control solutions
TERACOM
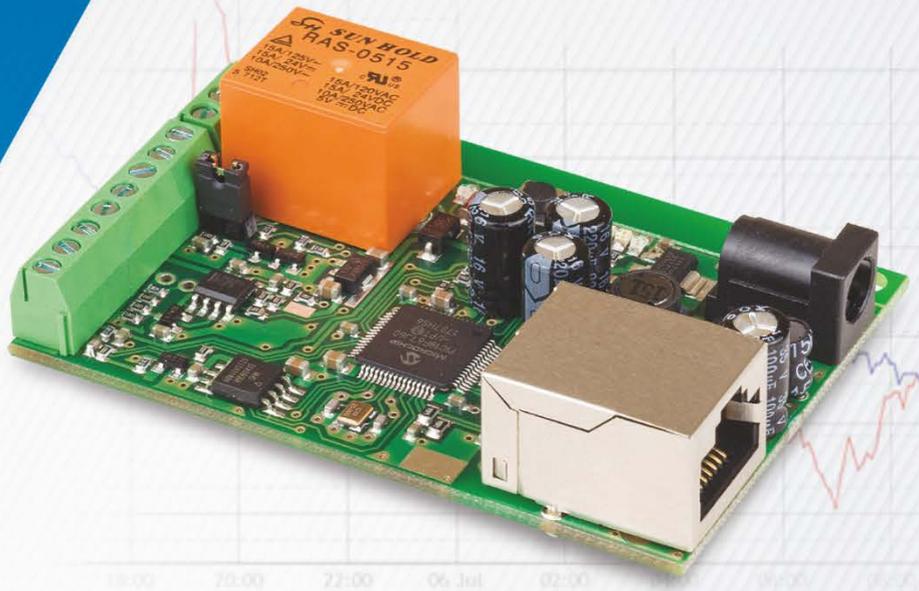
TCW112-CM
Remote environmental monitoring board
Revision 3.3 / March 2019

USER MANUAL

1. Short description

TCW112-CM is a remote environmental monitoring board, which is designed to work in IP-based networks. It has 1 digital and 1 analog input, 1-Wire interface and 1 relay output. It can be managed by WEB interface and/or SNMP programs.

The relay can be activated either remotely (WEB, SNMP etc.) or locally - from the status of monitored parameter (temperature, humidity, analog voltage and dry contact). Only one parameter can manage the relay at the same time, but for every parameter can be sent an e-mail if it goes outside of the previously predefined range.

2. Features

- Password protected, web-based configuration and control;
- 1 digital input with " dry contact" and "logic level" modes;
- 1 analog input with 0 to 60VDC range;
- 1 relay with NO and NC contacts;
- Long 1-Wire support for 1 temperature (TST1XX) or temperature/humidity (TSH2xx) sensor;
- SNMP v.1;
- SNMP traps sending for alert conditions;
- E-mail sending for alert conditions;
- SMTP with authentication (SSL/TLS is not supported);
- HTTP and SNMP port changing;
- HTTP and XML API commands;
- Remote firmware update.

3. Specifications

- Physical characteristics
  Dimensions: 72 x 50 x 18 mm
  Weight: 45 g

- Environmental limits
  Operating тemperature 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 requirements
  Input Voltage: 10 to 14 VDC
  Input Current: 120 mA @ 12 VDC (with activated relay)

- Ethernet connectivity
  10 Mbit/s transfer rate
  Half-duplex mode only
  Auto-negotiation not supported

- Digital input
  Isolation: Non isolated
  Mode: Dry contact or Logic level
  Maximum input voltage: +5.5VDC
  Minimum input voltage for high logic level: +2.5VDC
  Maximum input voltage for low logic level: +0.8VDC
  Sampling rate: 10mS
  Digital filtering time interval: 30mS

- Analog input
  Isolation: Non isolated
  Type: Single ended
  Resolution: 10 bits
  Mode: Voltage
  Input Range: 0 to 60 VDC
  Accuracy: ±1%
  Sampling Rate: 37.6mS per channel (averaged value of 64 samples)
  Input Impedance: 1 mega-ohms (min.)
  Supply voltage for analog sensor (+VA): 5.0 ± 0.1
 Maximum output current for analog sensor (+VA): 0.1A

- Relay output
  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

- 1-Wire interface
  Output voltage (+VW): 5.3 ± 0.2 VDC
  Maximum output current (+VW): 0.2 A

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

4. Connectors and LED's

The location of the connectors and LED's are shown below:

J1 - Jumper for Digital input mode
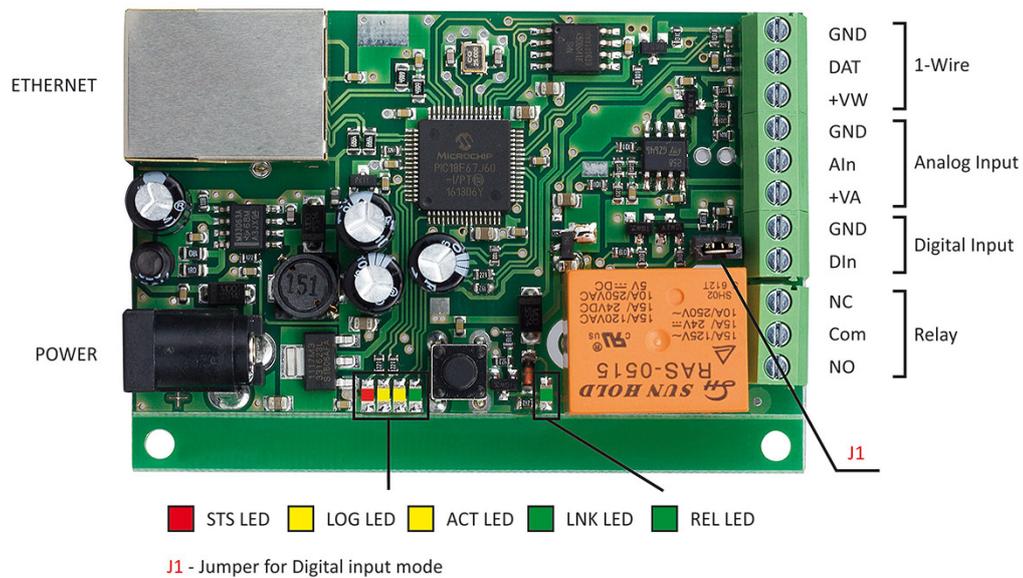
4.1 Connectors

The device has following connectors:

- Power – 2.1x5.5mm connector, central positive;
- Ethernet - RJ45 connector;
- Screw terminals:
  - GND   ground for 1-Wire sensor;
  - DAT   data input/output of 1-Wire sensor;
  - +VW   power supply for 1-Wire sensor;
  - GND   ground for analog input;
  - AIn   analog input;
  - +VA   power supply for analog sensors;
  - GND   ground for digital input;
  - DIn   digital input, operates either in "dry contact" mode (J1 is closed) or "logic level" mode (J1 is open);
  - Relay   normal open and normal closed contacts are available.

4.2 LED indicators

The following LED's show the status of the controller:

- STS (red) – flashes when the main program of the controller is executed;
- LOG (yellow) – indicates that somebody is logged via WEB interface;
- ACT (yellow) – flashing when there is an activity;
- LNK (green) – ON when the link is up, OFF when no or bad connection;
- REL (green) – indicates that the relay is activated.

5. Powering

TCW112-CM is designed to be supplied by adapter SYS1421-0612-W2E or similar, intended for use in the conditions of overvoltage category II, and priorly assessed for compliance with safety requirements. The power supply equipment shall be resistant to short circuit and overload in the secondary circuit.

When in use do not position the equipment so that it is difficult to disconnect the device from the power supply.

6. Installation

The installation consists of mounting the device, connecting to an IP network, connecting inputs and outputs, providing power and configuring via a web browser.

This device must be installed by qualified personnel.

This device must not be installed directly outdoors.

This device should be mounted in a clean and dry location room. Ventilation is recommended for installations where the ambient air temperature is expected to be high.

The device should be installed in the not flammable box. See Appendix-A, fig. 1 for mechanical details. Maintain spacing from adjacent equipment. Allow 50 mm of space on all sides, as shown in fig.2 in Appendix A. This provides ventilation and electrical isolation.

7. Configuration

Please follow the steps below for proper installation:

1. Mount the controller in a dry and ventilated place.
2. Connect the Ethernet port to a 10/100MB Ethernet network. For direct connection to a PC using a "crossover" cable.
3. Connect the I/O pins of the controller according to the required application.
4. Connect the power supply.

If the red LED (STS) blinks, the main program of the controller is executed. By default TCW112-CM is delivered with the following network settings:

*IP address: **192.168.1.2**, Subnet Mask: **255.255.255.0**, Default Gateway: **192.168.1.1***

Communication with TCW112-CM can be established by assigning a temporary IP address to the computer. This address should be on the same network (for example 192.168.1.3). To get access to the web interface, you should type http://192.168.1.2 into the browser address field.
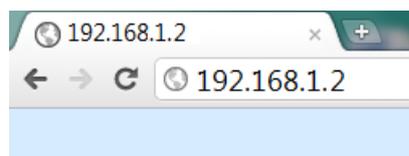
If the network settings are correct, the "Login" page will appear.

The web-based interface allows configuration, monitoring, and control.

7.1 Login page

After opening the Login page, authorization data must be entered (by default username=admin, password=admin). It is recommended to change the username and password to prevent unauthorized access to the controller.
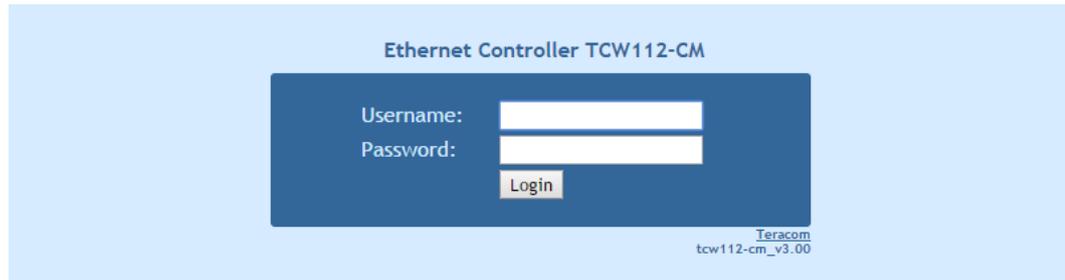
The controller supports one active session – only one user can operate the device. If another user tries to log in, the message "Someone's logged in" appears:
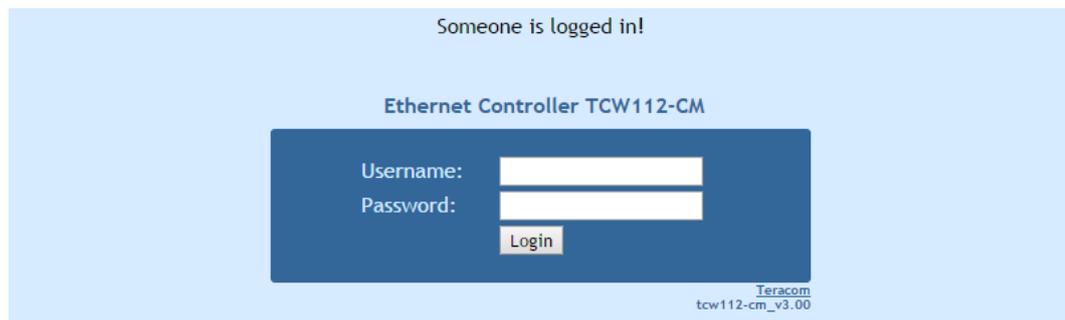
The active session will stay open until the "Monitoring" page is open. Inactivity on other pages or closing the browser without logoff will terminate the session automatically in 4 minutes.

7.2 Monitoring page

After successful authorization, the "Monitoring page" appears:
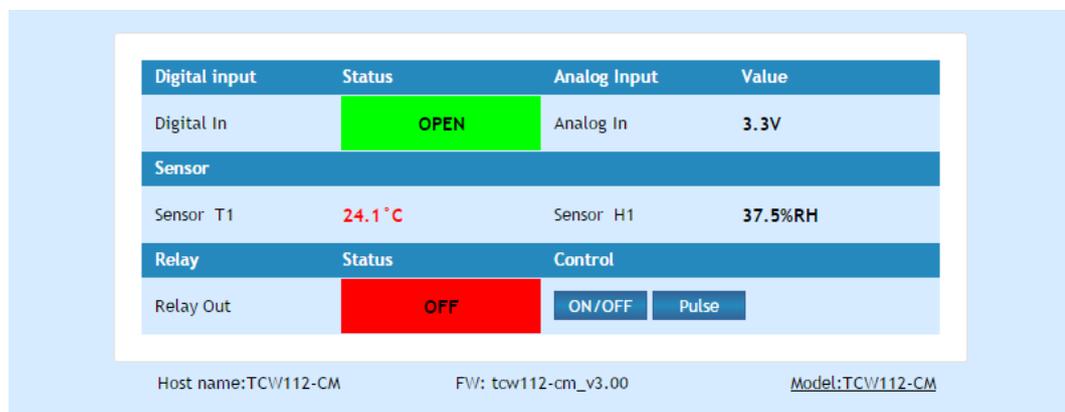
The "Monitoring page" provides information about the state of the digital and analog input, relay status, temperature, and humidity (if a sensor is connected).

Digital input can be used for monitoring the state of discrete devices – motion sensor, door contact, relay contact, alarm output etc. The digital input is not galvanic isolated. One side of the contact is connected to "Digital In" and another side is connected to "GND" pins. Digital input is sampled every 30mS. The change of input status is considered valid if the same value is read in seven consecutive samples.
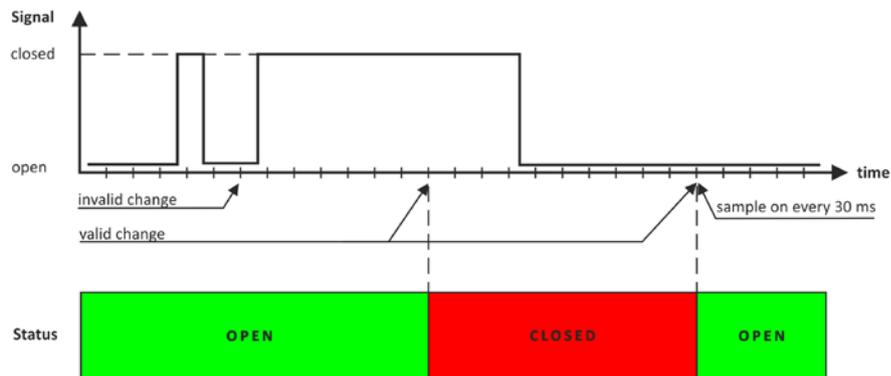
7.3 Network Setup page

The Network parameters are set on this page. The following parameters can be changed:

- **Static/DHCP** – IP Address can be static or dynamic (DHCP server should be present in the network);
- **IP address, Subnet mask, Default gateway** – these fields are active if IP address is static;
- **DNS** – this field is mandatory if domain names are used instead of IP addresses. By default DNS has the same IP address as Default gateway;
- **Time Server** and **Time Zone** – these fields are used when e-mail is sent;
- **Host Name** – up to 16 symbols, it appears as a "Subject" in sent e-mails;
- **MAC** – device MAC address.

The good practice is to change the default IP address of controller immediately after first power-on. This will avoid collisions if many devices are used on the same network. It may be necessary to clear the arp cache, each time you connect a new device to the network. This is done by typing *arp -d* in the command prompt window of the computer.

To use e-mail alerts following fields should be completed:

- **Mail server type** – either "custom" or "tcw gateway".

    "Custom" – public or private mail server without SSL should be used.
    Important! TCW112-CM does not support Secure Socket Layer (SSL);
    "Tcw gateway" - dedicated mail server is used.
    Important! The service is free and not guaranteed.
- **Mail server [IP:port]** – domain or IP address and port of SMTP mail server**;**
- **Sender E-mail** – sender e-mail;
- **Username** and **Password** – authentication details for mail server;
- **Recipient e-mail**.

Authentication details for WEB access to TCW112-CM can be set in the last section. Only one user is supported.

7.4   I/O setup page

For temperature, humidity and analog voltage - MIN, MAX, and HYSTERESIS values can be set. These values arranged windows for monitored parameter.

When the measured value goes out of range SNMP trap or e-mail (if enabled) will be sent. Leaving range is considered when the parameter goes lower than MIN values or higher than MAX. Coming back in the range is considered when the parameter goes higher than (MIN + HYSTERESIS) or lower than (MAX – HYSTERESIS).
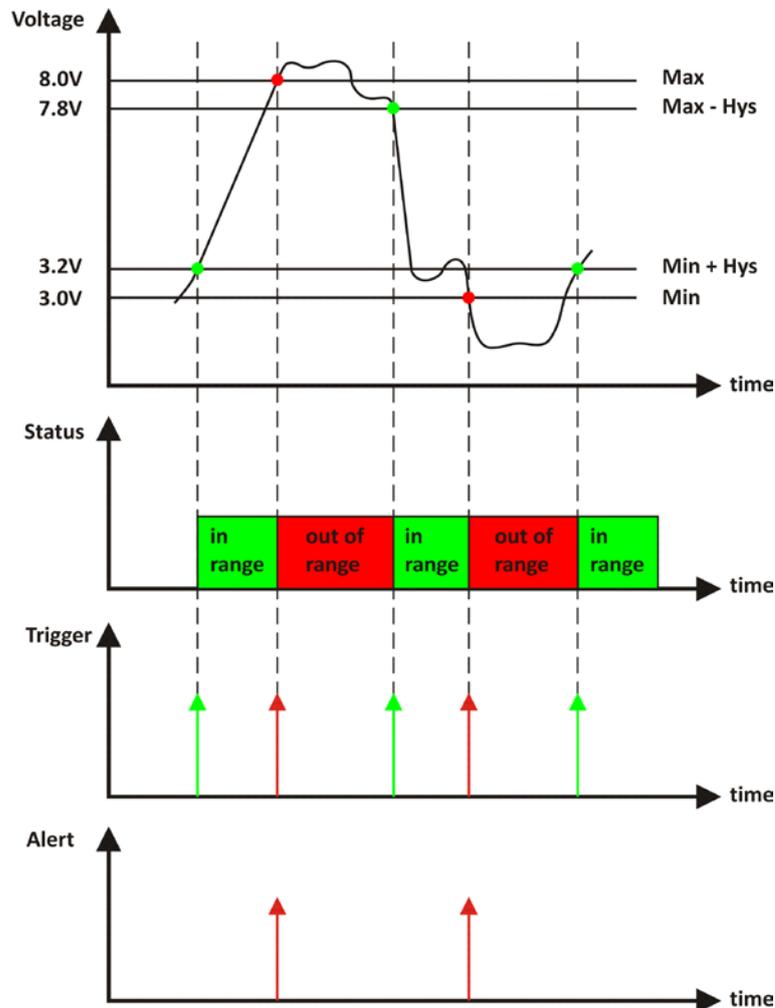
Example:

TCW112-CM, TST100, and appropriate heater are used to control the room temperature. The wanted minimum temperature is 19°C. The initial temperature is 17°C.

TST100 is assigned to the first position for 1-Wire sensors.

For Relay1 local activation from Sensor1 is set.

Following parameters are set for Sensor1: Min=19, Max=100 and Hys=0.5.

Sensor				
	Min.	Max.	Hysteresis	If out of range
Temperature, °C	19.0	100.0	0.5	send_email ▼
Humidity, %RH	0.0	60.0	0.5	do nothing ▼

When the controller is switched on, Relay1 is immediately activated because the monitored temperature is out of range. This switches the heater on. The temperature is going higher.

When temperature reaches 19.5°C (19.0 + 0.5) it goes in range (trigger condition) and Relay1 is deactivated. The heater is switched off.

The temperature falls and when it reached 19°C it goes out of range (trigger and alert conditions). The relay is activated (heater is switched on) and e-mail is sent.
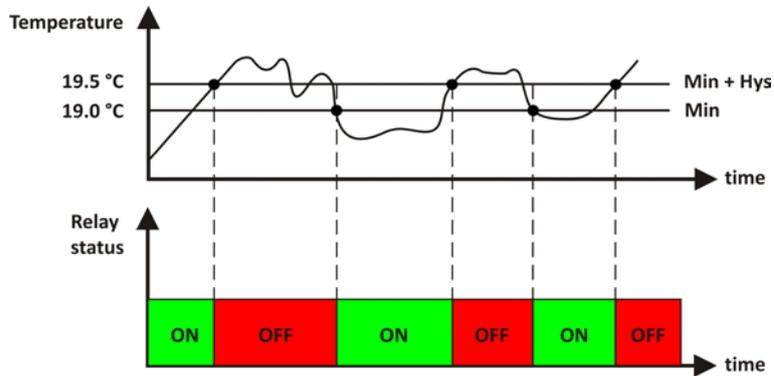
For digital input, conditional e-mail sending can be arranged by following part of the page:

Digital input	
Email Alert	if_OPEN-TO-CLOSED ▼

The relay can be activated automatically depends on of the value of the monitored parameter (humidity, temperature, analog voltage and changes on digital input) or manually. Only one parameter can be assigned for relay activation, at the same time:

Relay output		
Pulse Duration	6	sec(1-253)
Relay activated from	manual ▼	
Save relay state after change via HTTP API	No ▼	100 000 write cycles are guaranteed

When manual activation is selected, "Pulse" and "ON/OFF" buttons on "Monitoring page" are active. The duration of the pulse for relay activation can be set from 1 to 253 seconds.

Automatic monitoring page refresh interval can be set from 1 to 253 second.

For every sensor, analog input, digital input and relay description with a length of 11 characters can be set.

Descriptions	
Sensor	Sensor
Analog Input	Analog In
Digital Input	Digital In
Relay	Relay Out

Temperature units can be changed between Fahrenheit and Celsius.

Units	
Temperature Units	C ▼

Automatic monitoring page refresh interval can be set from 1 to 253 second.

Monitoring page	
Refresh interval	1 sec(1-253)

7.5 SNMP Setup page

TCW112-CM supports SNMP v.1 that enables trap delivery to an SNMP management application. This enables the device to be part of large monitoring and control networks. The possible settings for "SNMP" section are:

- **SNMP Configuration** – enable/disable SNMP;
- **SNMP Port** – allows standard port changing;
- **Write/Read community** – performs client authentication;
- **SNMP Traps** – enable/disable SNMP trap messages;
- **IP address** – IP address of the receiving host;
- **Community string** – performs client authentication;
- **Trap Interval** - time interval in seconds for SNMP trap messages;
- **Max. Traps number** – maximum number of SNMP trap messages sent if trap condition is present.

SNMP traps are sent if:

- event occurs (status change) on digital input;
- measured voltage on analog input goes outside the range;
- measured temperature goes outside the range;
- measured humidity goes outside the range;
- restart condition.

8. Application examples

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Teracom Ltd. cannot assume responsibility or liability for actual use based on the examples and diagrams.

8.1 Temperature and humidity control

TCW112-CM supports 1-Wire temperature and humidity sensors, which makes it suitable for use in heating and cooling systems.
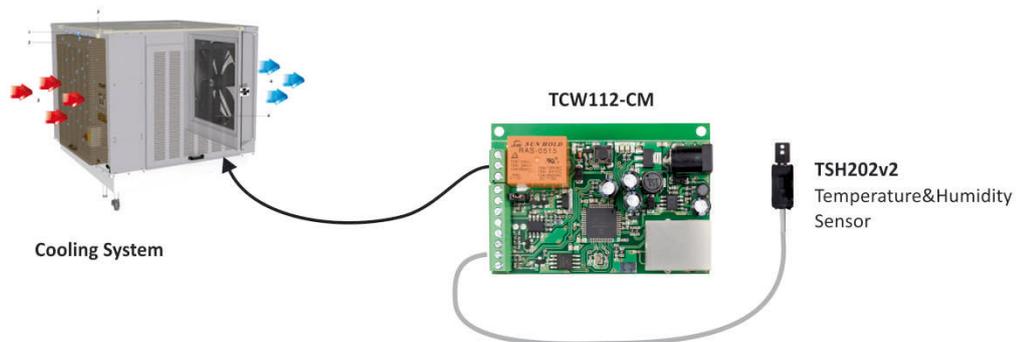
8.2 Data acquisition

TCW112-CM can be used in Data Acquisition Systems (DAQ). The device uses SNMP v.1 protocol for communication with monitoring and management software applications.
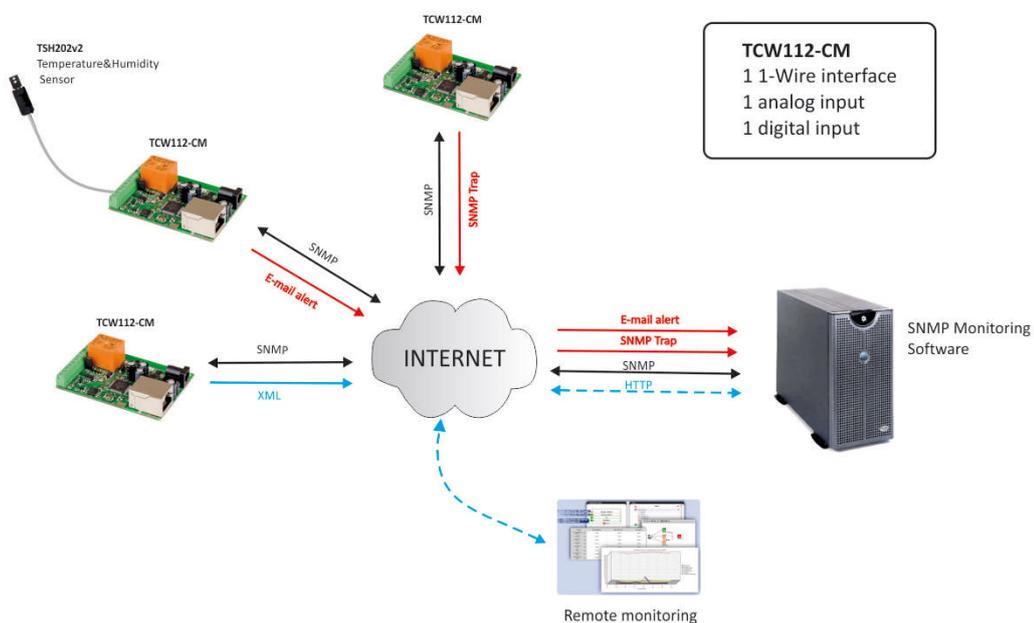
8.3   Remote control

The controlled device is connected in series with the relay contacts.

Users can operate TCW112-CM using a web browser or SNMP applications.
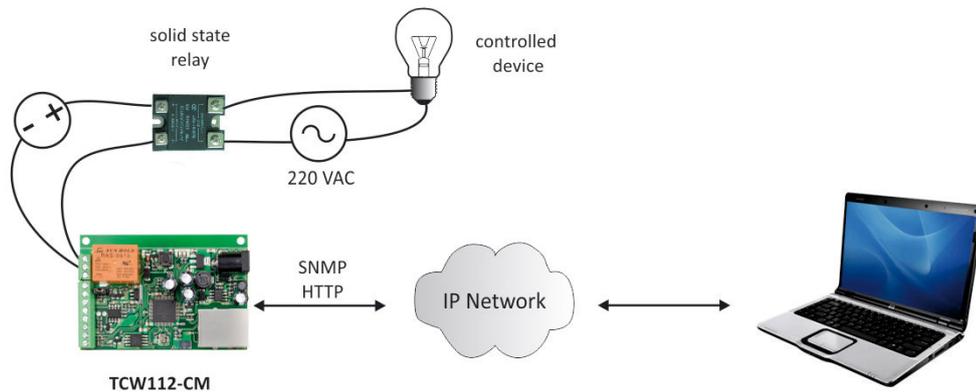
8.4   Remote monitoring

A relay contact of the monitored device is connected to the digital input. When an event occurs – the controller can send an e-mail and/or SNMP trap.
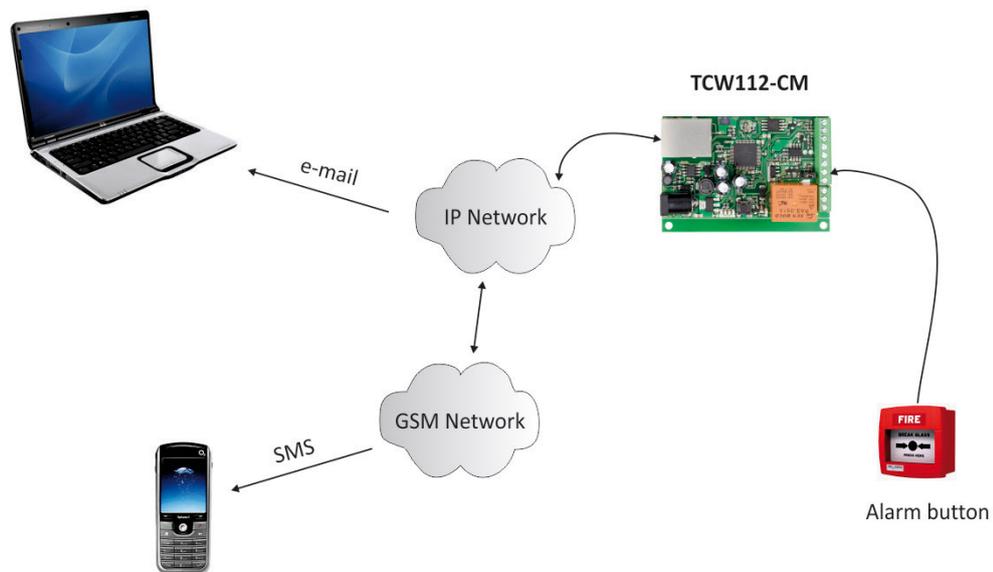
9.   1-Wire Bus

1-Wire is a registered trademark of Maxim Integrated Products, Inc. It is designed to connect several sensors over a short wiring. The bus carries power and a single data wire. It is not suitable for long distances or environments with EMC interference. We strongly recommend reading Maxim's 1-Wire tips at http://www.maxim-ic.com/app-notes/index.mvp/id/148.

We strongly recommend keeping the total wiring length under 30m, although functionality has been achieved in the longer distance.

We guarantee proper operation only with our 1-Wire sensors series TST1XX and TSH2XX.

10. Control and monitoring using SNMP

TCW112-CM can be configured and monitored through SNMP (Simple Network Management Protocol). This could be done using every SNMPv.1 compatible program. Parameters that can be changed, are grouped according to their functions in the tables below. To obtain a valid OID number it is necessary to replace "x" symbol with "1.3.6.1.4.1.38783". To save the changes configurationSaved (OID x.3.7.0) should be set to "1".

10.1 Product

OID	Name	Access	Description	Syntax
x.1.1.0	name	read-only	Device name	String
x.1.2.0	version	read-only	Firmware version	String
x.1.3.0	date	read-only	Firmware release date	String

10.2 Setup -> network

network				
OID	**Name**	**Access**	**Description**	**Syntax**
x.2.1.1.0	deviceIPAddress	read-write	Device IP address	IpAddress
x.2.1.2.0	subnetMask	read-write	Subnet Mask	IpAddress
x.2.1.3.0	gateway	read-write	Gateway IP address	IpAddress
x.2.1.4.0	deviceMACAddress	read-write	Device MAC address	OCTET STRING (SIZE(6))
x.2.1.5.0	dhcpConfig	read-write	DHCP configuration ON/OFF	INTEGER { off(0), on(1) }
x.2.1.6.0	dns	read-write	Domain Name Server Address	IpAddress
x.2.1.7.0	hostName	read-write	Host Name	String (SIZE (0..38))

10.3 Setup -> snmpSetup

SNMP				
OID	**Name**	**Access**	**Description**	**Syntax**
x.2.4.1.0	snmpConfiguration	read-write	SNMP Configuration ENABLED/DISABLED	INTEGER { disabled(0), enabled(1) }
x. 2.4.2.0	trapEnabled	read-write	Indicates if this trap entry is enabled or not	INTEGER { no(0), yes(1) }
x. 2.4.3.0	trapReceiverIPAddress	read-write	Trap receiver IP address	IpAddress
x. 2.4.4.0	trapCommunity	read-write	Trap community	String (SIZE (0..13))
x.2.4.5.0	trapInterval	read-write	Trap Interval	INTEGER (1..253)
x.2.4.6.0	maxNumberOfTraps	read-write	Max Number of Traps	INTEGER (1..253)

10.4 Setup -> oneWireSensor -> temperature

oneWireSensor -> temperature				
OID	**Name**	**Access**	**Description**	**Syntax**
x.2.5.1.1.0	temperatureMin	read-write	Temperature minimum value	INTEGER (-400..1250)
x.2.5.1.2.0	temperatureMax	read-write	Temperature maximum value	INTEGER (-400..1250)
x.2.5.1.3.0	temperatureHyst	read-write	Temperature hysteresis	INTEGER (0..1250)
x.2.5.1.4.0	temperatureAction	read-write	Temperature Action	INTEGER { noAction(0), sendMail(1) }

10.5   Setup -> oneWireSensor -> humidity

oneWireSensor -> humidity				
OID	Name	Access	Description	Syntax
x.2.5.2.1.0	humidityMin	read-write	Humidity minimum value	INTEGER (0..1000)
x.2.5.2.2.0	humidityMax	read-write	Humidity maximum value	INTEGER (0..1000)
x.2.5.2.3.0	humidityHyst	read-write	Humidity hysteresis	INTEGER (0..1000)
x.2.5.2.4.0	humidityAction	read-write	Humidity Action	INTEGER { noAction(0), sendMail(1) }

10.6   Setup -> analogInput

analogInput				
OID	Name	Access	Description	Syntax
x.2.6.1.0	voltageMin	read-write	Voltage minimum value	INTEGER (0..1000)
x.2.6.2.0	voltageMax	read-write	Voltage maximum value	INTEGER (0..1000)
x.2.6.3.0	voltageHyst	read-write	Voltage hysteresis	INTEGER (0..1000)
x.2.6.4.0	voltageAction	read-write	Voltage Action	INTEGER { noAction(0), sendMail(1) }
x.2.6.5.0	voltageDescription	read-write	Voltage input description	DisplayString (SIZE (0..11))

10.7   Setup -> digitalInput

digitalInput				
OID	Name	Access	Description	Syntax
x.2.7.1.0	digitalInputAction	read-write	Digital Input Action	INTEGER { noAction(0), mailIfOpenToClosed(1), mailIfClosedToOpen(2) }
x.2.7.2.0	digitalInputDescription	read-write	Digital input description	DisplayString (SIZE (0..11))

10.8   Setup -> relay

Relay				
OID	Name	Access	Description	Syntax
x.2.8.1.0	relayControl	read-write	Relay Control Item	INTEGER { manual(0), temperature(1), humidity(2), analogInput(3), digitalInput(4) }
x.2.8.2.0	relayPulseWidth	read-write	Relay Pulse Width	INTEGER (1..253)
x.2.8.3.0	relayDescription	read-write	Relay description	DisplayString (SIZE (0..11))

10.9   Setup -> recipients

recipients				
OID	Name	Access	Description	Syntax
x.2.9.1.0	recipientEmailAddress	read-write	recipient e-mail address	String (SIZE (0..38))

10.10 Monitor and control

OID	Name	Access	Description	Syntax
x.3.1.0	digitalInputState	read-write	Digital Input State	INTEGER { closed(0), open(1) }
x.3.2.0	relayState	read-write	Relay State	INTEGER { off(0), on(1) }
x.3.3.0	relayPulse	read-write	Relay Pulse	INTEGER { off(0), on(1) }
x.3.4.0	voltx10Int	read-only	Voltage x10 in Integer format	INTEGER (0..1000)
x.3.5.0	tempx10Int	read-only	Temperature x10 in Integer format	INTEGER (-400..1250)
x.3.6.0	humix10Int	read-only	Humidity x10 in Integer format	INTEGER (0..1000)
x.3.7.0	configurationSaved	read-write	Configuration save status SAVED/UNSAVED	INTEGER { unsaved(0), saved(1) }
x.3.8.0	restartDevice	read-write	Restart Device	INTEGER { cancel(0), restart(1) }
x.3.9.0	temperatureUnits	read-write	Temperature units	INTEGER { celsius(0), fahrenheit(1) }

11. XML and HTTP API commands

XML is often preferred choice when it comes to M2M communication and system integration. The monitored values are transmitted in status.xml file that can be easily processed by software applications.

Below is the structure of the XML file, which is located at http://your.ip.address/status.xml:

```
<Monitor>
        <Device>TCWTCW112-CM</Device>
        <ID>00:04:A3:AA:00:01</ID>
        <Hostname>TCW112-CM</Hostname>
        <FW>3.00</FW>
        <DigitalInput1Description>Digital In</DigitalInput1Description>
        <DigitalInput1>OPEN</DigitalInput1>
        <DinAlarm1>0</DinAlarm1>
        <Relay1Description>Relay Out</Relay1Description>
        <Relay1>OFF</Relay1>
        <pulseWidth>6</pulseWidth>
        <AnalogInput1Description>Analog In</AnalogInput1Description>
        <AnalogInput1>3.3V</AnalogInput1>
        <AinAlarm1>0</AinAlarm1>
        <Sensor1Description>Sensor</Sensor1Description>
        <Temperature1>21.6°C</Temperature1>
        <TempAlarm1>0</TempAlarm1>
        <Humidity1>37.8%RH</Humidity1>
        <HumAlarm1>0</HumAlarm1>
</Monitor>
```

If XML/HTTP API authentication is enabled, basic access authentication is required to access the status.xml file. The format of the command is shown 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

Where uuuu is username and pppp is password. Both parameters are unencrypted.

The relay output can be controlled by sending HTTP commands:

Command	Description
http://device.ip.address/status.xml?r1=1	Turn Relay 1 ON
http://device.ip.address/status.xml?r1=0	Turn Relay 1 OFF
http://device.ip.address/status.xml?tg1=1	Toggle Relay 1 state
http://device.ip.address/status.xml?pl1=1	Pulse Relay 1

If XML/HTTP API authentication is enabled, basic access authentication is required to send HTTP commands. The format of the commands is shown in the table below (username=admin, pass=admin):

XML/HTTP API authentication	Format
enabled	http://device.ip.address/status.xml?a= admin:admin&r1=1
disabled	http://device.ip.address/status.xml?r1=1

12. Firmware update

TCW112-CM supports remote firmware update. To update the device follow the steps below:

- Go to www.teracomsystems.com and download the latest firmware version file from TCW112-CM product page;

- Go to the device login page, enter username and password and press the "Login" button;

- Go to "Update" menu, select the update .cod file and press "upload" button;
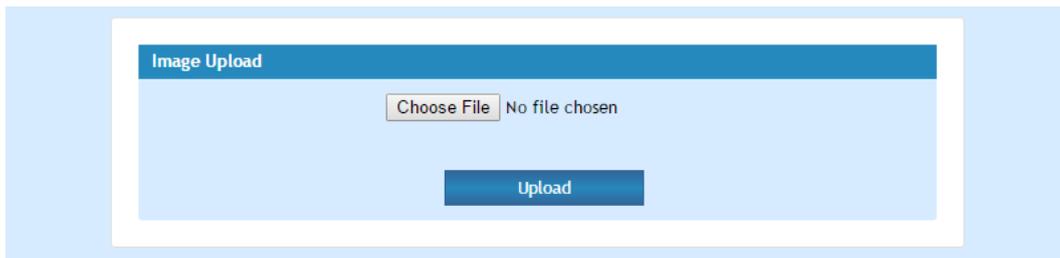
- After the firmware update is completed, you will be forwarded to the device Login page.

Attention! Don't turn off the power supply during the update. Turning off the power supply will damage the device.

For some updates factory default settings procedure is mandatory.

13. Factory default settings

TCW112-CM can be restored to its factory default settings following the steps below:

- Turn off the power supply from the unit;

- Press and hold the RESET button then turn on the power supply;

- After turning the power supply release the RESET button. The LED's STS and LOG will flash 14 times, after that only the STS LED will continue to blink. The controller is restored to its default settings.

RESET

The factory default settings are:

Username (Admin)	admin
Password (Admin)	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

14.

15. Environment information

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

When the controller is a part of a system, the other elements of the system shall comply with the EMC requirements and shall be intended for use in the same ambient conditions.

16. Safety

This device must not be used for medical, life-saving purposes or for any purpose where its failure could cause serious injury or the loss of life.

To reduce the risk of fire, only flexible stranded wire, with cross section 0.5mm² or larger for wiring of digital and analog inputs and relay output of the device should be used.

To avoid electric shock and fire hazard, 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 (damage) of the controller if recommended free spaces to adjacent devices are not ensured. The joint part with external component shall have space for attachment/removal of the cable after installation.

Teracom does not guarantee successful operation of the product if the product was used under conditions deviating from the product specifications.

To ensure that the device works correctly follow the steps below:

- ensure that the device is installed correctly, refer this user manual;
- log into the devices via browser program;
- make proper setup;
- set up the digital inputs to work in "dry contact" mode;
- short the "DI" and "GND";
- install sensor TSH1XX or TST1XX on the 1-Wire bus;
- go to "Monitoring page" of WEB interface – proper parameters value should be displayed at the same time flashing "STS" led should indicate the proper operation.

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.

17. Maintenance

Upon completion of any service/repair to the device or once per year, safety check must be performed to determine that this product is in proper operating condition.

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

Fig.1

Fig.2