | read-write | Relay 1 description | DisplayString |
| x.3.2.2.4.1.2.0 | relay1pulseWidth | read-write | Relay1 Pulse x100ms | Integer32 |
| x.3.2.2.4.1.3.0 | relay1controlledBy | read-write | Relay1 control logic | INTEGER { manual(0),sensor11(1), sensor21(2),sensor31(3 ),sensor41(4),sensor51( 5),sensor61(6),sensor7 1(7),sensor81(8),sensor 12(9),sensor22(10),sens or32(11),sensor42(12),s ensor52(13),sensor62(1 4),sensor72(15),sensor 82(16),analog1(17),anal og2(18),analog3(19),an alog4(20),digital1(21),di gital2(22),digital3(23),di gital4(24),anyAlarm(25) ,anySensor(26),anyAnal og(27),anyDigital(28),fu nc1(29), func2(30), shedule1(31),shedule2( 32),shedule3(33),shedu le4(34) } |

### setup -> io-> relaysSetup -> relay2setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.4.2.1.0 | relay2description | read-write | Relay 2 description | DisplayString |
| x.3.2.2.4.2.2.0 | relay2pulseWidth | read-write | Relay 2 Pulse x100ms | Integer32 |
| x.3.2.2.4.2.3.0 | relay2controlledBy | read-write | Relay 2 control logic | INTEGER { manual(0),sensor11(1), sensor21(2),sensor31(3 ),sensor41(4),sensor51( 5),sensor61(6),sensor7 1(7),sensor81(8),sensor 12(9),sensor22(10),sens or32(11),sensor42(12),s ensor52(13),sensor62(1 4),sensor72(15),sensor 82(16),analog1(17),anal og2(18),analog3(19),an alog4(20),digital1(21),di gital2(22),digital3(23),di gital4(24),anyAlarm(25) ,anySensor(26),anyAnal og(27),anyDigital(28),fu nc1(29), func2(30), shedule1(31),shedule2( 32),shedule3(33),shedu le4(34) } |

### setup -> io-> relaysSetup -> relay3setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.4.3.1.0 | relay3description | read-write | Relay 3 description | DisplayString |
| x.3.2.2.4.3.2.0 | relay3pulseWidth | read-write | Relay 3 Pulse x100ms | Integer32 |
| x.3.2.2.4.3.3.0 | relay3controlledBy | read-write | Relay 3 control logic | INTEGER { manual(0),sensor11(1), sensor21(2),sensor31(3 ),sensor41(4),sensor51( 5),sensor61(6),sensor7 1(7),sensor81(8),sensor 12(9),sensor22(10),sens or32(11),sensor42(12),s ensor52(13),sensor62(1 4),sensor72(15),sensor 82(16),analog1(17),anal og2(18),analog3(19),an alog4(20),digital1(21),di gital2(22),digital3(23),di gital4(24),anyAlarm(25) ,anySensor(26),anyAnal og(27),anyDigital(28),fu nc1(29), func2(30), shedule1(31),shedule2( 32),shedule3(33),shedu le4(34) } |

### setup -> io-> relaysSetup -> relay4setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.4.4.1.0 | relay4description | read-write | Relay 4 description | DisplayString |
| x.3.2.2.4.4.2.0 | relay4pulseWidth | read-write | Relay 4 Pulse x100ms | Integer32 |
| x.3.2.2.4.4.3.0 | relay4controlledBy | read-write | Relay 4 control logic | INTEGER { manual(0),sensor11(1), sensor21(2),sensor31(3 ),sensor41(4),sensor51( 5),sensor61(6),sensor7 1(7),sensor81(8),sensor 12(9),sensor22(10),sens or32(11),sensor42(12),s ensor52(13),sensor62(1 4),sensor72(15),sensor 82(16),analog1(17),anal og2(18),analog3(19),an alog4(20),digital1(21),di gital2(22),digital3(23),di gital4(24),anyAlarm(25) ,anySensor(26),anyAnal og(27),anyDigital(28),fu nc1(29), func2(30), shedule1(31),shedule2( 32),shedule3(33),shedu le4(34) } |

### setup -> io -> virtualSetup -> virtual1setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.5.1.1.0 | virtualInput1description | read-write | Virtual input 1 description | DisplayString |
| x.3.2.2.5.1.2.0 | virtualInput1max | read-write | Virtual input 1 maximum | Integer32 |
| x.3.2.2.5.1.3.0 | virtualInput1min | read-write | Virtual input 1 minimum | Integer32 |
| x.3.2.2.5.1.4.0 | virtualInput1hyst | read-write | Virtual input 1 hysteresis | Integer32 |
| x.3.2.2.5.1.5.0 | virtualInput1Parent | read-write | Virtual input 1 parent | INTEGER{ none(0),sensor11(1),sensor21(2),sensor31(3),sensor41(4),sensor51(5),sensor61(6),sensor71(7),sensor81(8),sensor12(9),sensor22(10),sensor32(11),sensor42(12),sensor52(13),sensor62(14),sensor72(15),sensor82(16),analog1(17),analog2(18),analog3(19),analog4(20) } |

### setup -> io -> virtualSetup -> virtual2setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.5.2.1.0 | virtualInput2description | read-write | Virtual input 2 description | DisplayString |
| x.3.2.2.5.2.2.0 | virtualInput2max | read-write | Virtual input 2 maximum | Integer32 |
| x.3.2.2.5.2.3.0 | virtualInput2min | read-write | Virtual input 2 minimum | Integer32 |
| x.3.2.2.5.2.4.0 | virtualInput2hyst | read-write | Virtual input 2 hysteresis | Integer32 |
| x.3.2.2.5.2.5.0 | virtualInput2Parent | read-write | Virtual input 2 parent | INTEGER{ none(0),sensor11(1),sensor21(2),sensor31(3),sensor41(4),sensor51(5),sensor61(6),sensor71(7),sensor81(8),sensor12(9),sensor22(10),sensor32(11),sensor42(12),sensor52(13),sensor62(14),sensor72(15),sensor82(16),analog1(17),analog2(18),analog3(19),analog4(20) } |

### setup -> io -> virtualSetup -> virtual3setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.5.3.1.0 | virtualInput3description | read-write | Virtual input 3 description | DisplayString |
| x.3.2.2.5.3.2.0 | virtualInput3max | read-write | Virtual input 3 maximum | Integer32 |
| x.3.2.2.5.3.3.0 | virtualInput3min | read-write | Virtual input 3 minimum | Integer32 |
| x.3.2.2.5.3.4.0 | virtualInput3hyst | read-write | Virtual input 3 hysteresis | Integer32 |
| x.3.2.2.5.3.5.0 | virtualInput3Parent | read-write | Virtual input 3 parent | INTEGER{ none(0),sensor11(1),sensor21(2),sensor31(3),sensor41(4),sensor51(5),sensor61(6),sensor71(7),sensor81(8),sensor12(9),sensor22(10),sensor32(11),sensor42(12),sensor52(13),sensor62(14),sensor72(15),sensor82(16),analog1(17),analog2(18),analog3(19),analog4(20) } |

### setup -> io -> virtualSetup -> virtual4setup

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.2.2.5.4.1.0 | virtualInput4description | read-write | Virtual input 4 description | DisplayString |
| x.3.2.2.5.4.2.0 | virtualInput4max | read-write | Virtual input 4 maximum | Integer32 |
| x.3.2.2.5.4.3.0 | virtualInput4min | read-write | Virtual input 4 minimum | Integer32 |
| x.3.2.2.5.4.4.0 | virtualInput4hyst | read-write | Virtual input 4 hysteresis | Integer32 |
| x.3.2.2.5.4.5.0 | virtualInput4Parent | read-write | Virtual input 4 parent | INTEGER{ none(0),sensor11(1),sensor21(2),sensor31(3),sensor41(4),sensor51(5),sensor61(6),sensor71(7),sensor81(8),sensor12(9),sensor22(10),sensor32(11),sensor42(12),sensor52(13),sensor62(14),sensor72(15),sensor82(16),analog1(17),analog2(18),analog3(19),analog4(20) } |

### monitorNcontrol -> sensors -> sensor1

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.1.1.0 | s11Int | read-only | S11 value x1000 in Integer format | Integer32 |
| x.3.3.1.1.2.0 | s12Int | read-only | S12 value x1000 in Integer format | Integer32 |
| x.3.3.1.1.3.0 | s1ID | read-only | S1 ID value | Mac Address |

### monitorNcontrol -> sensors -> sensor2

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.2.1.0 | s21Int | read-only | S21 value x1000 in Integer format | Integer32 |
| x.3.3.1.2.2.0 | s22Int | read-only | S22 value x1000 in Integer format | Integer32 |
| x.3.3.1.2.3.0 | s2ID | read-only | S2 ID value | OCTET STRING (SIZE (16)) |

### monitorNcontrol -> sensors -> sensor3

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.3.1.0 | s31Int | read-only | S31 value x1000 in Integer format | Integer32 |
| x.3.3.1.3.2.0 | s32Int | read-only | S32 value x1000 in Integer format | Integer32 |
| x.3.3.1.3.3.0 | s3ID | read-only | S3 ID value | OCTET STRING (SIZE (16)) |

### monitorNcontrol -> sensors -> sensor4

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.4.1.0 | s41Int | read-only | S41 value x1000 in Integer format | Integer32 |
| x.3.3.1.4.2.0 | s42Int | read-only | S42 value x1000 in Integer format | Integer32 |
| x.3.3.1.4.3.0 | s4ID | read-only | S4 ID value | OCTET STRING (SIZE (16)) |

### monitorNcontrol -> sensors -> sensor5

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.5.1.0 | s51Int | read-only | S51 value x1000 in Integer format | Integer32 |
| x.3.3.1.5.2.0 | s52Int | read-only | S52 value x1000 in Integer format | Integer32 |
| x.3.3.1.5.3.0 | s5ID | read-only | S5 ID value | OCTET STRING (SIZE (16)) |

### monitorNcontrol -> sensors -> sensor6

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.6.1.0 | s61Int | read-only | S61 value x1000 in Integer format | Integer32 |
| x.3.3.1.6.2.0 | s62Int | read-only | S62 value x1000 in Integer format | Integer32 |
| x.3.3.1.6.3.0 | s6ID | read-only | S6 ID value | OCTET STRING (SIZE (16)) |

### monitorNcontrol -> sensors -> sensor7

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.7.1.0 | s71Int | read-only | S71 value x1000 in Integer format | Integer32 |
| x.3.3.1.7.2.0 | s72Int | read-only | S72 value x1000 in Integer format | Integer32 |
| x.3.3.1.7.3.0 | s7ID | read-only | S7 ID value | OCTET STRING (SIZE (16)) |

### monitorNcontrol -> sensors -> sensor8

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.1.8.1.0 | s81Int | read-only | S81 value x1000 in Integer format | Integer32 |
| x.3.3.1.8.2.0 | s82Int | read-only | S82 value x1000 in Integer format | Integer32 |
| x.3.3.1.8.3.0 | s8ID | read-only | S8 ID value | OCTET STRING (SIZE (16)) |

### monitorNcontrol -> analog

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.2.1.0 | voltage1Int | read-only | Voltage1 x1000 in Integer format | Integer32 |
| x.3.3.2.2.0 | voltage2Int | read-only | Voltage2 x1000 in Integer format | Integer32 |
| x.3.3.2.3.0 | voltage3Int | read-only | Voltage3 x1000 in Integer format | Integer32 |
| x.3.3.2.4.0 | voltage4Int | read-only | Voltage4 x1000 in Integer format | Integer32 |

### monitorNcontrol -> digital

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.3.1.0 | digitalInput1State | read-only | Digital1 Input State | INTEGER {closed(0), open(1)} |
| x.3.3.3.2.0 | digitalInput2State | read-only | Digital2 Input State | INTEGER {closed(0), open(1)} |
| x.3.3.3.3.0 | digitalInput3State | read-only | Digital3 Input State | INTEGER {closed(0), open(1)} |
| x.3.3.3.4.0 | digitalInput4State | read-only | Digital4 Input State | INTEGER {closed(0), open(1)} |

### monitorNcontrol -> relays -> relay1

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.4.1.1.0 | relay1State | read-write | Relay1 State | INTEGER {off(0), on(1)} |
| x.3.3.4.1.2.0 | relay1Pulse | read-write | Relay1 Pulse | INTEGER {off(0), on(1)} |

### monitorNcontrol -> relays -> relay2

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.4.2.1.0 | relay2State | read-write | Relay2 State | INTEGER {off(0), on(1)} |
| x.3.3.4.2.2.0 | relay2pulse | read-write | Relay2 pulse length | INTEGER {off(0), on(1)} |

### monitorNcontrol -> relays -> relay3

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.4.3.1.0 | relay3State | read-write | Relay3 State | INTEGER {off(0), on(1)} |
| x.3.3.4.3.2.0 | relay3pulse | read-write | Relay3 pulse length | INTEGER {off(0), on(1)} |

### monitorNcontrol -> relays -> relay4

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.4.4.1.0 | relay4State | read-write | Relay4 State | INTEGER {off(0), on(1)} |
| x.3.3.4.4.2.0 | relay4pulse | read-write | Relay4 pulse length | INTEGER {off(0), on(1)} |

## monitorNcontrol

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.5.0 | configurationSaved | read-write | Configuration save status SAVED/UNSAVED | INTEGER { unsaved(0), saved(1) } |
| x.3.3.6.0 | restartDevice | read-write | Restart Device | INTEGER { cancel(0), restart(1) } |
| x.3.3.7.0 | temperatureUnit | read-only | Unit of the all temperature values | INTEGER { celcius(0), fahrenheit(1) } |
| x.3.3.8.0 | hardwareErr | read-only | Hardware Error | INTEGER { noErr(0), owErr(1), hwErr(2) } |
| x.3.3.9.0 | pressureUnit | read-only | Unit of the pressure value | INTEGER { hPa(0), mbar(1), mmhg(2)} |

## monitorNcontrol -> functions

| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.10.1.0 | func1State | read-only | Funtion 1 State | INTEGER { false(0), true(1) } |
| x.3.3.10.2.0 | func2State | read-only | Funtion 2 State | INTEGER { false(0), true(1) } |
| x.3.3.10.3.0 | func3State | read-only | Funtion 3 State | INTEGER { false(0), true(1) } |
| x.3.3.10.4.0 | func4State | read-only | Funtion 4 State | INTEGER { false(0), true(1) } |

## monitorNcontrol -> virtual

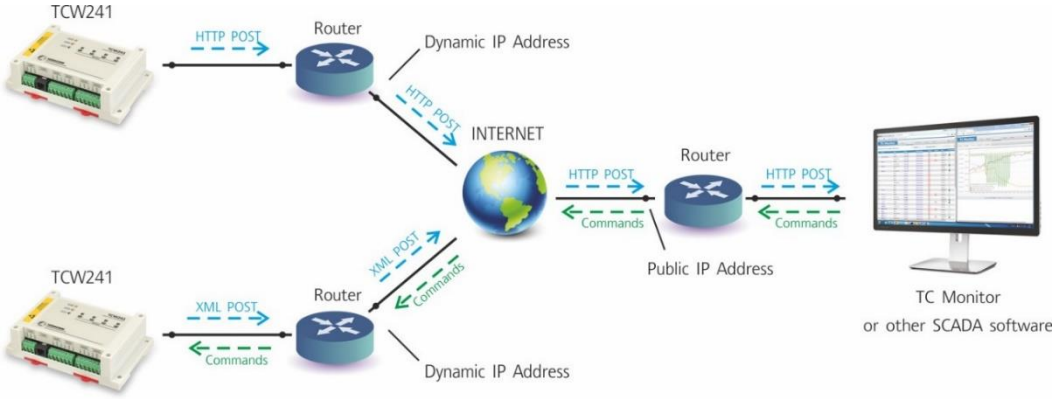
| OID | Name | Access | Description | Syntax |
|---|---|---|---|---|
| x.3.3.11.1.0 | virtualInput1Int | read-only | Virtual input 1 x1000 in Integer format | Integer32 |
| x.3.3.11.2.0 | virtualInput2Int | read-only | Virtual input 2 x1000 in Integer format | Integer32 |
| x.3.3.11.3.0 | virtualInput3Int | read-only | Virtual input 3 x1000 in Integer format | Integer32 |
| x.3.3.11.4.0 | virtualInput4Int | read-only | Virtual input 4 x1000 in Integer format | Integer32 |

## 8.2. HTTP API

### 8.2.1. HTTP POST

The TCW241 can execute HTTP/HTTPS POST requests to upload XML or JSON files to a dedicated server. This functionality is particularly useful when the controller is situated behind a router without a public IP address or when the user lacks access to the router's configuration. It is important to note that the server should possess a public IP address.

The typical monitoring application is shown in the picture below:




HTTP/HTTPS POSTs can be sent either periodically or periodically in conjunction with alarm conditions. In response, the server can send an HTTP GET request with the appropriate command—refer to section 8.2.3 for details on HTTP API commands.

To test HTTP/HTTPS POST functionality, follow these steps:

- Save following code as post.php:

```
<?php
    define("FILENAME", 'status.xml');
    define("FOLDER", '');
    define("SEPARATOR", '');
    define("STR_SUCCESS", 'set FIN');
    define("STR_ERROR", 'error');

    if($_SERVER['REQUEST_METHOD'] == 'POST'){
        $datePrefix = date('YmdHis', strtotime('now'));
        $pathname = FOLDER.SEPARATOR.$datePrefix.'_'.FILENAME;
        $postdata = file_get_contents("php://input");
        $handle = fopen($pathname, 'w+');
        $content = var_export($postdata, true);
        fwrite($handle, substr($content, 1, strlen($content)-2));
        fclose($handle);
        echo (($handle === false) ? STR_ERROR : STR_SUCCESS)."\r\n";
    }
        else {
            echo "The PHP script is working!";
        }
?>
```

- Upload the post.php file to a public web server that supports PHP. To ensure the script is functioning correctly, enter the URL (for example, www.yourserverURL.com/post.php) in your web browser. If successful, a webpage displaying “The PHP script is working!” will appear.
- Configure the TCW241 controller to send HTTP/HTTPS POST requests to your web server. Input the URL (yourserverURL.com/post.php) in the URL field, and click the “Test HTTP POST” button.
- If the HTTP/HTTPS POST request is received and processed successfully, “OK” will be displayed next to the button. Additionally, an XML file will be created in the same directory where post.php is located. The filename will include a timestamp, formatted as 20151120103318_status.xml.

### 8.2.2. HTTP GET

HTTP GET can be utilized to monitor the TCW241 by retrieving XML or JSON files. The format for accessing the status is as follows:

http://device.ip.address/status.xml

http://device.ip.address/status.json

For further details regarding the structure of these files, refer to sections 8.2.4 XML file structure and 8.2.5 JSON file structure.

HTTP GET requests can be sent at any time to the TCW241 if it is on the same network or has appropriate routing. If there is no direct access to the device, an HTTP GET can be sent immediately after receiving an HTTP POST from the same device.

#### 8.2.2.1. Commands

All commands used with HTTP POST are also applicable to HTTP GET. The correct format for sending commands is:

http://device.ip.address/status.xml?yyy=xxx

Where:

yyy is the command;
xxx is the parameter.

Example:

To turn Relay 1 ON, the following command can be used
http://device.ip.address/status.xml?ron=1

#### 8.2.2.2. HTTP GET authentication

If HTTP API authentication is enabled, basic access authentication is required to access the status.xml file. The format of the command is detailed in the table below:

| XML/HTTP API authentication | Format |
|---|---|
| enabled | http://device.ip.address/status.xml?a=uuuu:pppp |
| disabled | http://device.ip.address/status.xml |

Example:
To set the POST period to 120 seconds, the following command can be used, assuming the username is admin and the password is admin
http://device.ip.address/status.xml?a=admin:admin&pper=120

### 8.2.3. HTTP API commands

| Command | Description |
|---|---|
| ron=**n** | Turn relay **n** ON<br>(**n** is 1,2,4 or 8)<br>ron=1 - will turn ON relay 1<br>ron=2 - will turn ON relay 2<br>ron=4 - will turn ON relay 3<br>ron=8 - will turn ON relay 4 |
| ron=1&ron=2&ron=4&ron=8 | Turn four relays ON |
| rof=**n** | Turn relay **n** OFF<br>(**n** is 1,2,4 or 8 )<br>rof=1 - will turn OFF relay 1<br>rof=2 - will turn OFF relay 2<br>rof=4 - will turn OFF relay 3<br>rof=8 - will turn OFF relay 4 |
| rof=1&rof=2&rof=4&rof=8 | Turn four relays OFF |

| | |
|---|---|
| rtg=**n** | Toggle relay **n** state<br>(**n** is 1,2,4 or 8)<br>rtg=1 - will toggle relay 1 state<br>rtg=2 - will toggle relay 2 state<br>rtg=4 - will toggle relay 3 state<br>rtg=8 - will toggle relay 4 state |
| rpl=**n** | Pulse relay **n**<br>(**n** is 1,2,4 or 8)<br>rpl=1 – will pulse relay 1<br>rpl=2 – will pulse relay 2<br>rpl=4 – will pulse relay 3<br>rpl=8 – will pulse relay 4 |
| vn**f**=10.0 | Set Min of analog input to 10.0<br>(**f** is 1,2,3 or 4 for the respective input)<br>vn1=10.0 will set Min for analog input 1 |
| vx**f**=20.0 | Set Max of analog input to 20.0<br>(**f** is 1,2,3 or 4 for the respective input)<br>vx2=20.0 will set Max for analog input 2 |
| vy**f**=1.0 | Set Hys of analog input to 1.0<br>(**f** is 1,2,3 or 4 for the respective input)<br>vy1=1.0 will set Hys for analog input 1 |
| sn**pt**=30.0 | Set Min of sensor to 30.0<br>(**p** is 1,2,3,4,5,6,7 or 8 for the respective sensor<br>**t** is 1 or 2 for the respective parameter of sensor)<br>sn12=30.0 will set Min for sensor 1, parameter 2 |
| sx**pt**=40.0 | Set Max of sensor to 40.0<br>(**p** is 1,2,3,4,5,6,7 or 8 for the respective sensor<br>**t** is 1 or 2 for the respective parameter of sensor)<br>sx42=40.0 will set Min for sensor 4, parameter 2 |
| sy**pt**=2.0 | Set Hys of sensor to 2.0<br>(**p** is 1,2,3,4,5,6,7 or 8 for the respective sensor<br>**t** is 1 or 2 for the respective parameter of sensor)<br>sy81=2.0 will set Hys for sensor 8, parameter 1 |
| delsen=xxxx | Notification delay for sensors<br>(xxxx is between 0 and 3600) |
| delanl=xxxx | Notification delay for analog inputs<br>(xxxx is between 0 and 3600) |
| deldig=xxxx | Notification delay for digital inputs<br>(xxxx is between 0 and 3600) |
| dda1=xxxx | Low to high delay for digital input 1<br>(xxxx is between 0 and 3600) |
| ddd1=xxxx | High to low delay for digital input 1<br>(xxxx is between 0 and 3600) |
| dda2=xxxx | Low to high delay for digital input 2<br>(xxxx is between 0 and 3600) |
| ddd2=xxxx | High to low delay for digital input 2<br>(xxxx is between 0 and 3600) |
| dda3=xxxx | Low to high delay for digital input 3<br>(xxxx is between 0 and 3600) |
| ddd3=xxxx | High to low delay for digital input 3<br>(xxxx is between 0 and 3600) |
| dda4=xxxx | Low to high delay for digital input 4<br>(xxxx is between 0 and 3600) |
| ddd4=xxxx | High to low delay for digital input 4 |

| | |
|---|---|
| | (xxxx is between 0 and 3600) |
| dataf=x | Data format XML/JSON for HHTP POST – 0 XML, 1 JSON |
| pushtls=x | HTTP/HTTPS protocol, where x is 0 for HTTP and 1 for HTTPS |
| purl=yyy | URL for HTTP POST to Server 1, where yyy is a full path to php file. Example:<br>purl=212.25.45.120:30181/xampp/test/posttest.php |
| pper=x | HTTP POST period in seconds<br>(x is between 10 and 14400) |
| dk=xxx | HTTP POST key – xxx is up to 17 characters |
| save | Save all previous changes (except relays' one) in the FLASH memory.<br>**As every save reflects the FLASH cycles (endurance), this command should be used very carefully.**<br>pper=120&save – will set POST period to 120 seconds and save it |
| FIN | Terminate session.<br>(It works with HTTP/HTTPS POST, but not with HTTP GET) |

### 8.2.4. XML file structure

```
<Monitor>
    <DeviceInfo>
        <DeviceName>TCW241</DeviceName>
        <HostName>TCW241</HostName>
        <ID>5C:32:C5:00:69:03</ID>
        <FwVer>TCW241-v1.252</FwVer>
        <MnfInfo>www.teracomsystems.com</MnfInfo>
        <SysContact>info@teracomsystems.com</SysContact>
        <SysName>SysName</SysName>
        <SysLocation>SysLocation</SysLocation>
    </DeviceInfo>
    <S>
        <S1>
            <description>S1:TST1xx</description>
            <id>2867895F07000058</id>
            <item1>
                <value>24.313</value>
                <unit>°C</unit>
                <alarm>0</alarm>
                <min>-40.000</min>
                <max>85.000</max>
                <hys>8.500</hys>
            </item1>
            <item2>
                <value>---</value>
                <unit>---</unit>
                <alarm>0</alarm>
                <min>---</min>
                <max>---</max>
                <hys>---</hys>
            </item2>
        </S1>
        <S2>
            <description>S2:TSH2xx</description>
            <id>015225B71700FF45</id>
            <item1>
                <value>25.500</value>
                <unit>°C</unit>
                <alarm>0</alarm>
                <min>-40.000</min>
                <max>85.000</max>
                <hys>8.500</hys>
            </item1>
            <item2>
                <value>33.750</value>
                <unit>%RH</unit>
                <alarm>0</alarm>
                <min>0.000</min>
                <max>100.000</max>
                <hys>10.000</hys>
            </item2>
        </S2>
        <S3>
            <description>S3</description>
            <id>0000000000000000</id>
            <item1>
                <value>---</value>
                <unit>---</unit>
                <alarm>0</alarm>
                <min>---</min>
                <max>---</max>
                <hys>---</hys>
            </item1>
            <item2>
                <value>---</value>
                <unit>---</unit>
                <alarm>0</alarm>
                <min>---</min>
                <max>---</max>
                <hys>---</hys>
            </item2>
        </S3>
        <S4>
            <description>S4</description>
```

```
    <id>0000000000000000</id>
    <item1>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item1>
    <item2>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item2>
</S4>
<S5>
    <description>S5</description>
    <id>0000000000000000</id>
    <item1>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item1>
    <item2>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item2>
</S5>
<S6>
    <description>S6</description>
    <id>0000000000000000</id>
    <item1>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item1>
    <item2>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item2>
</S6>
<S7>
    <description>S7</description>
    <id>0000000000000000</id>
    <item1>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item1>
    <item2>
        <value>---</value>
        <unit>---</unit>
        <alarm>0</alarm>
        <min>---</min>
        <max>---</max>
        <hys>---</hys>
    </item2>
```

```
    </S7>
    <S8>
        <description>S8</description>
        <id>0000000000000000</id>
        <item1>
            <value>---</value>
            <unit>---</unit>
            <alarm>0</alarm>
            <min>---</min>
            <max>---</max>
            <hys>---</hys>
        </item1>
        <item2>
            <value>---</value>
            <unit>---</unit>
            <alarm>0</alarm>
            <min>---</min>
            <max>---</max>
            <hys>---</hys>
        </item2>
    </S8>
</S>
<AI>
    <AI1>
        <description>Server room</description>
        <value>-24.953</value>
        <unit>%RH</unit>
        <multiplier>31.740</multiplier>
        <offset>0.8260</offset>
        <alarm>1</alarm>
        <min>0.000</min>
        <max>10.000</max>
        <hys>0.010</hys>
    </AI1>
    <AI2>
        <description>Analog Input 2</description>
        <value>0.036</value>
        <unit>V</unit>
        <multiplier>1.000</multiplier>
        <offset>0.0000</offset>
        <alarm>1</alarm>
        <min>4.500</min>
        <max>5.500</max>
        <hys>0.010</hys>
    </AI2>
    <AI3>
        <description>Analog Input 3</description>
        <value>0.048</value>
        <unit>V</unit>
        <multiplier>1.000</multiplier>
        <offset>0.0000</offset>
        <alarm>0</alarm>
        <min>0.000</min>
        <max>60.000</max>
        <hys>1.000</hys>
    </AI3>
    <AI4>
        <description>Analog Input 4</description>
        <value>0.047</value>
        <unit>V</unit>
        <multiplier>1.000</multiplier>
        <offset>0.0000</offset>
        <alarm>0</alarm>
        <min>0.000</min>
        <max>60.000</max>
        <hys>1.000</hys>
    </AI4>
</AI>
<VI>
    <VI1>
        <description>Virtual Input 1</description>
        <value>24.313</value>
        <unit>°C</unit>
        <multiplier>1.000</multiplier>
        <offset>0.0000</offset>
        <alarm>1</alarm>
        <min>-5.000</min>
```

```
            <max>15.000</max>
            <hys>0.500</hys>
        </VI1>
        <VI2>
            <description>Virtual Input 2</description>
            <value>25.500</value>
            <unit>°C</unit>
            <multiplier>1.000</multiplier>
            <offset>0.0000</offset>
            <alarm>0</alarm>
            <min>-20.000</min>
            <max>35.000</max>
            <hys>1.000</hys>
        </VI2>
        <VI3>
            <description>Virtual Input 3</description>
            <value>33.750</value>
            <unit>%RH</unit>
            <multiplier>1.000</multiplier>
            <offset>0.0000</offset>
            <alarm>1</alarm>
            <min>35.000</min>
            <max>60.000</max>
            <hys>0.500</hys>
        </VI3>
        <VI4>
            <description>Virtual Input 4</description>
            <value>0.036</value>
            <unit>V</unit>
            <multiplier>1.000</multiplier>
            <offset>0.0000</offset>
            <alarm>0</alarm>
            <min>0.000</min>
            <max>30.000</max>
            <hys>0.100</hys>
        </VI4>
    </VI>
    <DI>
        <DI1>
            <description>Digital Input 1</description>
            <value>OPEN</value>
            <valuebin>1</valuebin>
            <alarmState>CLOSED</alarmState>
            <alarm>0</alarm>
        </DI1>
        <DI2>
            <description>Digital Input 2</description>
            <value>OPEN</value>
            <valuebin>1</valuebin>
            <alarmState>CLOSED</alarmState>
            <alarm>0</alarm>
        </DI2>
        <DI3>
            <description>Digital Input 3</description>
            <value>OPEN</value>
            <valuebin>1</valuebin>
            <alarmState>CLOSED</alarmState>
            <alarm>0</alarm>
        </DI3>
        <DI4>
            <description>Digital Input 4</description>
            <value>OPEN</value>
            <valuebin>1</valuebin>
            <alarmState>CLOSED</alarmState>
            <alarm>0</alarm>
        </DI4>
    </DI>
    <R>
        <R1>
            <description>Relay 1</description>
            <value>OFF</value>
            <valuebin>0</valuebin>
            <pulseWidth>0.1</pulseWidth>
            <control>0</control>
        </R1>
        <R2>
            <description>Relay 2</description>
```

```
            <value>OFF</value>
            <valuebin>0</valuebin>
            <pulseWidth>0.2</pulseWidth>
            <control>0</control>
        </R2>
        <R3>
            <description>Relay 3</description>
            <value>OFF</value>
            <valuebin>0</valuebin>
            <pulseWidth>0.3</pulseWidth>
            <control>0</control>
        </R3>
        <R4>
            <description>Relay 4</description>
            <value>OFF</value>
            <valuebin>0</valuebin>
            <pulseWidth>0.4</pulseWidth>
            <control>0</control>
        </R4>
    </R>
    <HTTPPush>
        <Key/>
        <PushPeriod>300</PushPeriod>
    </HTTPPush>
    <hwerr/>
    <Alarmed>1</Alarmed>
    <Scannig/>
    <Time>
        <Date>11.10.2023</Date>
        <Time>13:24:38</Time>
    </Time>
</Monitor>
```

Where:

*<value>--- </value>* and *<unit>--- </unit>* means no 1-Wire sensor on this position;
*<alarm>1</alarm>* means there is trigger condition.

### 8.2.5. JSON file structure

```
{
   "Monitor": {
      "DeviceInfo": {
         "DeviceName": "TCW241",
         "HostName": "TCW241",
         "ID": "5C:32:C5:00:69:03",
         "FwVer": "TCW241-v1.252",
         "MnfInfo": "www.teracomsystems.com",
         "SysContact": "info@teracomsystems.com",
         "SysName": "SysName",
         "SysLocation": "SysLocation"
      },
      "S": {
         "S1": {
            "description": "S1:TST1xx",
            "id": "2867895F07000058",
            "item1": {
               "value": "24.375",
               "unit": "°C",
               "alarm": "0",
               "min": "-40.000",
               "max": "85.000",
               "hys": "8.500"
            },
            "item2": {
               "value": "---",
               "unit": "---",
               "alarm": "0",
               "min": "---",
               "max": "---",
               "hys": "---"
            }
         },
         "S2": {
            "description": "S2:TSH2xx",
            "id": "015225B71700FF45",
```

```
    "item1": {
      "value": "25.625",
      "unit": "°C",
      "alarm": "0",
      "min": "-40.000",
      "max": "85.000",
      "hys": "8.500"
    },
    "item2": {
      "value": "33.813",
      "unit": "%RH",
      "alarm": "0",
      "min": "0.000",
      "max": "100.000",
      "hys": "10.000"
    }
  },
  "S3": {
    "description": "S3",
    "id": "0000000000000000",
    "item1": {
      "value": "---",
      "unit": "---",
      "alarm": "0",
      "min": "---",
      "max": "---",
      "hys": "---"
    },
    "item2": {
      "value": "---",
      "unit": "---",
      "alarm": "0",
      "min": "---",
      "max": "---",
      "hys": "---"
    }
  },
  "S4": {
    "description": "S4",
    "id": "0000000000000000",
    "item1": {
      "value": "---",
      "unit": "---",
      "alarm": "0",
      "min": "---",
      "max": "---",
      "hys": "---"
    },
    "item2": {
      "value": "---",
      "unit": "---",
      "alarm": "0",
      "min": "---",
      "max": "---",
      "hys": "---"
    }
  },
  "S5": {
    "description": "S5",
    "id": "0000000000000000",
    "item1": {
      "value": "---",
      "unit": "---",
      "alarm": "0",
      "min": "---",
      "max": "---",
      "hys": "---"
    },
    "item2": {
      "value": "---",
      "unit": "---",
      "alarm": "0",
      "min": "---",
      "max": "---",
      "hys": "---"
    }
  },
```

```
    "S6": {
      "description": "S6",
      "id": "0000000000000000",
      "item1": {
        "value": "---",
        "unit": "---",
        "alarm": "0",
        "min": "---",
        "max": "---",
        "hys": "---"
      },
      "item2": {
        "value": "---",
        "unit": "---",
        "alarm": "0",
        "min": "---",
        "max": "---",
        "hys": "---"
      }
    },
    "S7": {
      "description": "S7",
      "id": "0000000000000000",
      "item1": {
        "value": "---",
        "unit": "---",
        "alarm": "0",
        "min": "---",
        "max": "---",
        "hys": "---"
      },
      "item2": {
        "value": "---",
        "unit": "---",
        "alarm": "0",
        "min": "---",
        "max": "---",
        "hys": "---"
      }
    },
    "S8": {
      "description": "S8",
      "id": "0000000000000000",
      "item1": {
        "value": "---",
        "unit": "---",
        "alarm": "0",
        "min": "---",
        "max": "---",
        "hys": "---"
      },
      "item2": {
        "value": "---",
        "unit": "---",
        "alarm": "0",
        "min": "---",
        "max": "---",
        "hys": "---"
      }
    }
  },
  "AI": {
    "AI1": {
      "description": "Server room",
      "value": "-24.894",
      "unit": "%RH",
      "multiplier": "31.740",
      "offset": "0.8260",
      "alarm": "1",
      "min": "0.000",
      "max": "10.000",
      "hys": "0.010"
    },
    "AI2": {
      "description": "Analog Input 2",
      "value": "0.036",
      "unit": "V",
```

```
      "multiplier": "1.000",
      "offset": "0.0000",
      "alarm": "1",
      "min": "4.500",
      "max": "5.500",
      "hys": "0.010"
    },
    "AI3": {
      "description": "Analog Input 3",
      "value": "0.049",
      "unit": "V",
      "multiplier": "1.000",
      "offset": "0.0000",
      "alarm": "0",
      "min": "0.000",
      "max": "60.000",
      "hys": "1.000"
    },
    "AI4": {
      "description": "Analog Input 4",
      "value": "0.049",
      "unit": "V",
      "multiplier": "1.000",
      "offset": "0.0000",
      "alarm": "0",
      "min": "0.000",
      "max": "60.000",
      "hys": "1.000"
    }
  },
  "VI": {
    "VI1": {
      "description": "Virtual Input 1",
      "value": "24.375",
      "unit": "°C",
      "multiplier": "1.000",
      "offset": "0.0000",
      "alarm": "1",
      "min": "-5.000",
      "max": "15.000",
      "hys": "0.500"
    },
    "VI2": {
      "description": "Virtual Input 2",
      "value": "25.625",
      "unit": "°C",
      "multiplier": "1.000",
      "offset": "0.0000",
      "alarm": "0",
      "min": "-20.000",
      "max": "35.000",
      "hys": "1.000"
    },
    "VI3": {
      "description": "Virtual Input 3",
      "value": "33.813",
      "unit": "%RH",
      "multiplier": "1.000",
      "offset": "0.0000",
      "alarm": "1",
      "min": "35.000",
      "max": "60.000",
      "hys": "0.500"
    },
    "VI4": {
      "description": "Virtual Input 4",
      "value": "0.036",
      "unit": "V",
      "multiplier": "1.000",
      "offset": "0.0000",
      "alarm": "0",
      "min": "0.000",
      "max": "30.000",
      "hys": "0.100"
    }
  },
  "DI": {
```

```
      "DI1": {
        "description": "Digital Input 1",
        "value": "OPEN",
        "valuebin": "1",
        "alarmState": "CLOSED",
        "alarm": "0"
      },
      "DI2": {
        "description": "Digital Input 2",
        "value": "OPEN",
        "valuebin": "1",
        "alarmState": "CLOSED",
        "alarm": "0"
      },
      "DI3": {
        "description": "Digital Input 3",
        "value": "OPEN",
        "valuebin": "1",
        "alarmState": "CLOSED",
        "alarm": "0"
      },
      "DI4": {
        "description": "Digital Input 4",
        "value": "OPEN",
        "valuebin": "1",
        "alarmState": "CLOSED",
        "alarm": "0"
      }
    },
    "R": {
      "R1": {
        "description": "Relay 1",
        "value": "OFF",
        "valuebin": "0",
        "pulseWidth": "0.1",
        "control": "0"
      },
      "R2": {
        "description": "Relay 2",
        "value": "OFF",
        "valuebin": "0",
        "pulseWidth": "0.2",
        "control": "0"
      },
      "R3": {
        "description": "Relay 3",
        "value": "OFF",
        "valuebin": "0",
        "pulseWidth": "0.3",
        "control": "0"
      },
      "R4": {
        "description": "Relay 4",
        "value": "OFF",
        "valuebin": "0",
        "pulseWidth": "0.4",
        "control": "0"
      }
    },
    "HTTPPush": {
      "Key": "",
      "PushPeriod": "300"
    },
    "hwerr": "",
    "Alarmed": "1",
    "Scannig": "",
    "Time": {
      "Date": "11.10.2023",
      "Time": "13:32:55"
    }
  }
}
```

## 8.3. Modbus TCP/IP

Modbus TCP/IP is a serial communications protocol originally published by Modicon in 1979. It facilitates master-slave/client-server communication between intelligent devices. This protocol is commonly employed to connect a supervisory computer with a remote terminal unit (RTU) within supervisory control and data acquisition (SCADA) systems.

Modbus TCP/IP operates over Ethernet, enabling communication between devices such as sensors, actuators, and controllers. The protocol is widely adopted due to its simplicity and reliability in industrial and automation applications. It allows for the exchange of data and commands, making it an essential component for integrating and monitoring various devices within a networked environment.

### 8.3.1. Codes and answers

#### 8.3.1.1. Read Coil Status (FC=01)

Request

This command is requesting the ON/OFF status of discrete coils on address 100.

**01 0064 0001**

01: The Function Code 1 (read Coil Status)
0064: The Data Address of the coil to read ( 0064 hex = 100)
0001: The total number of coils requested. (01 hex = 1)

Response

**01 01 01**

01: The Function Code 1 (read Coil Status)
01: The number of data bytes to follow
01: 7 space holders & Coils 1 (0000 0001)
Due to the number of coils requested, the last data field **01** contains the status of only 1 coil. The 7 most significant bits in this data field are filled in with zeroes. The activated relay is 1.

#### 8.3.1.2. Force Single Coil (FC=05)

Request

This command is writing the contents of discrete on address 100 to ON.

**05 0064 FF00**

05: The Function Code 5 (Force Single Coil)
0064: The Data Address of the coil. ( 0064 hex = 100)
FF00: The status to write ( FF00 = ON, 0000 = OFF )

Response

The normal response is an echo of the query, returned after the coil has been written.

**05 0064 FF00**

05: The Function Code 5 (Force Single Coil)
0064: The Data Address of the coil. (0064 hex = 100)
FF00: The status written ( FF00 = ON, 0000 = OFF )

#### 8.3.1.3. Read Input Status (FC=02)

Request

This command is requesting the ON/OFF status of discrete input 1

**02 0064 0001**

02: The Function Code 2 (read Input Status)
0064: The Data Address of the input to read ( 0064 hex = 100 )

0001: The total number of coils requested.

Response

**02 01 01**

02: The Function Code 2 (read Input Status)
01: The number of data bytes to follow
01: 7 space holders & Discrete Input 100 (0000 0001)
The 7 most significant bits are filled in with zeroes.

### 8.3.1.4. Read Holding Registers (FC=03)

Request

This command is requesting the content of holding registers 19800.

**03 4D58 0002**

03: The Function Code 3 (read Holding Registers)
4D58: The Data Address of the first register requested (4D58 hex = 19800)
0002: The total number of registers requested. (read 2 registers each 2 byte = 4 bytes)

Response

**03 04 41BD 0655**

03: The Function Code 3 (read Sensor 1 Part 1 Holding Registers)
04: The number of data bytes to follow (2 registers x 2 bytes each = 4 bytes)
41BD 0655: 4 bytes value

All holding registers with float value are sent in big-endian.

In the example, the above value of 23.628 is sent.

Request

This command is requesting the content of holding registers 18100.

**03 46B4 0020**

03: Function Code 3 (read Sensor 1 description Holding Registers)
46B4: The Data Address of the first register requested (46B4 hex = 18100)
0020: The total number of registers requested (read 32 registers each 2 byte = 64 bytes)

Response

**03 40 5365 6E73 6F72 3100 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000**

03: Function Code 3 (read Analog Output Holding Registers)
40: The number of data bytes to follow (32 registers x 2 bytes each = 64 bytes)
5365 6E73 6F72 3100 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000: 64 bytes value
All holding registers with strings are sent in big-endian.
The answer is padded with 0.
In the example above string “Sensor1” is sent.

### 8.3.1.5. Exception codes

All exceptions are signaled by adding 0x80 to the function code of the request, and following this byte by a single reason byte for example as follows:

01 Illegal function

The function code received in the query is not an allowable action for the controller.

02 Illegal data address

The data address received in the query is not an allowable address for the slave. More specifically, the combination of the reference number and the transfer length is invalid. For a controller with 100 registers, a request with offset 96 and length 4 would succeed, a request with offset 96 and length 5 will generate exception 02.

### 8.3.2. Address table

| Parameter | FC | PDU decimal address | Data size | Data |
|---|---|---|---|---|
| Relay 1 | 01,05,15 | 100 | Discrete | |
| Relay 2 | 01,05,15 | 101 | Discrete | |
| Relay 3 | 01,05,15 | 102 | Discrete | |
| Relay 4 | 01,05,15 | 103 | Discrete | |
| | | | | |
| Digital input 1 | 02 | 100 | Discrete | |
| Digital input 2 | 02 | 101 | Discrete | |
| Digital input 3 | 02 | 102 | Discrete | |
| Digital input 4 | 02 | 103 | Discrete | |
| | | | | |
| Relay 1 description | 03,16 | 15000 | 64 bytes UTF-8 | |
| Relay 2 description | 03,16 | 15032 | 64 bytes UTF-8 | |
| Relay 3 description | 03,16 | 15064 | 64 bytes UTF-8 | |
| Relay 4 description | 03,16 | 15096 | 64 bytes UTF-8 | |
| | | | | |
| Relay 1 pulse width | 03,16 | 15200 | 32-bit Float | |
| Relay 2 pulse width | 03,16 | 15202 | 32-bit Float | |
| Relay 3 pulse width | 03,16 | 15204 | 32-bit Float | |
| Relay 4 pulse width | 03,16 | 15206 | 32-bit Float | |
| | | | | |
| Relay 1 activated from | 03,06,16 | 15300 | 16-bit unsign int | manual(0), sensor11(1), sensor12(2), sensor21(3), sensor22(4), sensor31(5), sensor32(6), sensor41(7), sensor42(8), sensor51(9), sensor52(10), sensor61(11), sensor62(12), sensor71(13), sensor72(14), sensor81(15), sensor82(16), analog1(17), analog2(18), analog3(19), analog4(20), digital1(21), digital2(22), digital3(23), digital4(24), anyAlarm(25), anySensor(26), |

| | | | | |
|---|---|---|---|---|
| | | | | anyAnalog(27), anyDigital(28), func1(29), func2(30), func3(31), func4(32), shedule1(33), shedule2(34), shedule3(35), shedule4(36), virtual1(37), virtual2(38), virtual3(39), virtual4(40) |
| Relay 2 activated from | 03,06,16 | 15301 | 16-bit unsign int | —"— |
| Relay 3 activated from | 03,06,16 | 15302 | 16-bit unsign int | —"— |
| Relay 4 activated from | 03,06,16 | 15303 | 16-bit unsign int | —"— |
| | | | | |
| Relay 1 action on alarm | 03,06,16 | 15400 | 16-bit unsign int | on (0), pulse (2) |
| Relay 2 action on alarm | 03,06,16 | 15401 | 16-bit unsign int | —"— |
| Relay 3 action on alarm | 03,06,16 | 15402 | 16-bit unsign int | —"— |
| Relay 4 action on alarm | 03,06,16 | 15403 | 16-bit unsign int | —"— |
| | | | | |
| Relays state after restart | 03,06 | 15500 | 16-bit unsign int | off (0), on (1), last state (2) |
| | | | | |
| Digital input 1 description | 03,16 | 16000 | 64 bytes UTF-8 | |
| Digital input 2 description | 03,16 | 16032 | 64 bytes UTF-8 | |
| Digital input 3 description | 03,16 | 16064 | 64 bytes UTF-8 | |
| Digital input 4 description | 03,16 | 16096 | 64 bytes UTF-8 | |
| | | | | |
| Digital input 1 alarm state | 03 | 16200 | 16-bit unsign int | |
| Digital input 2 alarm state | 03 | 16201 | 16-bit unsign int | |
| Digital input 3 alarm state | 03 | 16202 | 16-bit unsign int | |
| Digital input 4 alarm state | 03 | 16203 | 16-bit unsign int | |
| | | | | |
| Analog input 1 description | 03,16 | 17000 | 64 bytes UTF-8 | |
| Analog input 2 description | 03,16 | 17032 | 64 bytes UTF-8 | |
| Analog input 3 description | 03,16 | 17064 | 64 bytes UTF-8 | |
| Analog input 4 description | 03,16 | 17096 | 64 bytes UTF-8 | |
| | | | | |
| Analog input 1 max | 03,16 | 17200 | 32-bit Float | |
| Analog input 2 max | 03,16 | 17202 | 32-bit Float | |
| Analog input 3 max | 03,16 | 17204 | 32-bit Float | |
| Analog input 4 max | 03,16 | 17206 | 32-bit Float | |
| | | | | |
| Analog input 1 min | 03,16 | 17300 | 32-bit Float | |
| Analog input 2 min | 03,16 | 17302 | 32-bit Float | |
| Analog input 3 min | 03,16 | 17304 | 32-bit Float | |
| Analog input 4 min | 03,16 | 17306 | 32-bit Float | |
| | | | | |
| Analog input 1 hysteresis | 03,16 | 17400 | 32-bit Float | |
| Analog input 2 hysteresis | 03,16 | 17402 | 32-bit Float | |
| Analog input 3 hysteresis | 03,16 | 17404 | 32-bit Float | |
| Analog input 4 hysteresis | 03,16 | 17406 | 32-bit Float | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| Analog input 1 value | 03 | 17500 | 32-bit Float | |
| Analog input 2 value | 03 | 17502 | 32-bit Float | |
| Analog input 3 value | 03 | 17504 | 32-bit Float | |
| Analog input 4 value | 03 | 17506 | 32-bit Float | |
| | | | | |
| | | | | |
| Sensor 1 description | 03,16 | 18100 | 64 bytes UTF-8 | |
| Sensor 2 description | 03,16 | 18132 | 64 bytes UTF-8 | |
| Sensor 3 description | 03,16 | 18164 | 64 bytes UTF-8 | |
| Sensor 4 description | 03,16 | 18196 | 64 bytes UTF-8 | |
| Sensor 5 description | 03,16 | 18228 | 64 bytes UTF-8 | |
| Sensor 6 description | 03,16 | 18260 | 64 bytes UTF-8 | |
| Sensor 7 description | 03,16 | 18292 | 64 bytes UTF-8 | |
| Sensor 8 description | 03,16 | 18324 | 64 bytes UTF-8 | |
| | | | | |
| Sensor 1, S11 dimension | 03 | 18400 | 64 bytes UTF-8 | |
| Sensor 1, S12 dimension | 03 | 18432 | 64 bytes UTF-8 | |
| Sensor 2, S21 dimension | 03 | 18464 | 64 bytes UTF-8 | |
| Sensor 2, S22 dimension | 03 | 18496 | 64 bytes UTF-8 | |
| Sensor 3, S31 dimension | 03 | 18528 | 64 bytes UTF-8 | |
| Sensor 3, S32 dimension | 03 | 18560 | 64 bytes UTF-8 | |
| Sensor 4, S41 dimension | 03 | 18592 | 64 bytes UTF-8 | |
| Sensor 4, S42 dimension | 03 | 18624 | 64 bytes UTF-8 | |
| Sensor 5, S51 dimension | 03 | 18656 | 64 bytes UTF-8 | |
| Sensor 5, S52 dimension | 03 | 18688 | 64 bytes UTF-8 | |
| Sensor 6, S61 dimension | 03 | 18720 | 64 bytes UTF-8 | |
| Sensor 6, S62 dimension | 03 | 18752 | 64 bytes UTF-8 | |
| Sensor 7, S71 dimension | 03 | 18784 | 64 bytes UTF-8 | |
| Sensor 7, S72 dimension | 03 | 18816 | 64 bytes UTF-8 | |
| Sensor 8, S81 dimension | 03 | 18848 | 64 bytes UTF-8 | |
| Sensor 8, S82 dimension | 03 | 18880 | 64 bytes UTF-8 | |
| | | | | |
| Sensor 1, S11 max | 03,16 | 19200 | 32-bit Float | |
| Sensor 1, S12 max | 03,16 | 19202 | 32-bit Float | |
| Sensor 2, S21 max | 03,16 | 19204 | 32-bit Float | |
| Sensor 2, S22 max | 03,16 | 19206 | 32-bit Float | |
| Sensor 3, S31 max | 03,16 | 19208 | 32-bit Float | |
| Sensor 3, S32 max | 03,16 | 19210 | 32-bit Float | |
| Sensor 4, S41 max | 03,16 | 19212 | 32-bit Float | |
| Sensor 4, S42 max | 03,16 | 19214 | 32-bit Float | |
| Sensor 5, S51 max | 03,16 | 19216 | 32-bit Float | |
| Sensor 5, S52 max | 03,16 | 19218 | 32-bit Float | |
| Sensor 6, S61max | 03,16 | 19220 | 32-bit Float | |
| Sensor 6, S62 max | 03,16 | 19222 | 32-bit Float | |
| Sensor 7, S71 max | 03,16 | 19224 | 32-bit Float | |
| Sensor 7, S72 max | 03,16 | 19226 | 32-bit Float | |
| Sensor 8, S81 max | 03,16 | 19228 | 32-bit Float | |
| Sensor 8, S82 max | 03,16 | 19230 | 32-bit Float | |

| | | | | |
|---|---|---|---|---|
| Sensor 1, S11 min | 03,16 | 19300 | 32-bit Float | |
| Sensor 1, S12 min | 03,16 | 19302 | 32-bit Float | |
| Sensor 2, S21 min | 03,16 | 19304 | 32-bit Float | |
| Sensor 2, S22 min | 03,16 | 19306 | 32-bit Float | |
| Sensor 3, S31 min | 03,16 | 19308 | 32-bit Float | |
| Sensor 3, S32 min | 03,16 | 19310 | 32-bit Float | |
| Sensor 4, S41 min | 03,16 | 19312 | 32-bit Float | |
| Sensor 4, S42 min | 03,16 | 19314 | 32-bit Float | |
| Sensor 5, S51 min | 03,16 | 19316 | 32-bit Float | |
| Sensor 5, S52 min | 03,16 | 19318 | 32-bit Float | |
| Sensor 6, S61 min | 03,16 | 19320 | 32-bit Float | |
| Sensor 6, S62 min | 03,16 | 19322 | 32-bit Float | |
| Sensor 7, S71 min | 03,16 | 19324 | 32-bit Float | |
| Sensor 7, S72 min | 03,16 | 19326 | 32-bit Float | |
| Sensor 8, S81 min | 03,16 | 19328 | 32-bit Float | |
| Sensor 8, S82 min | 03,16 | 19330 | 32-bit Float | |
| | | | | |
| Sensor 1, S11 hysteresis | 03,16 | 19400 | 32-bit Float | |
| Sensor 1, S12 hysteresis | 03,16 | 19402 | 32-bit Float | |
| Sensor 2, S21 hysteresis | 03,16 | 19404 | 32-bit Float | |
| Sensor 2, S22 hysteresis | 03,16 | 19406 | 32-bit Float | |
| Sensor 3, S31 hysteresis | 03,16 | 19408 | 32-bit Float | |
| Sensor 3, S32 hysteresis | 03,16 | 19410 | 32-bit Float | |
| Sensor 4, S41 hysteresis | 03,16 | 19412 | 32-bit Float | |
| Sensor 4, S42 hysteresis | 03,16 | 19414 | 32-bit Float | |
| Sensor 5, S51 hysteresis | 03,16 | 19416 | 32-bit Float | |
| Sensor 5, S52 hysteresis | 03,16 | 19418 | 32-bit Float | |
| Sensor 6, S61 hysteresis | 03,16 | 19420 | 32-bit Float | |
| Sensor 6, S62 hysteresis | 03,16 | 19422 | 32-bit Float | |
| Sensor 7, S71 hysteresis | 03,16 | 19424 | 32-bit Float | |
| Sensor 7, S72 hysteresis | 03,16 | 19426 | 32-bit Float | |
| Sensor 8, S81 hysteresis | 03,16 | 19428 | 32-bit Float | |
| Sensor 8, S82 hysteresis | 03,16 | 19430 | 32-bit Float | |
| | | | | |
| Sensor 1, S11 multiplier | 03,16 | 19500 | 32-bit Float | |
| Sensor 1, S12 multiplier | 03,16 | 19502 | 32-bit Float | |
| Sensor 2, S21 multiplier | 03,16 | 19504 | 32-bit Float | |
| Sensor 2, S22 multiplier | 03,16 | 19506 | 32-bit Float | |
| Sensor 3, S31 multiplier | 03,16 | 19508 | 32-bit Float | |
| Sensor 3, S32 multiplier | 03,16 | 19510 | 32-bit Float | |
| Sensor 4, S41 multiplier | 03,16 | 19512 | 32-bit Float | |
| Sensor 4, S42 multiplier | 03,16 | 19514 | 32-bit Float | |
| Sensor 5, S51 multiplier | 03,16 | 19516 | 32-bit Float | |
| Sensor 5, S52 multiplier | 03,16 | 19518 | 32-bit Float | |
| Sensor 6, S61 multiplier | 03,16 | 19520 | 32-bit Float | |
| Sensor 6, S62 multiplier | 03,16 | 19522 | 32-bit Float | |
| Sensor 7, S71 multiplier | 03,16 | 19524 | 32-bit Float | |

| | | | | |
|---|---|---|---|---|
| Sensor 7, S72 multiplier | 03,16 | 19526 | 32-bit Float | |
| Sensor 8, S81 multiplier | 03,16 | 19528 | 32-bit Float | |
| Sensor 8, S82 multiplier | 03,16 | 19530 | 32-bit Float | |
| | | | | |
| Sensor 1, S11 offset | 03,16 | 19600 | 32-bit Float | |
| Sensor 1, S12 offset | 03,16 | 19602 | 32-bit Float | |
| Sensor 2, S21 offset | 03,16 | 19604 | 32-bit Float | |
| Sensor 2, S22 offset | 03,16 | 19606 | 32-bit Float | |
| Sensor 3, S31 offset | 03,16 | 19608 | 32-bit Float | |
| Sensor 3, S32 offset | 03,16 | 19610 | 32-bit Float | |
| Sensor 4, S41 offset | 03,16 | 19612 | 32-bit Float | |
| Sensor 4, S42 offset | 03,16 | 19614 | 32-bit Float | |
| Sensor 5, S51 offset | 03,16 | 19616 | 32-bit Float | |
| Sensor 5, S52 offset | 03,16 | 19618 | 32-bit Float | |
| Sensor 6, S61 offset | 03,16 | 19620 | 32-bit Float | |
| Sensor 6, S62 offset | 03,16 | 19622 | 32-bit Float | |
| Sensor 7, S71 offset | 03,16 | 19624 | 32-bit Float | |
| Sensor 7, S72 offset | 03,16 | 19626 | 32-bit Float | |
| Sensor 8, S81 offset | 03,16 | 19628 | 32-bit Float | |
| Sensor 8, S82 offset | 03,16 | 19630 | 32-bit Float | |
| | | | | |
| Sensor 1 ID | 03 | 19700 | 16 bytes UTF-8 | Example: 2860B85F07000094 |
| Sensor 2 ID | 03 | 19708 | 16 bytes UTF-8 | |
| Sensor 3 ID | 03 | 19716 | 16 bytes UTF-8 | |
| Sensor 4 ID | 03 | 19724 | 16 bytes UTF-8 | |
| Sensor 5 ID | 03 | 19732 | 16 bytes UTF-8 | |
| Sensor 6 ID | 03 | 19740 | 16 bytes UTF-8 | |
| Sensor 7 ID | 03 | 19748 | 16 bytes UTF-8 | |
| Sensor 8 ID | 03 | 19756 | 16 bytes UTF-8 | |
| | | | | |
| Sensor 1, S11 value | 03 | 19800 | 32-bit Float | |
| Sensor 1, S12 value | 03 | 19802 | 32-bit Float | |
| Sensor 2, S21 value | 03 | 19804 | 32-bit Float | |
| Sensor 2, S22 value | 03 | 19806 | 32-bit Float | |
| Sensor 3, S31 value | 03 | 19808 | 32-bit Float | |
| Sensor 3, S32 value | 03 | 19810 | 32-bit Float | |
| Sensor 4, S41 value | 03 | 19812 | 32-bit Float | |
| Sensor 4, S42 value | 03 | 19814 | 32-bit Float | |
| Sensor 5, S51 value | 03 | 19816 | 32-bit Float | |
| Sensor 5, S52 value | 03 | 19818 | 32-bit Float | |
| Sensor 6, S61 value | 03 | 19820 | 32-bit Float | |
| Sensor 6, S62 value | 03 | 19822 | 32-bit Float | |
| Sensor 7, S71 value | 03 | 19824 | 32-bit Float | |
| Sensor 7, S72 value | 03 | 19826 | 32-bit Float | |
| Sensor 8, S81 value | 03 | 19828 | 32-bit Float | |
| Sensor 8, S82 value | 03 | 19830 | 32-bit Float | |
| | | | | |
| Sensor 1, S11 alarm status | 03 | 20000 | 16-bit unsign int | normal (0), alarm (1) |

| | | | | |
|---|---|---|---|---|
| Sensor 1, S12 alarm status | 03 | 20001 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 2, S21 alarm status | 03 | 20002 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 2, S22 alarm status | 03 | 20003 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 3, S31 alarm status | 03 | 20004 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 3, S32 alarm status | 03 | 20005 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 4, S41 alarm status | 03 | 20006 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 4, S42 alarm status | 03 | 20007 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 5, S51 alarm status | 03 | 20008 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 5, S52 alarm status | 03 | 20009 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 6, S61 alarm status | 03 | 20010 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 6, S62 alarm status | 03 | 20011 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 7, S71 alarm status | 03 | 20012 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 7, S72 alarm status | 03 | 20013 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 8, S81 alarm status | 03 | 20014 | 16-bit unsign int | normal (0), alarm (1) |
| Sensor 8, S82 alarm status | 03 | 20015 | 16-bit unsign int | normal (0), alarm (1) |
| | | | | |
| Save configuration | 03,06 | 50000 | 16-bit unsign int | unsaved (0), saved (1) |
| Restart device | 03,06 | 50001 | 16-bit unsign int | cancel (0), restart (1) |
| Temperature unit | 03,06 | 50002 | 16-bit unsign int | Celsius (0), Fahrenheit (1) |
| HW error | 03 | 50003 | 16-bit unsign int | noErr (0), hwErr (1) |
| Device ID | 03 | 50100 | 18 bytes UTF-8 | Example:<br>5c:32:c5:00:ac:52 |
| Hostname | 03 | 50200 | 16 bytes UTF-8 | |
| Device IP | 03 | 50300 | 16 bytes UTF-8 | Example:<br>192.168.1.2 |

# 9. Factory default settings

The TCW241 can be restored to its original factory default settings in three different ways.

## 9.1. Factory default from the WEB interface

Pressing the “Factory default” button in the Administration -> Backup/Restore section will reset all parameters to their factory defaults, except for network settings.

## 9.2. Factory default with the reset button

If the reset button is pressed for more than 5 seconds while the device is powered on, all network settings will be reverted to factory defaults.

## 9.3. General factory default with the reset button

To perform a complete factory reset of all parameters, follow these steps:

- Press and hold the RESET button, then turn on the power supply.
- The yellow LED will illuminate, and the red LED will blink approximately five times per second.
- After about 5 seconds, the red LED will turn off, and you can release the button.
- The yellow LED will flash once per second while the red LED remains illuminated, indicating that the device is in working mode with factory default settings.


The factory default settings are:

| | |
|---|---|
| Username | admin |
| Password | admin |
| IP Address | 192.168.1.2 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 192.168.1.1 |
| SNMPConfiguration | disabled |
| readCommunity | public |
| writeCommunity | private |
| Analog inputs unit | voltage |
| Analog inputs multiplier | 1.000 |
| Analog inputs ofset | 0.000 |

## 10. Environment information

This equipment is intended for use in a Pollution Degree 2 environment, at altitudes of up to 2000 meters.

When the controller is part of a larger system, all other elements of the system must comply with EMC (Electromagnetic Compatibility) requirements and be suitable for use under the same ambient conditions.

## 11. Safety

This device must not be used for medical or life-saving purposes or for any application where its failure could result in serious injury or loss of life.

To reduce the risk of fire, use only flexible stranded wire with a cross-section of 0.5mm² or larger for wiring digital and analog inputs and relay outputs of the device.

To avoid electric shock and fire hazards, do not expose this product to liquids, rain, or moisture. Objects filled with liquids, such as vases, should not be placed on this device.

There is a risk of overheating (and potential damage) to the controller if the recommended free spaces next to adjacent devices are not maintained. Ensure that there is sufficient space for attaching and removing cables after installation.

Teracom does not guarantee the successful operation of the product if it is used under conditions that deviate from the product specifications.

To ensure that the device works correctly follow these steps:

- Ensure that the device is installed according to the instructions in this user manual;
- Log into the device via a web browser;
- Perform the necessary configuration settings;
- Short the “Din1” and “GND” terminals;
- Install a TSH2XX or TST1XX sensor on the 1-Wire bus;
- Navigate to the “Monitoring page” of the web interface. Proper parameter values should be displayed, and the flashing “STS” LED should indicate that the device is operating correctly.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Teracom Ltd. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

## 12. Maintenance

After any service or repair of the device, or at least once a year, a safety check must be performed to ensure that the product is in proper operating condition.

Clean the device only with dry cloth. Do not use liquid cleaners or aerosol cleaners. Do not use a magnetic/static cleaning device (dust remover) or any kind of abrasive materials to clean the device.

Following these guidelines will help maintain the device in optimal condition and ensure its longevity.

## Appendix A

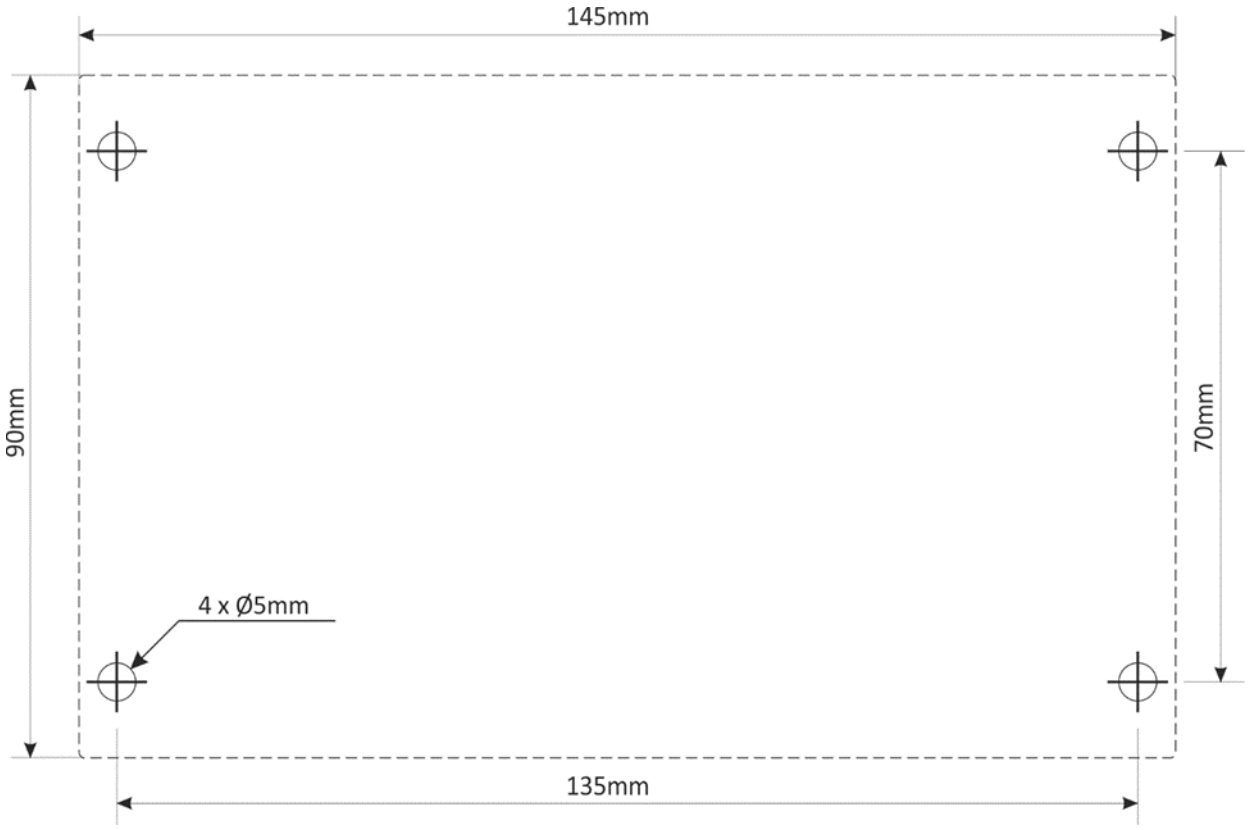



Fig.1

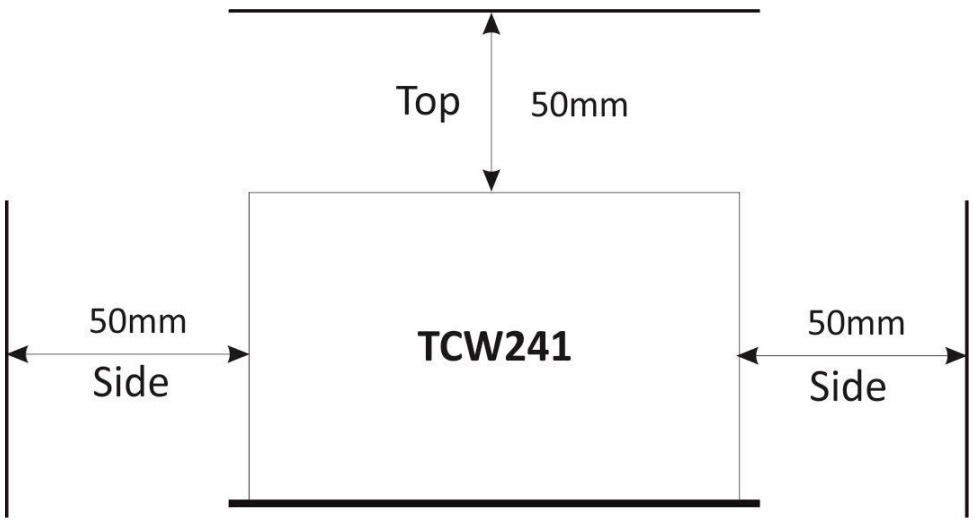



Fig.2