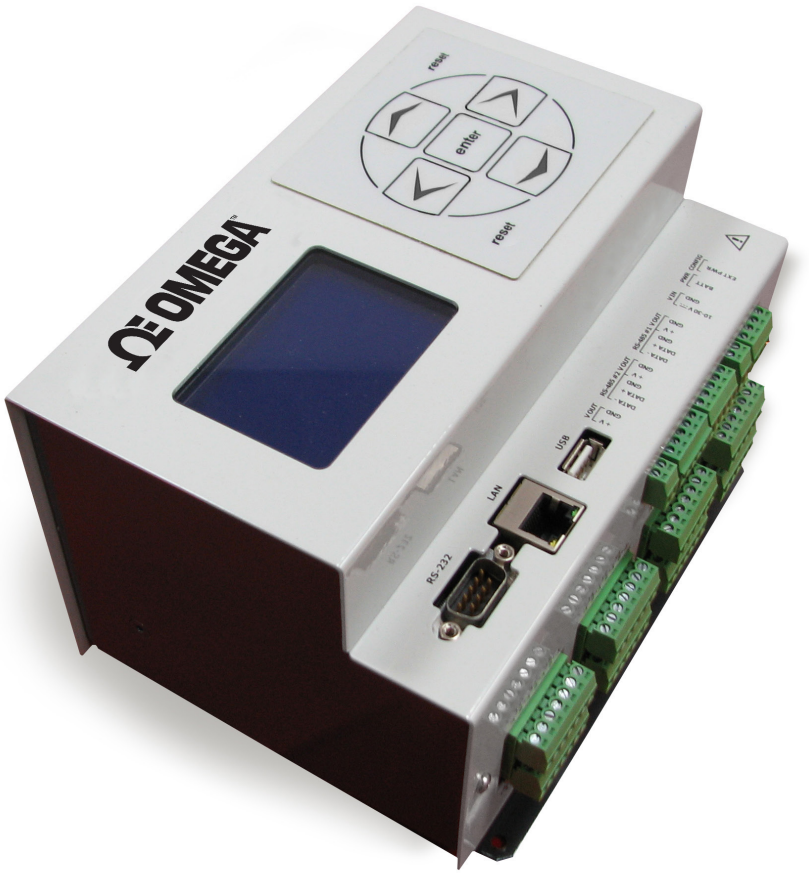
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USER MANUAL

OM-240

24-Channel Ethernet Data Logger with Embedded Web Server



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Specific Warnings



To guarantee the IP protection during the installation, expect to seal the instrument cables (with silicone or foam) after having tightened the cable-gland.
Through the installation expect suitable protections to avoid product overheating (e.g. a shelter to avoid direct sunlight); similarly for low temperatures.
Do not open in case of bad weather conditions (rain, snow, etc.).
Expect the recurring substitution of the hygroscopic salts.
Do not install in small locations and/or without ventilation, with high humidity, in potentially dangerous areas or where is prescribed the use of explosion proof components.
Electrical connections on the product must be executed only from qualified and expert personnel, in compliance with actual rules and regulations.
For external network powering, the plug at the end of the cord has ground contact; the grounding of the powering is provided from the plug inserted in the socket. The product powering source must be divided from dangerous voltage parts with double insulation and must guarantee an insulation of at least 3000 Vrms.
Be sure to have, in the plant, a suitable protection from electric short circuit (for example high sensitivity differential circuit-breaker at the root of the AC/DC power supply unit).
Before any maintenance on the product, the powering must be disconnected.
Avoid any action that can short-circuit the rechargeable battery poles.
To enable the product protections, expect a connection to the ground plant through a proper green-yellow grounding connector; this connector must be connected to the proper ground clamp (or to any bolt if it is a metal cabinet).
Verify periodically rechargeable battery voltage; expect a substitution after roughly 5 years and if the voltage measured on the poles is too low (e.g. 10.5 V for a battery with nominal voltage 12 V) and investigate on the causes.
Using the product differently from the one expected from the manufacturer can compromise safety conditions.
The use of parts other than original spare parts could lead to irregular functioning or even dangerous situations for person and things.

1. Quick Start

1.1. Overview

This chapter is about different product's features, starting from a device overview, and it will show how to connect every available sensor:

1. Front and Rear panel

Connection for:

2. Power Supply
3. Analog sensors
4. Digital Inputs
5. RS485 SmartModbus Sensors
6. Multiplexer boards

1.2. Device Overview

OM-240 is a universal datalogger, capable of reading 0..25mA Current Loop and Transmitter, -10..10 V, Vibrating Wire*, NTC, PT100, PT200, PT500, PT1000, Ratiometric, Wheatstone Bridge, Thermocouple, Potentiometer and SmartModbus RS-485 Digital Sensors.

It provides a maximum of 24 channels when using only 2 wires sensors.

OM-240 is expandable with SmartMux device.

1.3. Connections

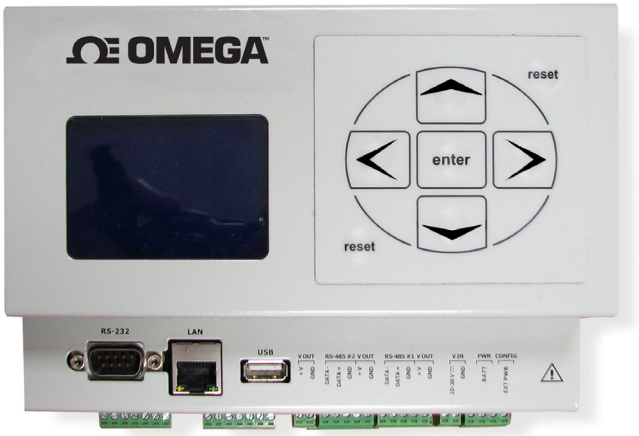


Figure 1 *Connections*

1.4. Front Panel

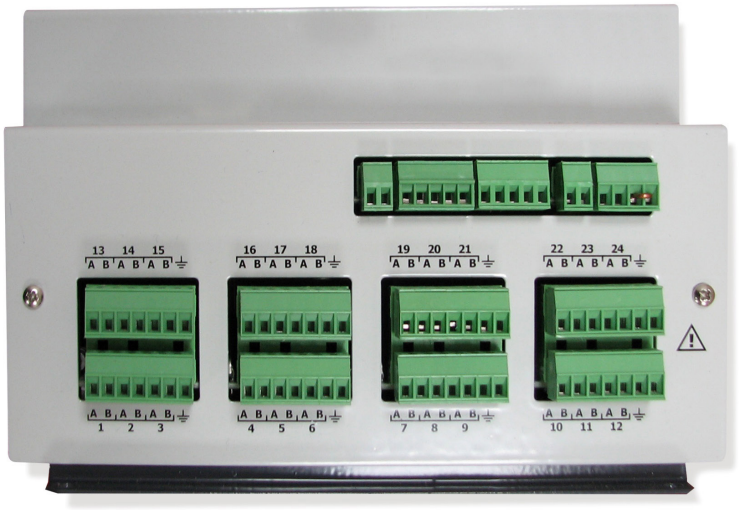


Figure 2 *Front Panel*

The majority of connections are located In OM-240's front panel:

- RS-232: it can be used to connect a 3G Modem to expand connectivity.
- Ethernet: This port is used to connect the device to an existing LAN. Internal Web Server can be browsed to configure and download acquired data. It can be used for Internet connection (Cloud, FTP and EMAIL connections).
- USB Host: it allows the user to download measures, events and alarm logs to a pendrive, or to update the firmware.
- V OUT: this connector is designed to output the same voltage applied to V IN. It can be turned off automatically when logger is in sleep mode or be kept always on.
- RS-485#2 – V OUT: This is SmartMux port, which allows the connection of 16 SmartMux in daisy chain and offers power supply.
- RS-485#1 – V OUT: This is SmartModbus port, which allows digital sensors connections and offers power supply.
- V IN: This port is to power the datalogger. It's designed to work in 10-30 V range.
- PWR-CONFIG: This port will allow the selection of Power supply. A jumper between two rightmost connections is needed to let the datalogger be powered up.
- ANALOG INPUTS: This 8 terminal blocks is used to connect analog sensors. Starting from bottom-left to bottom-right we find channels from 1 to 12, and from top-left to top-right we find channels from 13 to 24. Every 6 connections, there is a Ground connector designed to be the termination of shielded cables.

***Vibrating Vire reading is under development even if User Manual is ready for this feature.**

1.5. Rear Panel



Figure 3 *Rear Panel*

OM-240's rear panel has 2 Digital Inputs and 1 Digital Output.

- Digital Inputs IN1 IN2 can be configured to read rain meters and anemometers, or similar pulse sensors (optoisolated, Min input voltage is 5 V and Min current input is 2mA, while Max input voltage is 24 V and Max current is 10mA, Max frequency 1KHz, accuracy 0.1Hz).
- Digital Output is a relay output (for alarms), volt-free closure (low voltage, 30 V 2A).

1.6. Cabling

1.6.1. Overview

This chapter will explain every connection to datalogger, how to optimize connections availability and to use proper connectors to avoid unexpected behavior (malfunctions).

1.6.2. Power Supply

OM-240 can be supplied with 10 V to 30 V. In order to grant correct functioning of every connected sensor or device, and its internal circuitry, at least 2A PSU is needed. If Analog Sensors, External Modems, RS485 SmartModbus Sensors are powered from OM-240, a more powerful PSU should be used.



ALL V-OUT connections on the front panel - in the upper terminal block - expose the same V-IN applied. If you apply 24 V to V-IN, 24 V will be exposed.

Since OM-240 can work in a wide range of voltage, use has to choose the right one to power external devices connected.

1.7. Connecting PSU

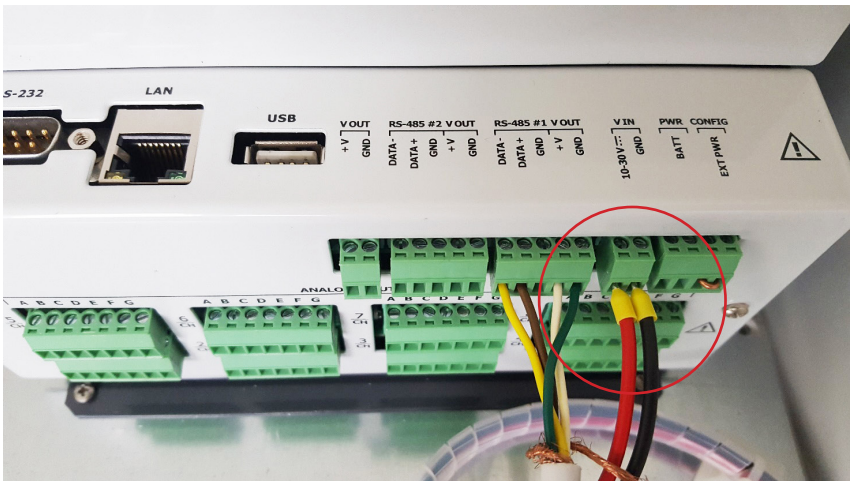
The logger should be configured before powering it up.

New datalogger are shipped already configured (as it follows) to be powered from external power source.

Rightmost pins of PWR CONFIG must be short-circuited to allow the datalogger to use V-IN source.

Connect V-IN to the right Power Supply Unit.

Picture below shows connections.



1.8. Analog Channels Connection

OM-240 can handle sensors up to a total of wires of 48.

Examples:

2 wires sensors: up to 24 channels

4 wires sensors: up to 12 channels

6 wires sensors: up to 8 channels

User can also mix sensors type and the datalogger will shift positions with this rule:

- 6 Wires sensors first
- 4 Wires sensors middle
- 2 Wires sensors last

With this simple rule, it will maximize connection simplicity.

Here are few examples:

1.9. Example 1 (2 wires sensors)

User connects 4 sensors, all of them are 2 wires:
First of all we configure the datalogger to read this sensors, as shown in Figure 4.

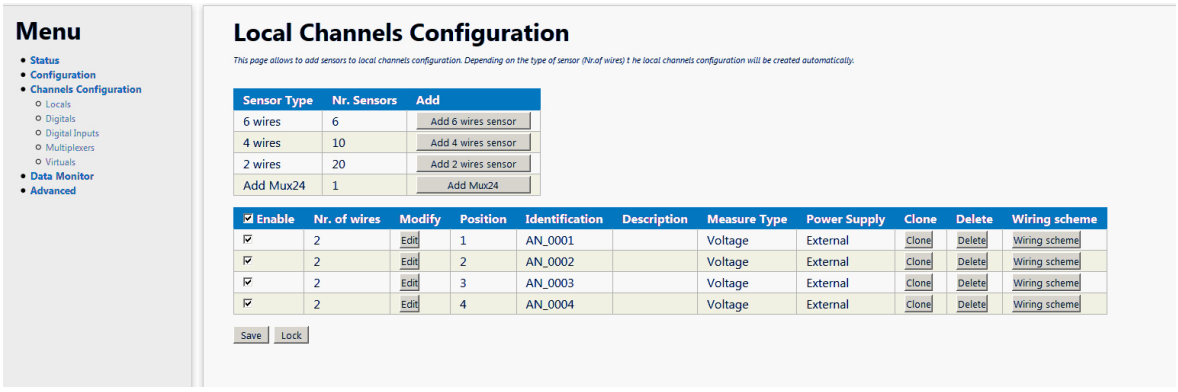


Figure 4 *Example 1 (2 wires sensors)*

Now we can proceed with physical configuration.

SENSOR1 will be connected to channel 1, A and B terminals.
SENSOR2 will be connected to channel 2, A and B terminals.
SENSOR3 will be connected to channel 3, A and B terminals.
SENSOR4 will be connected to channel 4, A and B terminals.

Wiring schemes are available from web server, or in the APPENDIX of this manual.

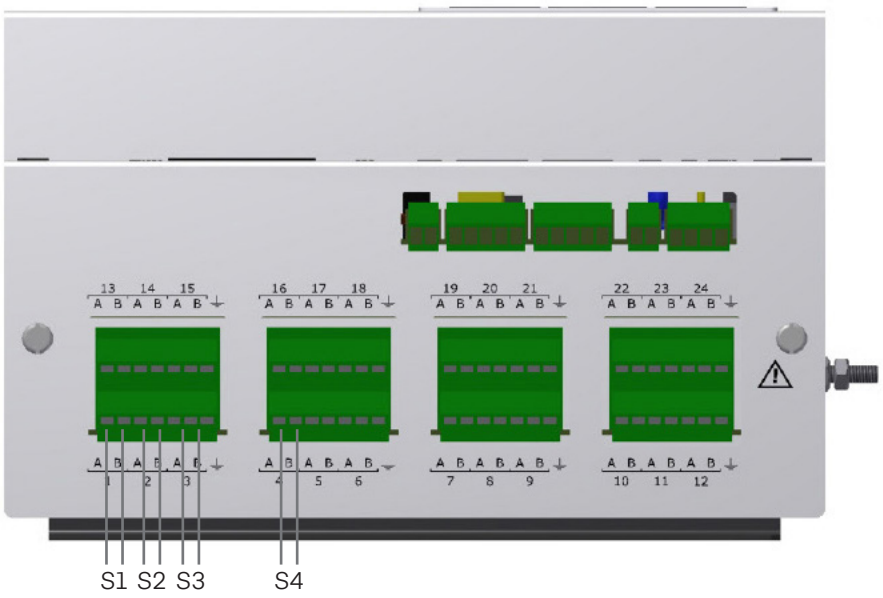


Figure 5 *Example 1*

1.10. Example 2 (4 wires sensors)

User connects 3 sensors, all of them are 4 wires:
First of all we configure the datalogger to read this sensors, as shown in Figure 6.

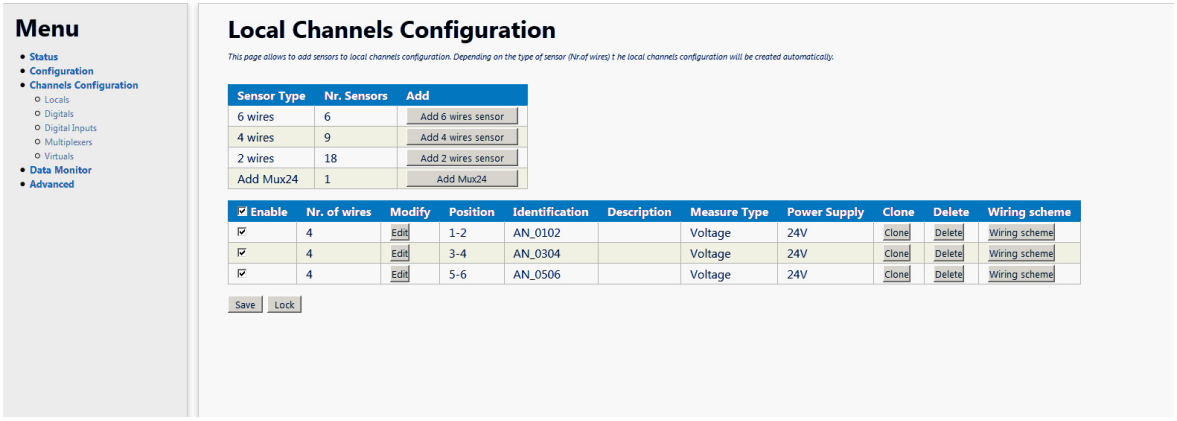


Figure 6 *Example 2 (4 wires sensors)*

Now we can proceed with physical configuration.

SENSOR1 will be connected to channel 1, A and B terminals, and channel 2, A and B terminals.
SENSOR2 will be connected to channel 3, A and B terminals, and channel 4, A and B terminals.
SENSOR3 will be connected to channel 5, A and B terminals, and channel 6, A and B terminals.

Wiring schemes are available from web server, or in APPENDIX of this manual.

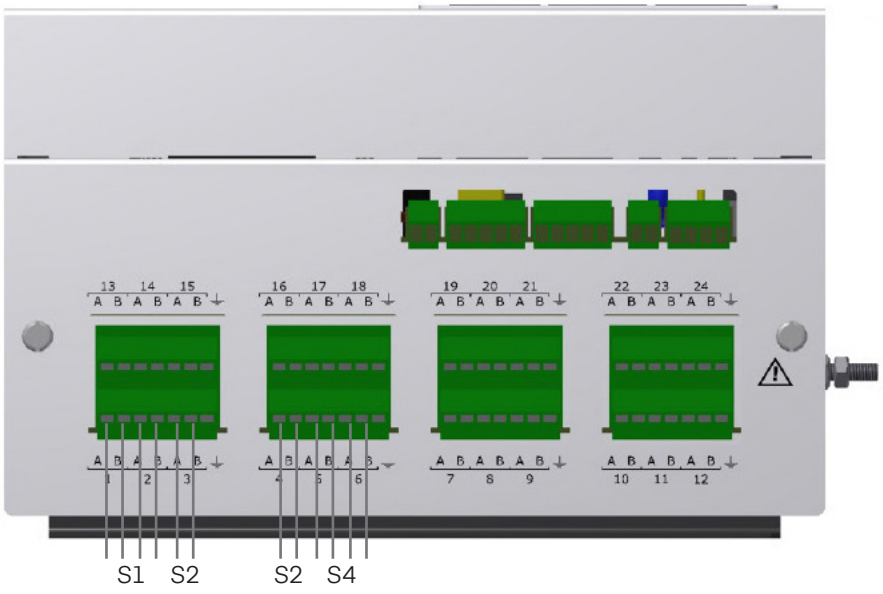


Figure 7 *Example 2*

1.11. Example 3 (6 wires sensors)

User connects 3 sensors, all of them are 6 wires:
First of all we configure the datalogger to read this sensors, as shown in Figure 8.

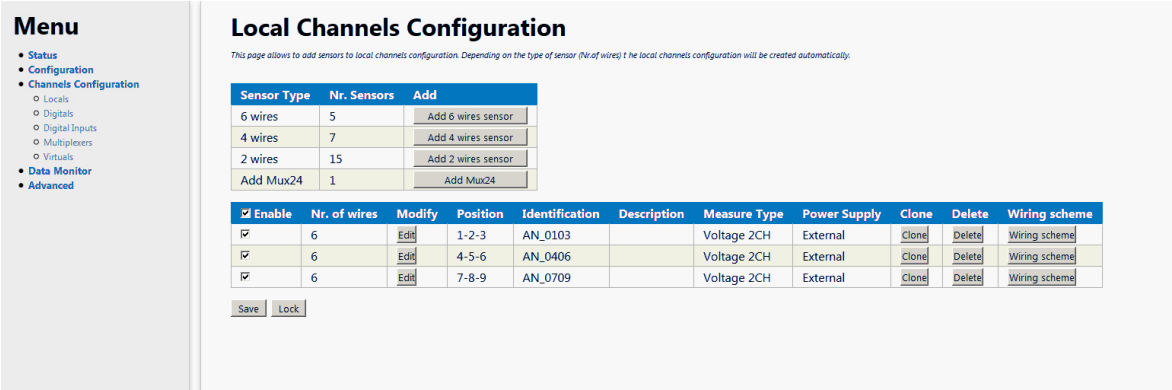


Figure 8 *Example 3 (6 wires sensors)*

SENSOR1 will be connected to channel 1, A and B terminals, channel 2, A and B terminals, and channel 3, A and B terminals.
SENSOR2 will be connected to channel 4, A and B terminals, channel 5, A and B terminals, and channel 6, A and B terminals.
SENSOR3 will be connected to channel 7, A and B terminals, channel 8, A and B terminals, and channel 9, A and B terminals.

Wiring schemes are available from web server, or in APPENDIX of this manual.

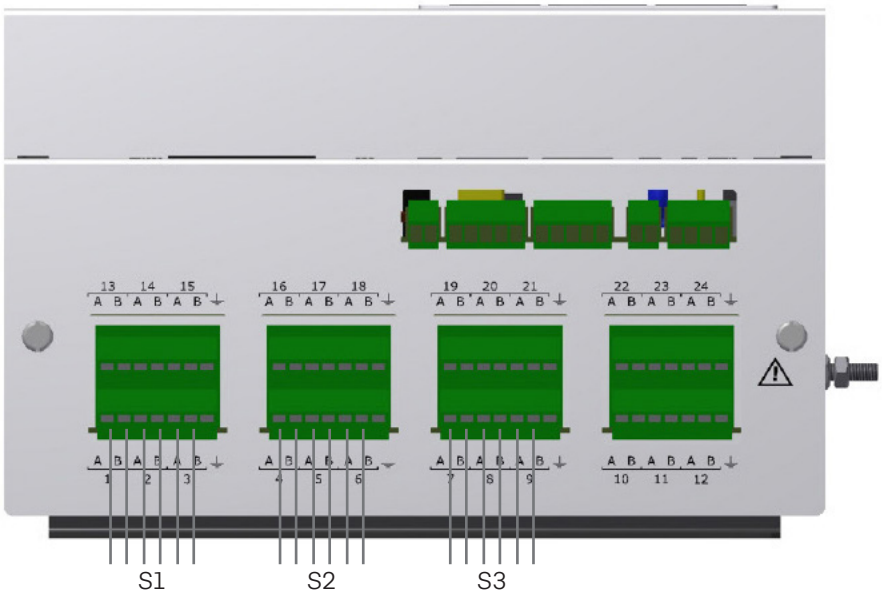


Figure 9 *Example 3*

1.12. Example 4 (4 wires and 2 wires mix)

User connects 4 sensors, 2 of them are 4 wires, while the other 2 are 2 wires.
First of all we configure the datalogger to read this sensors, as shown in Figure 10.

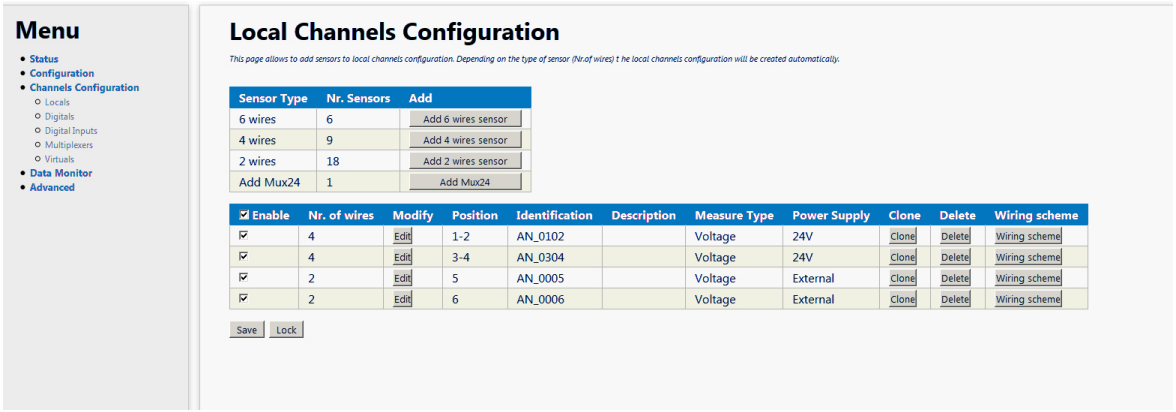


Figure 10 *Example 4 (4 wires and 2 wires mix)*

According to rules mentioned at the beginning of this chapter, we will start with 4 wires sensors, followed by 2 wires sensors.

SENSOR1 will be connected to channel 1, A and B terminals, and channel 2, A and B terminals.
SENSOR2 will be connected to channel 3, A and B terminals, and channel 4, A and B terminals.
SENSOR3 will be connected to channel 5, A and B terminals.
SENSOR4 will be connected to channel 6, A and B terminals.

Wiring schemes are available from web server, or in APPENDIX of this manual.

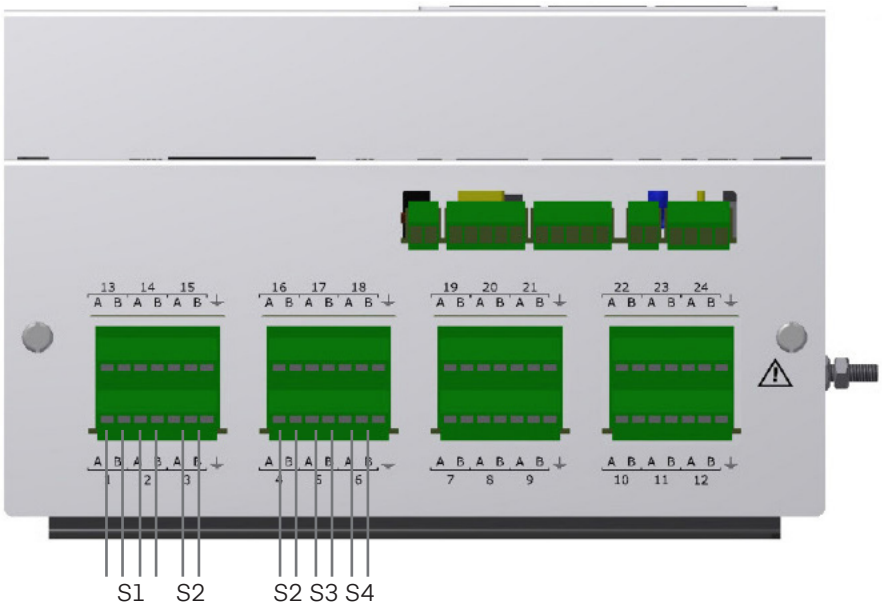


Figure 11 *Example 4*

1.13. Example 5 (6 wires and 2 wires mix)

User connects 3 sensors, 1 of them is 6 wires, while the other 2 are 2 wires.
First of all we configure the datalogger to read this sensors, as shown in Figure 12.

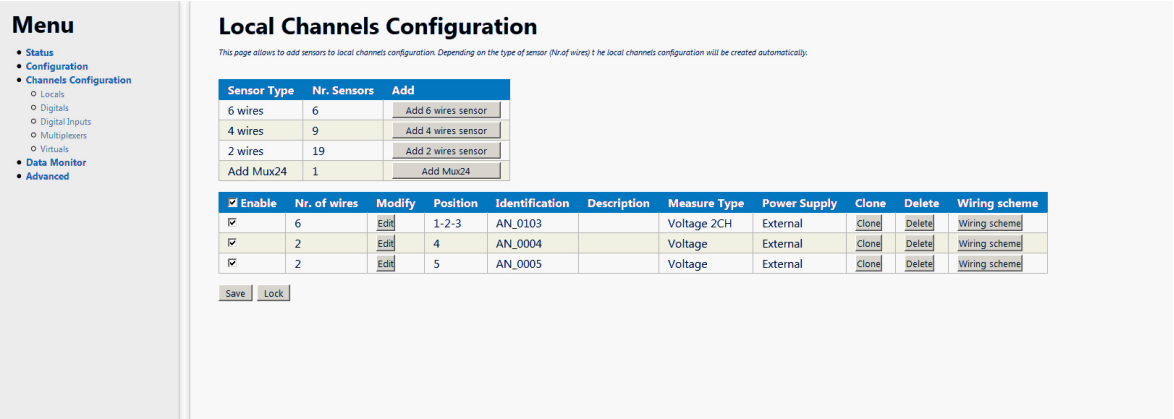


Figure 12 *Example 5 (6 wires and 2 wires mix)*

According to rules mentioned at the beginning of this chapter, we will start with 6 wires sensors, followed by 2 wires sensors.

SENSOR1 will be connected to channel 1, A and B terminals, channel 2, A and B terminals, and channel 3, A and B terminals.
SENSOR2 will be connected to channel 4, A and B terminals.
SENSOR3 will be connected to channel 5, A and B terminals.

Wiring schemes are available from web server, or in APPENDIX of this manual.

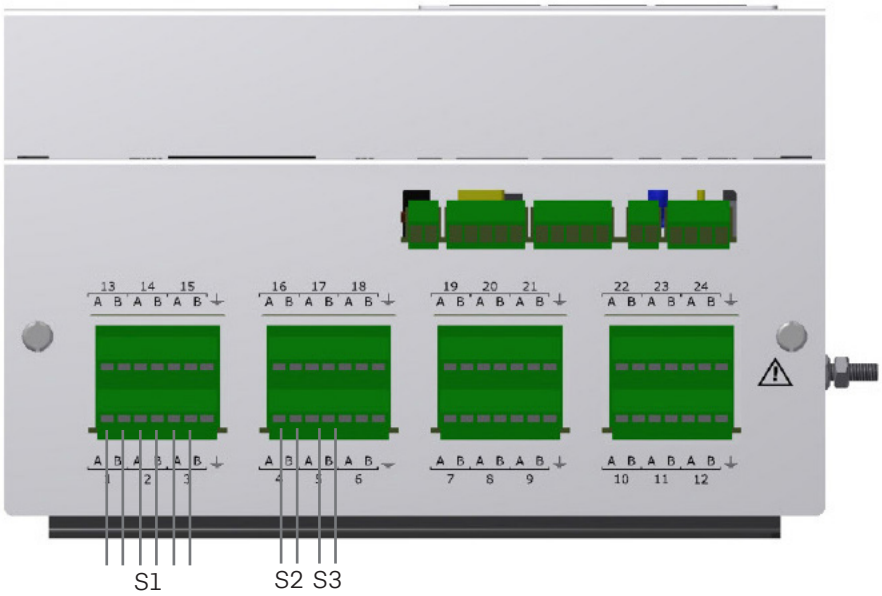


Figure 13 *Example 5*

1.14. Example 6 (6 wires and 4 wires mix)

User connects 3 sensors, 1 of them is 6 wires, while the other 2 are 4 wires.
First of all we configure the datalogger to read this sensors, as shown in Figure 14.

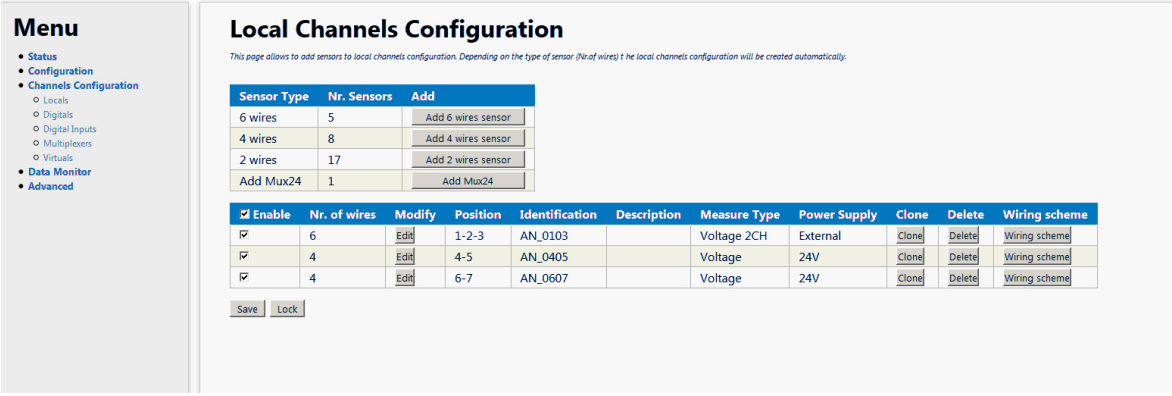


Figure 14 *Example 6 (6 wires and 4 wires mix)*

According to rules mentioned at the beginning of this chapter, we will start with 6 wires sensors, followed by 4 wires sensors.

SENSOR1 will be connected to channel 1, A and B terminals, channel 2, A and B terminals, and channel 3, A and B terminals.
SENSOR2 will be connected to channel 4, A and B terminals, and channel 5, A and B terminals.
SENSOR3 will be connected to channel 6, A and B terminals, and channel 7, A and B terminals.

Wiring schemes are available from web server, or in APPENDIX of this manual.

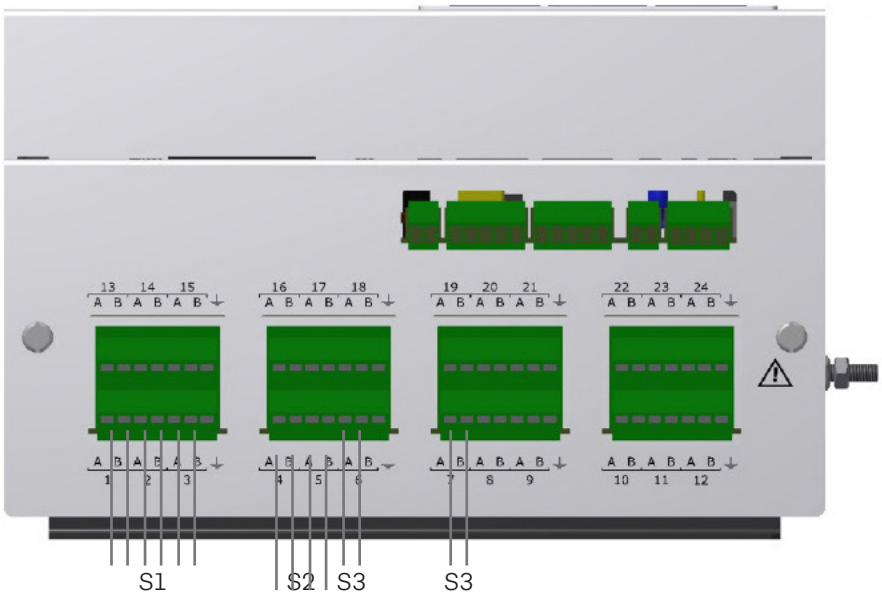


Figure 15 *Example 6*

1.15. Example 7 (6 wires, 4 wires and 2 wires mix)

User connects 5 sensors, 1 of them is 6 wires, other 2 are 4 wires, and the last 2 are 2 wires. First of all we configure the datalogger to read this sensors, as shown in Figure 16.

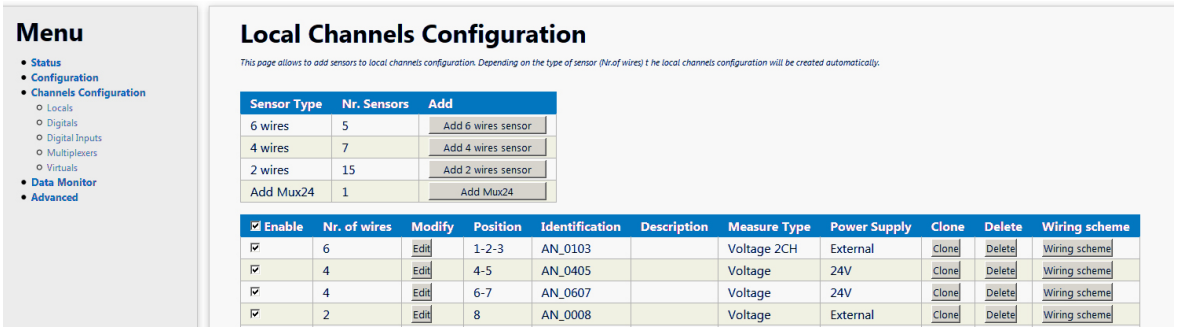


Figure 16 *Example 7 (6 wires, 4 wires and 2 wires mix)*

According to rules mentioned at the beginning of this chapter, we will start with 6 wires sensors, followed by 4 wires and 2 wires.

SENSOR1 will be connected to channel 1, A and B terminals, channel 2, A and B terminals, and channel 3, A and B terminals.
SENSOR2 will be connected to channel 4, A and B terminals, and channel 5, A and B terminals.
SENSOR3 will be connected to channel 6, A and B terminals, and channel 7, A and B terminals.
SENSOR4 will be connected to channel 8, A and B terminals.
SENSOR5 will be connected to channel 9, A and B terminals.

Wiring schemes are available from web server, or in APPENDIX of this manual.

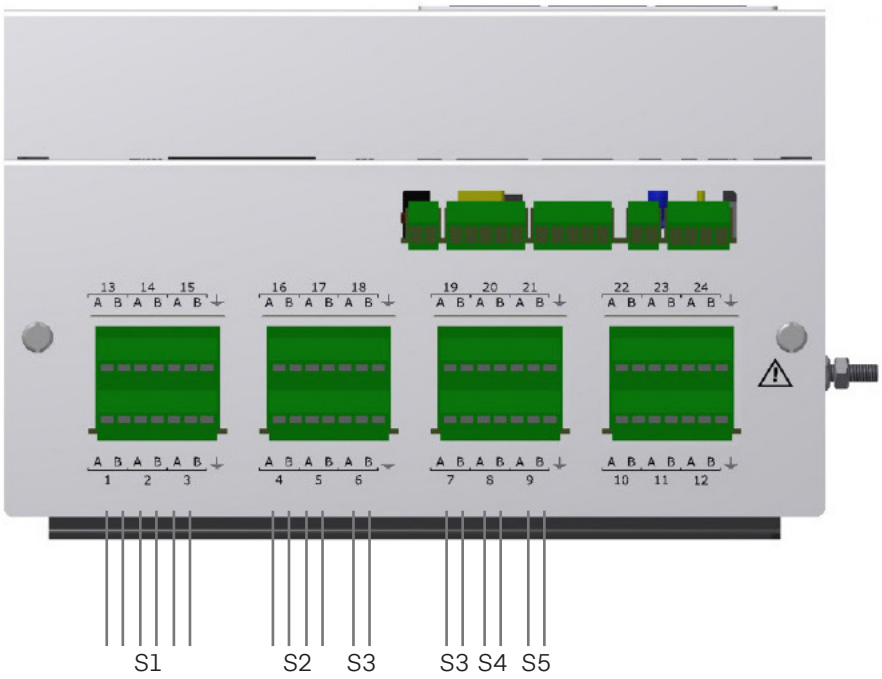


Figure 17 *Example 7*

1.16. Digital Inputs Connection

OM-240 has 2 digital inputs (on rear panel) that can be configured, independently, as "Trigger" or "Rainmeter/Anemometer".

If they are configured as Trigger, a pulse on the channel will start an acquisition of all configured channels.

If they are configured as Rainmeter/Anemometer, input frequency will be measured and logged in measure log.

Readable signal specifications:

- Min 5 V (2mA max)
- Max 24 V (10mA max)
- Max Frequency 1KHz
- Accuracy: 0.1Hz

Inputs are optoisolated.

1.17. Example

In order to configure a trigger, connect it to DIGITAL INPUTS IN1 (or IN2, not showed here):

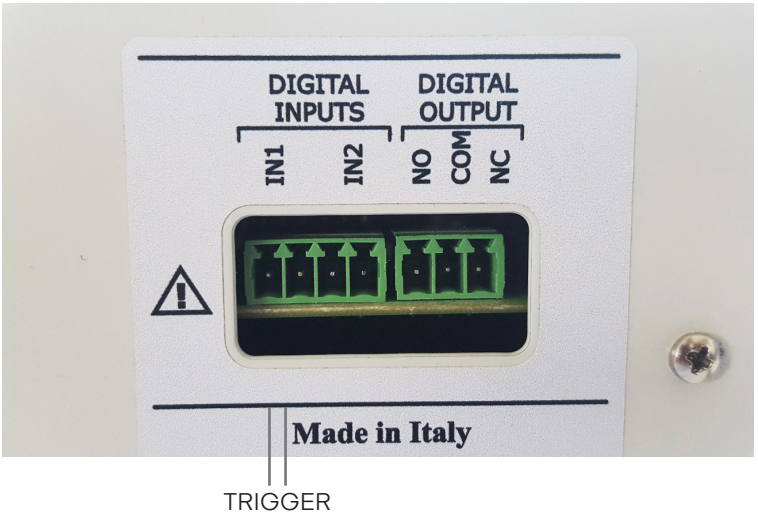


Figure 18 *Example*

Open OM-240's web server, at "Channels Configuration -> Digital Inputs" page. Select Trigger in the IN1 Input field:

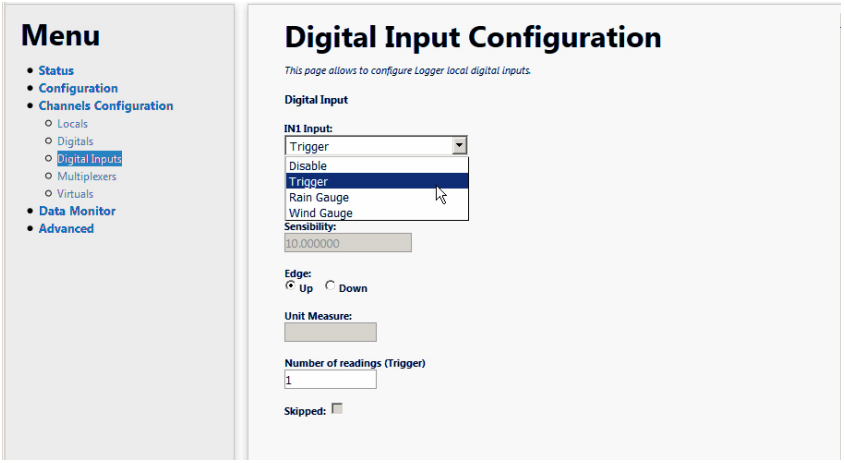


Figure 19 *Digital Inputs Configuration*

Edge parameter (Up and Down) indicates if the trigger will raise voltage between poles or drop it, or if it's a "rectangular" wave, you can choose to use rising front or falling front.

Number of reading indicates how many acquisition cycles will be performed after a trigger event.

In order to use Triggers the OM-240 should not go in sleep mode. Check Energy Management section to configure the datalogger to avoid switch off (by selecting Always ON).

For more information about how to configure Digital Inputs, refer to Digital Inputs section.

1.18. Digital Output Connection

OM-240 is provided with a Digital Output (NC / NO), which can drive low voltage (max 30 V, 2A). It's a relay, so it is a volt-free switch.

In order to handle higher voltages or currents, use internal relay to drive a rugged heavy duty relay.

1.18.1. RS485 SmartModbus Connection

OM-240 can read digital sensor over the RS-485 SmartModbus port.

The port used for sensors connection is RS-485#1.

Rs-485#2 port does not work with digital sensors as it is designed to work only with multiplexers.

RS-485#1 port presents 5 connections:

- Data – : can be named as B or "inverting pin" or TxD-/RxD-.
- Data + : can be named as A or "non inverting pin" or TxD+/RxD+.
- GND: it is the reference pin. It is recommended to use GND (SC, C, or reference pin) while connecting RS-485 sensors.
- +V: OM-240 can power RS485 sensors. It provides the same power source applied to OM-240 VIN. Be careful to choose the right supply to power both datalogger and sensor.
- GND: same as +V, is the negative connection of power supply.

RS-485 allows daisy chain connections. The example below shows an OM-240 datalogger with four temperature and humidity probes connected in daisy chain.

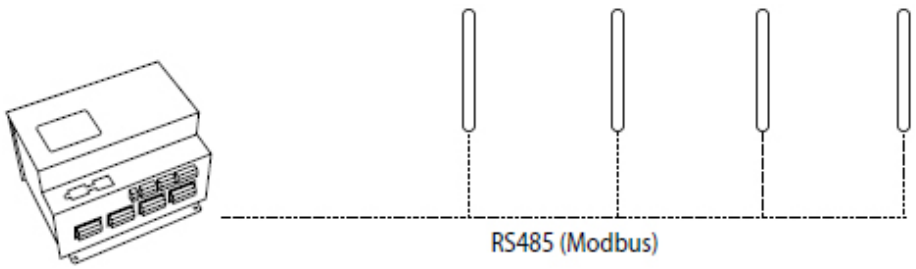


Figure 20 *RS485 SmartModbus Connection*

The **minimum distance** between two nodes (OM-240 to probe, or probe to probe) is **30 cm**.

Be careful on cable dimensions, as they are affected from total length and probe numbers. Be sure to choose a cable of the right size for your project.

Example

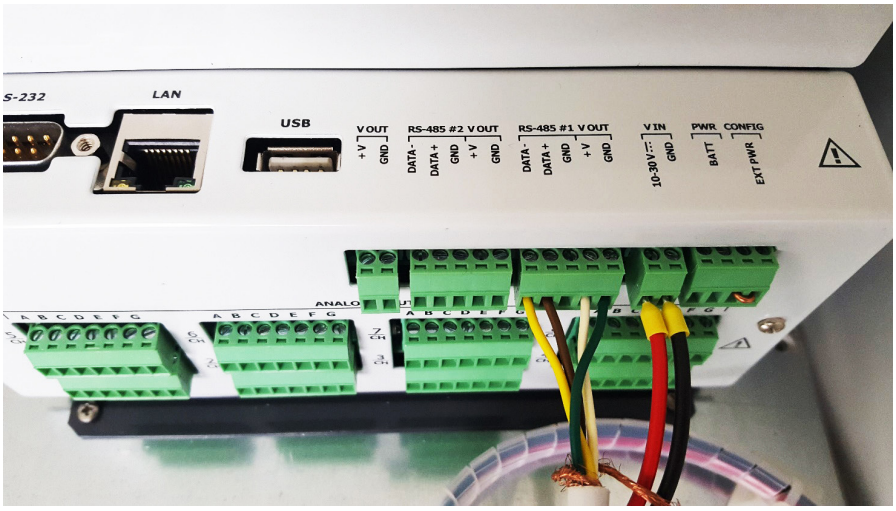


Figure 21 *Example*

Not all probes have a signal GND (SC) pin, and in the example above, the probe was not connected to signal ground.

1.19. Multiplexers Connection

OM-240 offers Analog Sensors expandability through Multiplexers.

Multiplexers are expansion boards that can read up to 24 sensors each, with connections logic similar to OM-240 (explained in Multiplexer Section), which will be connected to channel 22/23/24 of OM-240.

More than one Multiplexer can be connected to OM-240, up to 16 Units, daisy chained to RS-485#2 and channels 22/23/24.

2. Setup

2.1. Powering the Datalogger

The OM-240 is supplied not powered to avoid that during transport the backup battery will discharge.

To begin working with the OM-240 proceed as follows:

- Connect external powering (battery charger or photovoltaic panel);



Do not invert battery polarity, otherwise the data logger may be damaged or stop working.

2.1.1. Default OM-240 Settings

The network card is setup from as follows:

IP Address: 192.168.1.100

Subnet Mask: 255.255.255.0

Gateway: 192.168.1.1

DNS1: 0.0.0.0

DNS2: 0.0.0.0

To connect with the OM-240 is necessary to setup PC network card in the same class of the data logger, but with different IP (e.g. 192.168.1.200).

2.1.2. Direct Connection (LOCAL) to the Datalogger

To connect and manage the OM-240 through its on-board web pages, after the proper configuration of PC network card, connect the PC to the OM-240 through an Ethernet crossover cable (supplied). Once connected through the supplied cable, open any internet browser and put, in the address bar, OM-240 IP address (default 192.168.1.100).

After a few seconds you will be asked for the data logger access credentials.

Notes:

- The OM-240 is compatible with the main internet browsers (FireFox, IE9, Safari, Chrome). FireFox is recommended to manage the OM-240.
- First page upload can take some time.

Following are the default credentials:

User "Admin" **User "User"**

User: Admin User: User
Psw: Admin Psw: User

2.2. Remote Connection to the Datalogger

This manual contains all basic information to properly connect the OM-240 to the network through ethernet connection.

There is also a description of the procedure to set the logger and connect it through DHCP.

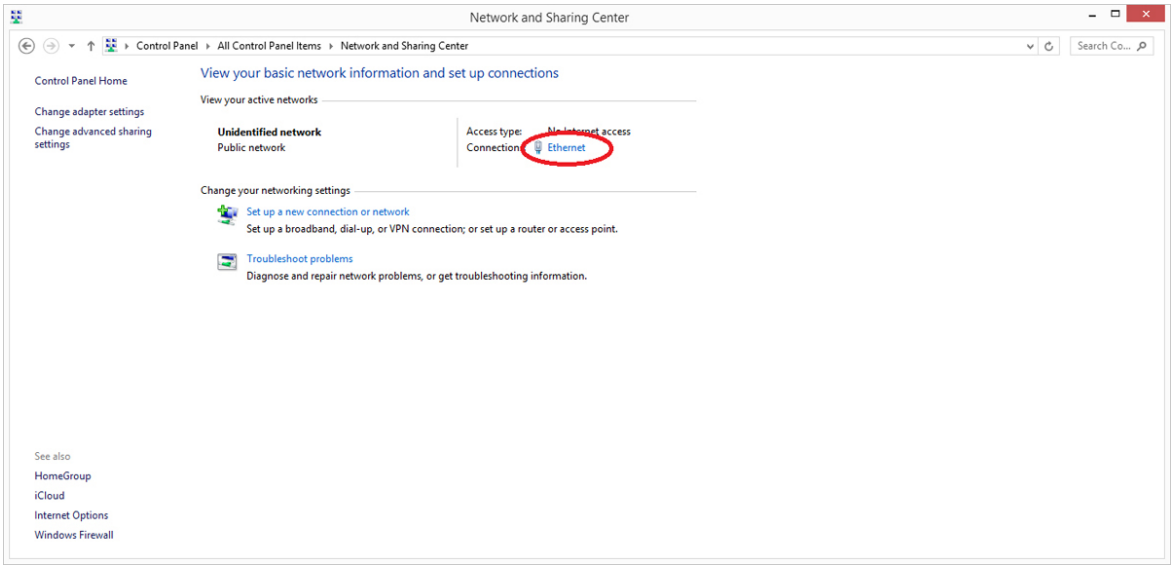
2.2.1. IP Computer Settings

2.2.1.1. Overview

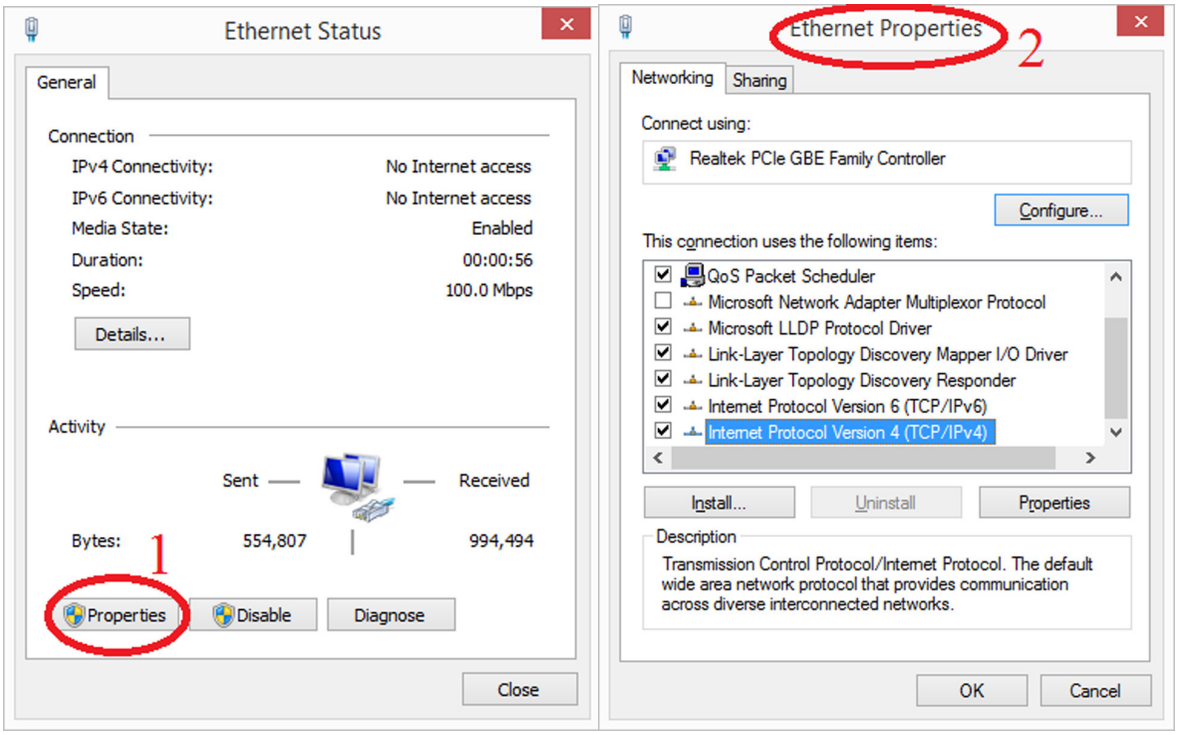
Here you will learn how to set the computer IP address to allow the connection with the OM-240.

2.2.1.2. Description

Open control panel and then: Network and Internet – Network Centre and Sharing

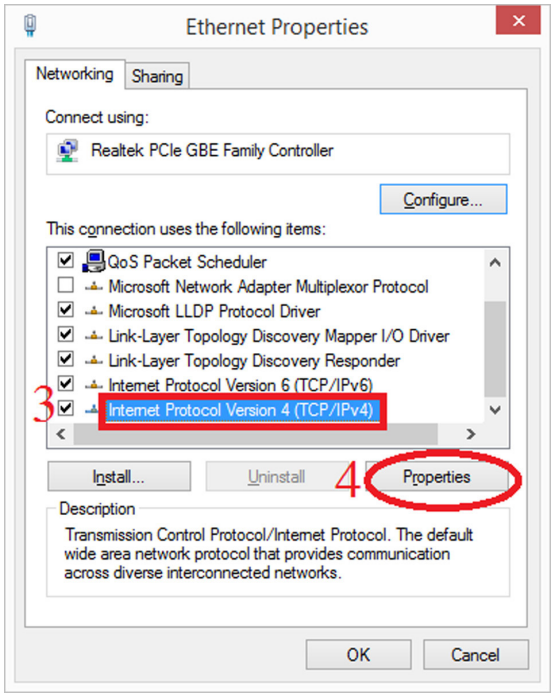


Then click on LAN connection and enter Properties (1)

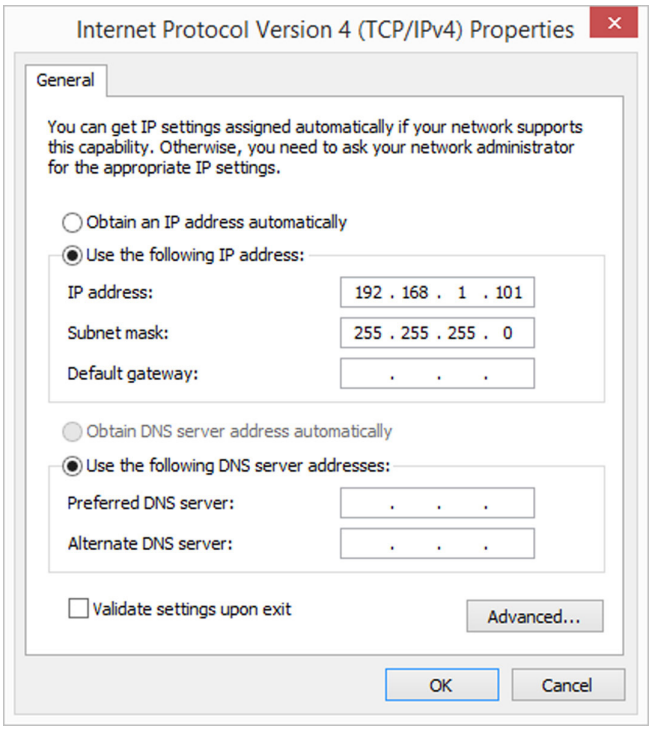


A new window will open “Properties-LAN connection” (2)

Select “Internet protocol version 4 (TCP/IPv4)” (3), and click on Properties (4).



Select "Use this IP: "and write data you see in the picture below.



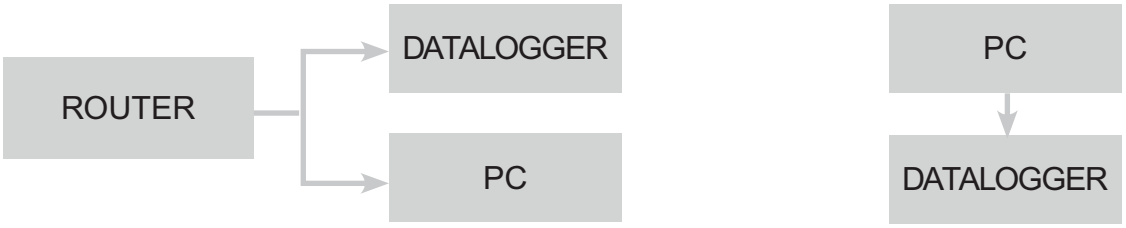
2.3. Web Connection and Opening

2.3.1. Overview

Here you will learn how to connect the OM-240 to the network and how to access the WEB.

2.3.2. Description

Connect the OM-240 through Ethernet cable (Look at the 2 different block diagrams).



Open the browser and write in the search bar the OM-240 IP address "192.168.1.100" and then enter user and password:

User: Admin
Password: Admin

2.4. Connection through DHCP

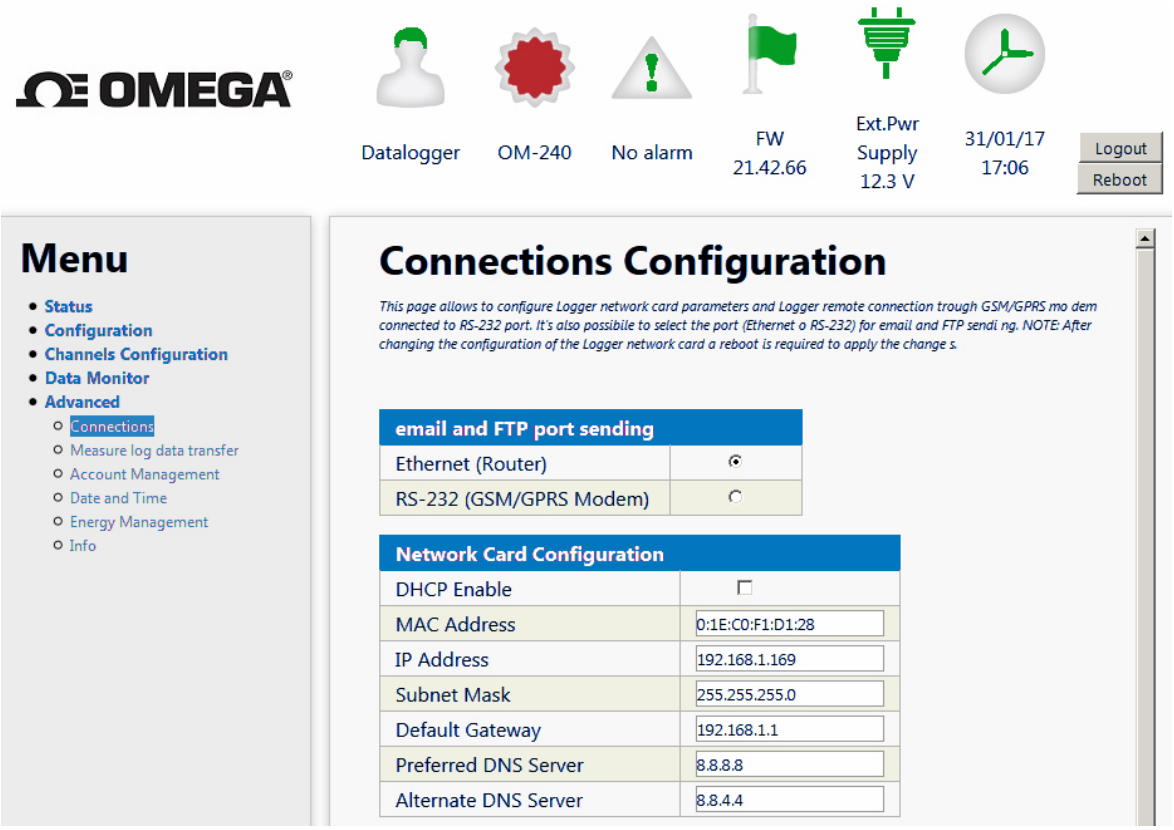
2.4.1. Overview

Here you will learn how to connect the OM-240 through DHCP. This option will allow the user to use either the OM-240 webserver and the usual Internet connection.

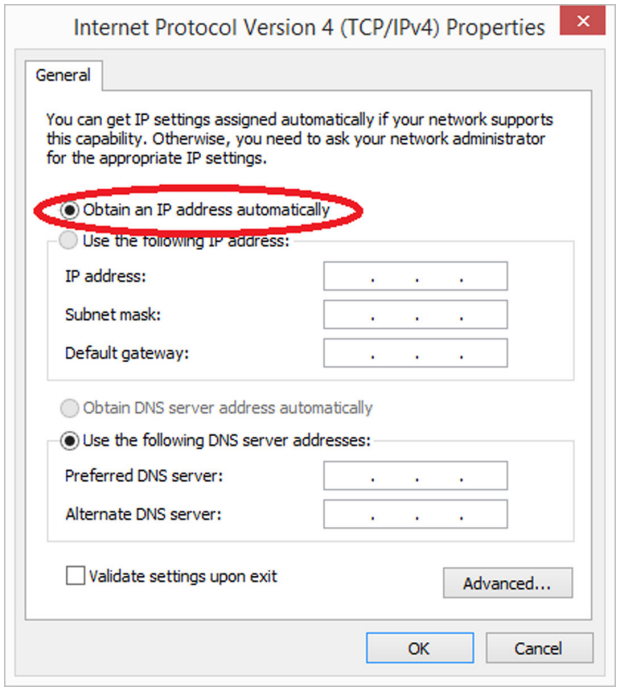
Note: *The router must be connected to a DHCP server.*

2.4.2. Description

When you are connected to the OM-240 web server (192.168.1.100 IP address to be written in the search bar), select "Advanced" from left menu and then "Connections".



1. Flag "DHCP Enable" and then start OM-240 reboot.
2. After Rebooting, IP address has to be setted up – look at chapter "Computer IP settings."
3. In few steps (summary):
4. Open Control Panel and then "Network Centre and Sharing" window.
5. Enter "LAN Connection" and open Properties.
6. Select: Internet protocol version 4 (TCP/IPv4) and then click on Properties.
7. This time – unlike before - select "Obtain an IP address automatically".



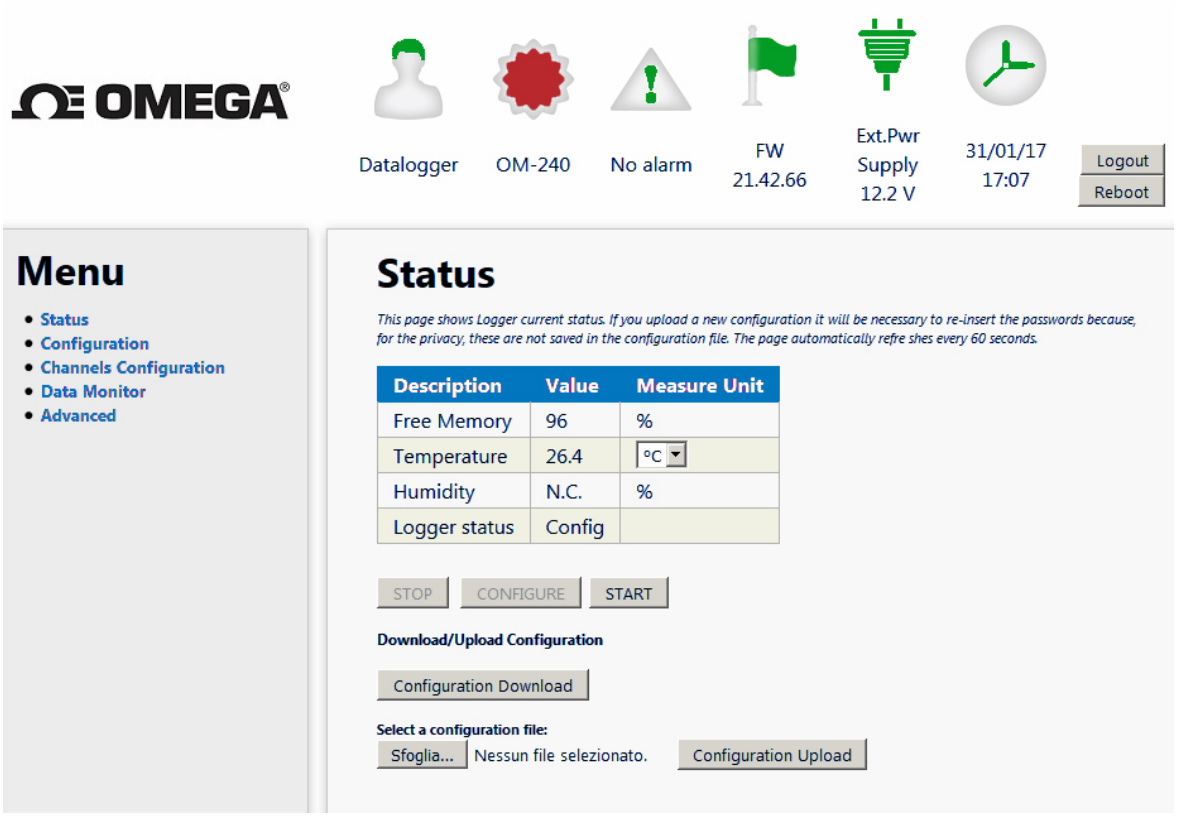
Click OK and close all windows.

Control from display the new IP address (see picture below).



Notes: The IP address shown in the picture has been assigned by the router.

Now you should enter the IP address shown in the display – instead of default IP address 192.168.1.100 - in order to enter in the OM-240 web server.

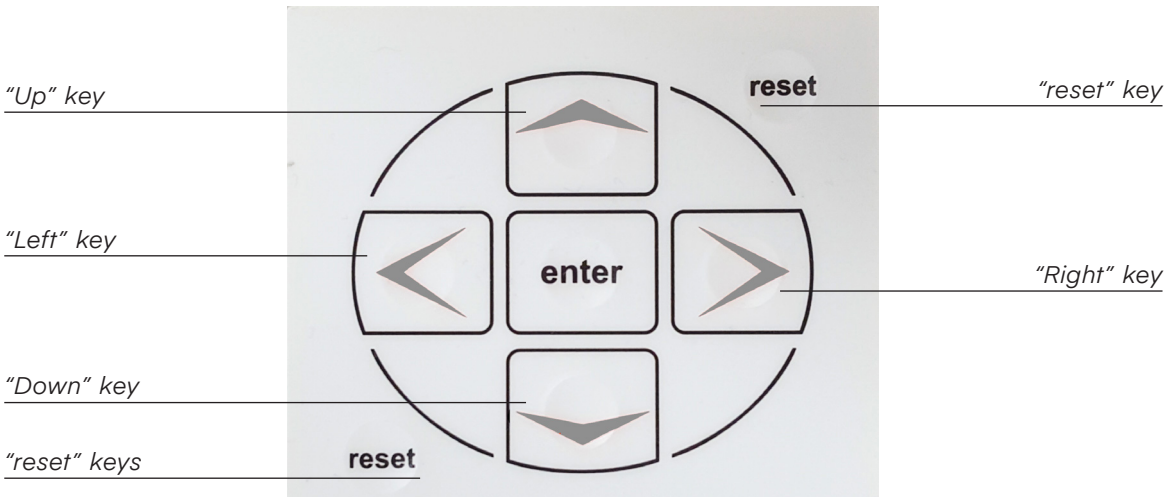


2.4.3. Display and Keyboard Functionality

Through the OM-240 keyboard and instructions shown on the display is possible to perform some simple operations without using a computer connected to OM-240.

Note: Some operations (data download on USB key, FW update, network card enabling, etc...) can require the OM-240 to automatically restart; this is normal.

2.4.3.1. Keyboard Overview



"Up", "Down", "Left" e "Right" keys are used to move within menus and submenus and to select the options. The "Enter" key is used to confirm the option.

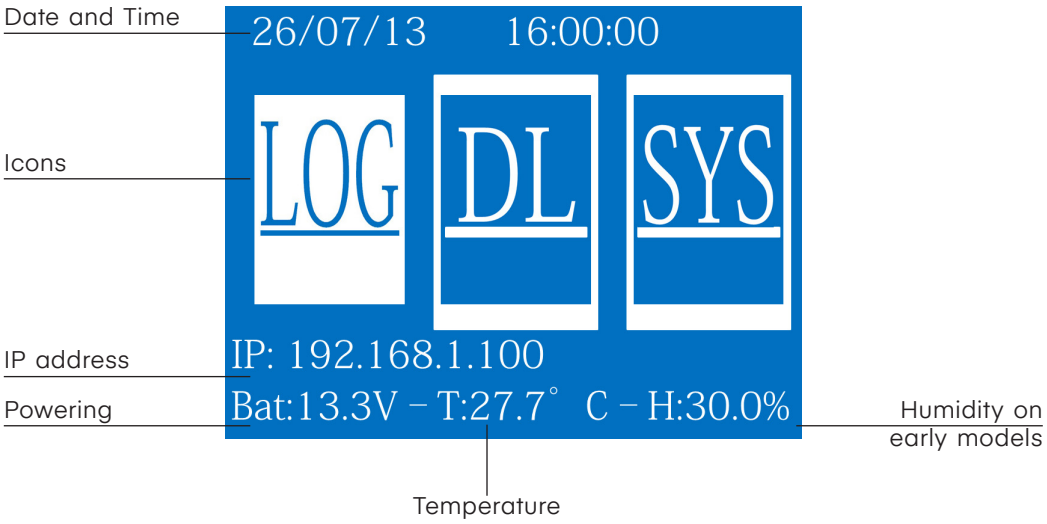
The reset keys are used in case the OM-240 stops working. Pushing both keys at the same time, you reboot the datalogger.

2.4.3.2. Display Overview

Display main page has three icons in the middle and some information in the upper and lower part of the display.

The information shown in the main page are:

- Date and time
- IP address
- External powering voltage or internal batteries percentage
- Internal temperature



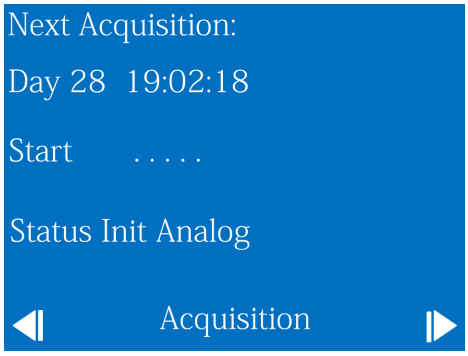
Icons in the main page have the following meaning:

LOG: It shows last reading stored for each sensor configured on the OM-240. Through "Right" and "Left" keys is possible to browse the different sensors.



To return to main menu press "Enter" key.

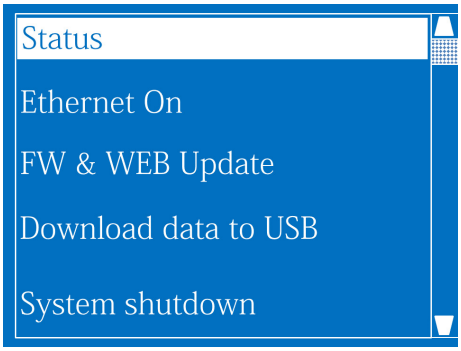
DL: It shows OM-240 current status.

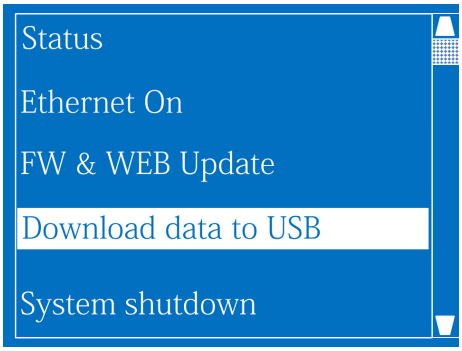


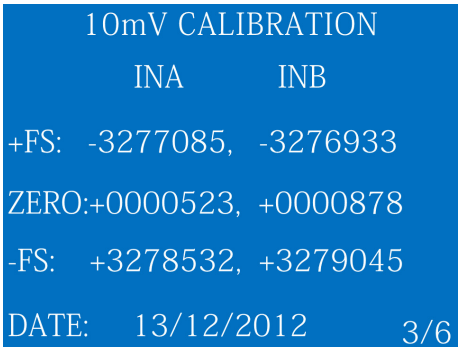
To return to main menu press ◁▯

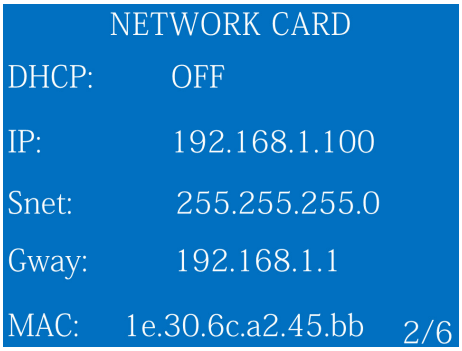
ACQUISITION	It is possible to see in real time the current acquired channel. Selecting "Acquisition" between one measuring cycle and the other, an extemporaneous acquisition will be instantly executed.
START DL	Start the data logger if not already running.
STOP DL	Stop the data logger if running.
TEST FTP	Test FTP parameters with sample file.
TEST MAIL	Test Mail parameters with sample email.
TEST ALL	Test both FTP and Mail.

SYS: Here you can find OM-240 connection parameters (network card), calibration values and functions to download data on USB pen drive, update firmware and OM-240 stop (in safety mode before cutting the power).











Do not use at the same time the web interface and display functionality. When you select SYS menu, the OM-240 enters in configuration mode: in this status the OM-240 WILL NOT PERFORM THE CONFIGURED ACQUISITIONS. Once you ended the operations in SYS menu, you must return in the main page (with the three icons).

2.4.3.3. Firmware and Web Updates – Vibrating Wire Firmware Update

To update OM-240 web pages and firmware refer to "FW & WEB UPDATES – Vibr. Wire FW Update" manual.

2.4.3.4. Data download

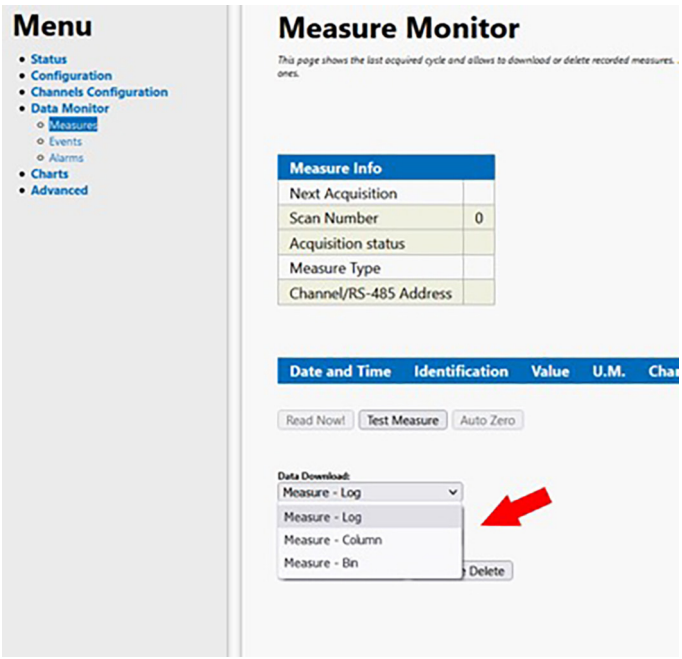
It is possible to download data (readings, log events and log alarms files) in two ways:

- PC (through web interface)
- USB (through USB pen drive)

To download data through a PC connected to the OM-240, first configure the PC network card (with the OM-240's same class but with different IP). Through the pages "Data Monitor – Measures, Events, Alarms" is possible to download files as CSV format (compatible with the most common spreadsheets e.g. Microsoft Excel, Apple Numbers, Open Office Calc etc...).

2.4.3.5. Measure Update

Measures data can be download in three different formats: Log, Column, Binary. Format is selected from Data Monitor ☐ Measure page by following select box:



Log and Column format are csv formats so they are ready to use with standard spreadsheets software (Microsoft Excel, Apple Numbers, Open Office, ...). For this the most useful format is probably Column format.

However, if amount of data to download is high, the export in csv formats (Log and Column) could be very time consuming.

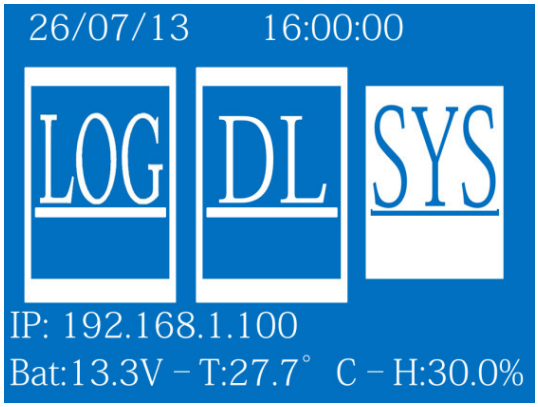
To avoid this, it is possible to download data in native binary format selecting Bin format.

Downloaded data is a .dat file that needs to be processed by dedicated tool named binExporter provided with datalogger.

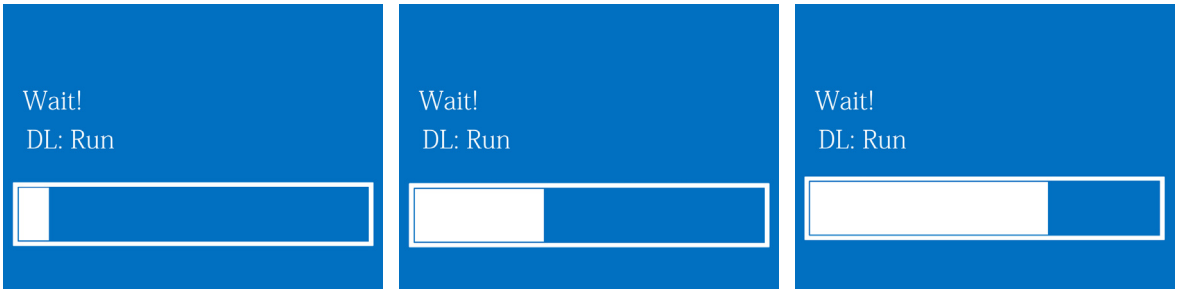
By mean of this tool binary data can be converted in standard csv formats (Log and Column).

See Appendix C for details about this tool.

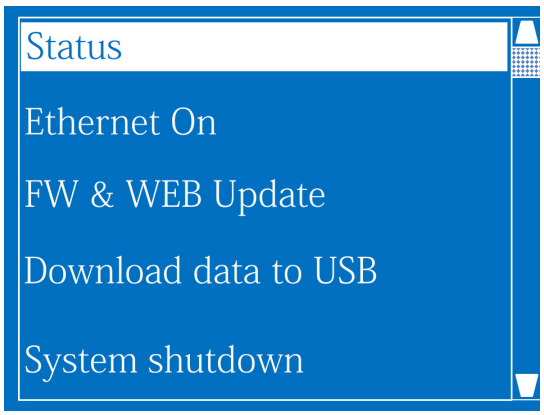
To download data through USB pen-drive (supplied):



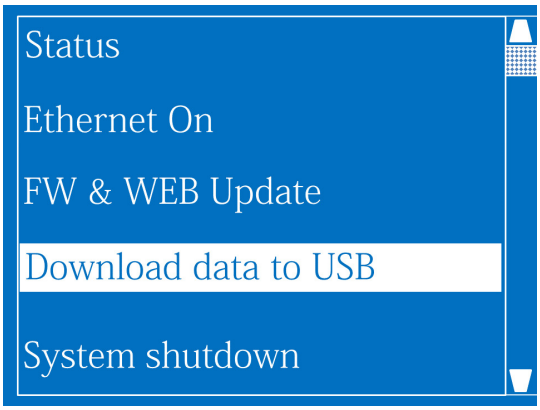
- Select through keyboard ("Right" and "Left" keys) the SYS menu and press "Enter" key; If the OM-240 has an acquisition in progress, is necessary to wait its end. In this case will be displayed the following screen:



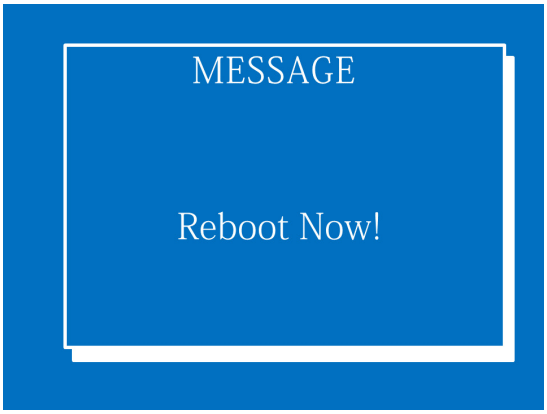
- When the acquisition ends, it will be displayed the following screen:



- Through “Up” and “Down” keys select the option “Download data on USB” and press “Enter” key;



- The following screen will be displayed and the OM-240 will be automatically restarted;

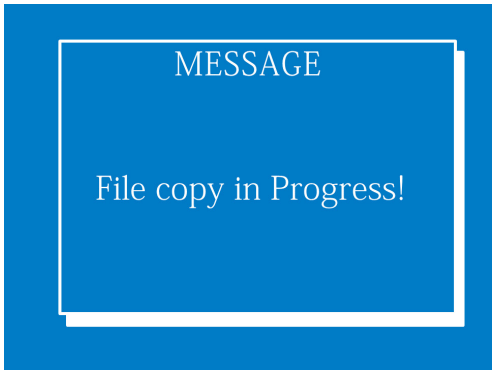


- At restart you will be asked to insert the USB pen-drive and to press “Enter” key to start data download;



Note: The USB pen-drive in the OM-240 must be FAT32 formatted. Other format will prevent the OM-240 to identify the USB pen-drive and the copy can’t be executed.

- Once the USB pen-drive is mounted, data copy will start automatically (according to OM-240 acquisitions quantity, the copy could take a few minutes).
- During the copy will be displayed the following screen:

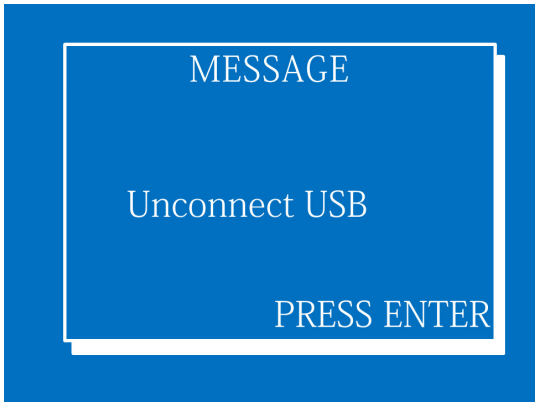


Do not disconnect the USB pen-drive or cut off the OM-240 powering during the copy, since the copy can be incomplete or corrupted.

- Once the copy is ended, the following message will be displayed; press “Enter” to proceed;



- Disconnect the USB pen-drive and press “Enter”. The OM-240 will be restarted and the acquisition will proceed as previously set.

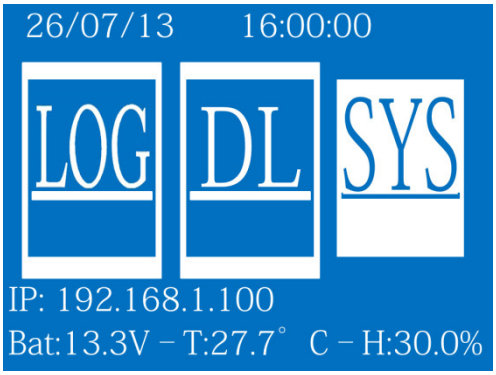


2.4.3.6. Datalogger Stop and Switch Off

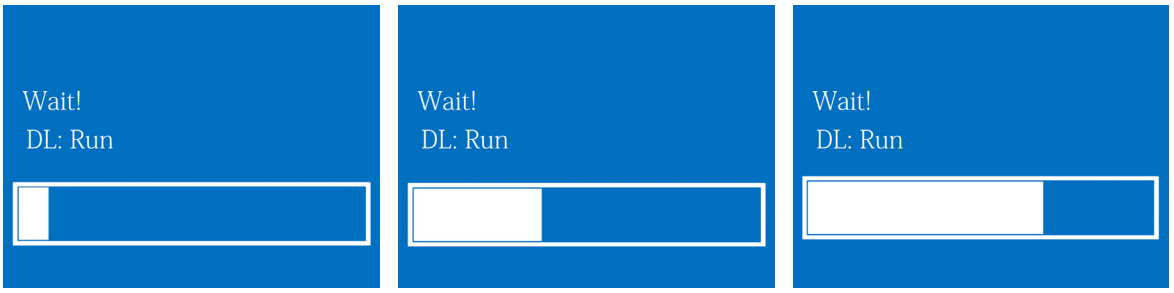
When is necessary to cut off the power from the OM-240 (for maintenance or other) is strongly recommended to stop the OM-240 following these steps.

Select, through keyboard, DL -> Stop DL.

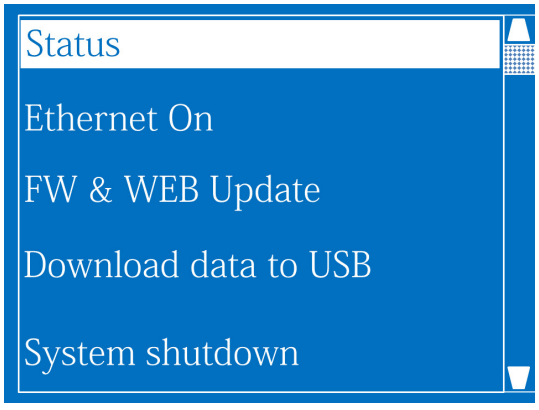
Select, through keyboard (Right and Left keys), the SYS menu and press “Enter”;



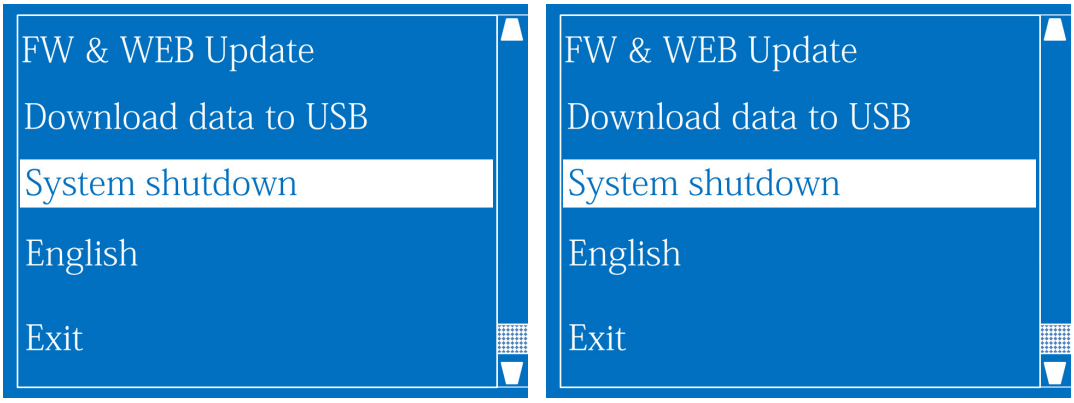
If the OM-240 has an acquisition in progress, is necessary to wait its end. In this case will be displayed the following screen:



- When the acquisition ends, it will be displayed the following screen:



- Using “Up” and “Down” keys select “System shutdown” and press “Enter”:



You will see the following screen:



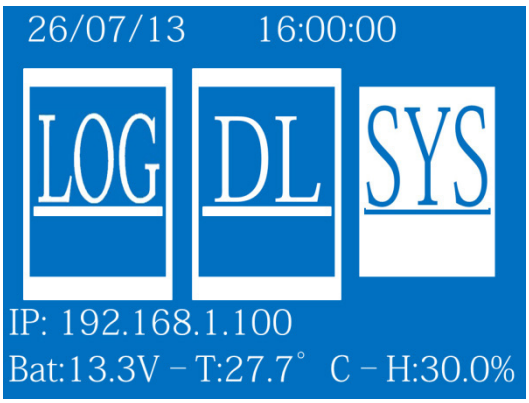
Now is possible to cut off the OM-240 power (e.g. Extract the “V IN” clamp.

Note: This switch off procedure allows OM-240 to end all the writing/reading cycles on the SD memory card. If OM-240 power is cut without software shutdown, a scandisk may occur at next boot.

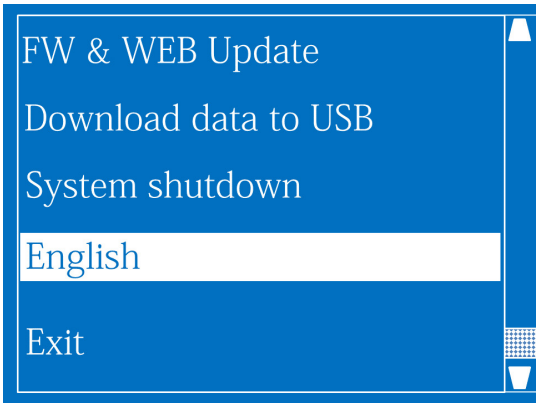
2.4.3.7. Display Language Setup

To modify display language:

- Select “SYS” menu and press “Enter” key:



- Through “Up” or “Down” keys select “English” and press “Enter” key:



- The selected language will be displayed. Using “Left” and “Right” key is possible to slide among the different languages. Select the chosen language and press “Enter” key:



- Display interface language will be changed in the selected one.

Note: Actually the available languages are **ITALIAN ENGLISH AND FRENCH**.

3. Web Interface

3.1. Web Pages Functionality

Follows a brief description of the main OM-240 web pages.

STATUS: Shows OM-240 status. In this page is shown the current OM-240 mode:

Run: OM-240 is set and started. It will start acquisitions according to selected configuration.

Config: OM-240 is in configuration mode. No acquisitions are in progress. In this mode is possible to modify configuration parameters (channel configurations, acquisition time, etc...), delete and download logs.

“Config” mode is expected only for “Admin” user.

Stop: OM-240 is stopped. No acquisitions are in progress. In this mode is possible to download logs but is not possible to change the configuration.

Moreover is possible to start, stop and set the OM-240 in configuration mode.

CONFIGURATION-ACQUISITIONS: in this page is possible to set acquisition frequency.

CHANNELS CONFIGURATION-LOCALS: in this page is possible to set local analog channels on the OM-240.

CHANNELS CONFIGURATION-MULTIPLEXER: in this page is possible to set multiplexer boards and their channels.



For sensors wiring it is necessary refers to the schemes on the OM-240 web pages.

CHANNELS CONFIGURATION-DIGITALS: In this page is possible to set digital channels to allow the OM-240 to read digital instruments.

DATA MONTOR-MEASURE: In this page is possible to display last OM-240 acquisition cycle. It's also possible to download OM-240 executed and saved acquisitions.

3.2. Web Interface Language Setup

To modify the web interface language, connect the OM-240 and access to web interface with the user (Admin or User) that needs to change the language

Then:

- Select, from left menu, "Advanced" and in the submenus "Account Management";

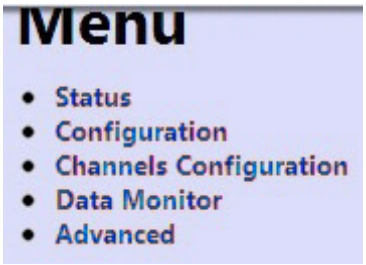


Figure 22 *Web Interface Language Setup*

- In the page that will be displayed select "Language";
- Insert the password in the field "Old password";
- Press on "Save changes".

Now the web interface will be converted in the selected language. To convert also the left menu is necessary to refresh the web page pressing F5 or the specific symbol on internet browser address bar.

Note: To avoid that the browser will keep the old language is necessary to completely delete internet browser cache.

3.3. Configuration of Local Analog Channels

In this manual is explained how to set up the local analog channels on the OM-240.

Note: *It is important to make sure that the software configuration of channels coincides with the physical wirings of sensors on channels. This is necessary to power correctly the sensors.*

To set up the local analog channels of the OM-240:

- Enter the OM-240 with user **Admin**;
- Make sure that the OM-240, in page **STATE**, is in **Config** mode before proceeding. If it is not in **Config** mode, **push on CONFIGURE** to set up the OM-240 in configuration mode;

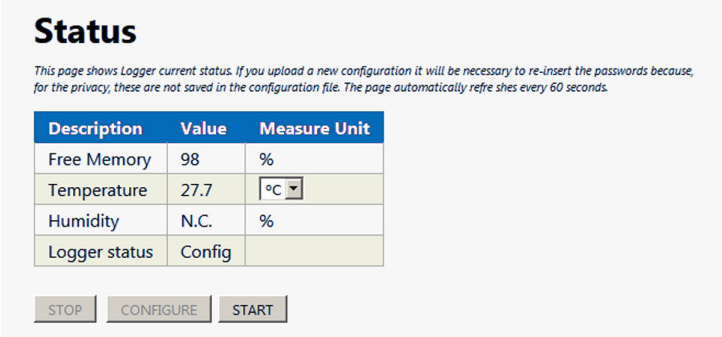


Figure 23 *Configuration of Local Analog Channels*

- From the left menu, select the page **CHANNELS CONFIGURATATION** and afterward the entry **LOCAL**;

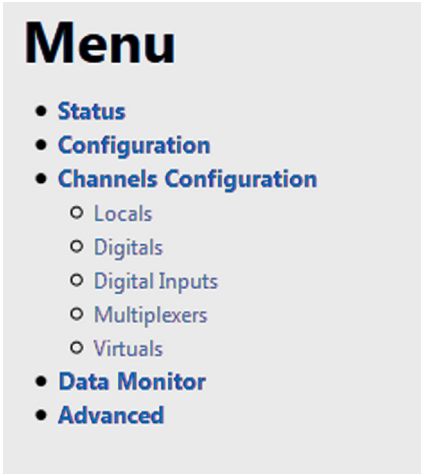


Figure 24 *Menu*

The page Local Channels CONFIGURATION opens. In this page it is possible to enable and edit the local analog channels of the OM-240.

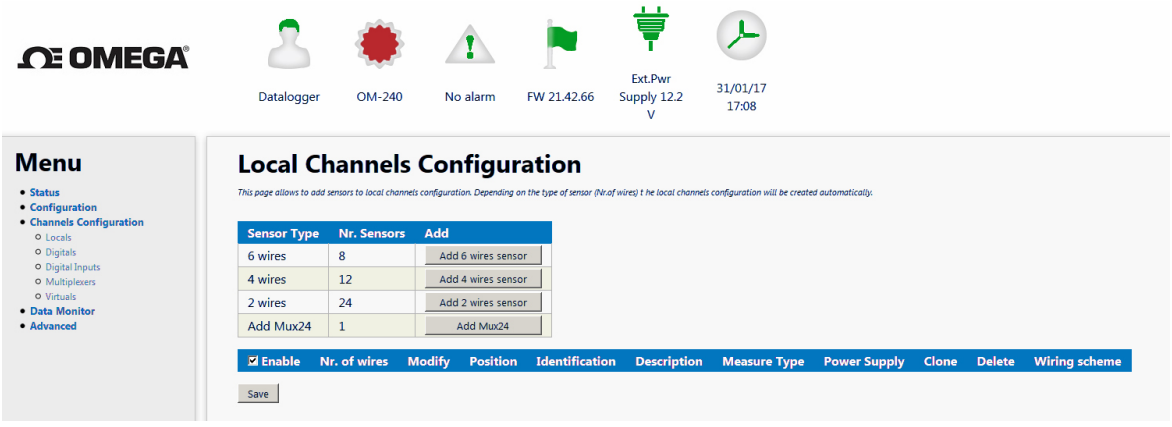


Figure 25 *Local Channels Configuration*

Add the proper sensor that you want to read.

- If your sensor requires two wires (for example a current loop 2 W)
  Add 2 wires sensor.
- If your sensor requires four wires (for example a volt 2ch with external supply)
  Add 4 wires sensor.
- If your sensor requires six wires (for example a ratiometric sensor)
  Add 6 wires sensor.

For example, if you push on button add 4 wires sensor in the underlying table a 4 wires sensors is added and it is possible to configure it.

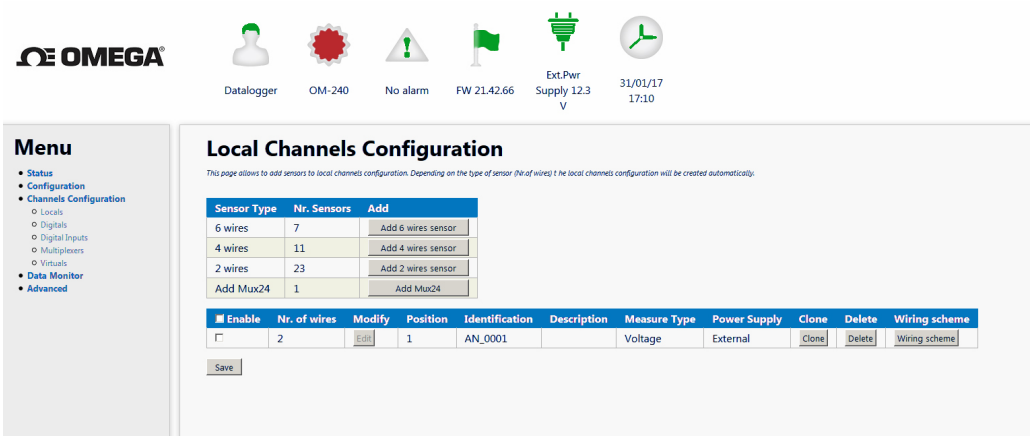


Figure 26 *Local Channels Configuration*

After enabling this channel press EDIT to setup sensors channel. Then, the first page of configuration of the selected channel opens (see next paragraph).

3.3.1. Input Configuration

The page in put con is composed by a table which contains all the input parameters of configuration.

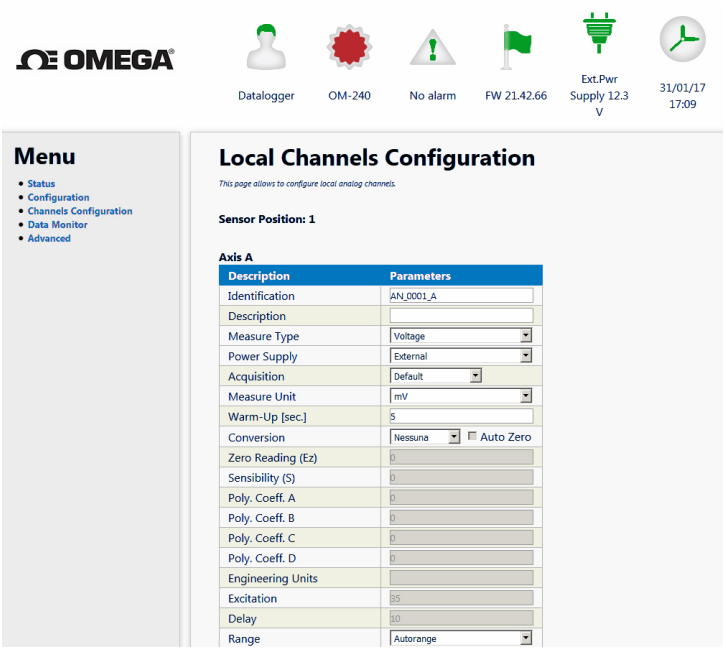


Figure 27 *Input Configuration*

Particularly:

INPUT	Non-editable field. It indicates the input that is configuring. The character "_A" or "_B" is added in case of a channel with 2 inputs (ex: 1_A, 1_B).
ACQUISITION:	the acquisition interval "personalized" for the channel.
IDENTIFICATION	Field editable from the user. Name to assign to the sensor. This field is exported as the heading of the column containing the measurements of sensor in file .CSV type "Measurements".
DESCRIPTION	Field editable from the user. Description ascribable to the sensor for a better identification. This field is present only in file .CSV type "log measurements".
MEASURE TYPE	Type of measurements to read on this input.
POWER SUPPLY	Power supply (output voltage or current) that the OM-240 will supply to the connected sensor. In case it is present "external", the OM-240 doesn't supply any power supply Different power supplies are proposed according to the "TYPE OF MEASURMENT" selected.
MEASURE UNIT	Electrical unit of measure of the sensor. For some types of sensors it is possible to choose between different units of measure (ex for vibrating wire: digit, Hz, μs).
WARM-UP [SEC]	Field editable from the user. "Warm-up" time of the sensor. It indicates how long the sensor is powered by the OM-240 before starting the measurement cycle. For some types of measurements, this field could be disabled.
CONVERSION	This field allows to select which conversion to realize between LINEAR and POLYNOMIAL. It is also possible to decide to realize NO conversion (in this case the reading is expressed in electrical unit). This field is necessary to convert the reading of the sensor from electrical unit (mA, mV, digit, etc.) to engineering unit (kPa, mm, mbar, etc.).
ZERO READING	This field is enabled if the linear conversion has been selected. For further information, please refer to manual "Linear and Polynomial Conversion Quick Start".
SENSIBILITY	This field is enabled if the linear conversion has been selected. For further information, please refer to manual "Linear and Polynomial Conversion Quick Start".
POLYNOMIAL COEFFICIENT A-B-C-D	This field is enabled if the polynomial conversion has been selected. For further information, please refer to manual "Linear and Polynomial Conversion Quick Start".
ENGINEERING UNIT	Field editable from the user. This field is enabled if the linear or polynomial conversion is selected. It represents the acronym of the unit of measure of the reading after the conversion in engineering unit.
EXCITATION	This field is enabled only for the type of measurement "Vibrating Wire" or "Vibrating Wire + Thermistor". It indicates (in msec) the period of each stimulation phase.
DELAY	This field is enabled only for the type of measurement "Vibrating Wire" and "Vibrating Wire + Thermistor". It indicates (in msec) the stabilization period, i.e. how long the OM-240 waits before starting the reading phase.
RANGE	This field allows to set up the range of functioning of the sensor. If AUTORANGE is configured, the OM-240 decides automatically with which range it is going to do the measurement. This implies an increase in the reading time of the sensor.
START FREQUENCY	This field is enabled only for the type of measurement "Vibrating Wire" or "Vibrating Wire + Thermistor". It indicates the frequency of the research start.
STOP FREQUENCY	This field is enabled only for the type of measurement "Vibrating Wire" or "Vibrating Wire + Thermistor". It indicates the frequency of the research end.

GAIN	Amplification factor applied to sensors' signal. Raise this parameter only if sensor is placed far from datalogger and datalogger provides unexpected or wrong readings.
EXCITATION FACTOR (%)	Maximum amplitude of sensor excitation signal. Lower this parameter only if sensor is placed close to datalogger and provides unexpected or wrong readings.
EXCITATION SCALING SPEED	This parameter sets adapting speed of excitation signal during vibrating wire reading.
NUMBER OF DECIMALS	Number of decimals recorded for this channel.
SKIPPED	The Data logger does not read the channel, but CSV file will be populated with "skipped" values. This is to ensure compatibility with software population layer in case of sensor change/removal.

Some fields will be grayed out depending on chosen sensor.

Note: In case of a channel with 2 inputs, the second configuration webpage is completely identical to that described above. Other fields could be "blocked" because they are connected to the configuration executed on input 1.

The second table on the page it is necessary to set up the possible alarm thresholds for the selected input. In particular:

ALARM TYPE	High: the input is in alarm only if the reading exceeds the value indicated in field HIGH THRESHOLD.
	Low: the input is in alarm only if the reading is lower than the value indicated in field LOW THRESHOLD.
	Derivate: the input is in alarm only if the reading differs from the previous reading of a value greater than or equal to the value indicated in field DERIVATE THRESHOLD.
HIGH THRESHOLD	Field editable from the user. It indicates the numerical value to assign to the high threshold. The value has to be inserted taking into account the unit of measure of the reading.
LOW THRESHOLD	Field editable from the user. It indicates the numerical value to assign to the low threshold. The value has to be inserted taking into account the unit of measure of the reading.
DERIVATE THRESHOLD	Field editable from the user. It indicates the numerical value to assign to the derived threshold. The value has to be inserted taking into account the unit of measure of the reading.
VC ALARM WITH LOGICAL OPERATIONS	Enabling this tick, the configured alarm is no longer connected to the single input. The channels that adopt this option will be "linked" to each other by logical operations (AND, OR, NOT and XOR). If this field is enabled, therefore it will be necessary to configure a virtual channel with an opportune logical operation.

Note: The values inserted in alarm thresholds have to take into account the possible linear or polynomial conversion that has been configured. If the user configured a conversion, the threshold values have to be inserted in engineering unit. If the user didn't configured any conversion, the thresholds values have to be inserted in electrical unit.

- Once the configuration of webpage ended, or of 2 webpages in case of a channel with 2 inputs, push SAVE MODIFICATIONS to confirm the created configuration.
- It is possible to visualize the scheme of connection of the just configured channel pushing on WIRING SCHEME in page LOCAL CHANNELS CONFIGURATION.

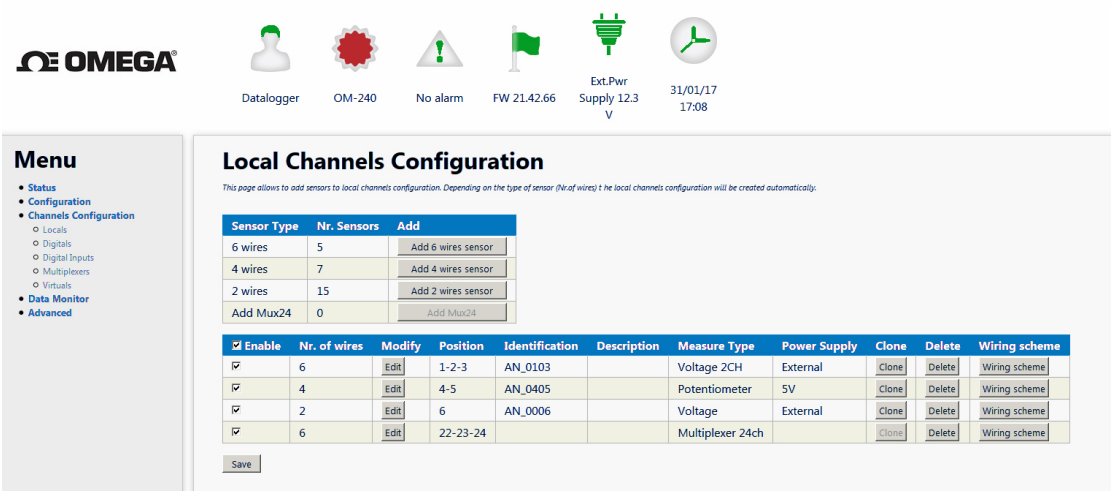


Figure 28 *Local Channels Configuration*

3.3.2. Multiplexer Configuration

Here is shown the standard configuration of an sensor connected to a channel of the multiplexer.

- Open page LOCAL CHANNEL CONFIGURATION and select the item CHANNELS CONFIGURATION/LOCAL from left menu;

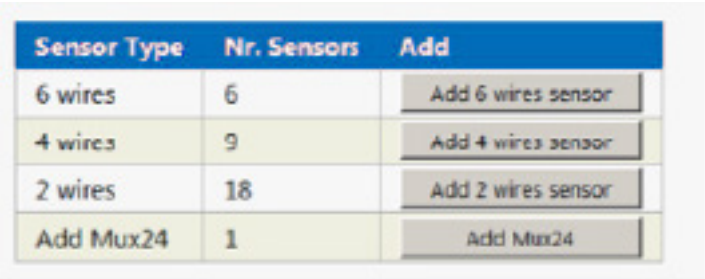


Figure 29 *Multiplexer Configuration*

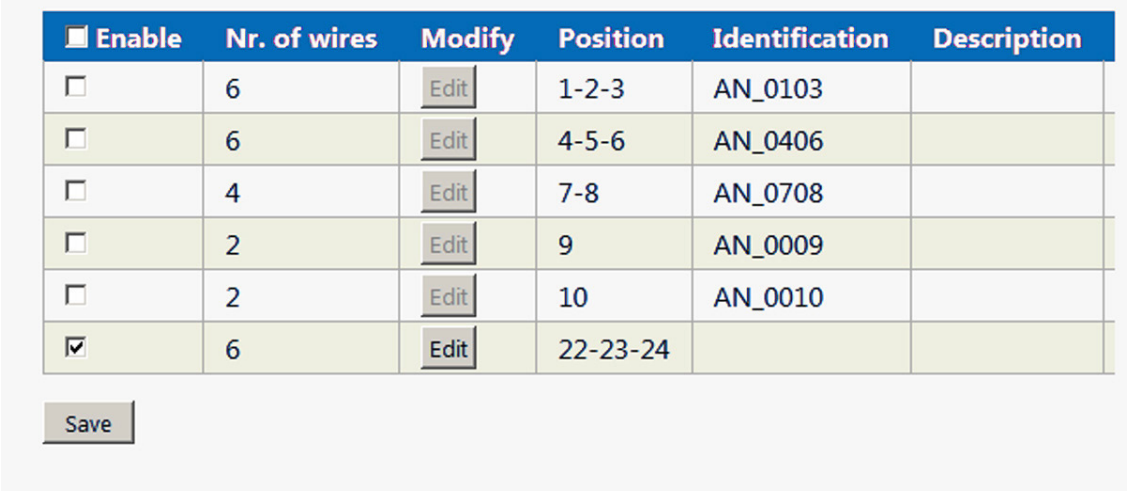


Figure 30 *Multiplexer Configuration*

- Tick the field ADD **MUX24**;
- Enable the new channel created, with position **22-23-24**, and click edit;
- The page for the configuration of MULTIPLEXERS opens;

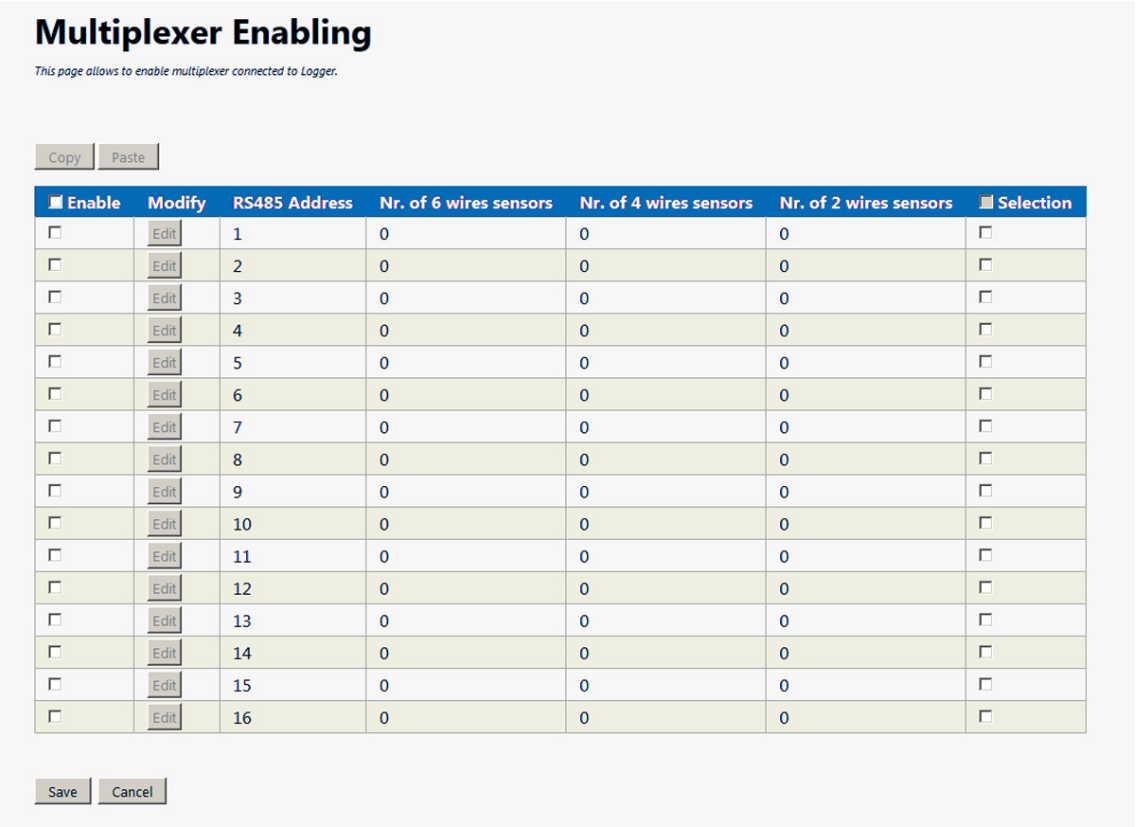


Figure 31 *Multiplexer Enabling*

Note: Selecting Mux 24ch on channel 22-23-24 it couldn't be possible to use them to connect a sensor.

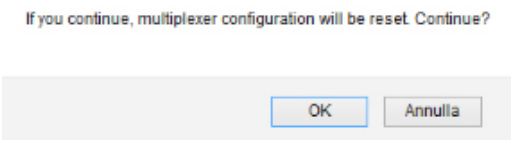


Figure 32 *Multiplexer Configuration Reset*

- After you saved the configuration, select from left menu the entry **CHANNELS CONFIGURATION/MULTIPLEXERS**;
- The page MULTIPLEXERS opens. Here you could select **MUX 24CH**.

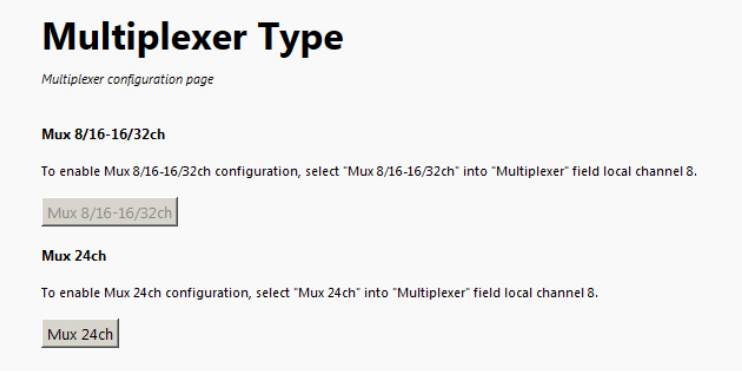


Figure 33 *Multiplexer Type*

- Thus, the page MULTIPLEXER ENABLING opens. Thanks to the tick ENABLE it is possible, pushing on edit, to configure the channels of the selected multiplexer-.

Note: It is possible to enable at most 16 multiplexers. We advise to enable only the multiplexers that are used.

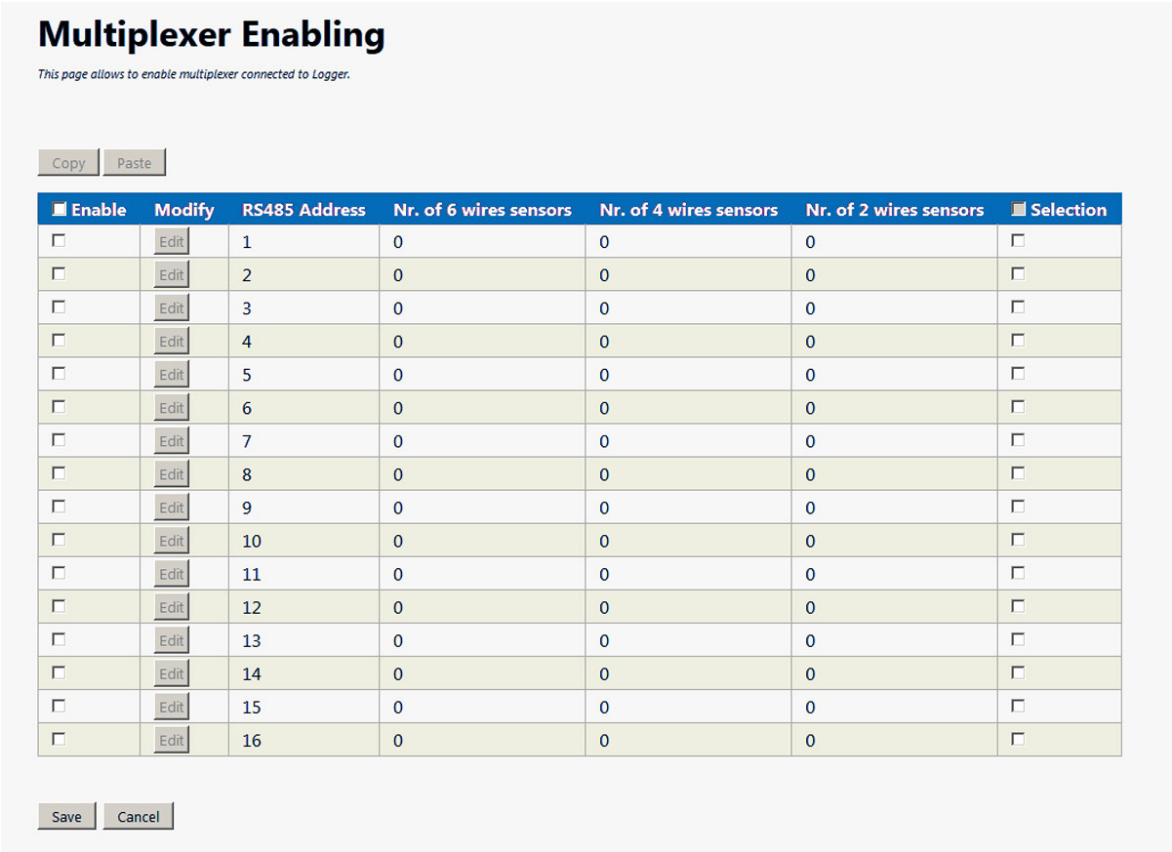


Figure 34 *Multiplexer Enabling*

- Then, the page **MULTIPLEXER CONFIGURATION** opens. This page allows the sensors insertion thanks to three buttons: **ADD 6 WIRES SENSOR, ADD 4 WIRES SENSOR AND ADD 2 WIRES SENSOR**.

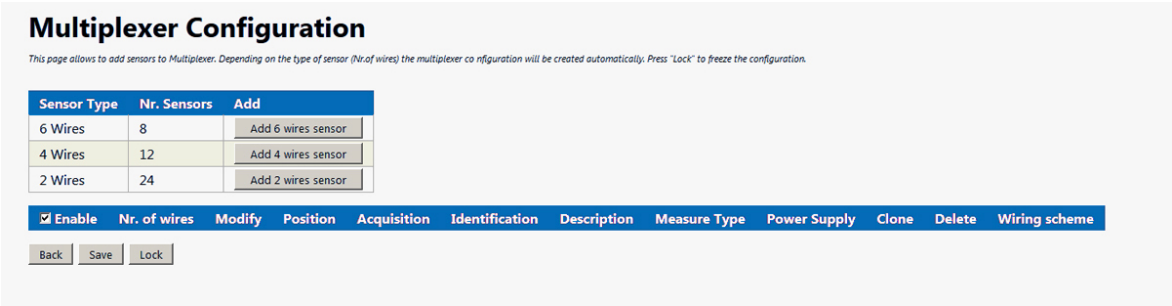


Figure 35 *Multiplexer Configuration*

- For example, if you push on button **ADD 4 WIRES SENSOR** in the underlying table a 4 wires sensors is added and it is possible to configure it.

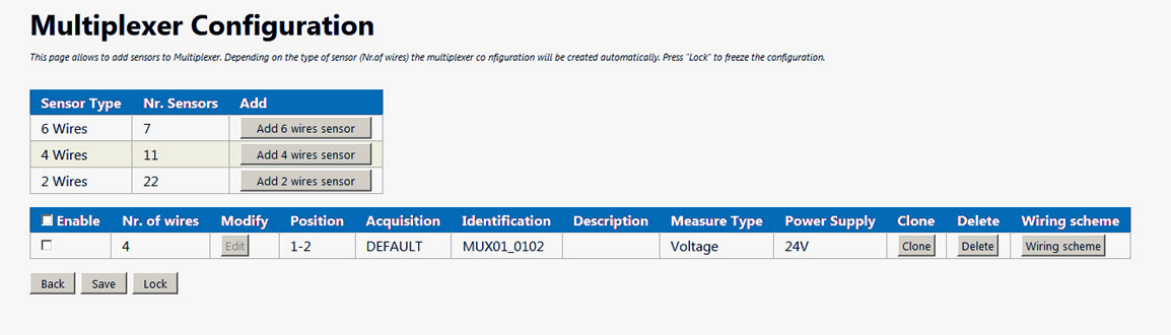


Figure 36 *Multiplexer Configuration*

- Pushing on **EDIT** it is possible to set up all sensor parameters, as you do for a local analog channel. The configuration of an analog channel on multiplexer is not different from that of a local analog channel.

Note: Once the configuration of all channels of multiplexer ended, it is advised to push on LOCK. In this way, the configuration is "blocked" and the removal of one or more sensors doesn't modify the position of those that are configured yet.



The addition of a new sensor to a multiplexer that has been already configured could cause a change in sensors position on multiplexer channels. In case of sensors that are physically already connected to the multiplexer, it is necessary to check that their positions are the same. If the positions changed, it is necessary to re-wire the sensors to the multiplexer."

4. Thermocouple on Multiplexer

Using firmware version lower than 25.70.24 it was not possible connect Thermocouple on Multiplexer.

Starting from firmware version 25.70.24 this is possible, in the same way that would be done for 2-wire local analog channel.

The only restriction is that, as soon as a Thermocouple is configured on Multiplexer, channel 24 on that Multiplexer is automatically reserved for cold joint compensation.

This implies two considerations:

- The actual number of useable channels is 24 – 1 = 23 since, as said, channel 24 is reserved for NTC connection.
- Is up to user connect on channel 24 an NTC. This NTC is not provided with datalogger but a standard 3K@25 °C NTC is suitable for this.

We suggest for example the model 44005 available on Omega market:

https://www.omega.com/en-us/sensors-and-sensing-equipment/temperature/sensors/rtd-sensors/44000-thermis-elements/p/44005

https://assets.omega.com/spec/44000_THERMIS_ELEMENTS.pdf

In the following the connection of NTC:

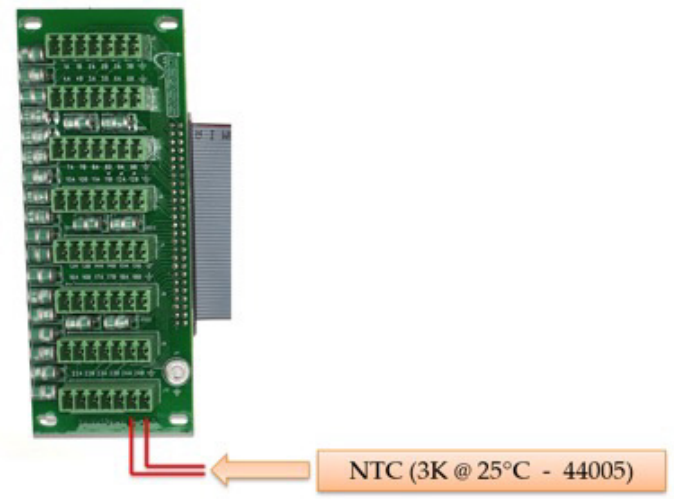


Figure 37 *Thermocouple on Multiplexer*

5. Modbus Sensors

5.1. What's Modbus?

Modbus is a serial communication protocol, made by Modicon in 1979 to link their PLC. It has become a de facto standard in communication protocol, and it's now a commonly available means of connecting industrial electronic devices.

Advantages in industrial sectors are:

- Developed with industrial applications in mind
- Openly published and royalty-free
- Easy to deploy and maintain
- Moves raw bits or words without placing many restriction on vendors

Modbus enables communication among many devices connected to the same network, for example a system that measures temperature and humidity and communicates the results to a computer. Modbus is often used to connect a supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition (SCADA) systems. Many of the data types are named from its use in driving relays: a single-bit physical output is called a coil, a single-bit physical input is called a discrete input or a contact.

Object Type	Access	Size
Coil	Read-Write	1-bit
Discrete Input/Contact	Read-Only	1-bit
Input Register	Read-Only	16-bits
Holding Register	Read-Write	16-bits

5.2. Digital Sensors Configuration

For digital sensors, the OM-240 family offers an in-depth configuration. After choosing Baudrate and Maximum RS485 Address (Fig. 1), the User can "Save Changes" and start the configuration of the sensors.

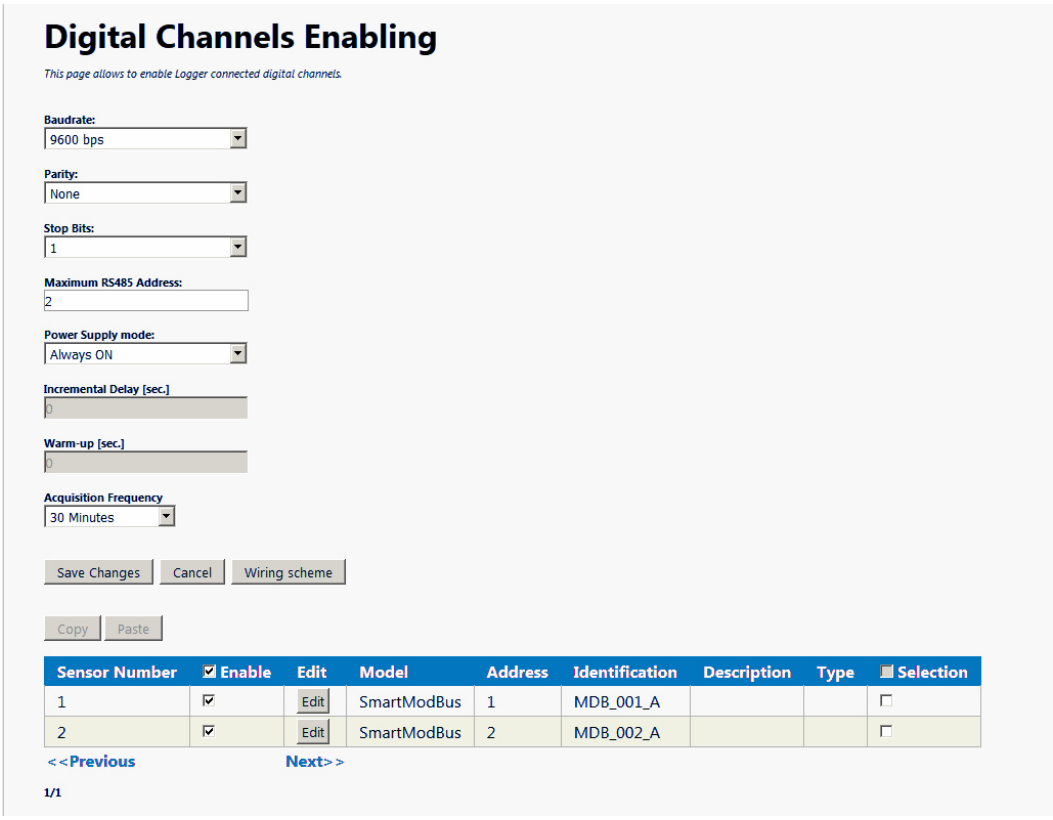


Figure 38 *Digital Channels Enabling*

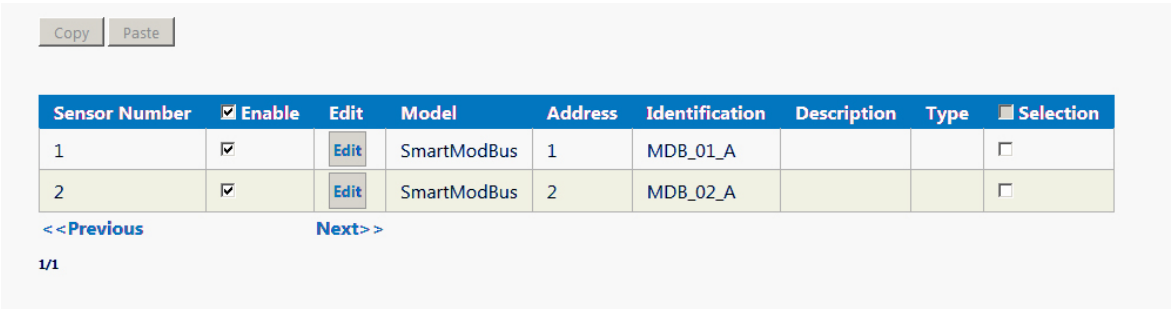


Figure 39 *Digital Sensors Configuration*

By clicking "Edit" (*Fig. 2*) on the sensor row to configure, the system shows typical sensor (IPI, H-LEVEL, TILTMETER) and a SmartModbus element (*Fig. 3*).

SmartModbus is selected if the User has a generic modbus sensor.

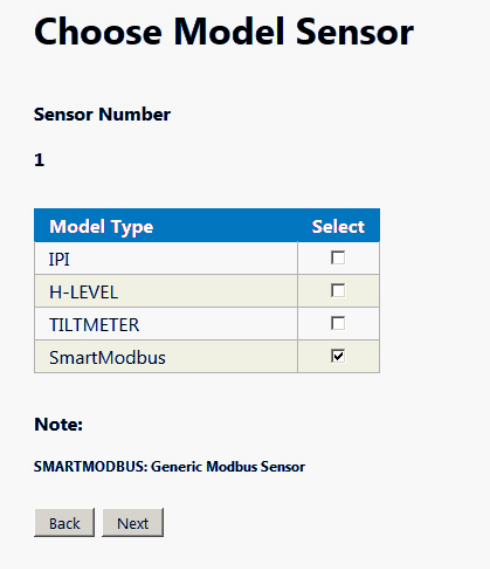


Figure 40 *Choose Model Sensor*

Click "Next" to proceed the configuration. Fig. 4 shows MODBUS parameters. These are usually provided by the sensor's manufacturer and reported in either the datasheet or instruction manual.

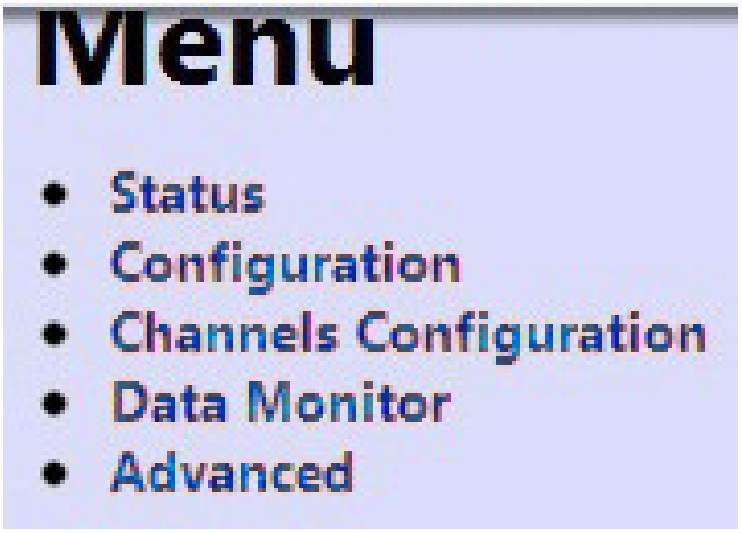


Figure 41 *Menu*

Modbus Address is sensor's modbus address, usually settable from the sensor.

Pre Measure Actions:

Some sensors require either a *command or a condition to be true* before actually pushing the data in the right register.

Send Command enabled orders the OM-240 to push data (Value field) in a sensor's register (Reg Address (hex)). You can "Force Multiple Reg" o "Write Coil".

Wait Condition enabled let the OM-240 check if Coil, Input or Holding are less, more, equal or different from a chosen Value. It allows also to wait for a certain time.

Endianless allows to select if the sensor use a Little Endian or Big Endian data type.

Acquire Measures:

This section is the actual data reading from the modbus sensor. On most sensors, this is the only section the User should care of.

Measure n enabled allows the OM-240 to read the register (Holding, Input or Coil) at the specified "Reg Address (hex)". Data Type is Signed or Unsigned Integer, Float and Fixend Point.

Register Number & Order let the User choose which register and in which order data is stored in. Usually is reported in sensor's datasheet or instruction manual.

Endianless allows to select if the sensor use a Little Endian or Big Endian data type.

Post Measure Actions:

As **Pre Measure Actions**, this is not always required, but some sensors need a register to be written in order to return in standby or reset. Settings are quite similar to **Pre Measure Actions' Send Command**, which can be enabled or not, and actions are **Force Multiple Reg, Write Coil** (Register Address is specified in Reg Address (hex) field) and Wait Time.

Endianless allows to select if the sensor use a Little Endian or Big Endian data type.

5.3. Output configuration and alarms 1 & 2

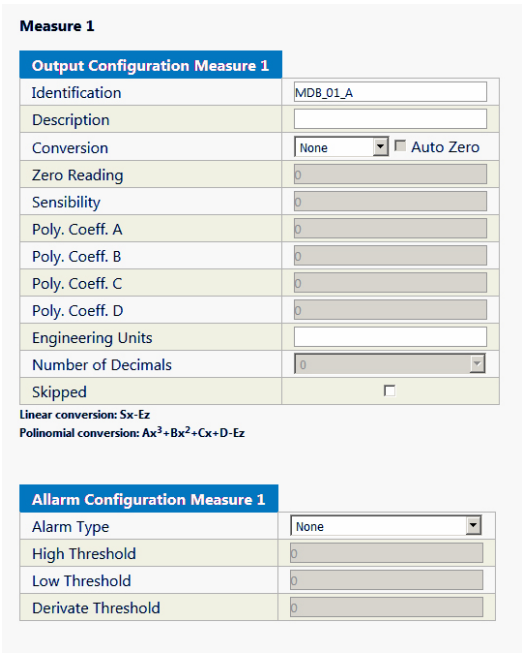


Figure 42 *Measure 1*

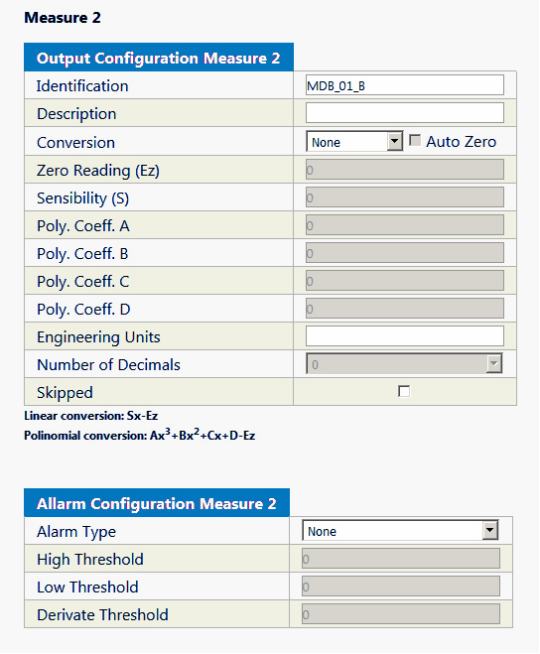


Figure 43 *Measure 2*

This are channel related settings. The user can specify channel name, a short description, and data conversion.

Conversion:

Linear: If sensor output is linear, the systems needs to know Zero Point (Ez) and Sensibility(S) and Number of Decimals (field will be enabled). The output will be equal to Sx - Ez

Polynomial: If sensor output is not linear this allows the user to specify sensor output curve, and enable Zero Reading (Ez), Poly.Coeff. A, B, C and D and Number of Decimals. The output will be equal to $Ax^3 + Bx^2 + Cx + D - Ez$

Engineering Units: To complete data with the right engineering unit like bar, °C, °F, %HR and so on.

Number of Decimals: After linear or poly conversion, here are the number of decimal digits the system will round the value at.

Skipped: The system will ignore this sensor

5.4. Virtual Channel Alarm

This section enables Logical Operations with Virtual Channels Alarm. Virtual Channels section allows logical operations between alarms, (AND, OR, XOR, NOT).

5.4.1. Tips

5.4.1.1. Multiple Sensor in One Single Modbus Device

Our System allows the user to connect one single Modbus device providing information coming from different sensors.

5.4.1.2. What if a Sensor has more than 2 Channels?

The OM-240 allows to create another sensor with the same Modbus address (Fig. 9, 10, 11), so user can select 4 (or more, creating other sensors) registers to read data from.

Pre Measure Actions (if required) will be set only in first sensor (relative to the Modbus slave device) and Post Measure Actions will be set only in last sensor (always relative to the Modbus slave device).

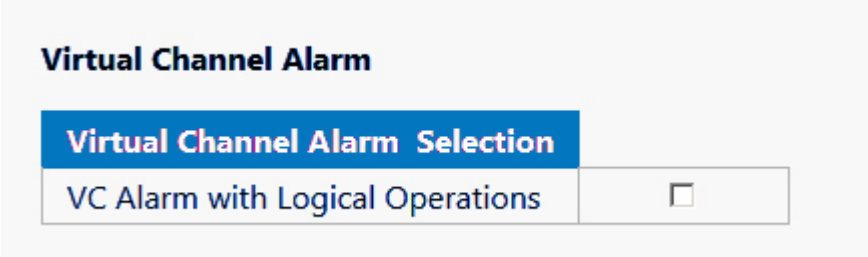
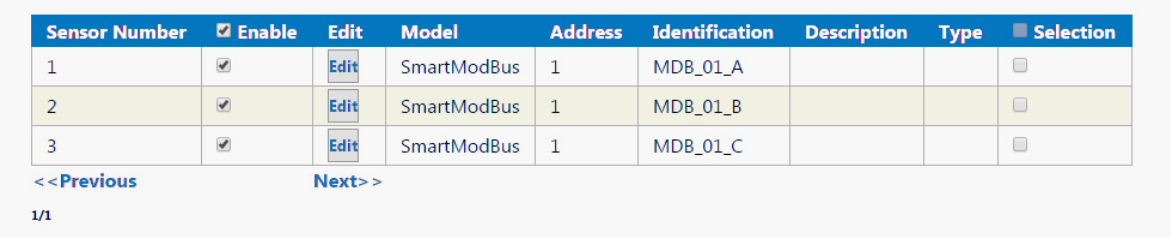


Figure 44 *Virtual Channel Alarm*

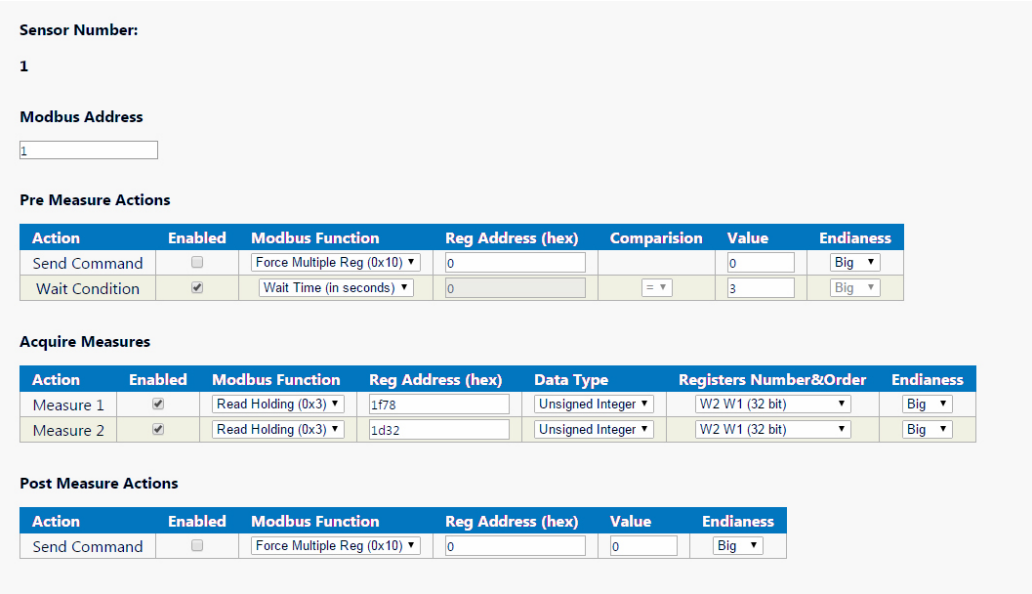


Sensor Number	Enable	Edit	Model	Address	Identification	Description	Type	Selection
1	☑	Edit	SmartModBus	1	MDB_01_A			☐
2	☑	Edit	SmartModBus	1	MDB_01_B			☐
3	☑	Edit	SmartModBus	1	MDB_01_C			☐

<<Previous Next>>

1/1

Figure 45 *Virtual Channel Alarm*



Sensor Number:

1

Modbus Address

1

Pre Measure Actions

Action	Enabled	Modbus Function	Reg Address (hex)	Comparision	Value	Endianess
Send Command	☐	Force Multiple Reg (0x10)	0		0	Big
Wait Condition	☑	Wait Time (in seconds)	0	=	3	Big

Acquire Measures

Action	Enabled	Modbus Function	Reg Address (hex)	Data Type	Registers Number&Order	Endianess
Measure 1	☑	Read Holding (0x3)	1f78	Unsigned Integer	W2 W1 (32 bit)	Big
Measure 2	☑	Read Holding (0x3)	1d32	Unsigned Integer	W2 W1 (32 bit)	Big

Post Measure Actions

Action	Enabled	Modbus Function	Reg Address (hex)	Value	Endianess
Send Command	☐	Force Multiple Reg (0x10)	0	0	Big

Figure 46 *Sensor Number 1*

Sensor Number:

2

Modbus Address

1

Pre Measure Actions

Action	Enabled	Modbus Function	Reg Address (hex)	Comparision	Value	Endianess
Send Command	☐	Force Multiple Reg (0x10)	0		0	Big
Wait Condition	☐	Read Holding (0x3)	0	=	0	Big

Acquire Measures

Action	Enabled	Modbus Function	Reg Address (hex)	Data Type	Registers Number&Order	Endianess
Measure 1	☑	Read Holding (0x3)	12b3	Unsigned Integer	W1 (16 bit)	Big
Measure 2	☑	Read Holding (0x3)	13a5	Unsigned Integer	W1 (16 bit)	Big

Post Measure Actions

Action	Enabled	Modbus Function	Reg Address (hex)	Value	Endianess
Send Command	☐	Force Multiple Reg (0x10)	0	0	Big

Figure 47 *Sensor Number 2*

Sensor Number:

3

Modbus Address

1

Pre Measure Actions

Action	Enabled	Modbus Function	Reg Address (hex)	Comparision	Value	Endianess
Send Command	☐	Force Multiple Reg (0x10)	0		0	Big
Wait Condition	☐	Read Holding (0x3)	0	=	0	Big

Acquire Measures

Action	Enabled	Modbus Function	Reg Address (hex)	Data Type	Registers Number&Order	Endianess
Measure 1	☑	Read Holding (0x3)	12b5	Unsigned Integer	W1 (16 bit)	Big
Measure 2	☑	Read Holding (0x3)	13b6	Unsigned Integer	W1 (16 bit)	Big

Post Measure Actions

Action	Enabled	Modbus Function	Reg Address (hex)	Value	Endianess
Send Command	☑	Force Multiple Reg (0x10)	11a1	4	Big

Figure 48 *Sensor Number 3*

6. Datalogger Configuration

6.1. Overview

This chapter will explain following webserver configuration pages:

- Change Datalogger's name
- Acquisition speed and precision
- IoT Enabling

Configuration -> Datalogger

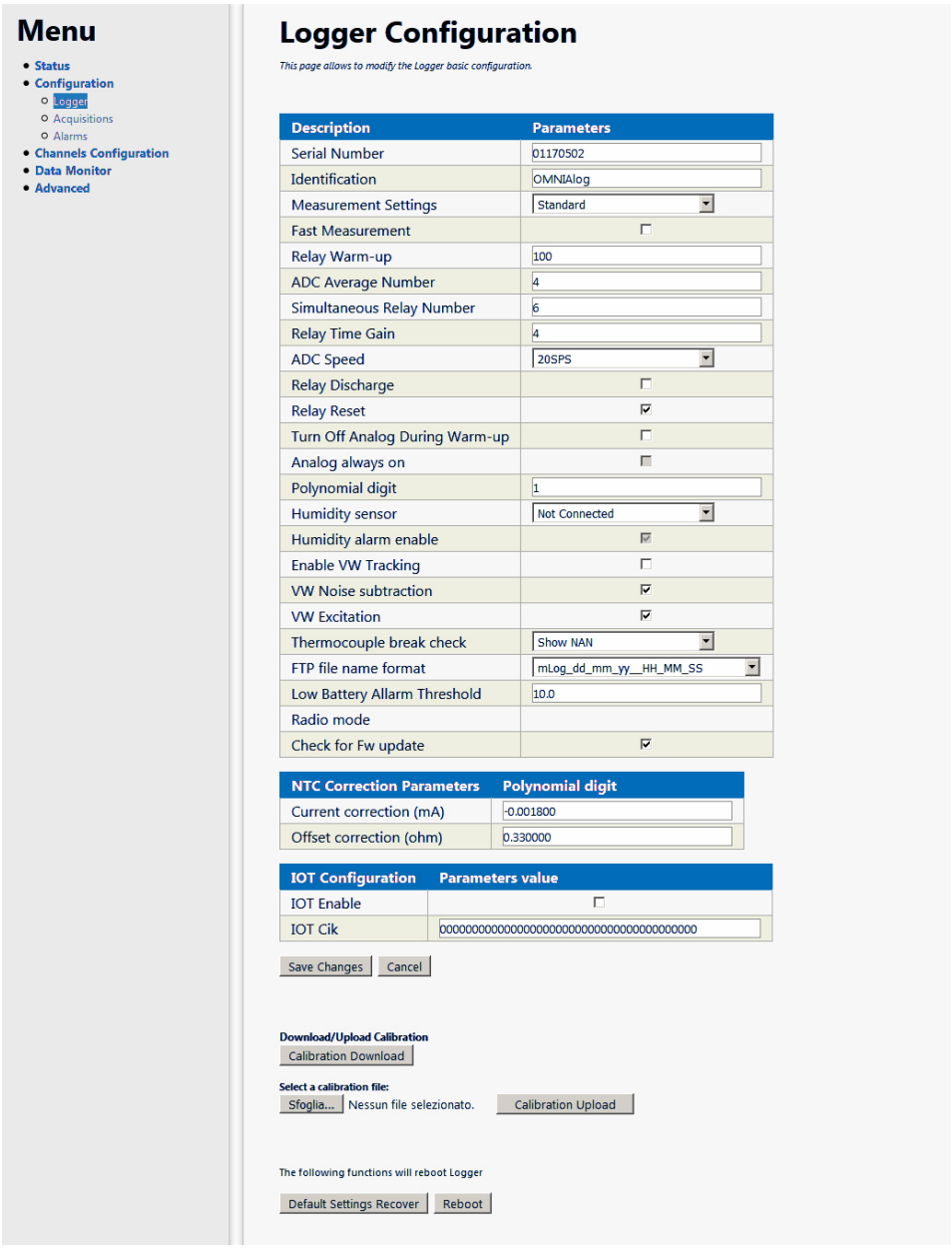


Figure 49 *Logger Configuration*

This page is dedicated to low levels tweaks to improve stability and correct readings.

Serial Number: This is the device serial number. It is composed by 8 decimal digits.

Identification: A short string (16 characters maximum) to identify the datalogger. Identification is used for USB data export. Admitted characters are:

Letters (a-z, A-Z)
Numbers (0-9)
Only this special characters: ._()[]-{}
Non-admitted characters will be substituted with _ (underscore) character.

Measurement Settings (Standard, High Precision, Fast): These are 3 different measure configurations. User can also modify settings, these are recommended settings.

Fast Measurement: The datalogger does not execute analog autocalibration.

Relay Warmup: Delay time between relay activation and acquisition process.

ADC Average Number: Number of average computed by Analog to Digital Converter.

Simultaneous Relay Number: Number of simultaneously activated relays.

Relay Time Gain: Relay excitation time (tens of milliseconds).

ADC Speed: ADC Sample rate, in SPS (Sample per Seconds).

Relay Discharge: Before acquisition process, all relays are set to short circuit to discharge capacitors.

Relay Reset: Optimization of relays movements.

Turn Off Analog During Warm-up: During sensor's warm-up, analog board is temporarily turned off.

Analog Always On: Analog circuits are turned on at first acquisition cycle (in RUN) and then won't be turned off (except when CONFIG or STOP mode are set). This allows faster acquisition rates. In Test Measure mode, analog board is turned on temporarily then turned off again. If datalogger will go in sleep mode, analog circuit should be re-initialized at next acquisition cycle.

Polynomial Digit: This field establishes number of decimal digits for channel with Linear or Polynomial conversions. This number is used if the channel is left at "DEFAULT". A single channel can override this setting in its own setting page.

Enable VW Tracking: This option will speed up Vibrating Wire Excitation by lowering the time needed for frequencies scan.

VW Noise Subtraction: It performs a noise analysis of the channel, to have a better SNR after excitation.

VW Excitation: This field enables the excitation of Vibrating Wire. If it's disabled, no excitation will be applied while reading vibrating wire, thus making the reading impossible. It can be used to test with functions generators.

Thermocouple Break Check: Before TC readings, OM-240 inspects TC circuitry to check total resistance. If value is out of thresholds, TC will be flagged as broken, and NAN, +FS or -FS will be recorded. If Thermocouple break check is disabled, this control won't be executed. It is useful to disable this control when using calibrators or mV sources connected as thermocouple, since their behavior is not the same as Thermocouple's wire.

FTP File Name Format: It allows choice between different file name's formats.

Low Battery Alarm Threshold: An alarm will be triggered if V IN voltage drops below this threshold.

Download/Upload Calibration: It allows logger calibration saving or restoring.

Default Settings Recover: It will restore default settings.

Reboot: It reboots the datalogger.

7. Alarms

7.1. Overview

- OM-240 can handle alarms of both channel (reading out of a determined range) and device (malfunction, wrong configuration etc.).
- Alarms can be recorded on Alarm logs and can be sent via SMS, EMAIL, FTP or activate through OM-240's Digital Output (refer to Chapter1 for more info).
- A first configuration must be done in the Alarm Configuration page (on the web server, click on "Configuration" and "Alarms"). The following screen will be prompted.

Simple steps to configure alarms:

- Select Output
- Select "Delay"
- Select "End"

7.2. Configuration

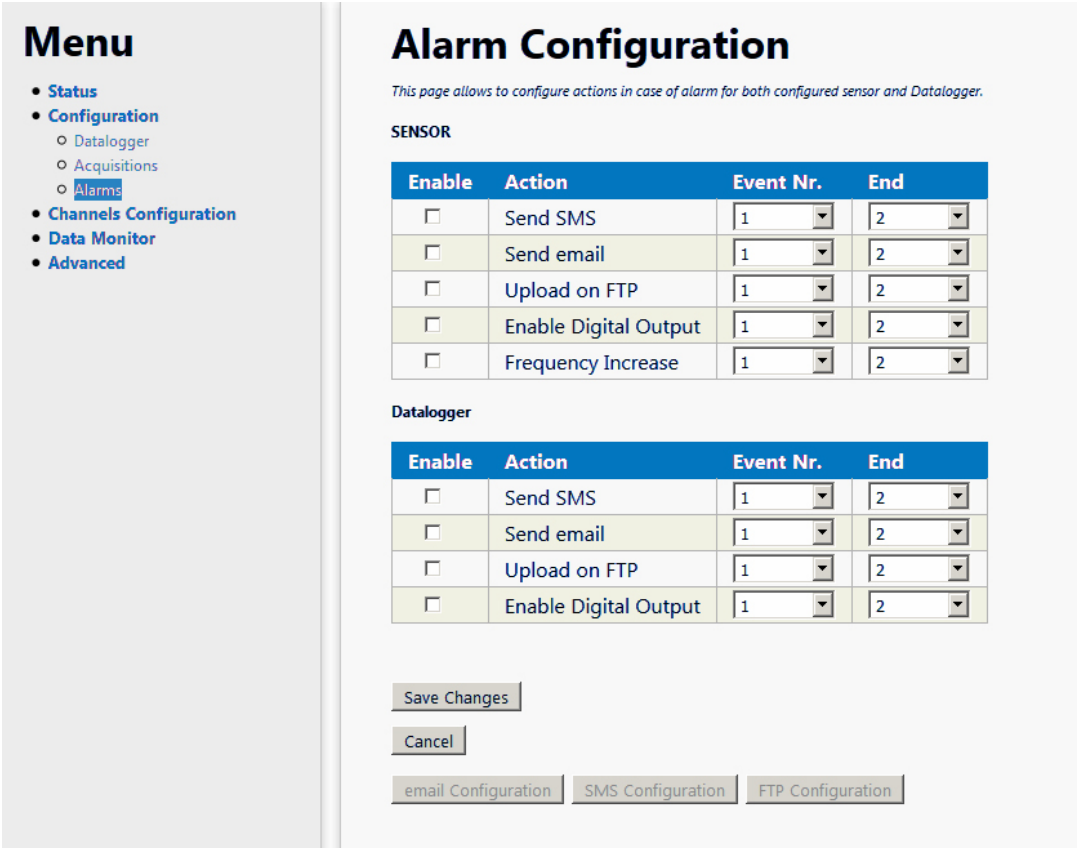


Figure 50 *Alarm Configuration*

In the "SENSOR" section, it is possible to select how OM-240 will handle Sensor's alarm:

Enabling any of this checkbox will modify datalogger's action:

- Send SMS will send an SMS (if RS232 modem is connected) with the Alarm.
- Send email will send an email (if RS232 modem OR Ethernet connection with internet is connected) with the Alarm, to specified recipient (see next section).
- Upload on FTP will upload the Alarm Log's row (if RS232 modem OR Ethernet connection with internet is connected) with the alarm triggered.
- Enable Digital Output will trigger the backpanel's terminal block to control an external Alarm system.
- Frequency increase will increase acquisition frequency to gather more information about the event that has triggered the alarm. Acquisition Frequency is set at 1 minute when the channel is in ALARM. If the datalogger is configured to read different sensors, and more than one sensor is in alarm, reading frequency will probably be lower.

There are pretty much the same options in the "OM-240" Section, except for Frequency increase.

Event Nr. Dropdown menu will let you choose the number of events in alarm at which the datalogger triggers the alarm. 1 means at the first occurrence, 2 will skip first value in alarm, and if it still in alarm during next acquisition the alarm will be triggered, otherwise there will be no alarm event.

End Dropdown menu will let you choose the number of events after which the datalogger will cease to trigger. NEVER is the option to disable this feature, and let the datalogger trigger EVERY set alarm.

After configuration, click Save to proceed.

If you selected SMS, email or FTP, the relative configuration option will be activated.

7.3. SMS Configuration

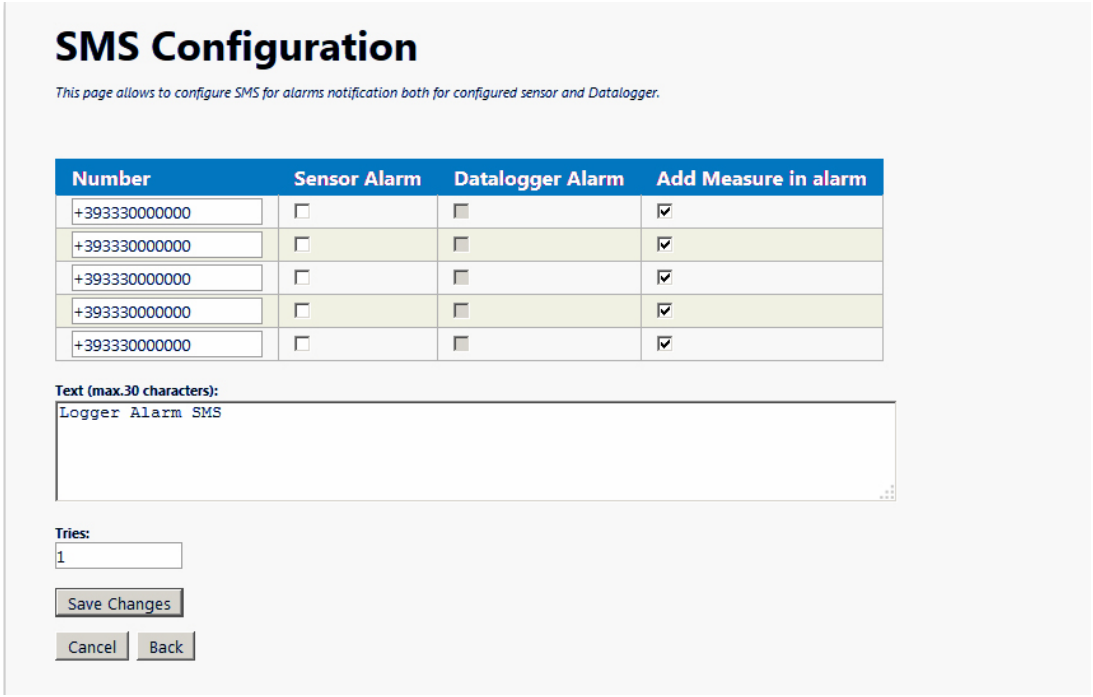


Figure 51 *SMS Configuration*

This page will let you select SMS recipient for triggered alarms.

Number: The recipient(s) of the SMS

Sensor Alarm: If you have selected SMS in sensors alarms this will let you use the current recipient for the sensor alarm

OM-240 Alarm: If you have selected SMS in OM-240 alarm this will let you use the current recipient for the datalogger's alarm

Add Measure in Alarm: It will attach measure value to the SMS

Text: It allows a small text writing (up to 30 characters) contained in the SMS

Tries: It makes you choose the number of tries if SMS send fail

Click save to proceed

7.4. Email Configuration

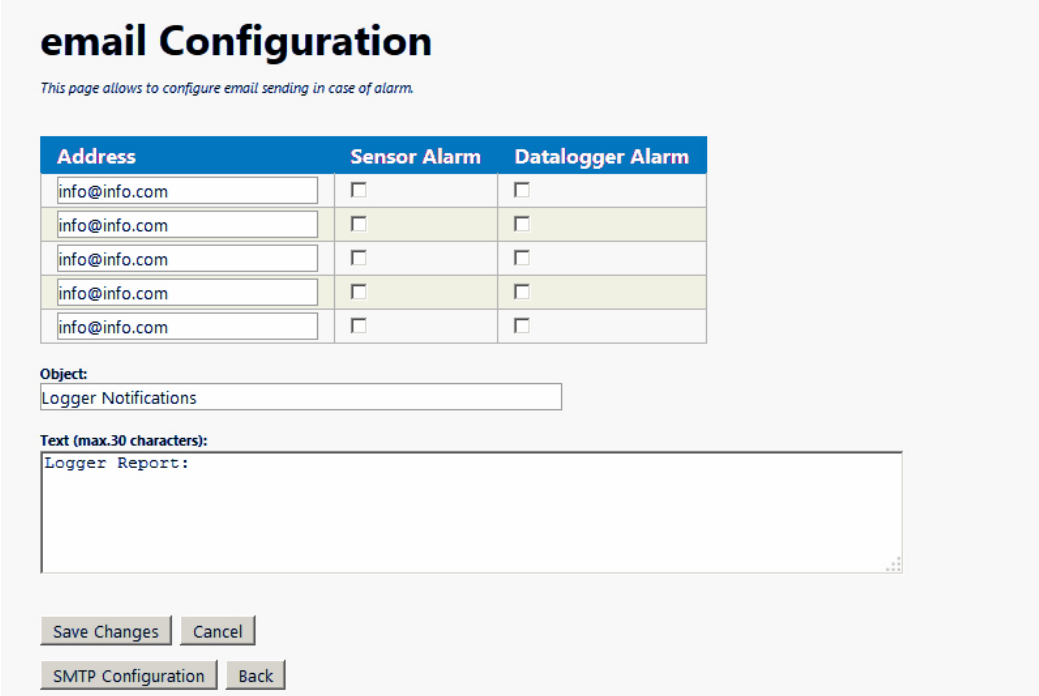


Figure 52 *Email Configuration*

This page will let you select the email recipient for triggered alarms.

Address: The email address of the recipient

Sensor Alarm: If you have selected email in sensors alarms this will let you use the current recipient for the sensor alarm

Datalogger Alarm: If you have selected email in datalogger alarm this will let you use the current recipient for the datalogger's alarm

Object: Email's object

Text: A small text (30 characters) to be sent with email

SMTP Configuration: It will open a new page to configure SMTP parameters

Save Changes to proceed

7.5. SMTP Configuration

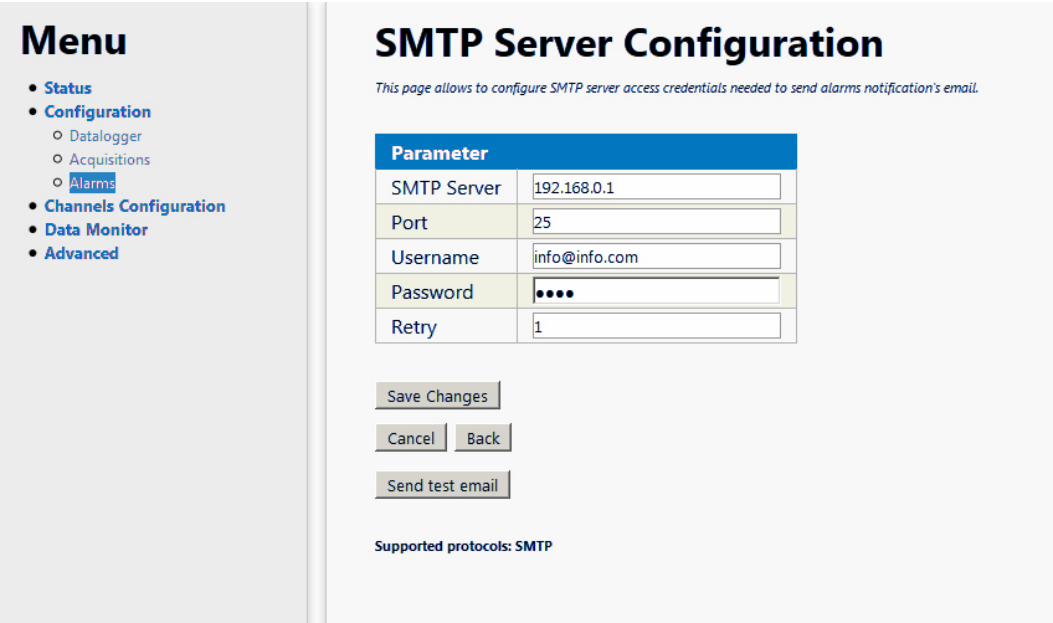


Figure 53 *SMTP Configuration*

This page allows the setup of SMTP parameter.

SMTP Server: The SMTP server to send mail

Port: Port used to communicate with SMTP Server

Username and Password: Credentials to be used to send email

Retry: Number of retry(ies) in case of transmission errors

Send Test Email: It will send an email to check if parameters are correct



Only standard SMTP (not encrypted) is supported.

7.6. FTP Configuration

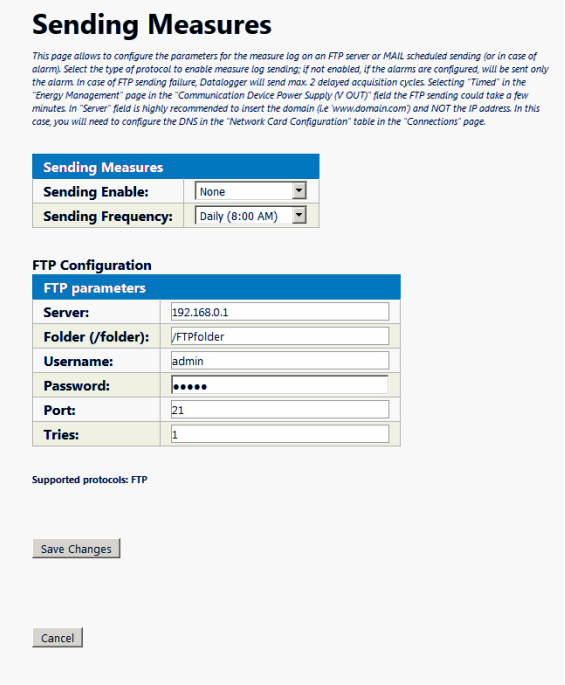


Figure 54 *FTP Configuration*

This page allows FTP connection configuration. Sending Measure Table is related to Measure log transfer and this is explained in the related section.

FTP Configuration table allows to setup all parameters for FTP server connection. If the server is not on the same LAN, a 3G modem or Internet connection is required.

Server: It is the server address

Folder: It allows to specify subfolder to be used. The directory MUST exist

Username and Password: Credentials used to connect to the server

Port: Port used to connect to the server

Tries: Number of attempts in case of failure

Save changes to continue



Only standard FTP (not encrypted) is supported.

7.7. Channel Alarm Types

Thresholds in OM-240 alarm settings are here described.



All alarms evaluations are computed AFTER linear or polynomial conversion, if any.

7.8. Low and High Thresholds

Thresholds are basically limits to sensor's ranges. If a threshold is overcome (lower value so low threshold, or higher value so high threshold), the alarm is triggered.

7.9. Derivate

Derivate alarm will analyze, at n sample, value of n–1 sample and compare to n sample.

If value(n) – value(n–1) > threshold, an alarm is triggered.

Examples

Derivate alarm, linear conversion

(Ln * S + Lz) – (Ln – 1 * S + Lz) > threshold

Ln is last sample, while Ln – 1 is second-last sample. S is sensibility parameter and Lz is offset (Zero reading) in linear conversion's channel settings.

8. Digital Inputs Configuration

The OM-240 has two digital inputs (IN1 & IN2) on its back side.



Figure 55 *Digital Inputs Configuration*

The digital inputs could be configured to acquire a TRIGGER or an RAIN GAUGE or an ANEMOMETER. The trigger could be used with a seismic station and it is used to start one or more acquisitions extemporaneous.

Note: In case of a rain gauge or anemometer, no elaboration of reading is considered (ex: average speed, maximum, instantaneous, daily storage, etc.).

To set up a digital input it is necessary:

- To select the entry **CHANNEL CONFIGURATION**, then **DIGITAL INPUTS**;
- The page **DIGITAL INPUTS CONFIGURATION** opens. In this page it is possible to set up 1 or both digital inputs independently;

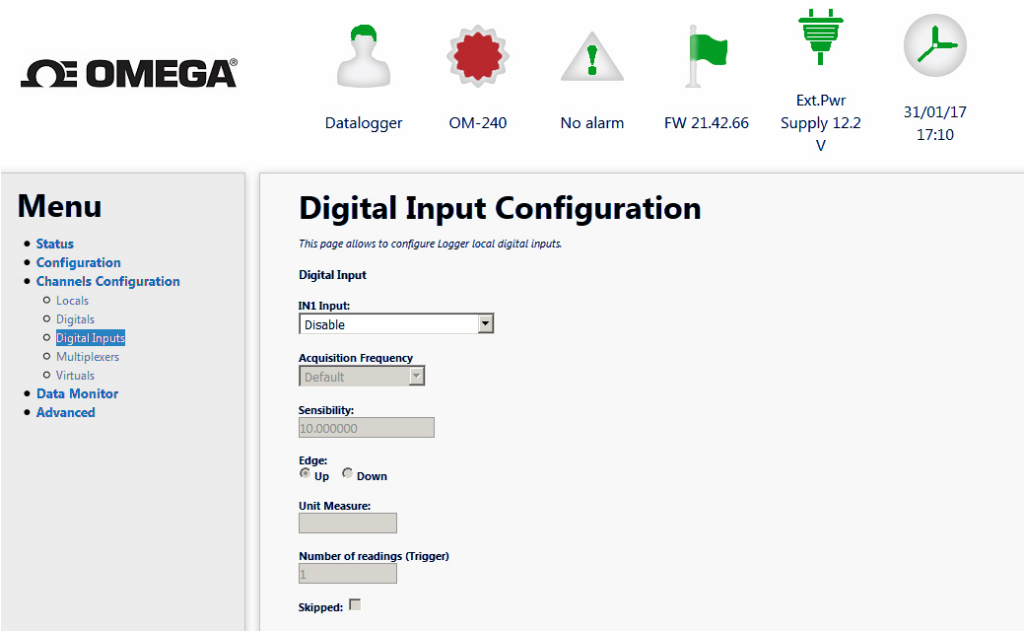


Figure 56 *Digital Input Configuration*

- In this page you could find the following fields:

INX INPUT (X is 1 or 2)	Using the drop-down menu, it is possible to select the type of digital input between 4 possibilities: - DISABLED - TRIGGER - RAIN GAUGE - WIND GAUGE The input has to be configured according to the sensor that is connected.
ACQUISITION FREQUENCY	Sampling rate of selected channel (wind gauge, rain gauge).
SENSIBILITY	This field enables only for RAIN GAUGE and ANEMOMETER. If it is well configured, it allows to transform the counts in engineering units (ex: from “counts” to “mm”).
EDGE	This field enables only for TRIGGER. It is possible to select between two entries: up or down. The state change could be high-low (DOWN) or low-high (UP). Therefore, if on the input generally there is no voltage and you want to do an acquisition with the OM-240, in case a voltage arrives on the input (ex: 5 Vdc) it is necessary to select UP. This because you pass from a low (0 Vdc) to a high (5 Vdc) state.
UNIT MEASURE	This field enables only for RAIN GAUGE and WIND GAUGE. It indicates the unit of measure of the read value.
NUMBER OF READINGS (TRIGGER)	Editable field. Numerical value. This field enables only for TRIGGER. It indicates how many extemporaneous and consecutive acquisitions the OM-240 has to do with a trigger. Acquisitions are done independently from the configured acquisition interval. These data are stored and so they could be exported in CSV file.

Note: If you enable the digital inputs, the OM-240 is in permanent acquisition. This means that, even if the OM-240 is in Timed, he will never go in “low consumption” mode. This situation has to be taken into account in case it is necessary to optimize the consumptions (for example with batteries or solar panel).

8.1. Example of Digital Input IN1 Configuration

Here is shown the standard configuration of a digital input configured as **TRIGGER**.

- Open page **DIGITAL INPUT CONFIGURATION** and select the entry **CHANNELS CONFIGURATION/DIGITAL INPUTS** from left menu;

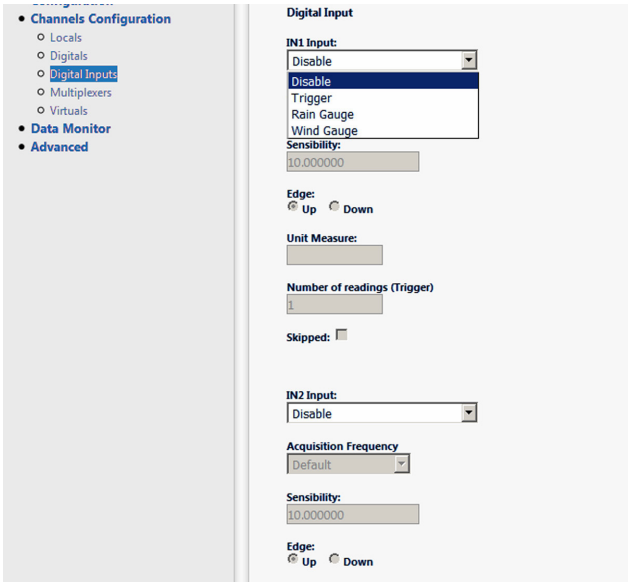


Figure 57 *Example of Digital Input IN1 Configuration*

- In field **INPUT IN1** select **TRIGGER**;

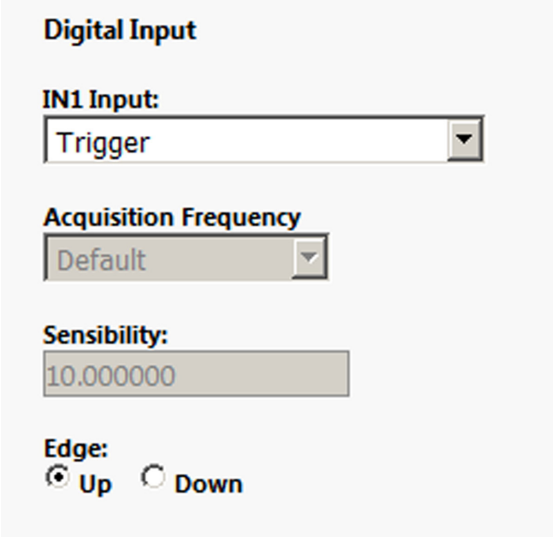


Figure 58 *Input IN1 Trigger*

- In field **EDGE** select **UP**;

Note: In this example it has been selected UP because we supposed there is any voltage on digital input IN1 and that in case of a trigger, a voltage of 5 Vdc is applied.

- In field **NUMBER OF READINGS (TRIGGER)** insert the number of acquisitions you want that the OM-240 does after a trigger signal (ex.5).

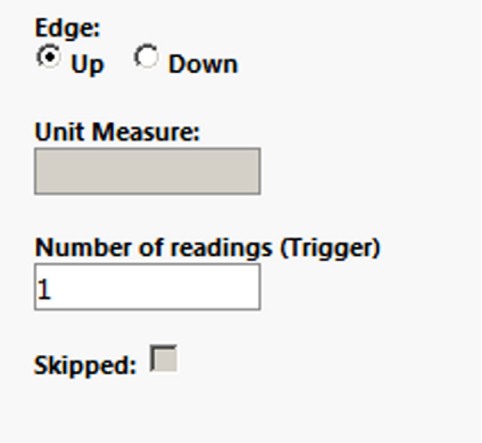


Figure 59 *Number of Readings (Trigger)*

- Push **SAVE CHANGES** to confirm the configuration.

The OM-240, with this configuration, in case it receives a positive voltage on-**DIGITAL INPUT IN1**, does 5 consecutive acquisitions of all configured channels.

A practical example of the use of trigger function is that of associate OM-240 to a Seismic Station. The majority of Seismic Stations has the possibility, in case of a seismic event, to activated a digital output (an output voltage). If this signal is connected directly to the digital input IN1 of the OM-240, when a seismic event happens the Seismic Station furnishes a digital output on the digital input of the OM-240. The OM-240 starts to acquire all connected sensors to verify the monitoring area after the event.

8.2. Example of Digital Input IN2 Configuration

Here is shown the standard configuration of a digital input configured as **RAIN GAUGE**.

- Open page **DIGITAL INPUT CONFIGURATION** and select the entry **CHANNELS CONFIGURATION/DIGITAL INPUTS** from left menu;

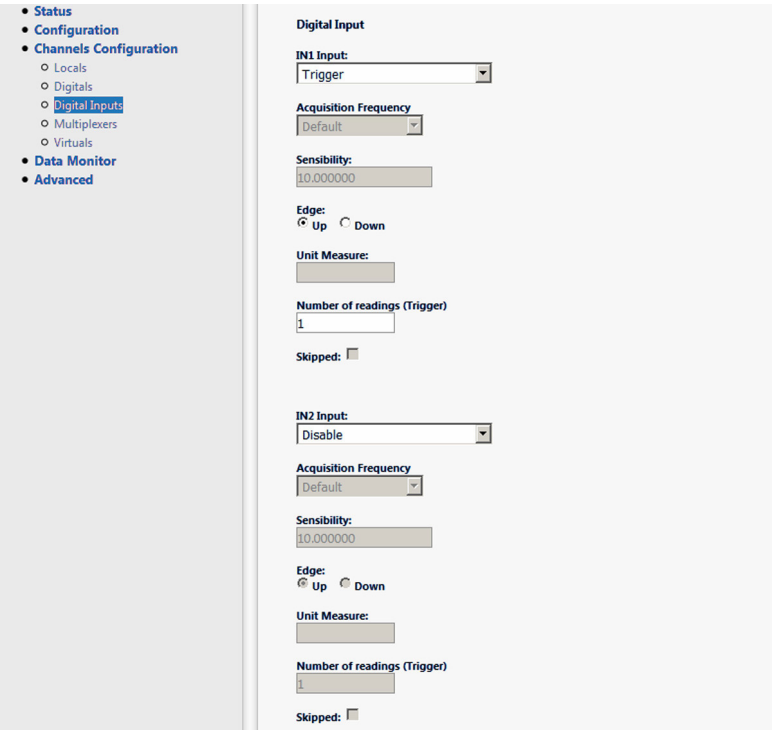


Figure 60 *Example of Digital Input IN2 Configuration*

- In field **INPUT IN2** select **RAIN GAUGE**;

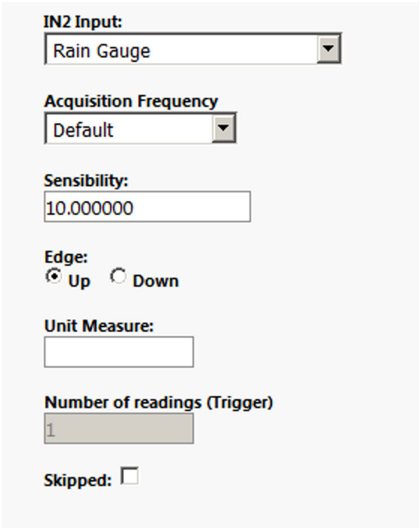


Figure 61 *Input IN2 Rain Gauge*

- In field **SENSIBILITY** insert the sensibility of sensor (for example 0.2 mm/count);
- In field **UNIT OF MEASURE** insert the unit of measure of the done conversion (example “mm”).

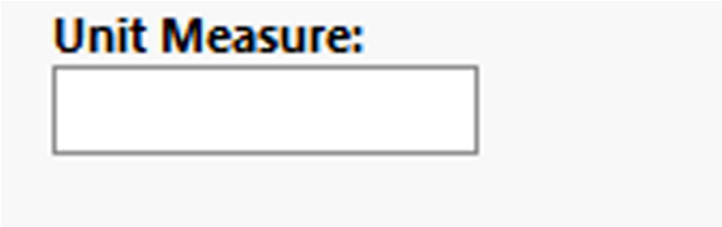


Figure 62 *Unit of Measure*

With this configuration, the OM-240 acquires the number of impulses for a period of a hour. Once this interval ends, the OM-240 memorizes the number of counts done during this period of time.

If for example in one hour 5 counts are detached, the OM-240 applies the following conversion:

5 COUNT * 0.2 MM/COUNT = 1 MM

Once the value is memorized, the counter sets to zero.

Alarm configuration is the same as all other channel types, with High, Low and Derivative Thresholds. VC alarm with Logical Operations is present, as a Virtual Channel alarm can be used in Virtual Channels Logical Alarms.

9. Virtual Channels

9.1. Overview

This chapter is focused on Virtual Channels (VC from now on), to understand why VC are implemented on OM datalogger and how to configure them.

1. Why are Virtual Channels implemented in OM Family? – This paragraph shows benefits of Virtual Channels.
2. Scripts – Scripts are a fundamental section of Virtual Channels' architecture.
3. Virtual Channels configuration – "HOW TO" use and configure Virtual Channels' with analog and digital sensors, digital input and multiplexers.
4. Common Errors – Here are shown common errors made during virtual channels creation, and how to avoid them.

9.2. Why are Virtual Channels Implemented?

We usually use sensors to get a measure. Anyway, we could need a way to modify that number because we need either a derived measure (airflow/airspeed) or an expression calculated on more than 1 sensor (dewpoint or Δ_t between two zones for instance). We can calculate this with spreadsheet or just let our datalogger do the work.

OM Family has this feature with Virtual Channels.

Virtual Cannels allows operations to be made on a single channel or between channels.

OM group them into Scripts, with a maximum of 5 scripts containing 16 virtual channels each. Each Virtual Channel can handle up to 9 elements (including Virtual Channel beloning to the same script).

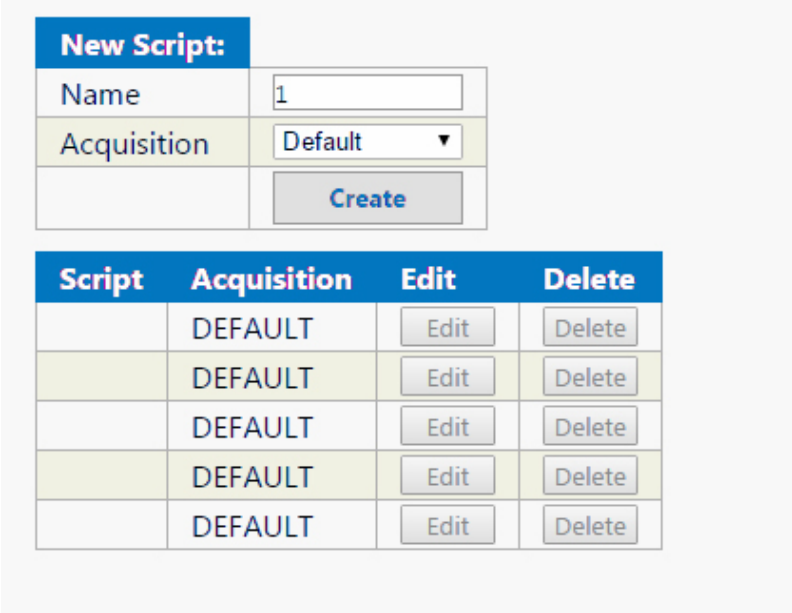


Figure 63 *Virtual Channels*

9.3. Scripts

OM-240 automatically provides the script name during its creation. Acquisition timing can be chosen between 1 second and 7 days, with "DEFAULT" option not overriding OM-240 global acquisition timing.

After selecting "Create" button the new script will be listed below:

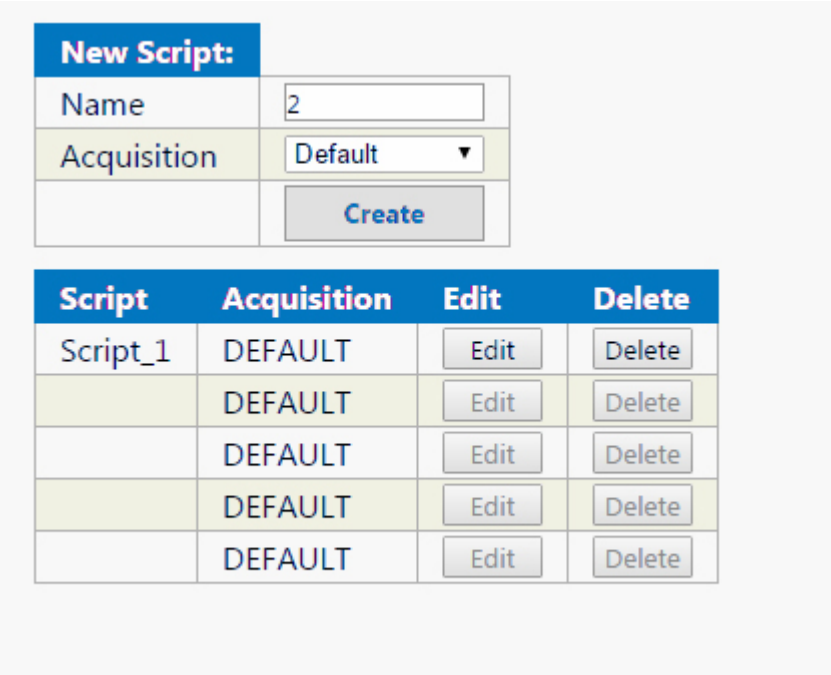


Figure 64 *Scripts*

Edit button allows the configuration of Virtual Channels contained by the selected Script. As we see in following Figure, OM-240 provides a large toolbox to program Virtual Channels.

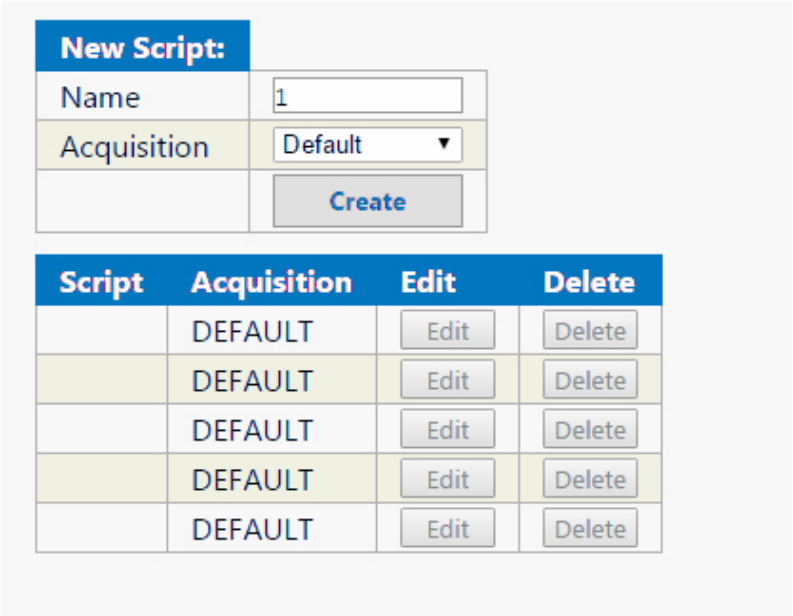


Figure 65 *Scripts*

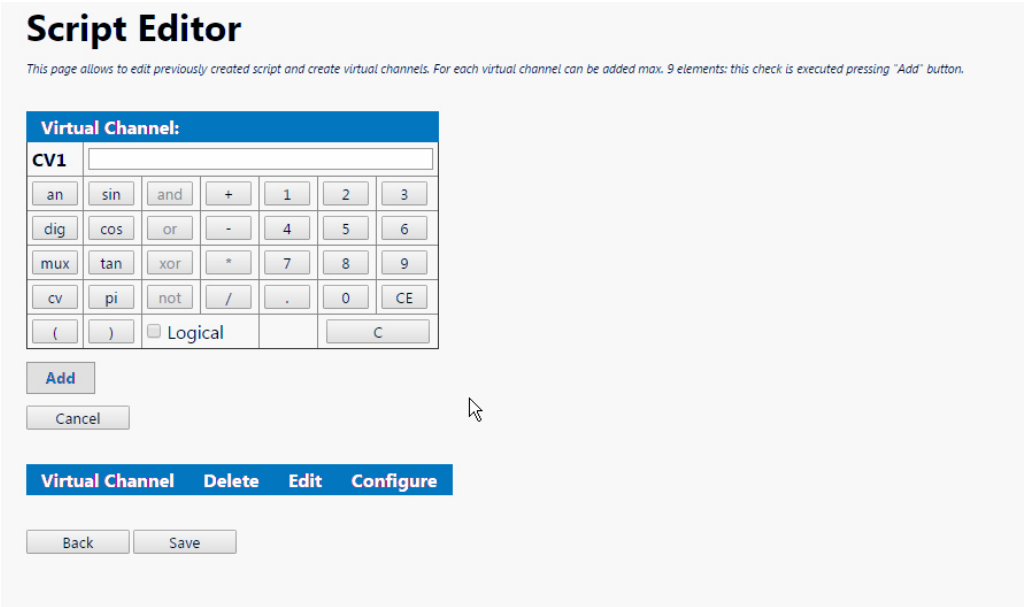


Figure 66 *Script Editor*

an: selects an analog channel (prompts a dialog box to input channel number)

dig: selects a digital channel (prompts a dialog box to input channel number)

mux: selects multiplexer position (prompts two dialog boxes, the 1st for channel number, the 2nd for mux address)

cv: selects a virtual channel (only those included in the same script, prompts a dialog box for CV number)

Apart from this we have mathematics operations, like +, –, *, /, sin, cos, tan, pi-value

Logical operations allow operations between alarms states. Every channel (analog, digital, virtual and mux) provides a checkbox in alarm configuration, VC Alarm with Logical Operations. This enables alarms to be handled by virtual channels.



Figure 67 *VC Alarm with Logical Operations*

The following Virtual Channel will trigger an alarm only if one of the two channels is in alarm.

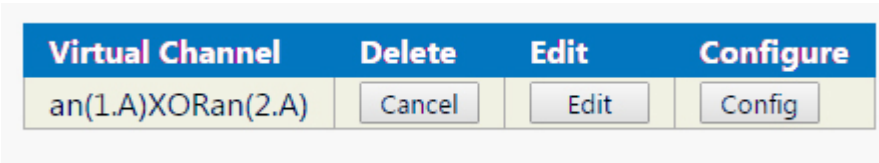


Figure 68 *Virtual Channel*

an(1.A)	an(2.A)	an(1.A) XOR an(2.A)
F	F	F
F	V	V
V	F	V
V	V	F

an(1.A)	an(2.A)	an(1.A) AND an(2.A)
F	F	F
F	V	F
V	F	F
V	V	F

an(1.A)	an(2.A)	an(1.A) OR an(2.A)
F	F	F
F	V	V
V	F	V
V	V	V

an(1.A)	NOT an(1.A)
F	V
V	F

9.4. Virtual Channel Configuration

By clicking "config" in the Virtual Channel row (Figure 23) the user can edit Identification (channel name) and alarm properties.

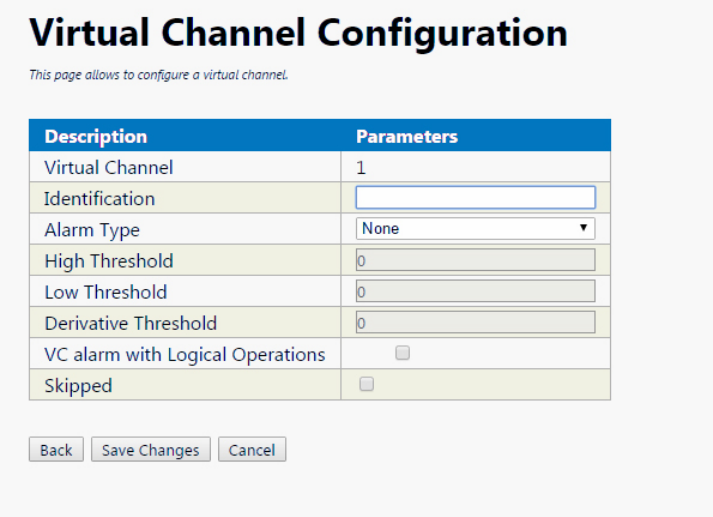


Figure 69 *Virtual Channel Configuration*

Alarm configuration is the same for all channel types, with High, Low and Derivative Thresholds. VC alarm with Logical Operation is present, as a Virtual Channel alarm can be used in Virtual Channels Logical Alarms.

9.5. Common Errors and Warnings

In order to write Virtual Channel's formula correctly, you should avoid typing the whole formula in the dialog box prompted by the system.



Figure 70 *Common Errors and Warnings*

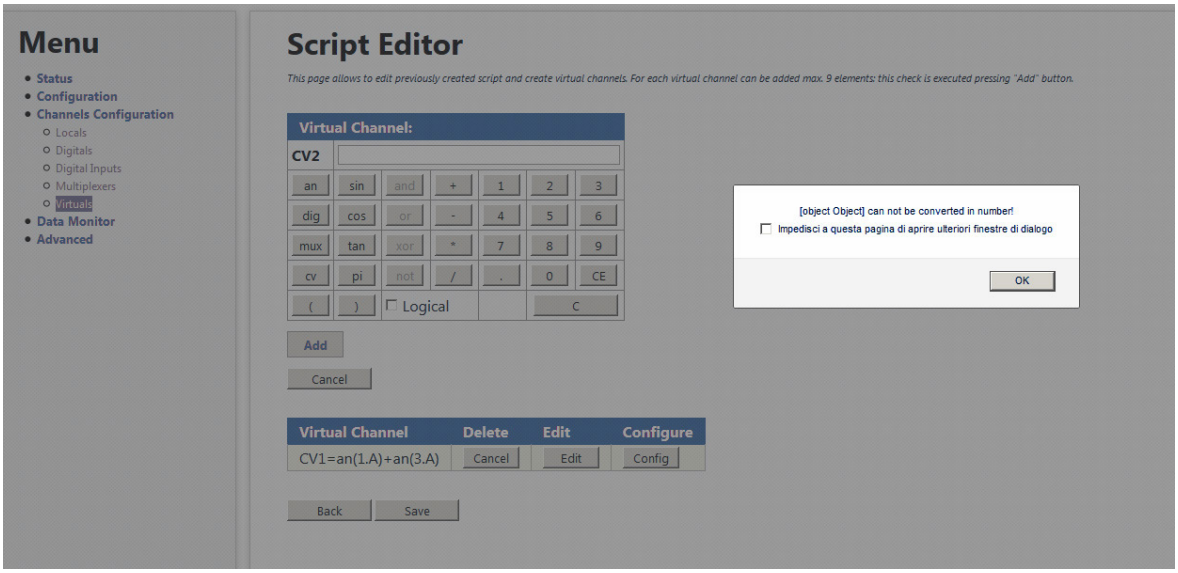


Figure 71 *Common Errors and Warnings*

As you can see this causes an error.

Formula has to be written using keys printed on the screen. The prompt should be used ONLY to write channel number.

The same procedure applies for dig, mux and cv buttons.

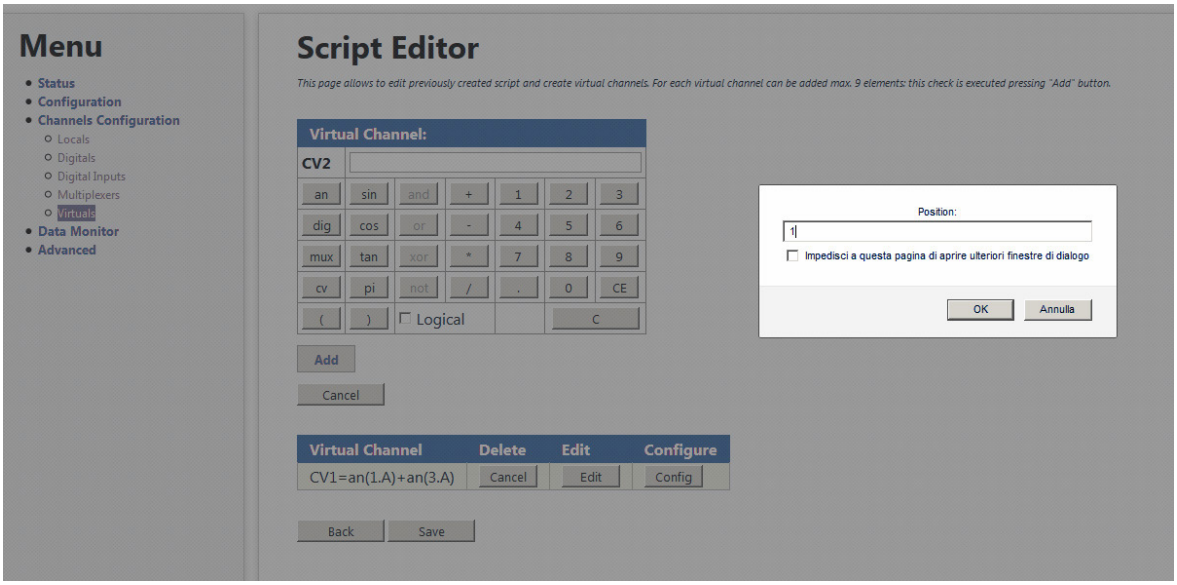


Figure 72 *Common Errors and Warnings*

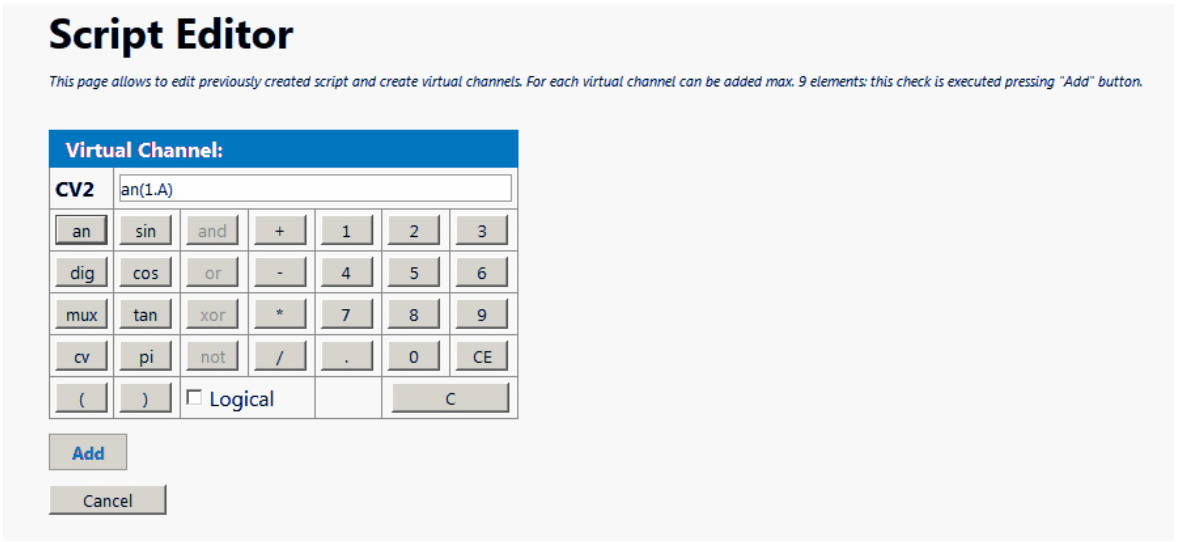


Figure 73 *Script Editor*

Channel B (1.B, 2.B, and so on) can't be used on Virtual Channels. If you need to use the channel B of a multiaxis sensor, like Voltage 2CH, Vibrating Wire + Thermistor, and all others, you should use 2 separate channels during configuration.

10. Advanced Configuration

10.1. Overview

Advanced parameters are explained in this section.

- Connection configuration, for Ethernet and 3G modem parameters.
- Measure log transfer, for FTP server configuration.
- Account management, to change account passwords.
- Date and Time, to change timezone or set daytime saving.
- Energy management, to improve power consumption especially if battery powered.
- Information about firmware versions, mac address, bootloader.

This section will show how to configure Advanced parameters in the OM-240's web server.

10.2. Connections

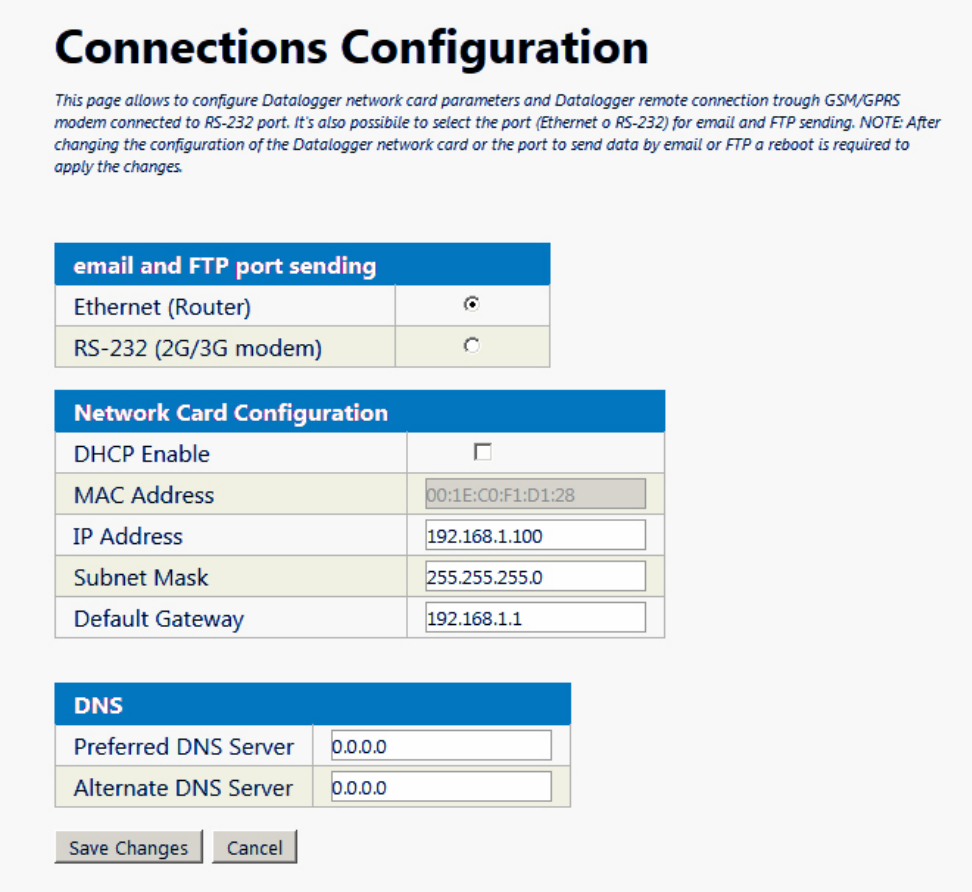


Figure 74 *Connections Configuration*

This page allows to set network parameters.

In the first block you select which connection will be used by OM-240 to send Email and FTP files.

10.3. Network Card Configuration

DHCP Enable: to choose whether or not to use DHCP or specify network parameters IP Address, Subnet Mask and Default Gateway, DNS Servers addresses depend on network infrastructure.

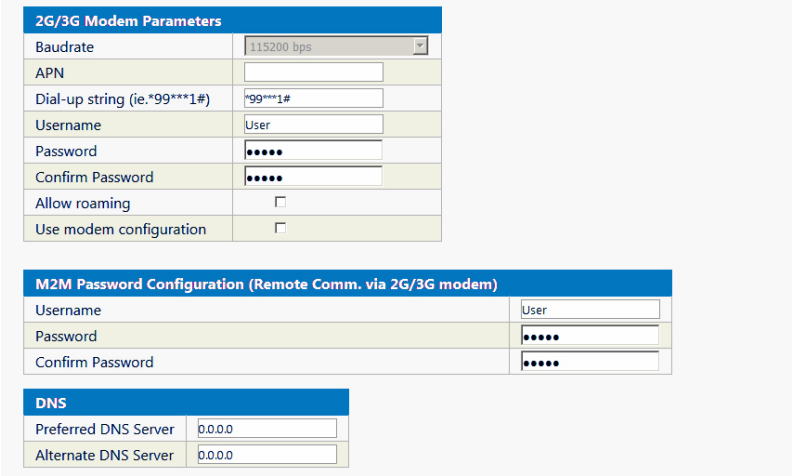


Figure 75 *Network Card Configuration*

This settings are related to 3G modem. Parameters are usually provided by telephone operator.



Remember to set DNS also on RS-232 2G/3G modem.

10.4. Measure Log Data Transfer

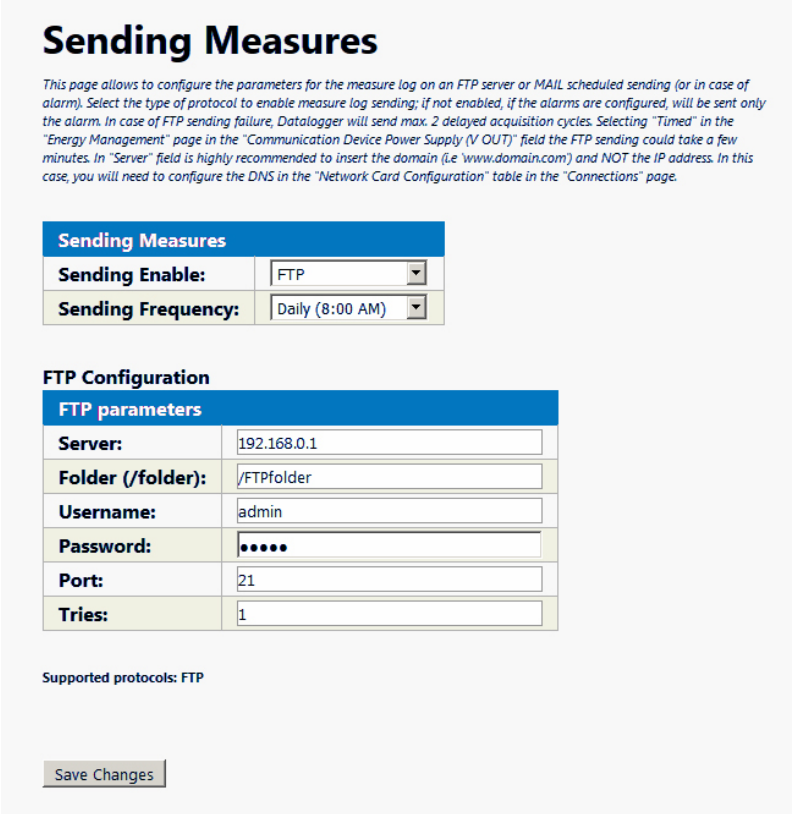


Figure 76 *Measure Log Data Transfer*

This page contains data transfer settings.

Sending Measure block allows to choose the way to send data:

None: no data transfer

Email: data will be transferred via email

FTP: data will be transferred via FTP

FTP Configuration block contains the configuration to create an FTP connection with a user's server.

10.5. Account Management

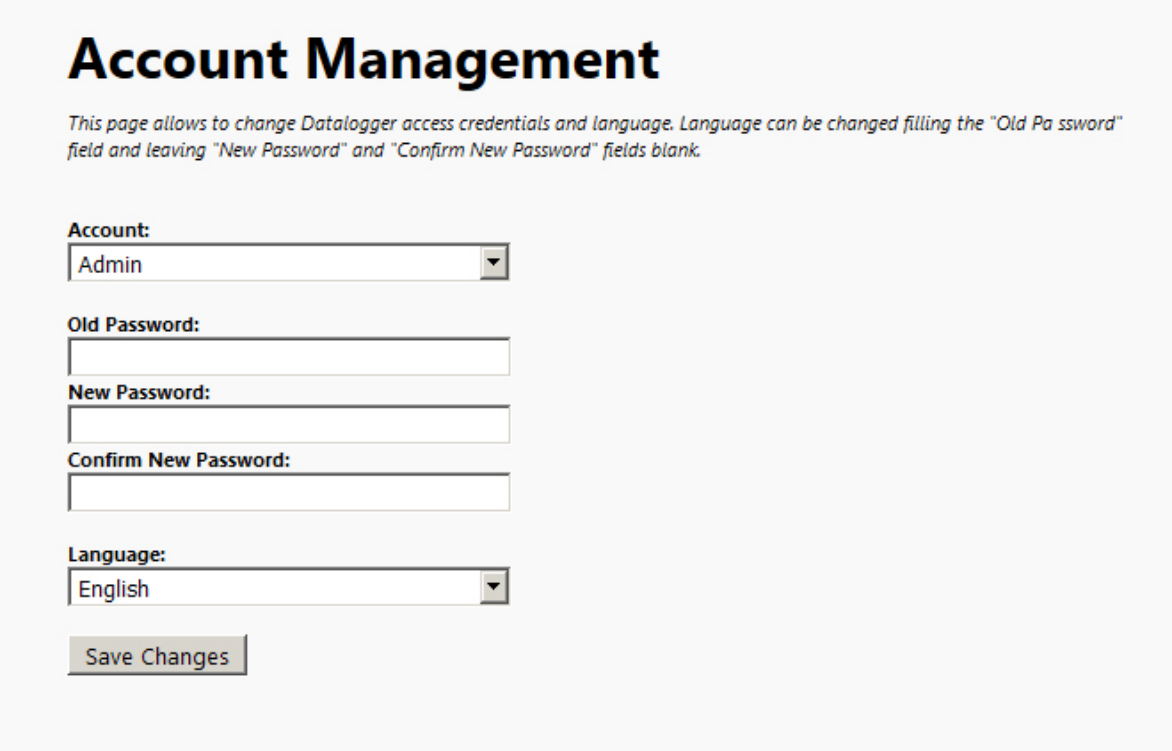


Figure 77 *Account Management*

Here it is possible to change the passwords for User and Admin accounts, and to change web language.

10.6. Date and Time

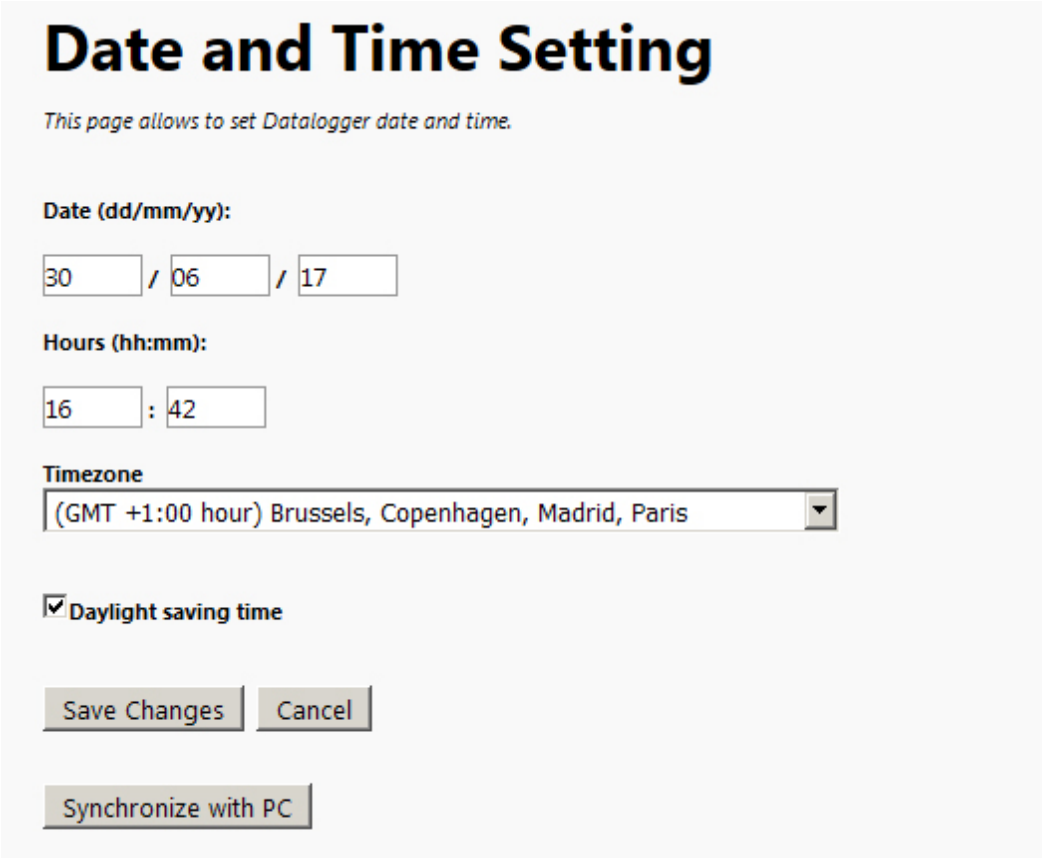


Figure 78 *Date and Time Setting*

In this screen it's possible to change date, hour and Timezone.

10.7. Energy Management

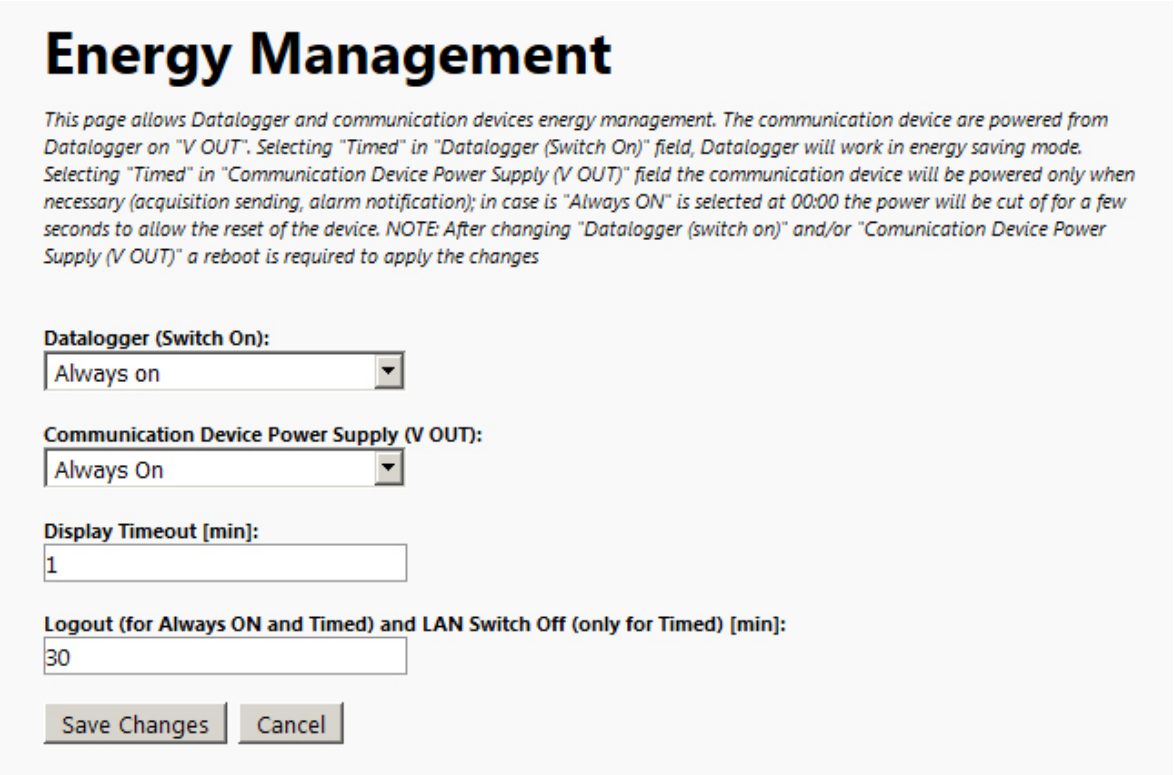


Figure 79 *Energy Management*

This page is about Energy Management.

OM-240 can work in 2 modes:

Always On: the datalogger does not turn off itself to save energy, Ethernet connection is available.

Timed: The datalogger turns off itself, waking up few minutes before acquisition starting.

VOUT port can be kept always on, or timed.

10.8. Info

This page contains information about firmware, web, bootloader and model. Note this parameters in case of assistance enquiry.

11. Charts

11.1. Overview

OM-240 is provided with a simple tool to generate Charts. It's available on request and need to be activated with a Purchased Key. Contact your dealer for more information.

It's possible to export data and save charts as pdf, png or vector files.

11.2. Activation

In order to activate charts, you have to buy a key from dealer. Load Data Monitor -> Charts page and insert the key in the right field and click Submit button.

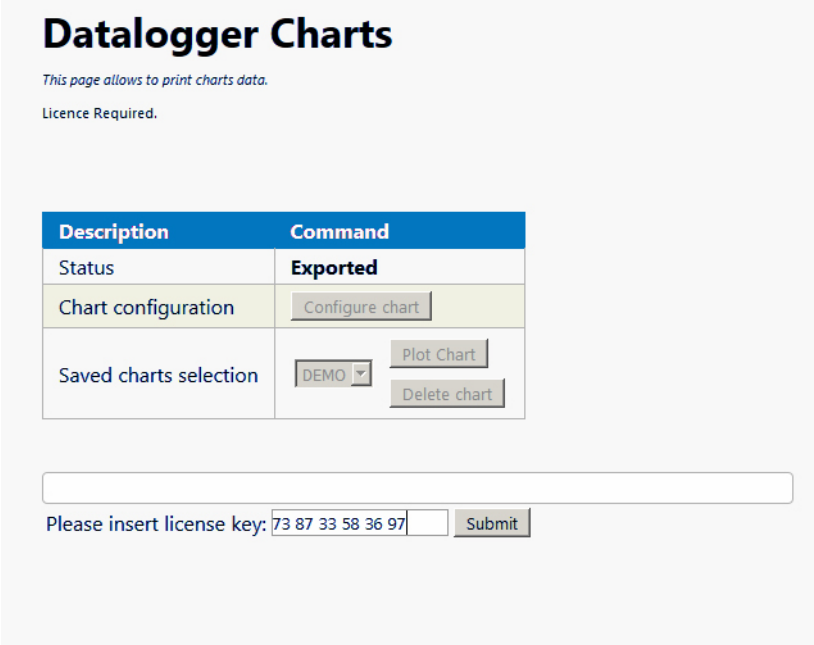


Figure 80 *Datalogger Charts*

11.3. Setup and Use

From the Web Server pages go in "Data Monitor" and then click "Charts". This screen will be loaded.

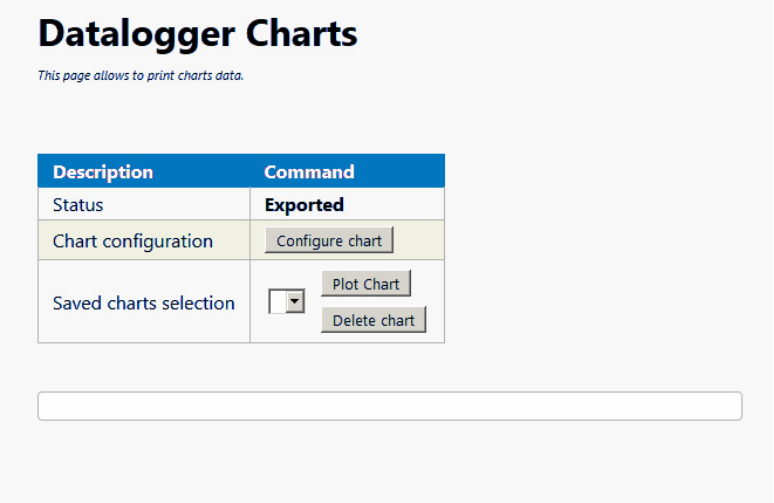


Figure 81 *Setup and Use*

No chart is available at this time, and we need to create one.

Click on "Configure chart" to proceed.

The next screen will ask for Start and Stop date, and you will need a Logarithmic scale (Log scale check) to allow different unit channels to fit the same chart and be readable.

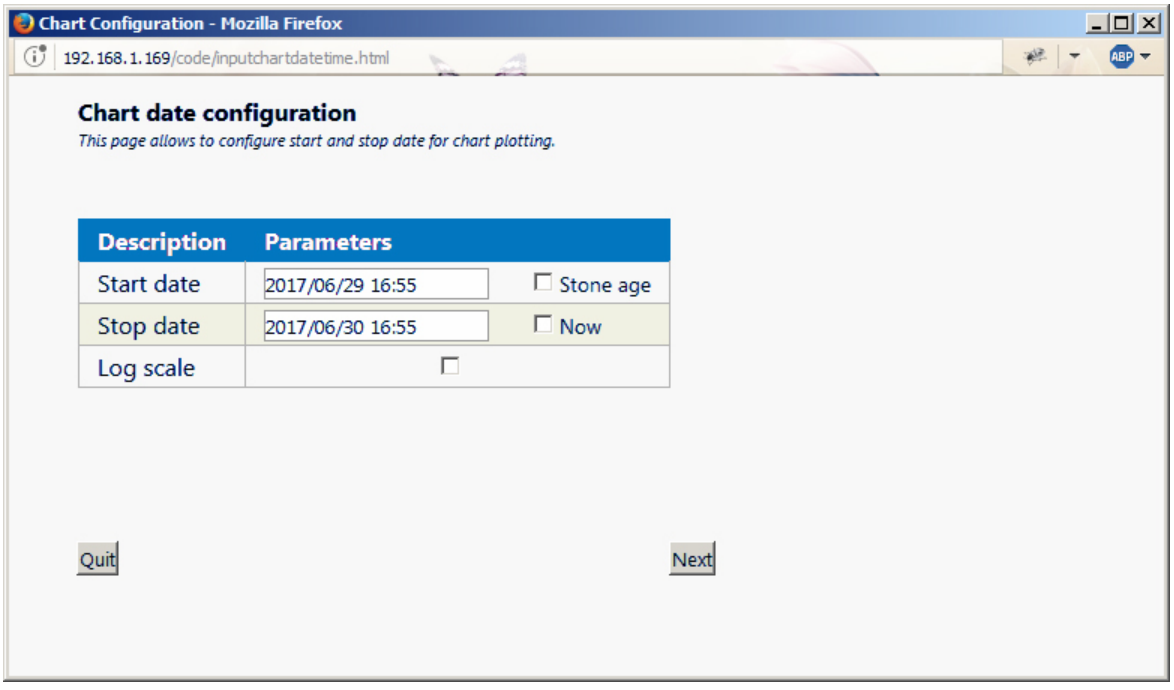


Figure 82 *Chart Date Configuration*

Click Next to proceed.

Sensor select screen allows channels selection, so you choose which channel(s) you want to include in the chart. One or more sensors should be selected to go further on.

Axis selection create up to 3 vertical axis related to that channel. If different scales are presents, this solves readability troubles.

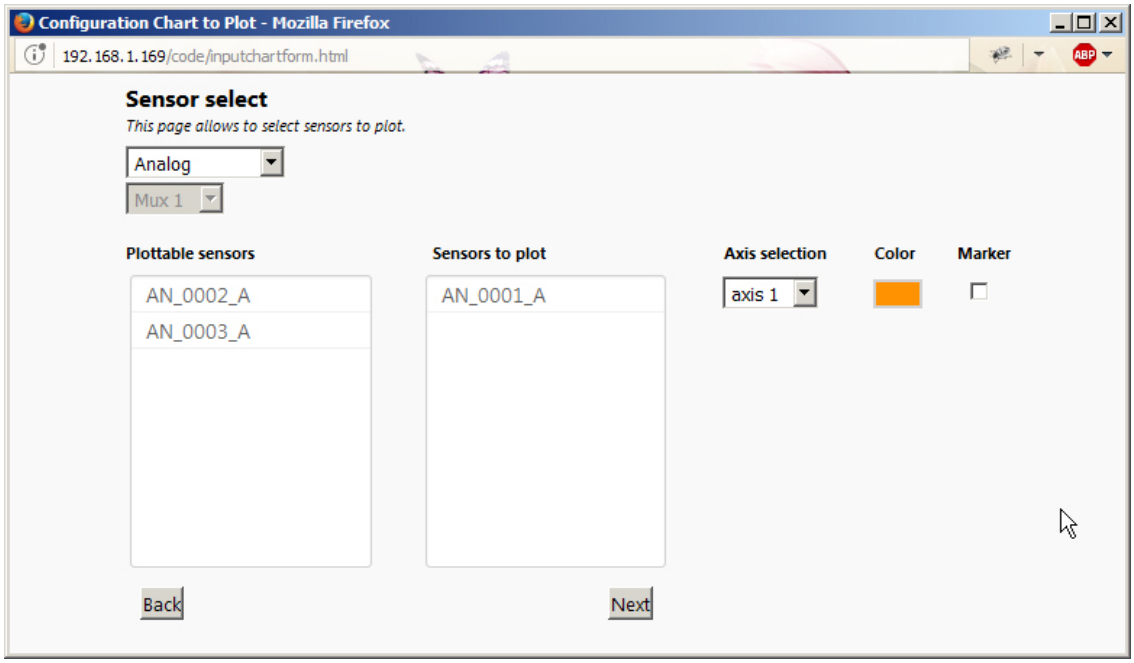


Figure 83 *Sensor Select*

Color window let the user select the color of that channels. A full palette is available.

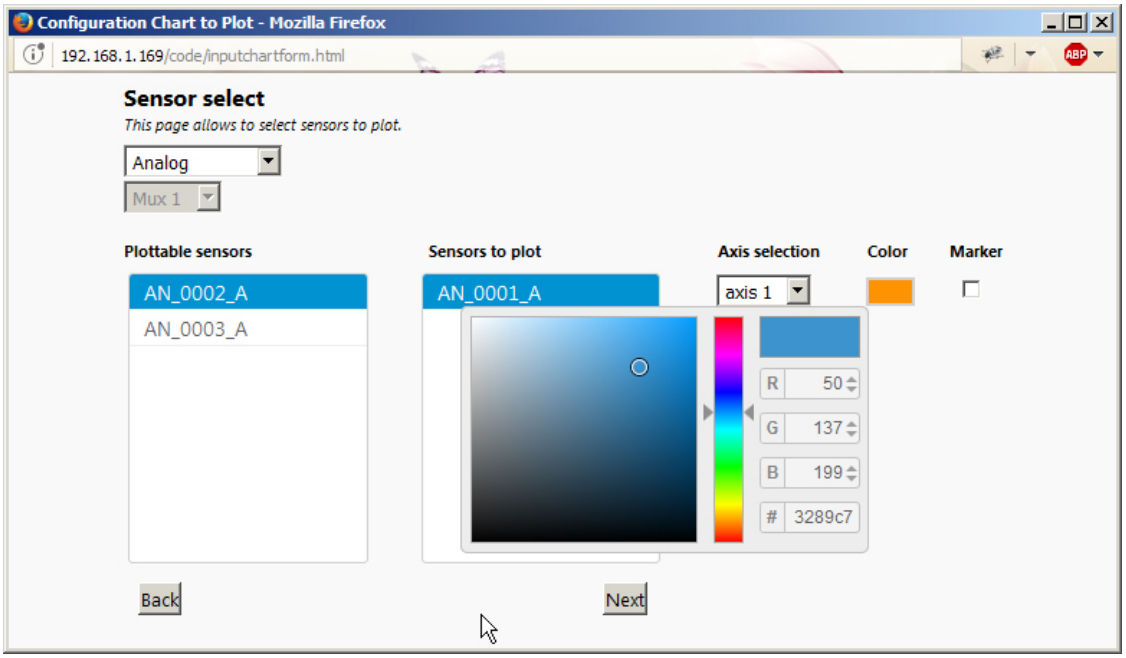


Figure 84 *Color Window*

Marker checkbox, will put markes points on the charts as shown here (AN_0001 has Marker checked, other channels instead do not).



Figure 85 *Marker Checkbox*

Click Next to go on last configuration screen.

Here it is possible to choose Chart's Title, Subtitle, Description and Name.

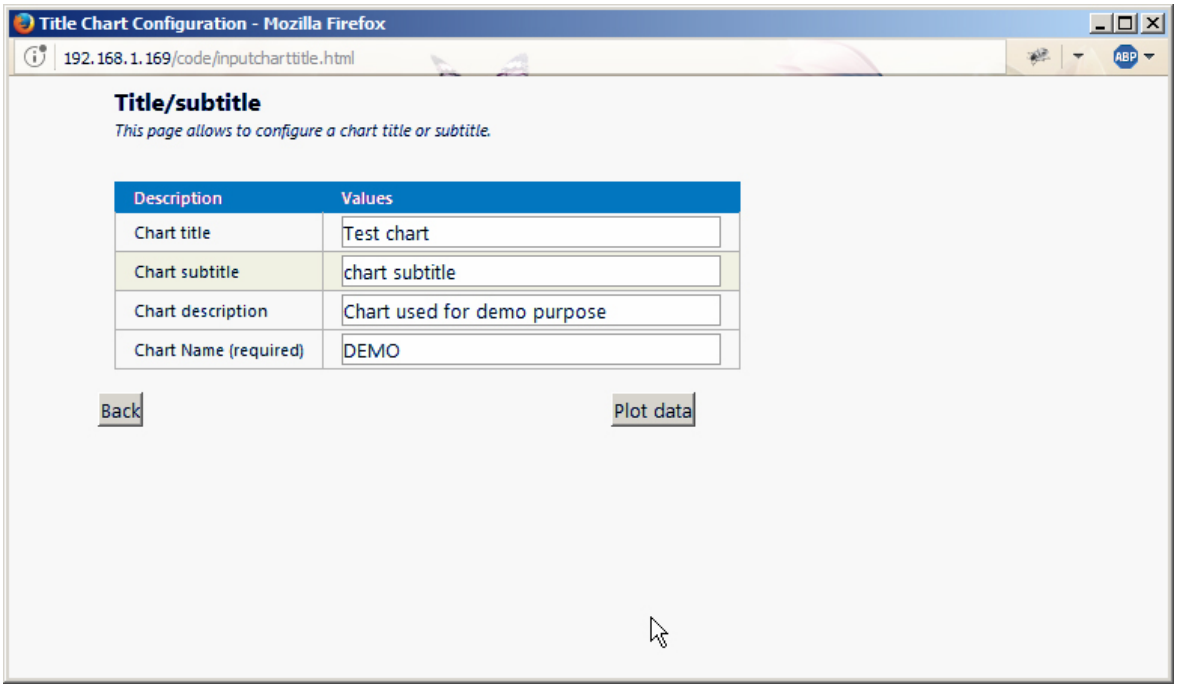


Figure 86 *Chart's Title, Subtitle, Description and Name*

Click “Plot data” to load the chart.

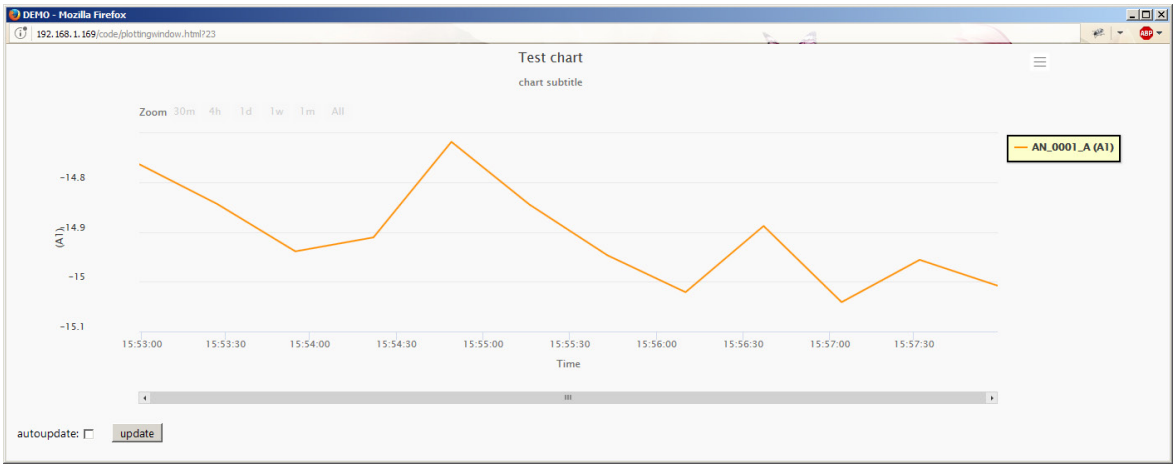


Figure 87 *Plot data*

From this screen it’s possible to print or download the chart:

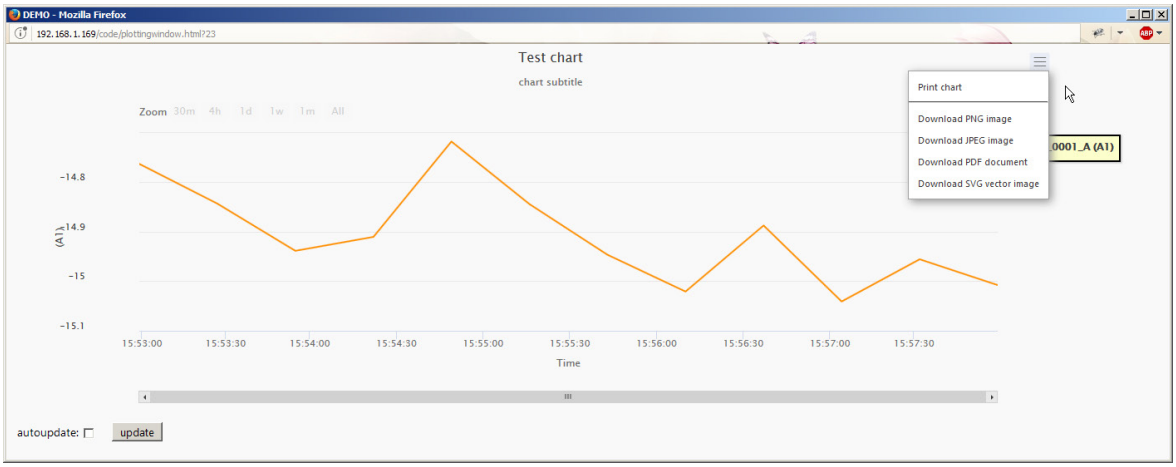


Figure 88 *Print or Download the Chart*

You can now select the new chart from “Saved charts selection” and Plot every time you need. It can be autoupdated after every new acquisition event by checking autoupdate flag, or manually updated with “update” button, in bottom left area of the window.

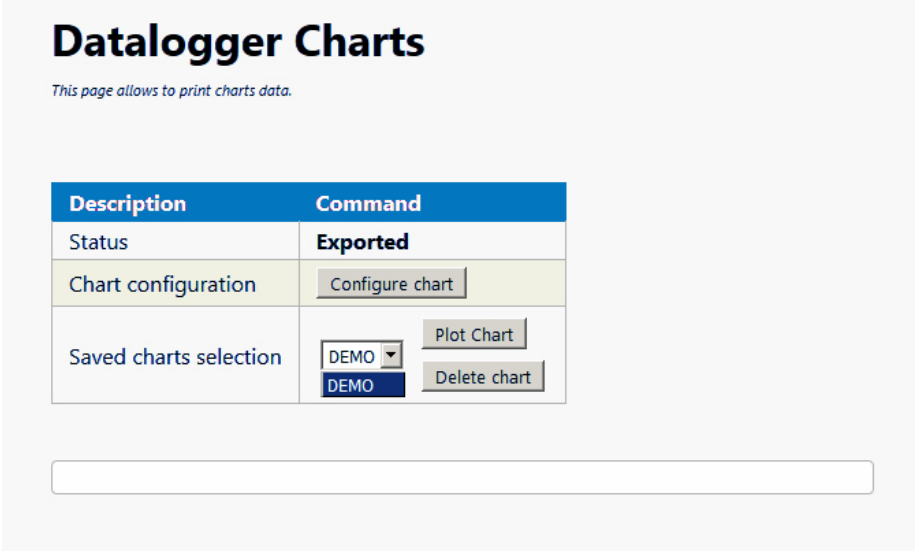


Figure 89 *Datalogger Charts*

12. Modbus TCP (Scada Integration)

12.1. Overview

Modbus ADU (application data unit) is sent in form of TCP packets. All Modbus TCP ADU are sent via TCP to registered port 502.

Modbus over TCP allows OM-240 integration in LabVIEW and SCADA systems. By reading holding registers, it's possible to gather all sensors data (analog, smartmodbus, multiplexers, digital inputs), events and alarm, datalogger status and information.

- It's possible to read sensor's alarm status.
- By integrating OM-240 in a SCADA, industrial plant remote monitoring and logging are possible without the need on-site visits.
- Maintenance costs are reduced through centralized control and monitoring to minimize downtime.
- Centralized alarms to improve operational effectiveness.
- Data could be available in mobility (depending on used SCADA).

13. Communication

13.1. Communication Bus

Communication bus for this module is **Ethernet** interface.

Port used for **TCP** communication is **502 (Modbus TCP Standard Port)**.

Modbus function to use for registry reading is **ReadHoldingRegister**.

13.2. Measure Register

For each sensor (analogs, digitals, multiplexers and virtual channels), 16 registers will be exported. Input A's last acquired measure (Offset 0-1), input b (Offset 2-3), sensor's temperature (Offset 4-5), Acquisition's timestamp (Offset 6-7-8-9-10-11-12-13-14) and different flags to show acquisition status and alarm status (Offset 15).

Measures will be communicated in float IEEE754 standard.

Endianless can be user configured by writing 0-1-2-3 values into configuration register at 0x5000 address.

Following table will represent 4 endianless configurations:

IEEE754 = AA:BB:CC:DD
AA = MSB
DD = LSB

Configuration = 0 **(default)**

AA	BB	CC	DD
MSB Modbus address 0	LSB Modbus address 0	MSB Modbus address 1	LSB Modbus address 1

Configuration = 1

BB	AA	DD	CC
MSB Modbus address 0	LSB Modbus address 0	MSB Modbus address 1	LSB Modbus address 1

Configuration = 2

CC	DD	BB	AA
MSB Modbus address 0	LSB Modbus address 0	MSB Modbus address 1	LSB Modbus address 1

Configuration = 3

DD	CC	AA	BB
MSB Modbus address 0	LSB Modbus address 0	MSB Modbus address 1	LSB Modbus address 1

13.3. Timestamp Details

Timestamp is composed by 9 registers, with offset 6 (MSB) to 15 (LSB). Timestamp is an ASCII string 18 bytes long, in the following format: "dd/mm/yy hh:mm:ss"

13.4. Flag's Register

Flag's register is mapped as it follows:

BIT	Content
0	Sensor acquired
1	A valid Input
2	B valid Input
3	Valid Temp input
4	A alarm Input
5	B alarm Input
6	Temp alarm Input

13.5. Sensor Acquired

This register is set to 1 when sensor is acquired and a new data is available. SCADA (or Modbus Master) reads the updated register and reset it to 0 by using Coils Functions. In this way the system is ready to note the presence of a new acquisition.

This BIT is also accessible through read/write coils functions.

Coils are mapped on flag "Sensor Acquired" having referral to base address of each sensor.

To obtain Coil address of a sensor, Use the following formula:

Coil Address = Base Address/10

Base Address computation will be shown in next pages.

13.5.1. Example 1

Channel: CH4

Base Address: 30

Coil Address: 3

13.5.2. Example 2

Channel: DIG2

Base Address: 90

Coil Address: 9

By using Coil functions, Modbus Master will be able to read the entire Coil Vector (858 sensors) in a single Modbus transaction, to understand acquired sensors and to read only updated measures, without the need to read the 10 registers block every time.

13.6. Input X Valid

It indicates if matching Inputs are valid or not.

If sensor is configured as Volt 1CH, registers status will be:

- Input A Valid: 1
- Input B Valid: 0
- Input temp Valid: 0

For a digital single channel sensor, registers status will be:

- Input A Valid: 1
- Input temp Valid: 1
- Input B Valid: 0

13.7. Input X Alarm

It indicates if matching inputs are in alarm.

14. Register Map

14.1. General

All this registers are read-only.

Only “Sensor Acquired” BIT is read-write, using Write single/multiple coils.

14.2. Analog Sensors Locations

Register Address (dec)	Description	Sensor
0-1	MSB-LSB Input A LOCAL CH1	CH1
2-3	MSB-LSB Input B LOCAL CH1	CH1
4-5	MSB-LSB Temperature LOCAL CH1	CH1
6-14	Timestamp acquisition LOCAL CH1	CH1
15	Flags LOCAL CH1	CH1
16-17	MSB-LSB Input A LOCAL CH2	CH2
18-19	MSB-LSB Input B LOCAL CH2	CH2
20-21	MSB-LSB Temperature LOCAL CH2	CH2
22-30	Timestamp acquisition LOCAL CH2	CH2
31	Flags LOCAL CH2	CH2
...		
...		
...		
...		
112-113	MSB-LSB Input A LOCAL CH8	CH8
114-115	MSB-LSB Input B LOCAL CH8	CH8
116-117	MSB-LSB Temperature LOCAL CH8	CH8
118-126	Timestamp acquisition LOCAL CH8	CH8
127	Flags LOCAL CH8	CH8

14.3. Digital Sensors Locations

BASE_DIG+0 - BASE_DIG+1	MSB-LSB Input A DIGITAL 1	DIG1
BASE_DIG+2 - BASE_DIG+3	MSB-LSB Input B DIGITAL 1	DIG1
BASE_DIG+2 - BASE_DIG+3	MSB-LSB Input B DIGITAL 1	DIG1
BASE_DIG+4 - BASE_DIG+5	MSB-LSB Temperature DIGITAL 1	DIG1
BASE_DIG+6 - BASE_DIG+14	Timestamp acquisition DIGITAL 1	DIG1
BASE_DIG+15	Flags DIGITAL 1	DIG1
...	...	...
...	...	...
...	...	...
BASE_DIG+4048 - BASE_DIG+4049	MSB-LSB Input A DIGITAL 254	DIG254
BASE_DIG+4050 - BASE_DIG+4051	MSB-LSB Input B DIGITAL 254	DIG254
BASE_DIG+4052 - BASE_DIG+4053	MSB-LSB Temperature DIGITAL 254	DIG254
BASE_DIG+4054 - BASE_DIG+4062	Timestamp acquisition DIGITAL 254	DIG254
BASE_DIG+4063	Flags DIGITAL 254	DIG254

14.4. Multiplexers Sensors Locations

BASE_MUX+0 - BASE_MUX+1	MSB-LSB Input A MUX 1- CH1	MUX1 - CH1
BASE_MUX+2 - BASE_MUX+3	MSB-LSB Input B MUX 1- CH1	MUX1 - CH1
BASE_MUX+4 - BASE_MUX+5	MSB-LSB Temperature MUX 1- CH1	MUX1 - CH1
BASE_MUX+6 - BASE_MUX+14	Timestamp acquisition MUX 1- CH1	MUX1 - CH1
BASE_MUX+15	Flags MUX 1- CH1	MUX1 - CH1
...	...	...
...	...	...
...	...	...
BASE_MUX+496 - BASE_MUX+497	MSB-LSB Input A MUX 1- CH32	MUX1 - CH32
BASE_MUX+498 - BASE_MUX+499	MSB-LSB Input B MUX 1- CH32	MUX1 - CH32
BASE_MUX+500 - BASE_MUX+501	MSB-LSB Temperature MUX 1- CH32	MUX1 - CH32
BASE_MUX+502 - BASE_MUX+510	Timestamp acquisition MUX 1- CH32	MUX1 - CH32
BASE_MUX+511	Flags MUX 1- CH32	MUX1 - CH32
BASE_MUX+512 - BASE_MUX+513	MSB-LSB Input A MUX 2- CH1	MUX2 - CH1
BASE_MUX+514 - BASE_MUX+515	MSB-LSB Input B MUX 2- CH1	MUX2 - CH1
BASE_MUX+516 - BASE_MUX+517	MSB-LSB Temperature MUX 2- CH1	MUX2 - CH1
BASE_MUX+518 - BASE_MUX+526	Timestamp acquisition MUX 2- CH1	MUX2 - CH1
BASE_MUX+527	Flags MUX 2- CH1	MUX2 - CH1
...	...	...
...	...	...
...	MUX3	MUX3
...	MUX4	MUX4
...	...	...
...	...	...
...	MUX15 CH1	MUX15 - CH1
...	...	...
BASE_MUX+8176 - BASE_MUX+8177	MSB-LSB Input A MUX_16 - CH_32	MUX16 - CH32
BASE_MUX+8178 - BASE_MUX+8179	MSB-LSB Input B MUX_16 - CH_32	MUX16 - CH32
BASE_MUX+8180 - BASE_MUX+8181	MSB-LSB Temperature MUX_16 - CH_32	MUX16 - CH32
BASE_MUX+8182 - BASE_MUX+8190	Timestamp acquisition MUX_16 - CH_32	MUX16 - CH32
BASE_MUX+8191	Flags MUX_16 - CH_32	MUX16 - CH32

14.5. Digital Inputs Locations

BASE_DIN+0 - BASE_DIN+1	MSB-LSB Input A DigIn1	DigIn1
BASE_DIN+2 - BASE_DIN+3	MSB-LSB Input B DigIn1	DigIn1
BASE_DIN+4 - BASE_DIN+5	MSB-LSB Temperature DigIn1	DigIn1
BASE_DIN+6 - BASE_DIN+14	Timestamp acquisition DigIn1	DigIn1
BASE_DIN+15	Flags DigIn1	DigIn1
BASE_DIN+16 - BASE_DIN+17	MSB-LSB Input A DigIn2	DigIn2
BASE_DIN+18 - BASE_DIN+19	MSB-LSB Input B DigIn2	DigIn2
BASE_DIN+20 - BASE_DIN+21	MSB-LSB Temperature DigIn2	DigIn2

14.6. Virtual Channels Locations

BASE_DIN+22 - BASE_DIN+30	Timestamp acquisition DigIn2	DigIn2
BASE_DIN+31	Flags DigIn2	DigIn2
BASE_VIRT+0 - BASE_VIRT+1	MSB-LSB Input A Script1 Ch1	Script1 - Ch1
BASE_VIRT+2 - BASE_VIRT+3	MSB-LSB Input B Script1 Ch1	Script1 - Ch1
BASE_VIRT+4 - BASE_VIRT+5	MSB-LSB Temperature Script1 Ch1	Script1 - Ch1
BASE_VIRT+6 - BASE_VIRT+14	Timestamp acquisition Script1 Ch1	Script1 - Ch1
BASE_VIRT+15	Flags Script1 Ch1	Script1 - Ch1
BASE_VIRT+16 - BASE_VIRT+17	MSB-LSB Input A Script1 Ch2	Script1 - Ch2
BASE_VIRT+18 - BASE_VIRT+19	MSB-LSB Input B Script1 Ch2	Script1 - Ch2
BASE_VIRT+20 - BASE_VIRT+21	MSB-LSB Temperature Script1 Ch2	Script1 - Ch2
BASE_VIRT+22 - BASE_VIRT+30	Timestamp acquisition Script1 Ch2	Script1 - Ch2
BASE_VIRT+31	Flags Script1 Ch2	Script1 - Ch2
...	...	...
...	...	...
...	...	...
BASE_VIRT+1264 - BASE_VIRT+1265	MSB-LSB Input A Script5 Ch16	Script5 - Ch16
BASE_VIRT+1266 - BASE_VIRT+1267	MSB-LSB Input B Script5 Ch16	Script5 - Ch16
BASE_VIRT+1268 - BASE_VIRT+1269	MSB-LSB Temperature Script5 Ch16	Script5 - Ch16
BASE_VIRT+1270 - BASE_VIRT+1278	Timestamp acquisition Script5 Ch16	Script5 - Ch16
BASE_VIRT+1279	Flags Script5 Ch16	Script5 - Ch16

15. Sensors Base Address

Following formulas will show how to get every connected sensor's base address.

15.1. Local Sensors (Analog)

BASE_ANALOG = 0
Channel_ADDRESS = (Channel-1) * 16 + BASE_ANALOG
8 CH Channel = [1;8]
24 CH Channel = [1;24]

15.2. Digital Sensors (Smart Modbus)

	8 CH	24 CH
BASE_DIG	128	384

Channel_ADDRESS = (Channel-1) * 16 + BASE_DIG
Channel = [1;254]

15.3. Multiplexer Sensors

	8 CH	24 CH
BASE_MUX	4224	4480

Channel_ADDRESS = ((Address-1) * 32 * 16) + ((Channel-1) * 16) + BASE_MUX
Address = [1;16], Channel = [1;24]

15.4. Digital Inputs

	8 CH	24 CH
BASE_DIN	12416	12672

Channel_ADDRESS = ((Channel-1) * 16) + BASE_DIN
Channel = [1;2]

15.5. Virtual Channels

	8 CH	24 CH
BASE_VIRT	12448	12704

Channel_ADDRESS = ((Script-1) * 16 * 16) + ((Channel-1) * 16) + BASE_VIRT
Script = [1;5], Channel = [1;16]

15.6. Event Log Registers

This register set handles Event Log status.
For every log, timestamp, and code is exposed.
This register set starts at Modbus address 0x3800 (14336 DEC).

Register	Description	
14336 – 14344	Timestamp Event n	Event n
14346	Event Code n	Event n
14347 – 14410	Event String n	Event n
14411 – 14419	Timestamp Event n-1	Event n-1
14421	Event Code n-1	Event n-1
14422 – 14485	Event String n-1	Event n-1
...	...	...
...	...	...
...	...	...
15816 – 15824	Timestamp Event n-19	Event n-19
15826	Event Code n-19	Event n-19
15827 – 15890	Event String n-19	Event n-19

16. Status Registers

This register exposes information about the datalogger. Base Address for this register is 0x4000 (16384 DEC).

It can be read in every way, as there is no bond on alignments or number of registers to read.

Register (dec)	Description
16384	Datalogger status
16385	Next acquisition MSB
16386	Next acquisition
16387	Next acquisition LSB
16388	Firmware version MSB
16389	Firmware version LSB
16390	Model info 1
16391	Model info 2
16392	Model info 3
16393	Model info 4
16394	Model info 5
16395	Model info 6
16396	Model info 7
16397	Model info 8
16398	Model info 9
16399	Model info 10
16400	Model info 11
16401	Model info 12
16402	Serial number 1
16402	Serial number 2
16403	Serial number 3
16404	Serial number 4
16405	Device name 1
16406	Device name 2
16407	Device name 3
16408	Device name 4
16405	Device name 5
16406	Device name 6
16407	Device name 7
16408	Device name 8
16409	External digital input status (LSB) + External digital output status (MSB)

16.1. Datalogger Status

This register contains datalogger status.

Register Value	Description
1	Ready
2	Run
3	Stop
4	Configuration
5	Alarm
6	Diagnostic
7	Error
8	Backup

16.2. Next Acquisition

This register, composed by 48 bits, exposes next acquisition's timestamp, when the datalogger acquires the next sensor.

Bit	Description
0-5	Seconds (0-59)
6-11	Minutes (0-59)
12-16	Hours (0-23)
17-21	Day (1-31)
22-25	Month (1-12)
26-32	Year (0-99)
33-47	Reserved

16.3. Firmware Version

These two registers, composed in the format A.B.CD, expose firmware version loaded on the datalogger.

Register	Bits	Description
Firmware version MSB	15-8	A
Firmware version MSB	7-0	B
Firmware version LSB	15-8	C
Firmware version LSB	7-0	D

Letters A, B and C, contain binary value of versions (values from 0 to 99).

Letter D contains, if present, ASCII value of alphanumeric character that could be present at the end of the version string to identify special firmwares. If D is not present, its value will be 0.

16.4. Model Info

This register, when chained, forms a 24 character string to identify configured datalogger model.

Chaining should be executed starting from Model info 1 to Model info 12 registers.

Example:

Model info 1 MSB	Model info 1 LSB	Model info 2 MSB	Model info 2 LSB	Model info 3 MSB	Model info 3 LSB
M	A	X	L	O	G

16.5. Serial Number

This register, when chained, forms an 8 characters long string to identify datalogger's serial number. Chaining should be executed starting from Serial Number 1 to Serial Number 4 registers.

Example:

Serial num. 1 MSB	Serial num. 1 LSB	Serial num. 2 MSB	Serial num. 2 LSB	Serial num. 3 MSB	Serial num. 3 LSB	Serial num. 4 MSB	Serial num. 4 LSB
1	5	2	1	4	7	9	6

16.6. Device Name

This register, when chained, forms a 16 characters string which represents datalogger's name. Chaining must be executed starting from Device name 1 register to Device name 8 register.

Example of Device name register's chaining (Device name: Bridge_1).

Device name 1 MSB	Device name 1 LSB	Device name 2 MSB	Device name 2 LSB	Device name 3 MSB	Device name 3 LSB	Device name 4 MSB	Device name 4 LSB
B	r	i	d	g	e	_	1

16.7. External Digital Input/Outputs Status

This register contains digital input/output current status.

16.7.1. MSB

It contains external digital output status.

16.7.2. LSB

It contains external digital input status.

B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
#	#	O6	O5	O4	O3	O2	O1	#	#	I6	I5	I4	I3	I2	I1

17. Troubleshooting

In case of OM-240 malfunctioning or irregular behavior, read the following pages and carry out the indicated attempts before contacting our Assistance Department.

17.1. Basic Troubleshooting

This paragraph provides basic OM-240 troubleshooting tips.

ARE YOU UP-TO-DATE?

1. Verify that you installed the last version of firmware
2. Verify that you have an adequate power supply (from photovoltaic module or external power supply) on the V IN clamp of the OM-240; check if the voltage is within the range accepted by the OM-240 and stable

IF THE OM-240 DOESN'T TURN ON

Follow this step, testing after each:

1. Remove power supply on V IN clamp for 10 seconds and try to reconnect.
2. Verify the presence of jumper cables on the "PWR CONFIG" clamp.
3. Control that the power supply system works, is correctly sized and respects the characteristic declared on datasheet.
4. Make sure you hadn't set the OM-240 in Timed mode using the webpage "Energy management".

Note: If on the display appears TELNET MODE, contact directly OMEGA Assistance technical support for assistance.

IF THE OM-240 DISPLAY STOPS RESPONDING

Follow this step, testing after each:

1. Remove power supply on V IN clamp for 10 seconds and try to reconnect.

IT IS IMPOSSIBLE TO UPLOAD THE CONFIGURATION

Follow this step, testing after each:

1. On webpage STATUS verify that the OM-240 is in "Config".
2. Make sure that the configuration you are trying to upload has been created with the same major release of the firmware on the OM-240.

Note: If what is written above is correct, the configuration file could be damaged. In this case, the OM-240 warns with an error message and the file is no more usable. We suggest to repeat the configuration.

IF THE OM-240 STOPS DURING AN ACQUISITION

Follow this step, testing after each:

1. Verify the events log and refer to manual "Codes Alarms-Events" to understand the eventual logs.
2. Verify that the OM-240 is correctly supplied. If the power supply is below the minimum threshold or over the maximum threshold of power supply, the OM-240 blocks every activity in progress;
3. Verify the alarm log to identify the problem and refer to manual "Codes Alarms-Events" to understand the eventual logs.
4. Verify if in alarm logs there is an "overcurrent" error. In case of overcurrent, the OM-240 stops the acquisition.
5. Verify the available memory. In case of full memory, the OM-240 stops the acquisition.

IT IS IMPOSSIBLE TO HAVE ACCESS TO SYS MENU

Follow this step, testing after each:

1. Verify that the OM-240 is not acquiring. In this case, wait until the end of the acquisition or go in "DL" menu and select "Stop DL".

IT IS NOT POSSIBLE TO DOWNLOAD DATA ON USB FLASH-DRIVE

Follow this step, testing after each:

1. Verify that the USB flash-drive is formatted in FAT32;
2. Verify with the PC that the USB flash-drive is read without any errors.
3. Try with a different USB flash-drive.

18. Local/Remote Communication

This paragraph provides OM-240 local communication (from PC through a LAN cable) and remote communication (from PC through internet) troubleshooting tips.

ARE YOU UP TO DATE?

1. Verify that you installed the last version of firmware.
2. Verify that you have the correct power supply (from photovoltaic module or external power supply) on the V IN clamp of the OM-240.

IF YOU ARE NOT ABLE TO ESTABLISH THE CONNECTION WITH THE OM-240

Follow this step, testing after each:

1. Remove the power supply on V IN clamp for 10 seconds and try to reconnect.
2. Reboot the PC and try to connect.
3. Make sure you configured appropriately the network card of the PC, that is it is part of the same subnet mask of the OM-240.

4. Make sure you are using the correct LAN cable according to the type of network you chose.

5. Make sure the OM-240 is not configured in "Timed". In this case the network card remains switched off. It is necessary to turn it on manually from SYS menu.

6. Make sure the OM-240 is not used by another user. The OM-240 accepts only one connection at a time.

7. Make sure that the last user that logged on the OM-240 had logged out. Otherwise, it is necessary to wait until the automatic log out. This happens after the time configured in page "Energy management" has passed. You could also reboot the OM-240, in order to not wait for the log out.

8. In case of use of remote communication devices (ex: HSPA router connected to the OM-240), remove them and do a test of direct connection between PC and the OM-240. This is necessary in order to exclude problems with communication interfaces.

IF USER CANNOT HAVE ACCESS TO THE OM-240 WITH AN USER

Follow this step, testing after each:

1. Make sure that the access credentials are correct.

2. If you logged out with a n user and you are trying to enter again with a different user, delete the browser cache, close and re-open the browser (some browsers are configured in order to memorize passwords).

3. Make sure that the last user that logged on the OM-240 had logged out. Otherwise, it is necessary to wait until the automatic log out. This happens after the time configured in page "Energy management" has passed. You could also reboot the OM-240, in order to not wait for the log out.

4. In case of use of remote communication devices (ex: HSPA router connected to OM-240), remove them and do a test of direct connection between PC and OM-240. This is necessary in order to exclude problems with communication interfaces.

THE CONNECTION TROUGH THE OM-240 AND COMPUTER GOES DOWN

Follow this step, testing after each:

1. Be sure that your PC is not set on Energy Saving mode.

2. Try to change the LAN cable.

3. Try using another LAN port of your PC or using another PC.

4. Verify that the OM-240 is not in Timed mode. In this case, once ended the timeout time configured in webpage "Energy management", the network card turns off if there isn't any data exchange.

19. E-Mail Sending

ARE YOU UP TO DATE?

1. Verify that you installed the last version of firmware.
2. Verify that you have the correct power supply (from photovoltaic module or external power supply) on the V IN clamp of the OM-240.

This paragraph provides OM-240 e-mail sending troubleshooting tips.

THE E-MAIL TRANSMISSION INVOLVES DIFFERENT DEVICES. IN THIS DOCUMENT, WE TRY TO DETERMINE WHICH DEVICE COULD CAUSE THE PROBLEM AND THEN WE TRY TO SOLVE IT.

The "system" is composed as follows:

1. OM-240
2. Internet Service Provider (ISP): allows the communication between OM-240 and the e-mail server.
3. E-mail Server (ESP): allows to send and to receive e-mails.

Note: It may be that the ISP (Telecom, Vodafone, AT&T, Verizon, etc.) doesn't coincide with the ESP (Gmail, AOL, etc.)

19.1. Resolution

FIRST OF ALL, INSURE WITH YOUR IPSP THAT:

1. The SIM card or your network is enabled to the internet.
2. The e-mail transmission is allowed on the used APN or on the used network.

SECONDLY, INSURE WITH YOUR ESP THAT:

1. There are no momentary breakdowns on ESP server.
2. The username and password of your e-mail account are valid and accepted.
3. That the e-mail account you want to use is active.

THESE POINTS DO NOT DEPEND ON OMEGA ENGINEERING AND NEED TO BE RESOLVED THROUGH YOUR ISP OR ESP

If you don't have any problem with the ISP and the ESP, you could proceed looking for causes on the OM-240.

IF THE OM-240 DOESN'T SEND ANY E-MAIL ALTHOUGH IT IS CONFIGURED

Follow this step, testing after each:

1. Verify the events log and refer to manual "Codes Alarms-Events" to understand eventual logs.
2. Verify that the SIM is properly inserted in its slot into the communication device (HSPA router or 2G modem) or that your network devices are properly configured to permit the e-mail sending (firewall, port, etc.).
3. Verify that you inserted your SMTP server account correctly ("SMTP Server Configuration" page).
4. Verify that the SMTP account is a simple authentication. The OM-240 doesn't support SSL.
5. If you use a communication device base on mobile network, verify that there is a mobile coverage (according to the adopted technology e.g.: 2G, 3G or 4G) on the site where the OM-240 is installed.
6. If you use a 2G (GSM/GPRS) modem, verify that there is a good 2G signal where the OM-240 is installed. In some place there is only a 3G or 4G coverage. 2G modem is not compatible with 3G, 4G and CDMA networks.

20. FTP Server Sending Data

ARE YOU UP-TO-DATE?

1. Verify that you installed the last version of firmware.
2. Verify that you have the correct power supply (from photovoltaic module or external power supply) on the V IN clamp of the OM-240.

THIS PARAGRAPH PROVIDES FTP SERVER SENDING DATA TROUBLESHOOTING TIPS

The FTP transmission involves different devices. In this document, we try to determine which device could cause the problem and then we try to solve it.

The "System" is composed as follows:

1. OM-240
2. Internet Service Provider (ISP): allows the communication between the OM-240 and FTP server.
3. Server FTP: physical space in which it is possible to memorize files.

Note: The FTP server could be completely transferred to societies that offer an hosting FTP service. It could also be internal. In this second case, you have to ask for information to your IT manager.

FIRST OF ALL, INSURE WITH YOUR ISP THAT

1. The SIM card or your network is enabled to the internet traffic through APN.
2. The data transmission on FTP server is allowed on the used APN or on the used network.

INSURE WITH YOUR SYSTEM ADMINISTRATOR OR WITH THE SOCIETY THAT SUPPLIES THE HOSTING FTP SERVICE THAT:

1. There are no momentary breakdowns on FTP server.
2. The username and password of FTP account are valid and accepted.
3. The FTP account and the same FTP server that will be used are active.

THESE POINTS DO NOT DEPEND ON OMEGA ENGINEERING AND NEED TO BE RESOLVED THROUGH YOUR ISP OR ESP

If you don't have any problem with the ISP and the FTP server, you could proceed looking for causes on the OM-240.

IF THE OM-240 DOESN'T SEND ANY DATA ON FTP SERVER ALSO IF CONFIGURED

Follow this step, testing after each:

1. Verify the events log and refer to manual "Codes Alarms-Events" to understand the possible logs.
2. If you use a HSPA router or 2G modem verify that the SIM card is properly inserted in its slot.
3. Verify that you have inserted your FTP server account correctly ("Measure log data transfer" page).
4. Verify that the FTP server is a basic authentication FTP (for example not MD5, KERBEROS etc.) and that doesn't utilize any secure layer (for example SSH/ SSL, FTPS/SFTP etc.). The OM-240 does not support secure layer and encrypted authentication (encrypted username and password).
5. If you use a mobile device, verify that there is a good coverage on the site were the OM-240 is installed.
6. If you use 2G (GSM/GPRS) modem, verify that there is a good 2G (GSM/GPRS) signal on the site were the OM-240 is installed. In some place there is only a 3G or 4G coverage. 2G modem is not compatible with 3G, 4G and CDMA networks.

21. Measure

ARE YOU UP-TO-DATE?

1. Verify that you installed the last version of firmware.
2. Verify that you have the correct power supply (from photovoltaic module or external power supply) on the V IN clamp of the OM-240.

This paragraph provides measure instruments troubleshooting tips.

ONE OR MORE VIBRATING WIRE INSTRUMENTS ARE NOT READ

Follow this step, testing after each:

1. Verify the events log and refer to the manual “Codes Alarms-Events” to understand the eventual logs;
2. Verify the instrument with a portable OM-240;
3. Verify the connection of instruments on the OM-240 inputs;
4. Change the parameters “Excitation time” (accepted values from 5 to 100) and “Delay Time” (accepted values from 20 to 100) focusing on this last one;
5. Try to contract the parameters “Start Frequency” and “End Frequency” according to the value read with the portable OM-240.
6. Consult the reference manual of the instrument.

ONE OR MORE ANALOG INSTRUMENTS ARE NOT READ

Follow this step, testing after each:

1. Verify the events log and refer to the manual “Codes Alarms-Events” to understand the eventual logs;
2. Verify the instrument with a portable OM-240;
3. Verify the connection of instruments on the OM-240 screw clamps;
4. Verify that the configured parameters are coherent and correct according to the type of connected instrument (power supply, warm-up time etc.).
5. Consult the reference manual of the instrument.

Appendix A

Wiring Schemes

Appendix A Wiring Schemes

This appendix will show how to connect different sensor types to OM-240 datalogger. Connection schemes are sorted by number of wires (2,4,6 wires).

A.1 2 Wires Sensors

Current Loop 2 Wires

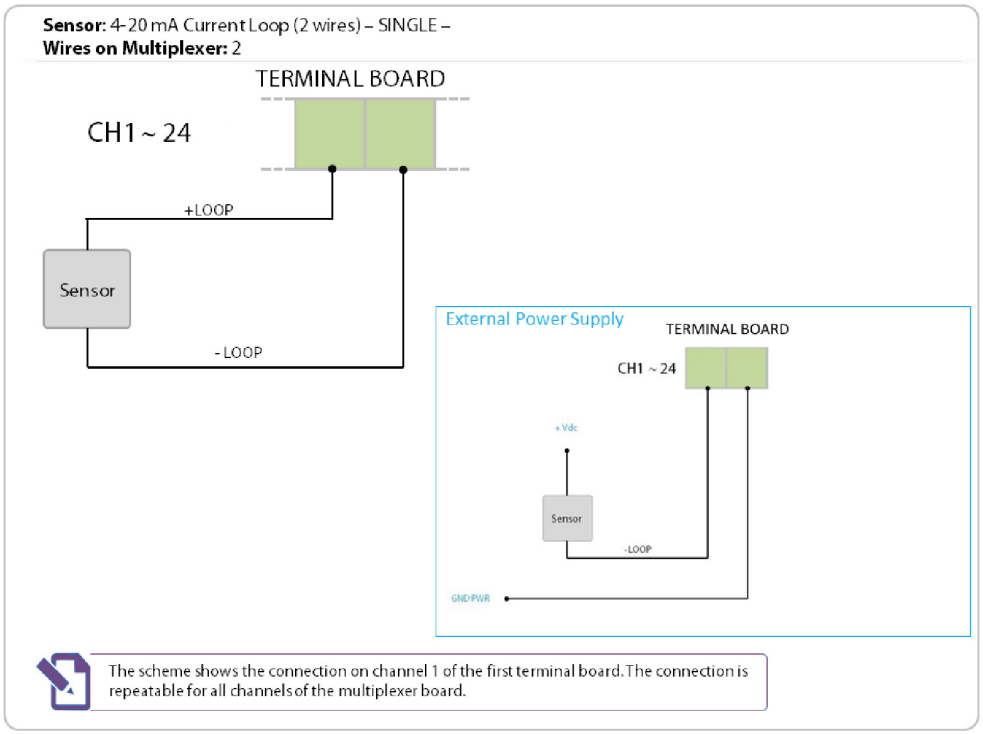


Figure 90 *Current Loop 2 Wires*

4..20mA Transmitter (External Supply)

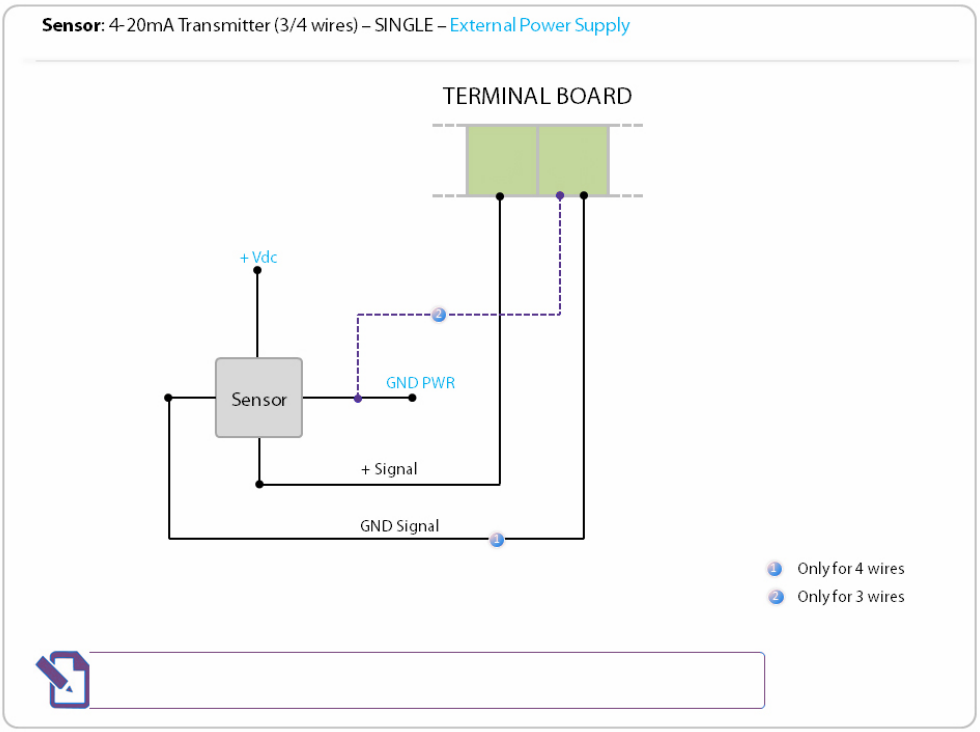


Figure 91 *4..20mA Transmitter (External Supply)*

Servo Uni Axial (External Supply)

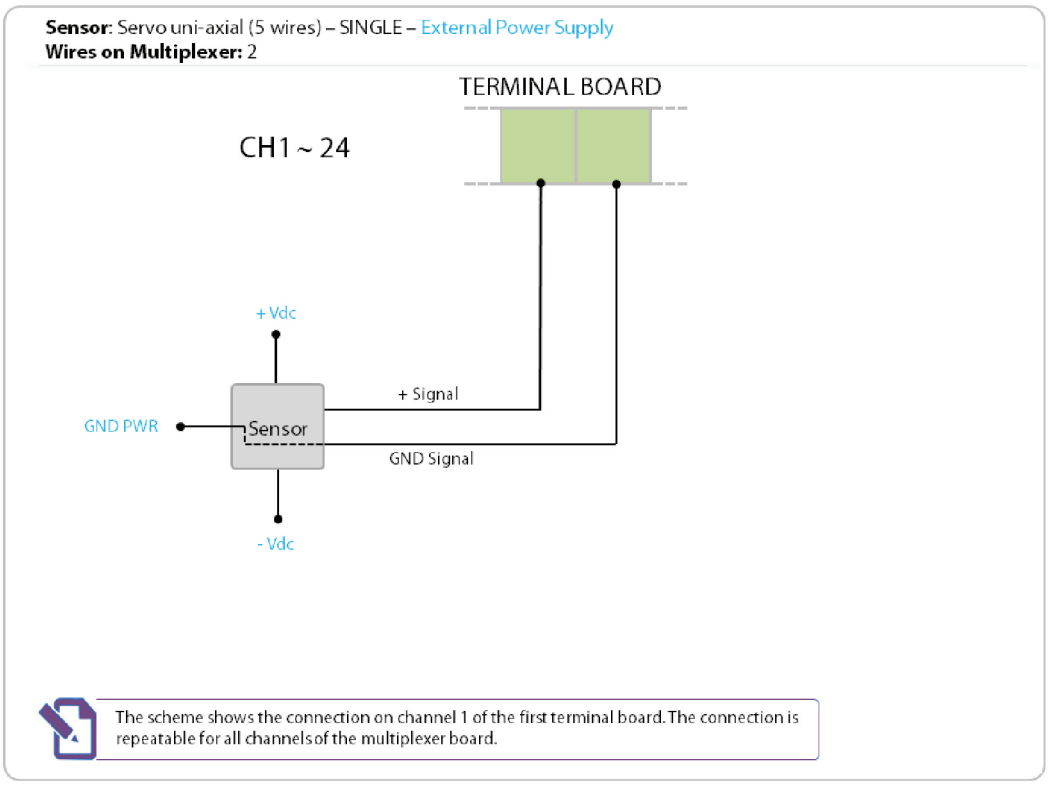


Figure 92 *Servo Uni Axial (External Supply)*

Thermistor

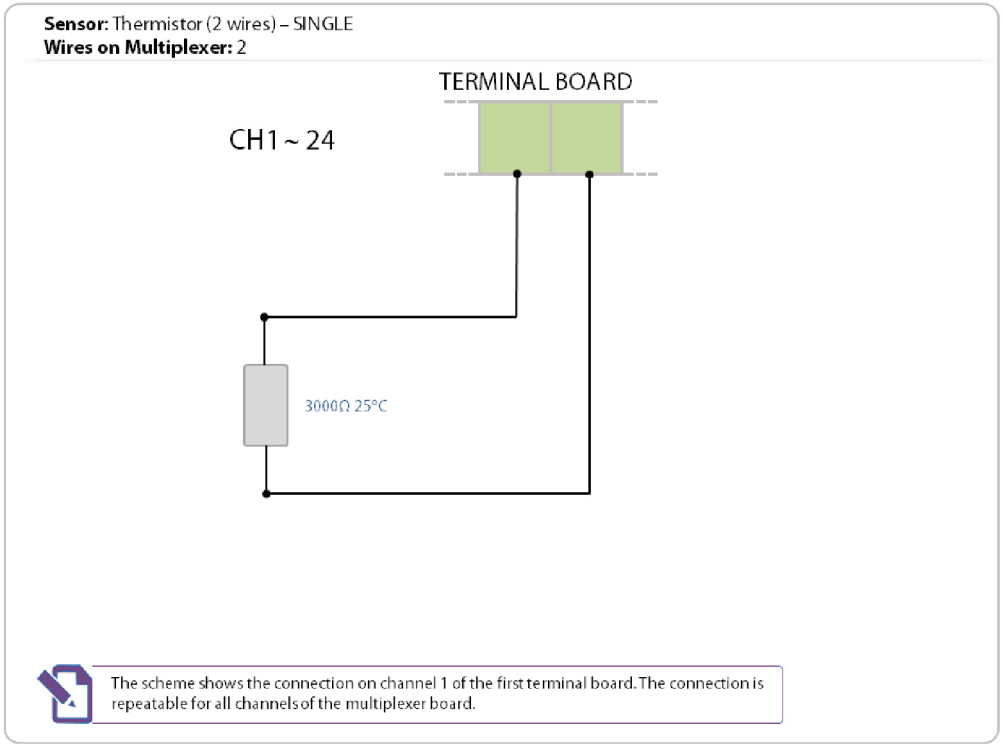


Figure 93 *Thermistor*

Thermocouple

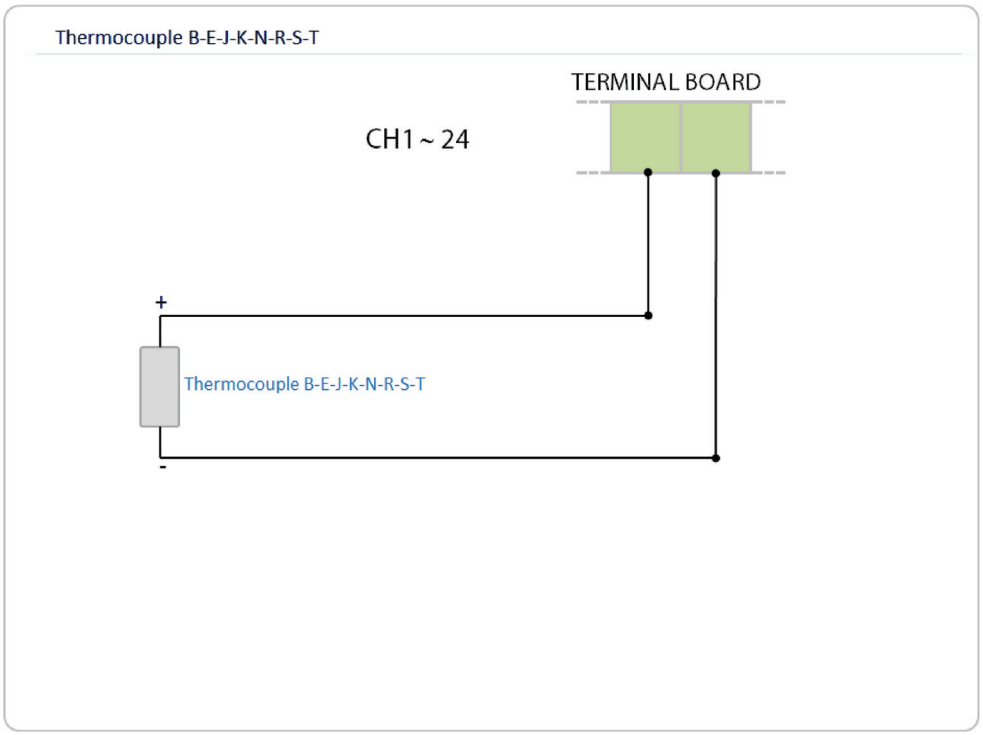


Figure 94 *Thermocouple*

Vibrating Wire

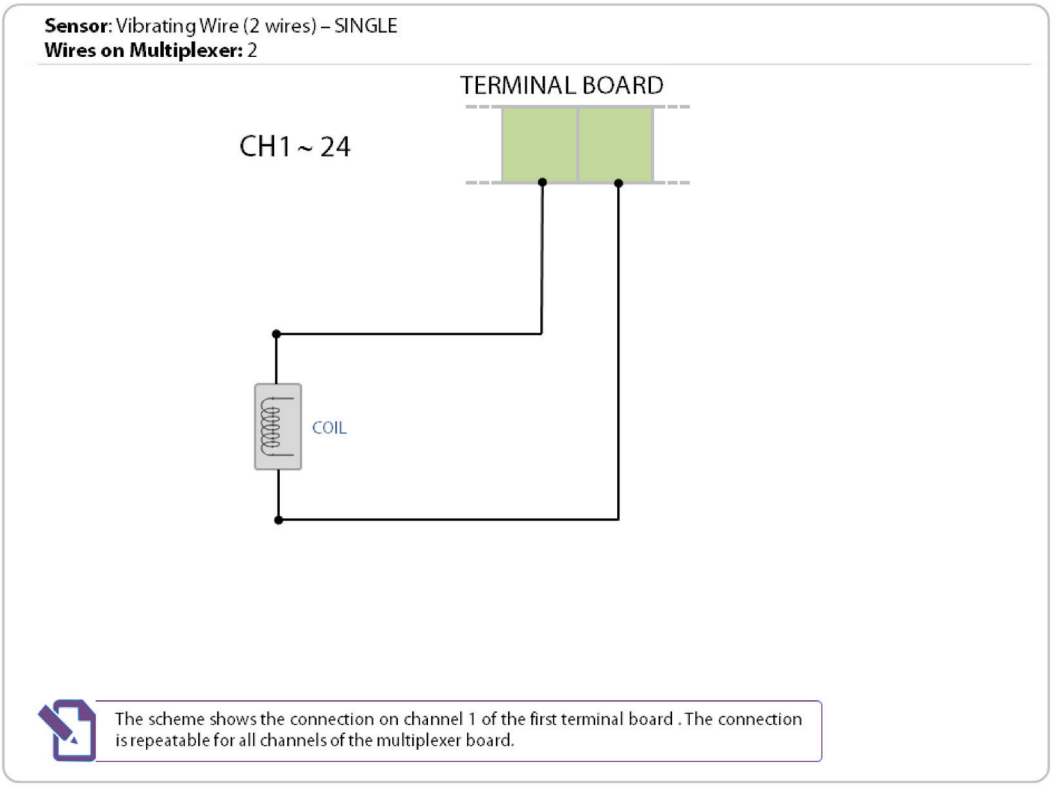


Figure 95 *Vibrating Wire*

Voltage (External Supply)

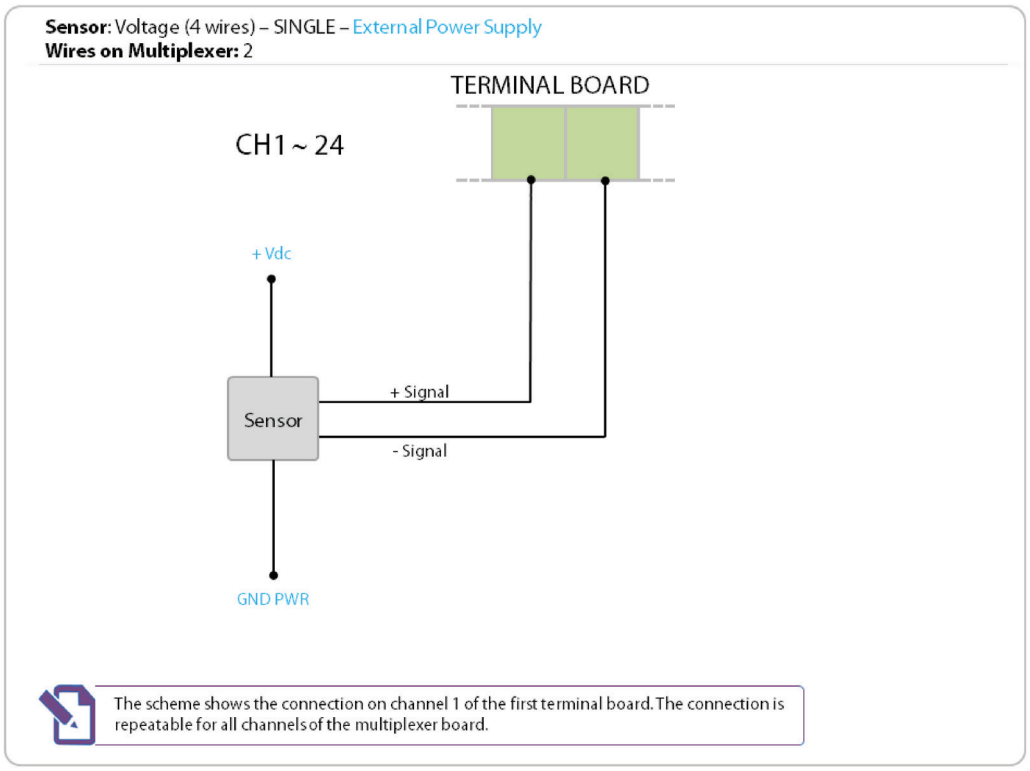


Figure 96 *Voltage (External Supply)*

A.2 4 Wires

4..20 Transmitter

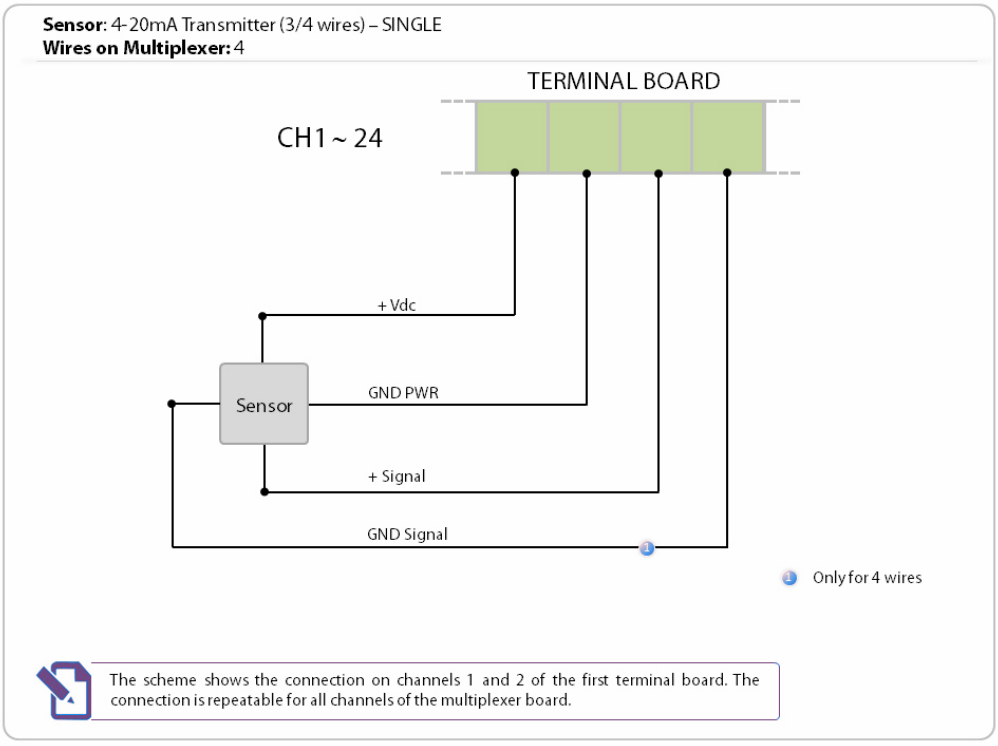


Figure 97 *4..20 Transmitter*

4..20 Transmitter 2 Channel (External Supply)

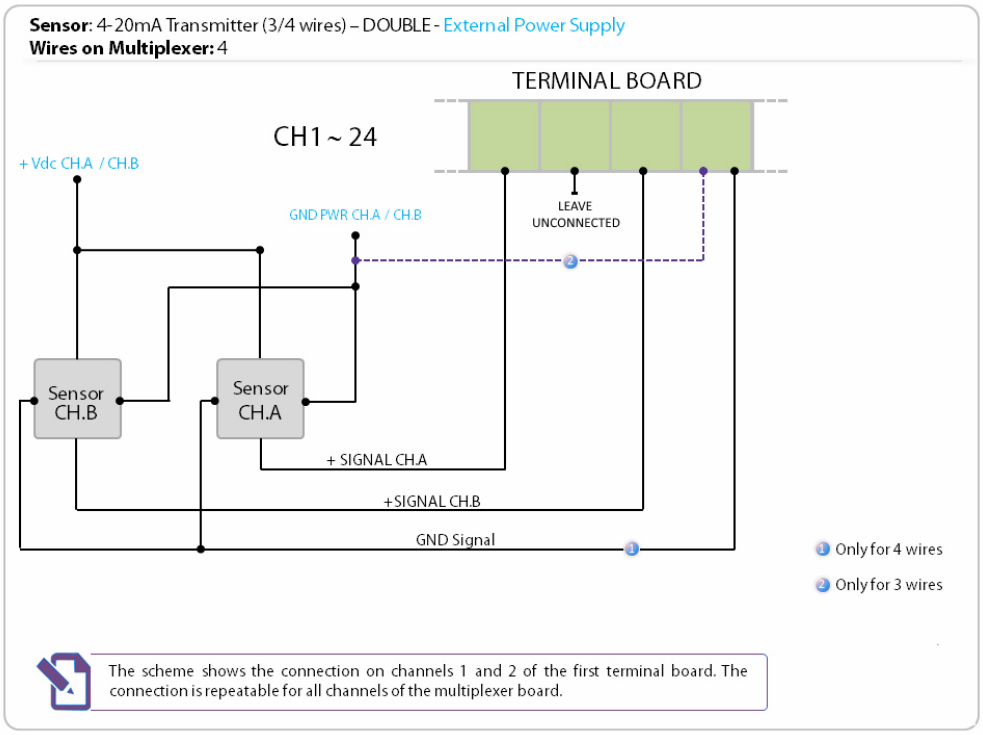


Figure 98 *4..20 Transmitter 2 Channel (External Supply)*

Current Loop 2 Channels (Internal and External Supply)

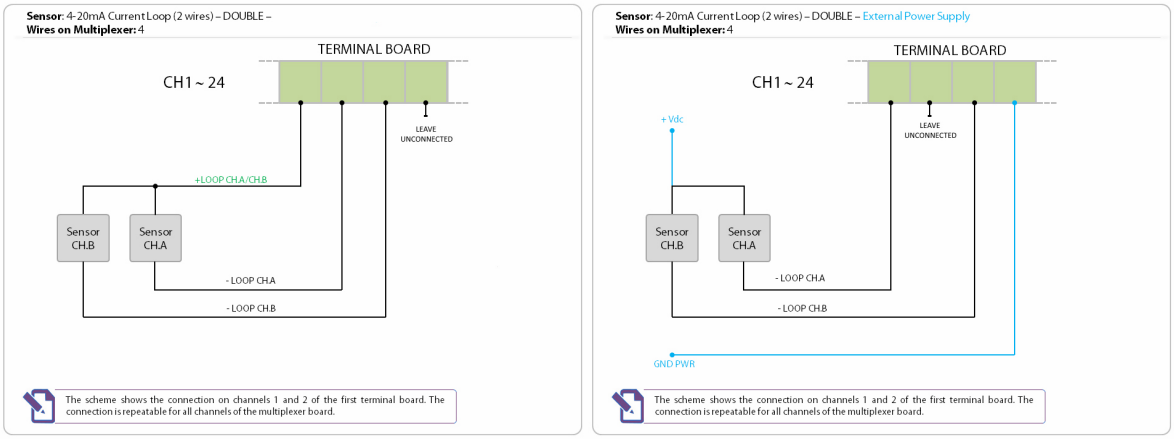


Figure 99 *Current Loop 2 Channels (Internal and External Supply)*

Potenziometer 4 Wires

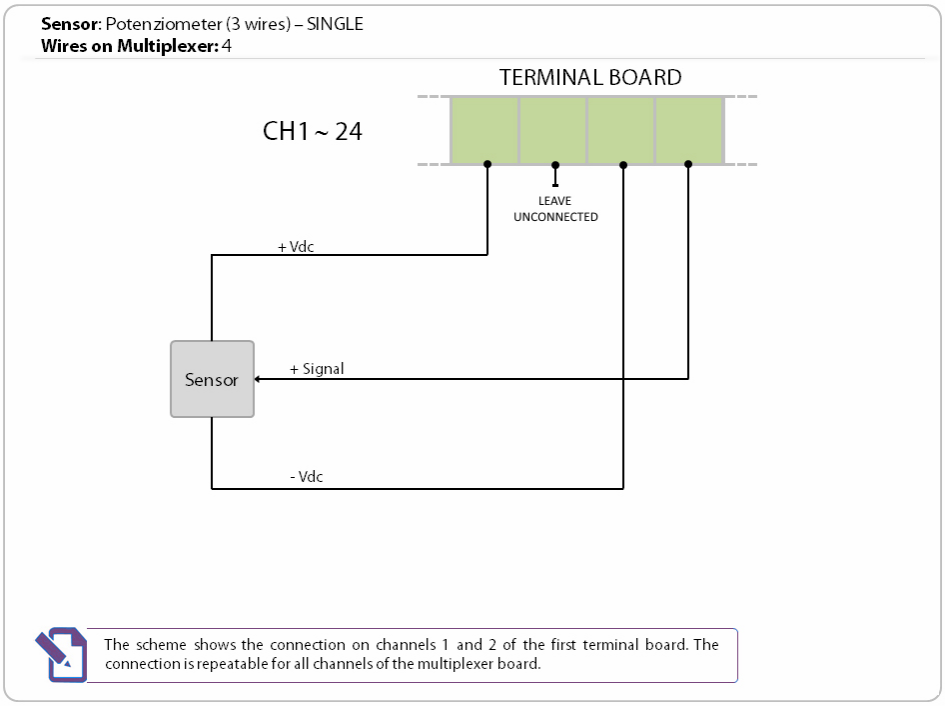


Figure 100 *Potenziometer 4 Wires*

Potenziometer (2 Channel)

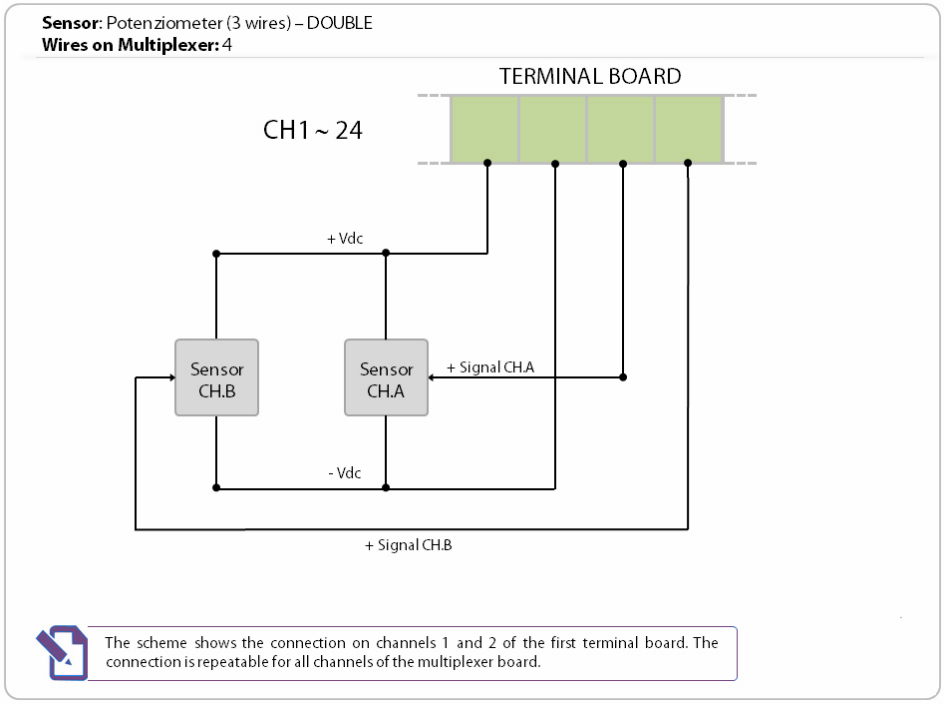


Figure 101 *Potenziometer (2 Channel)*

PT100/PT200/PT500/PT1000

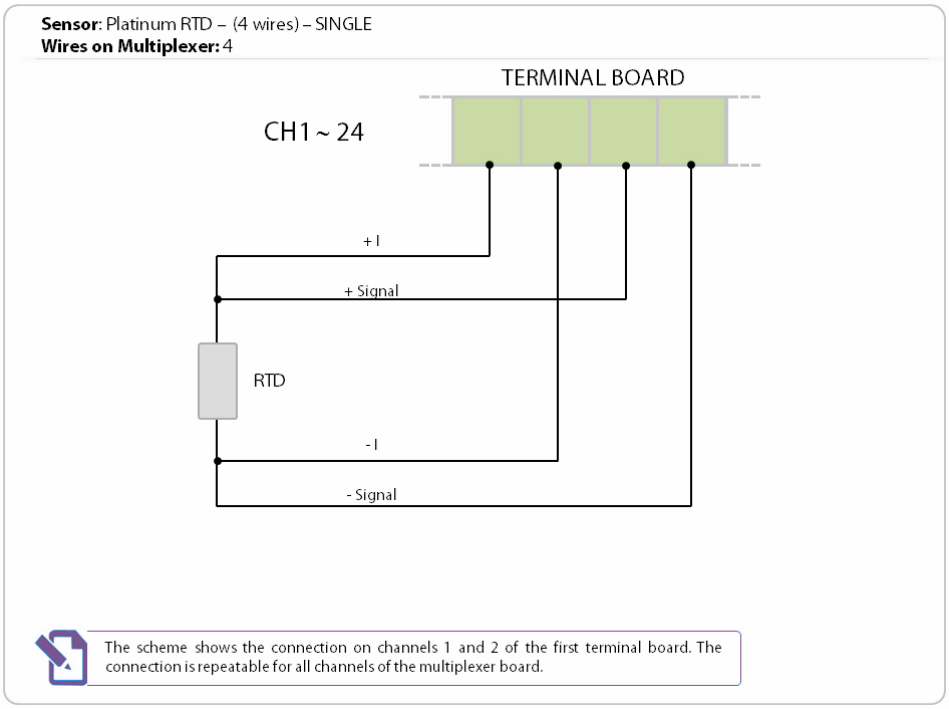


Figure 102 *PT100/PT200/PT500/PT1000*

Ratiometric (External Supply)

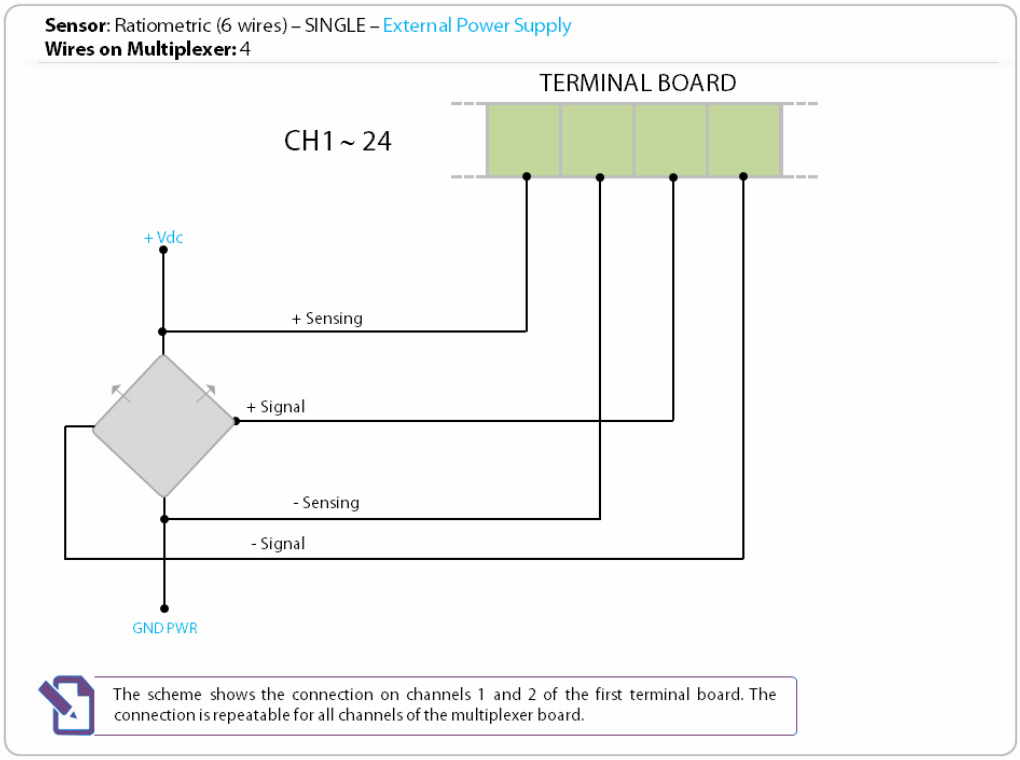


Figure 103 *Ratiometric (External Supply)*

Servo BiAxial (External Supply)

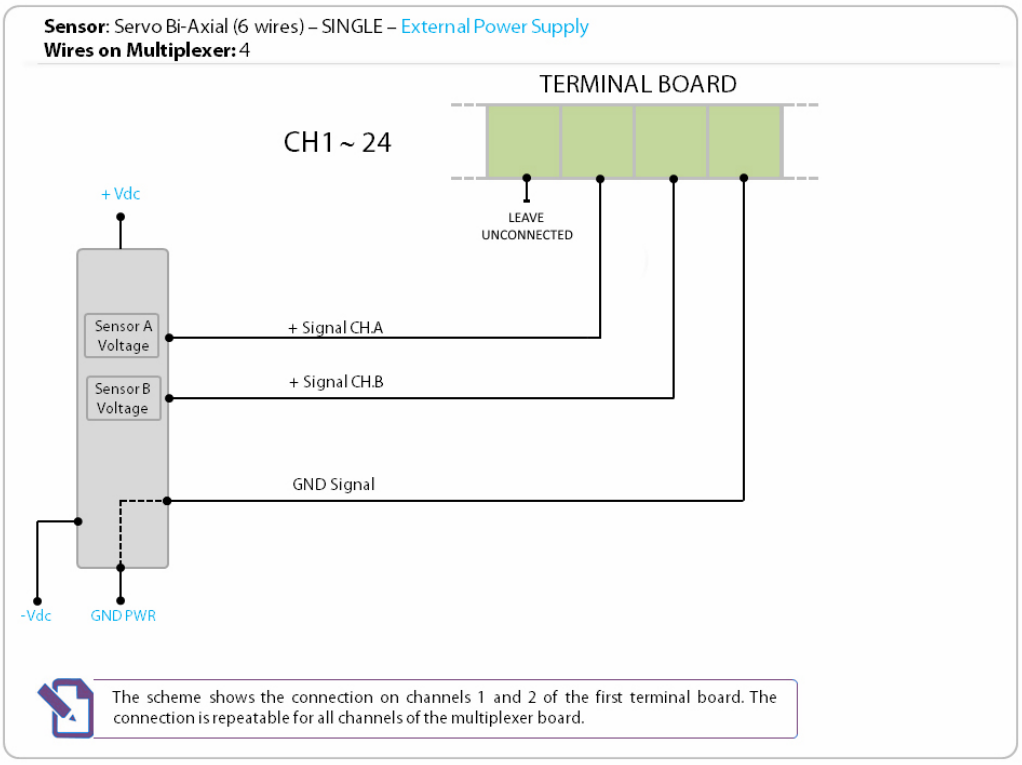


Figure 104 *Servo BiAxial (External Supply)*

Vibrating Wire with Thermistor (NTC)

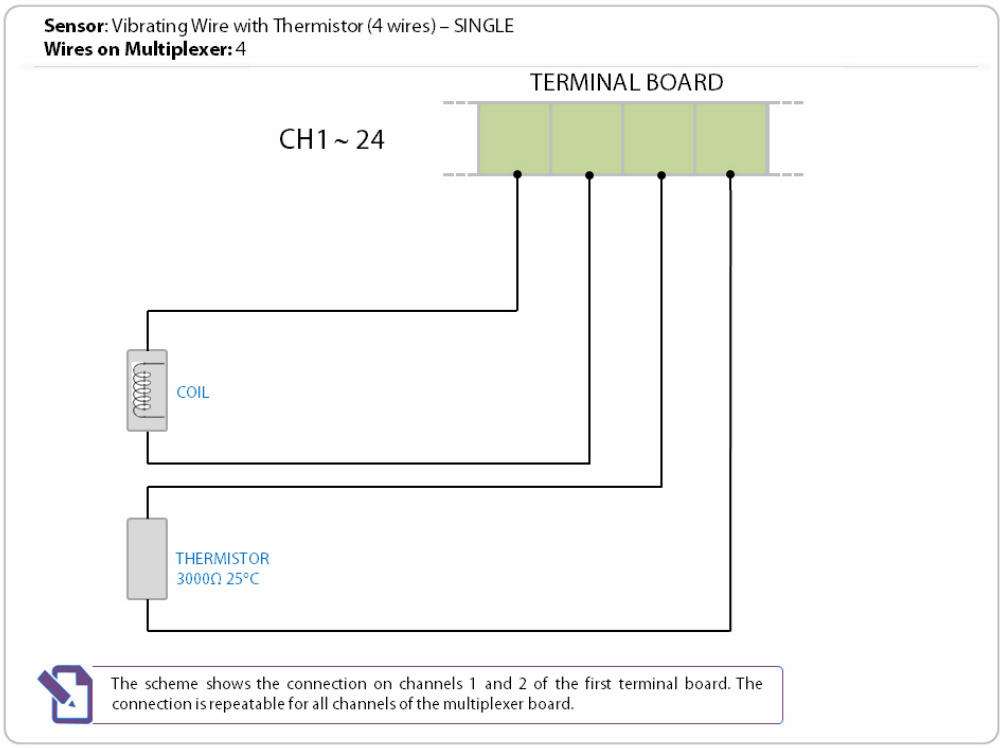


Figure 105 *Vibrating Wire with Thermistor (NTC)*

Voltage

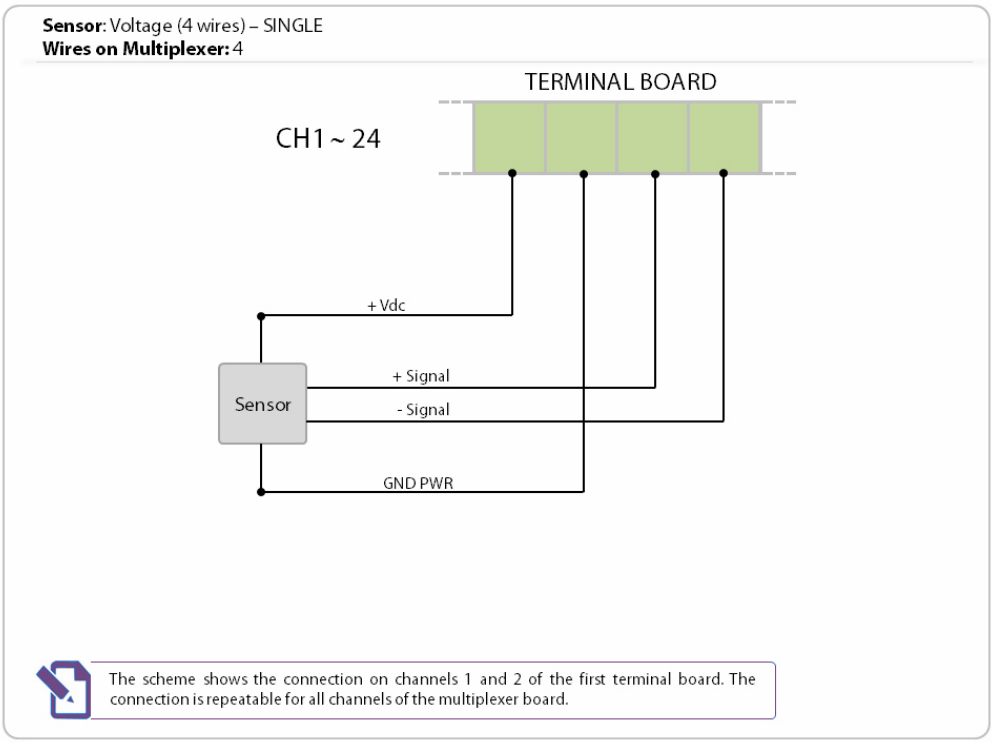


Figure 106 *Voltage*

Voltage 2 Channels (External supply)

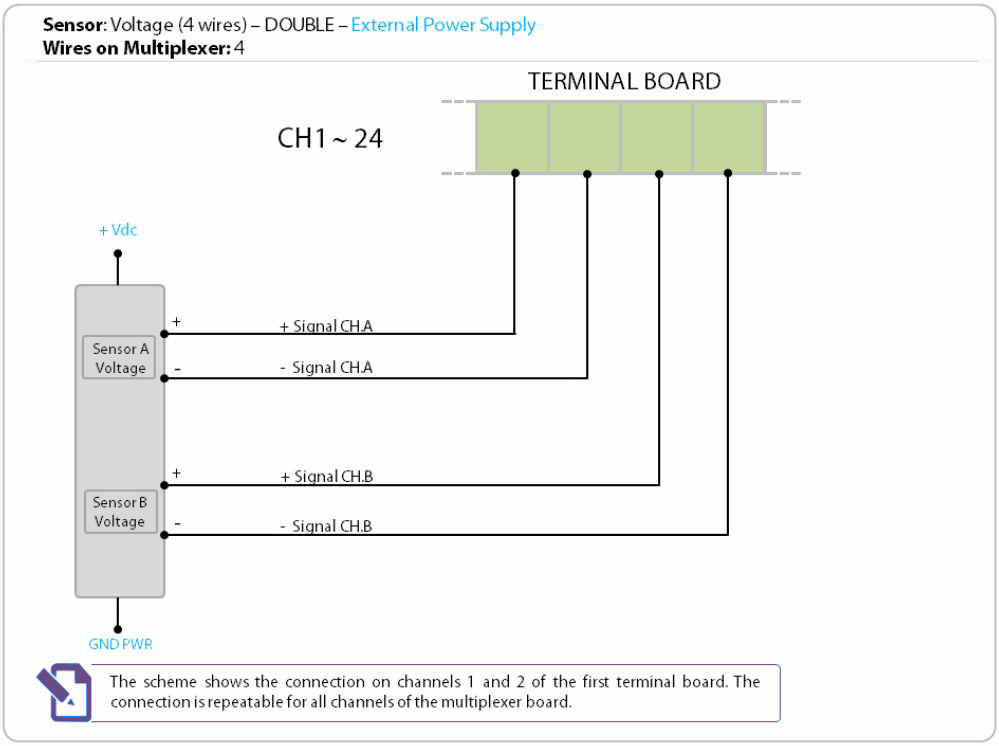


Figure 107 *Voltage 2 Channels (External supply)*

A.3 6 Wires

2..40mA Transmitter 2 Channels

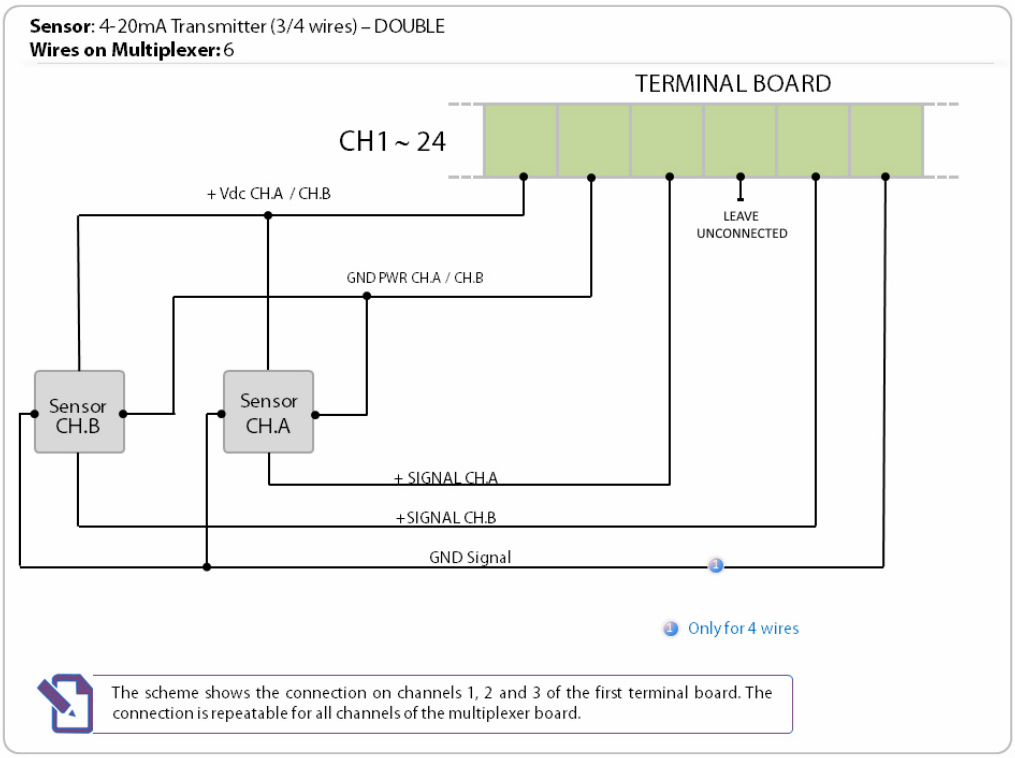


Figure 108 *2..40mA Transmitter 2 Channels*

Ratiometric

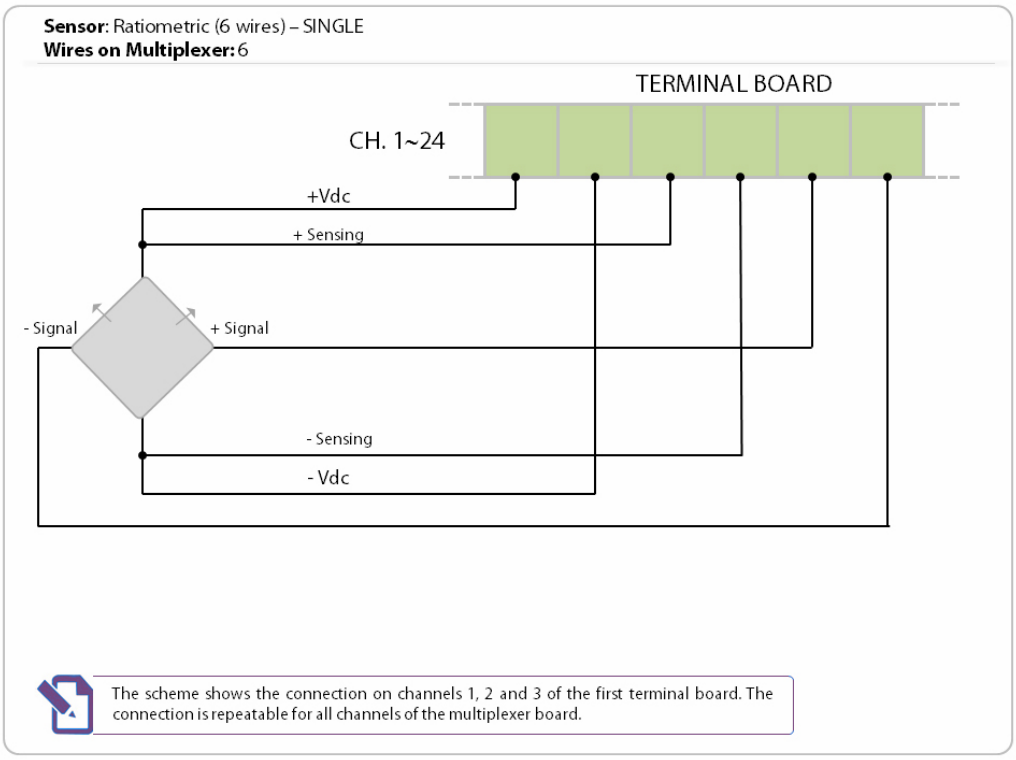


Figure 109 *Ratiometric*

Servo Biaxial

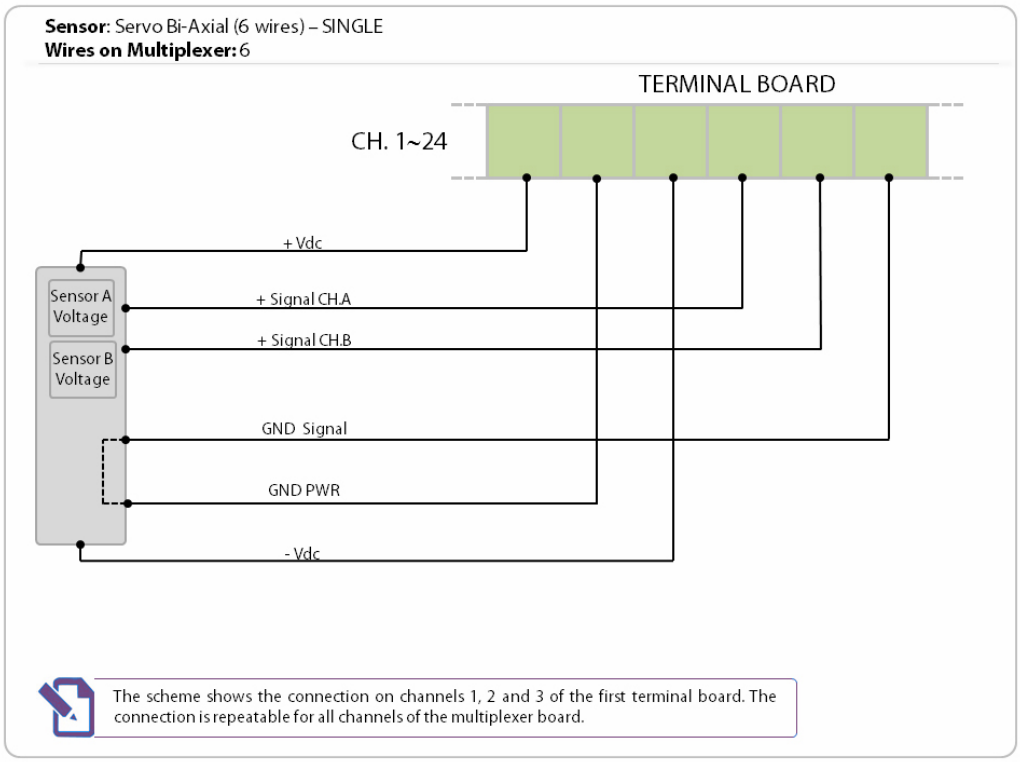


Figure 110 *Servo Biaxial*

Servo UniAxial (5 Wires)

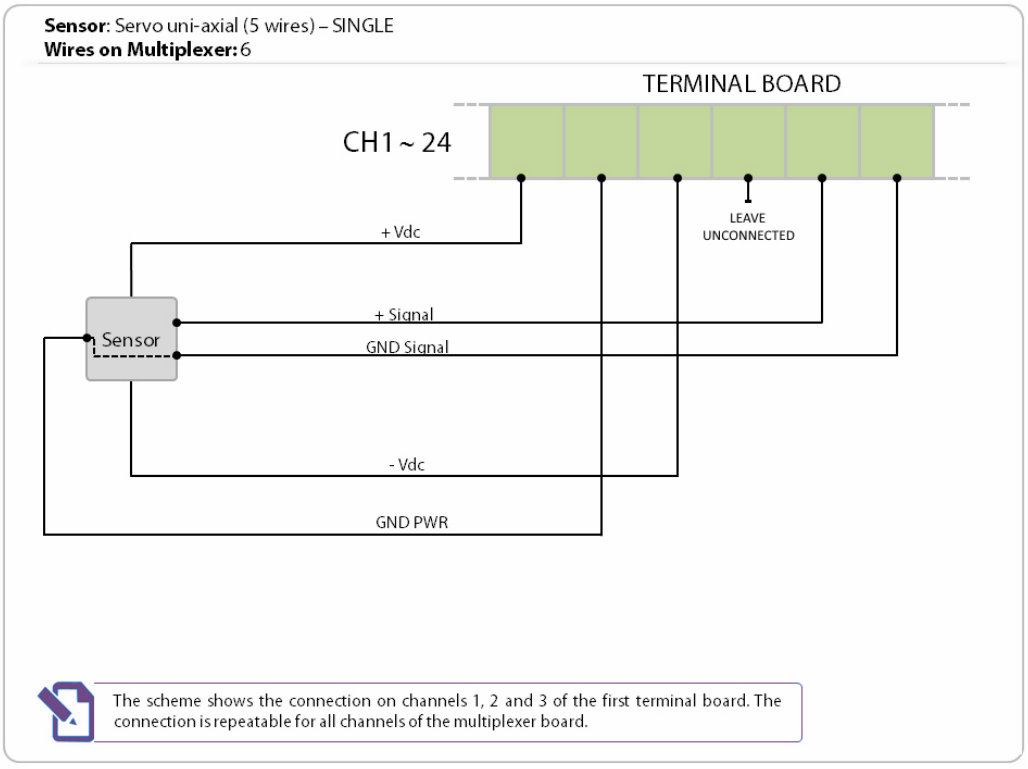


Figure 111 *Servo UniAxial (5 Wires)*

Voltage 2 Channel

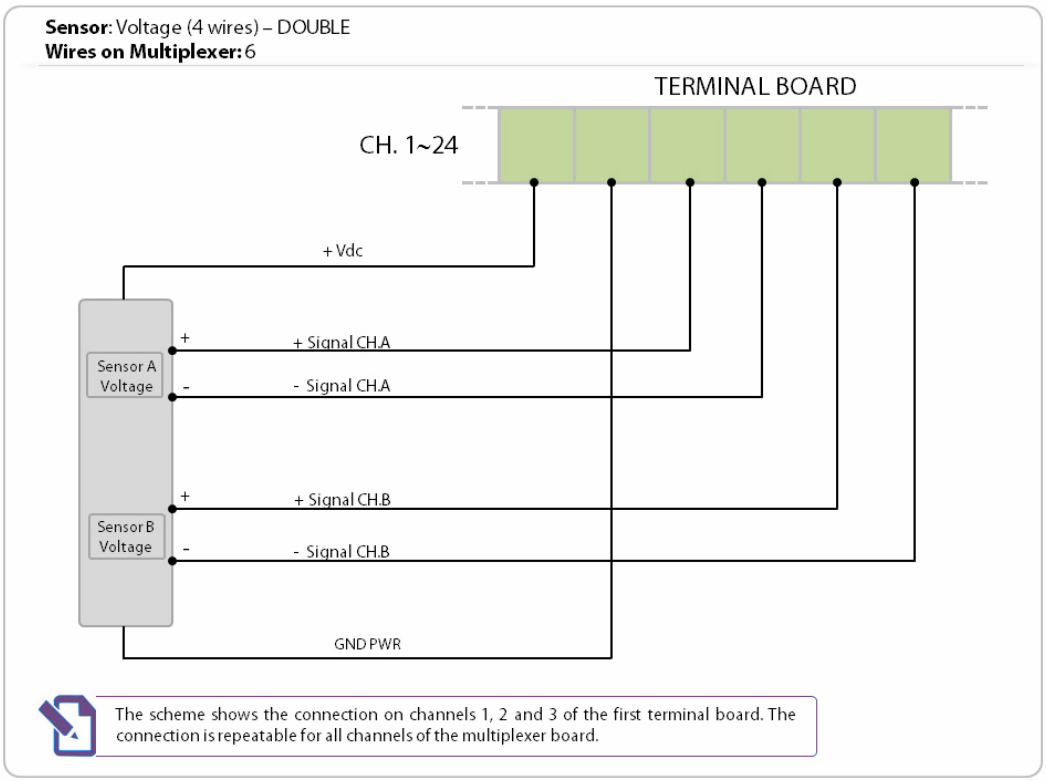


Figure 112 *Voltage 2 Channel*

Appendix B

Multiplexer Board

Appendix B Multiplexer Board

B.1 Connection

Multiplexers are connected to RS-485#2 port on the OM-240.

The MUX has two 10 poles connectors on the relay boards, to daisy chain them.

GND, +V, A and B poles have to be connected to the OM-240 RS-485#2 port.

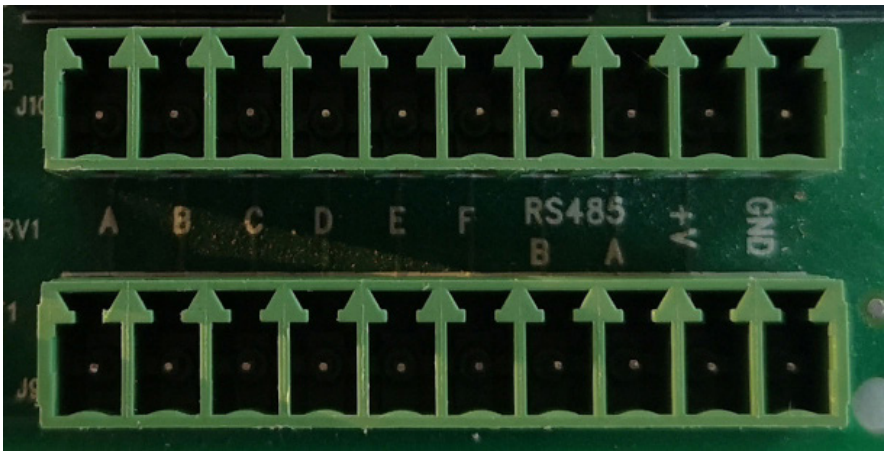
Mind that RS-485#2 port is:

MUX	OM-240
B	Data -
A	Data +
-	GND
+V	+V
GND	GND

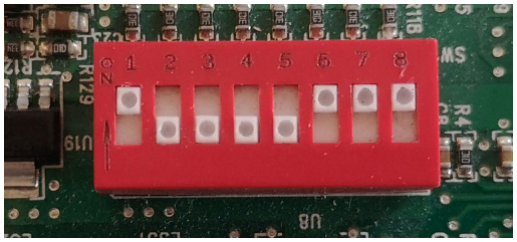
For signal line, we have, on the same 10 poles connector, A, B, C, D, E and F poles:

MUX	OM-240
A	22A
B	22B
C	23A
D	23B
E	24A
F	24B

If more than a MUX is connected, you should use the other 10 poles connector on the MUX to connect the second MUX and so on.



B.2 DIP Switch Configuration



DP1	DP2	DP3	DP4	DP5	DP6	DP7	DP9
ADDR0	ADDR1	ADDR2	ADDR3	ADDR4	SLEEP	BAUD0	BAUD1

DIP Switch 1 to 5 set Address:

DP1	DP2	DP3	DP4	DP5	ADDRESS
1	0	0	0	0	1
0	0	1	1	0	12
1	1	1	1	1	31



Max multiplexer number is 16

DP6 is related to sleep mode

DP6	SLEEP BEHAVIOUR
0	MUX goes in sleep status when not interrogated
1	MUX does not sleep if not interrogated

DP7 and DP8 sets BAUDRATE. OM-240 supports only 9600bps

DP7	DP8	BAUDRATE
0	0	1200 bps
1	0	2400 bps
0	1	4800 bps
1	1	9600 bps

B.3 Cable Length

Power supply (+V and GND): here you must ensure the right Voltage to the farest MUX connected. So right cable section and supply voltage to OM-240 (remember, OM-240 can be powered up to 30 V, and the same Voltage is used for the MUX supply, via +V and GND).

RS-485 (A and B): RS-485 standards apply.

Signals (A, B, C, D, E, F): Here you should dimension cables and distance based on the measure you need to acquire: for instance 4..20mA is far more tolerant to cable resistance than 0-10mV.

Ratiometric uses 2 more wires for sense so it is ok to use long cables, and so on.

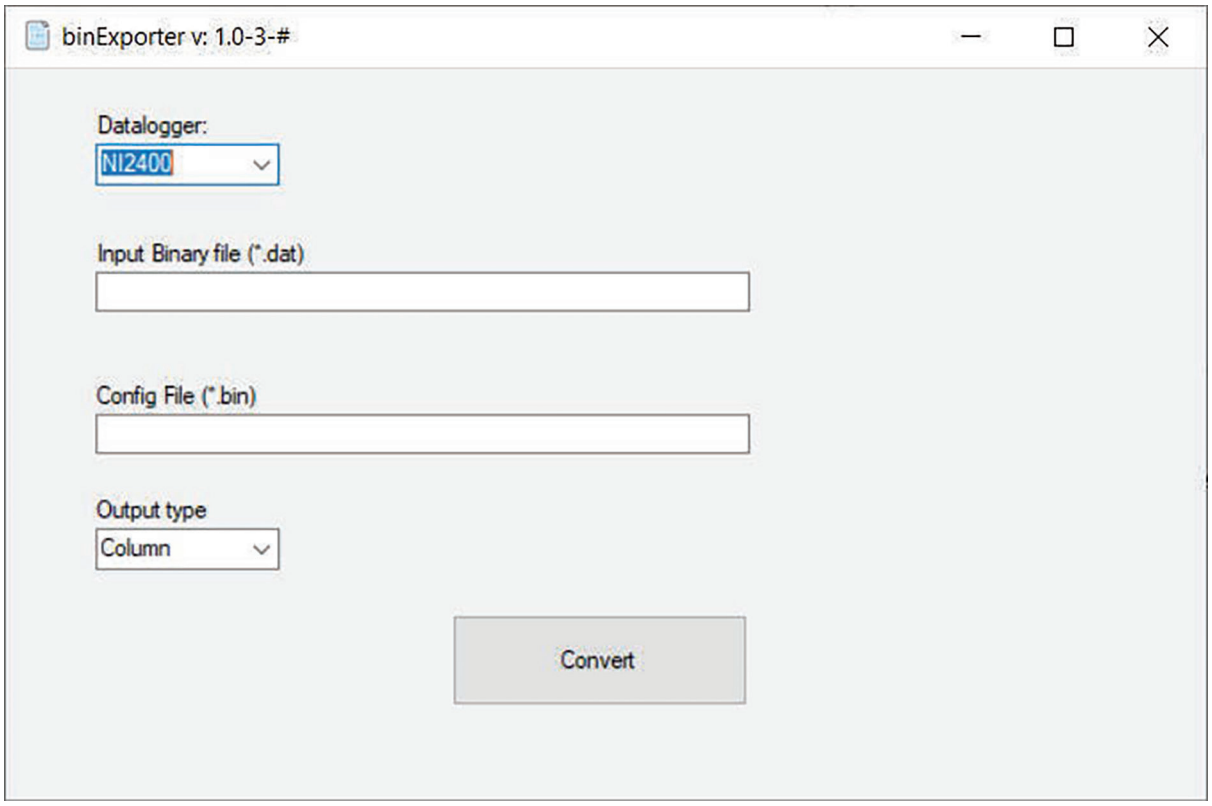
Appendix C

binExporter Tool

Appendix C binExporter Tool

binExporter is a tool needed to offline convert measure binary data (.dat file) to standard csv formats.

Launching tool you will face the following interface:



- Drag & drop .dat file (downloaded from datalogger with binary option) in "Input Binary file" field
- Drag & drop configuration file (.bin) downloaded from datalogger (from home page)
- Select desired csv format: Log or Column
- Click on "Convert"

Output csv file is created in the same folder of input binary file.

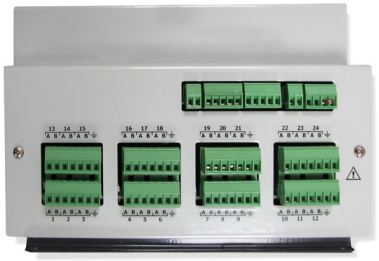
Maintenance

In the event that you need after-sale calibration, service or repair of your OM-240, please contact Omega's Customer Service Department for an Authorized Return (AR) No.

Omega Customer Service
email: cservice@omega.com
Phone: 1-800-622-2378

Specifications









- On-Board Web Server
- 24 Differential Analog Input Channels
- Measures: Thermocouples, PT100 RTD, NTC Thermistor, mV, mA, mV/V
- View Data in real Time or Store to 2 GB Internal Memory
- Available GPRS Modem
- Expandable up to 384 channels with multiplexers
- Ethernet, RS485, RS232 and USB Connections
- SMS and e-mail Alerts

The OM-240 is a versatile, high accuracy “smart” data acquisition system with 24 analog inputs. It can be used in a wide range of applications including HVAC, oil and gas, water quality, energy and building monitoring. With the OM-240 no other configuration/analysis software package is needed as it is provided with a Web server on board; just use a standard Web browser and it is ready to use. Logged data is ready to be shown in graphic “real time” mode (License required) or exported in a CSV file.

CPU and Memory

- ***Processor:*** ARM Cortex-M3 MCU with 1 MB Flash, 120 MHz CPU, ART Accelerator, Ethernet
- ***RAM Memory:*** 1 Mbyte RAM
- ***Mass Storage:*** 2 GB SD card for data (about 5 Mega data points) and Web pages
- ***Clock accuracy:*** High precision RTC (real time clock with battery back-up) temperature compensated
- ***On-Board Sensors:*** Temperature (accuracy ±1%), measured inside the datalogger

Analog Inputs

Number of Inputs: 24 differential analog inputs, individually configured. Channel expansion provided by multiplexers. There are 8 terminal blocks (each terminal block can handle up to 3 sensors). The OM-240 is designed to work with 2 to 6-wire sensors. You can connect 2-wire sensors on each channel and read 24 sensors, or 4-wire sensor and read 12 channels. The system will order sensors depending on how many wires they use, placing 6 wires sensors first, 4 wires in the middle, and 2 wires last.

Once software configuration is done, clicking on "Wiring scheme" button on the web interface near the sensors will show how to physically connect the chosen sensor to the block. It shows "relative" position, so if you start connecting sensors from the first you will not have to leave "unused" positions (except for the ground connection of every block, if not used).

Multiplexers are needed if the total "wires" from sensors exceeds the 48 provided by the OM-240.

Analog Measurements

Measurement Rate

	Maximum Speed	Standard Speed
Analog Initialization (±10 V range)	1.70 sec	7.10 sec
Instrument Warm-Up	Depends on sensor configuration	
Measurement (±10 V range)	80 ms	1.57 sec

Times indicated are not valid for vibrating wire measures
Init analog phase is made only once before measurement cycle

ADC: 24-bit (22 true bit) differential analog-to-digital converters, 5SPS to 1000SPS, 0-24 average function, auto-calibration and auto-range

Analog Input Types

Current Loop (2 Wires): 0 to 25mA range; power supply: 24/10 Vdc, external

Transmitter (3-4 Wires): 0 to 25mA range; power supply: 24/10 Vdc, external

Voltage (4 Wires): ±10 mV, ±100mV, ±1 V, ±10 V ranges; power supply: 24/20/10/5 Vdc, external

Servo Inclinometer: ±5 V range; power supply: ± 12 Vdc (dual), external

Wheatstone Bridge (6 Wires, With Sensing): ±10mV/V range; power supply: 10/5 Vdc, external (max 10 Vdc)

Minimum bridge resistance: 200 Ω; power supply: 10/5 Vdc, external (max 10 Vdc)

Potentiometer: ±2.5 V range; power supply: 10/5 Vdc

Thermocouple Input Types and Ranges

THERMOCOUPLE (LOGGER @ 25°C AMBIENT TEMPERATURE)		
TC TYPE	RANGE	ERROR
TC-K	From -200 °C to 1370 °C	±1,24 °C
TC-B	From 600 °C to 1820 °C	±1,22 °C
TC-J	From -200 °C to 1200 °C	±1,04 °C
TC-T	From -200 °C to 400 °C	±1,99 °C
TC-E	From -200 °C to 1000 °C	±0,93 °C
TC-R	From -20 °C to 1760 °C	±1,64 °C
TC-N	From -260 °C to 1300 °C	±1,24 °C
TC-S	From -20 °C to 1760 °C	±1,64 °C

RTD Input: 100Ω Platinum (Pt100/200/500/1000)
RTD: range -195 to 847 °C (-319 to 1556 °F);
Power supply: 1.2mA
Thermistor (3000 Ω@25 °C NTC):
Range: -50 to 0 °C (-58 to 32 °F) maximum error ± 2 °C (± 3,6 °F)
Range: 0 °C to 150 °C (32 to 302 °F) maximum error ± 1 °C (± 1,8 °F)
Power supply: 0.05mA/0.1mA/1.2mA

Reading Resolution:
1 µA at FS for 20mA range;
1 µV at FS for ±10mV range;
10 µV at FS for ±100mV range;
100 µV at FS for ±1 V range;
1 mV at FS for ±10 V range;
0.1 °C for Pt100 RTD;
0.1 °C for NTC thermistor;
0.1 Hz for 6000 Hz range;
0.001 mV/V at FS for ±10 mV/V (Wheatstone bridge)

Measurement Accuracy:
0.01%mV/mA FS (0.17% FS for Pt100/Pt200/Pt500/Pt1000) - with Standard Measurement
Temperature Drift: < 10 ppm/°C, range -30 to 70 °C
Input Noise Voltage: 5.42 µV pp
Input Limits: ±12 V
DC Common Mode Rejection: >105 dB
Normal Mode Rejection: >90 dB
Input Impedance: 20 MΩ typical

Switched Output Power Supply: The voltage 'V OUT' is switched on and off under program control. V OUT is the unregulated input power supply 'V IN' (2 A)

Digital I/O

Digital Output: One relay output (for alarm, etc.): volt-free closure (low voltage 30 V, 2A)
Digital Inputs: Two opto-isolated digital inputs individually selectable for switch closure.
Max Input Voltage: 24 V (max current: 10mA)
Min Input Voltage: 5 V (max current: 2mA)
Measurement Rate (MR): max frequency 1 kHz
Accuracy: 0.1 Hz

PROTECTION:

- Electro-Mechanical Relays for Measuring Each Channel:
  Electrical Endurance: min 2 x 10^5 operations
  Mechanical Endurance: 100 x 10^6 operations.

- Circuit Protection (Gas Discharge Tubes):
  DC Breakdown Voltage (@100 V/s): 75 V
  Tolerance of DCBV: ± 20%
  Impulse Breakdown Voltage (@100 v/µs): 250 V
  Impulse Breakdown Voltage (@1k v/µs): 525 V

- Overvoltage and Reverse Polarity Protection
  Short Circuit Protection on Every Output

Interfaces

Display & Keyboard: Small backlight graphic LCD 128 x 64 dpi with membrane keyboard for the minimal local management without the PC. Keyboard for starting a data acquisition scan, sequential display of the last stored readings for each channel (sensor ID, converted unit reading, unit of measure), device status, data download and firmware/Web pages update by USB pen drive, safe mode (back-up/format/restore internal SD card).

LAN Ethernet Isolated: 10/100 Mbps, RJ45

RS232: 9-pin, DE9: DCE port for optional GSM/GPRS modem connection
Baud Rates: selectable from 9600 bps to 115.2 kbps
Default Format: 8 data bits; 1 stop bits; no parity

USB: USB 2.0 pen drive only (FAT 32), 5 V 200mA

RS485#1 OPTO-ISOLATED:
Connection: 5 screw clamp port for max. No.254 Modbus RS485 digital bus sensors
Communication Interface: RS485
Communication Protocol: MODBUS RTU
Voltage 'V OUT': Switched on and off under program control. V OUT is the unregulated input power supply 'V IN' (1 A).
Power supply management: Always on or energy safe

RS485#2 OPTO-ISOLATED:
Connection: 5 screw clamp port for max. 16 multiplexer boards connection.
Communication interface: RS485
Communication protocol: MODBUS RTU
Voltage 'V OUT': Switched on and off under program control. V OUT is the unregulated input power supply 'V IN' (1 A).
Every channel of each multiplexer board is completely independent.

Software & Firmware

- Web server on board (independent OS platform)
- Live update (firmware and web pages)
- Acquisition Time Interval: selectable from 1 second up to 1 week (depends on the number of channels acquired)
- FTP client to send data/alarms on an FTP server (SFTP not supported)
- MAIL to send data/alarms to max 5 email address (SMTPS/SSL not supported)
- SMS to send alarms to max 5 telephone numbers
- Data download (readings, logs) in .csv file (compatible with Microsoft Excel)
- Virtual channels management
- Languages: Italian, English and French

System Power Requirements

Voltage (External Power Supply): 10 to 30 Vdc (reverse polarity protected), max 5A
External Rechargeable Batteries: 12 Vdc nominal
Typical Current Drain (@12 Vdc, External Power Supply):
Sleep Mode(MAX): 315 µA
ON: 62mA - ON with ethernet connected: 87mA - ON with display ON: 115mA
ON with display ON and ethernet connected: 142mA

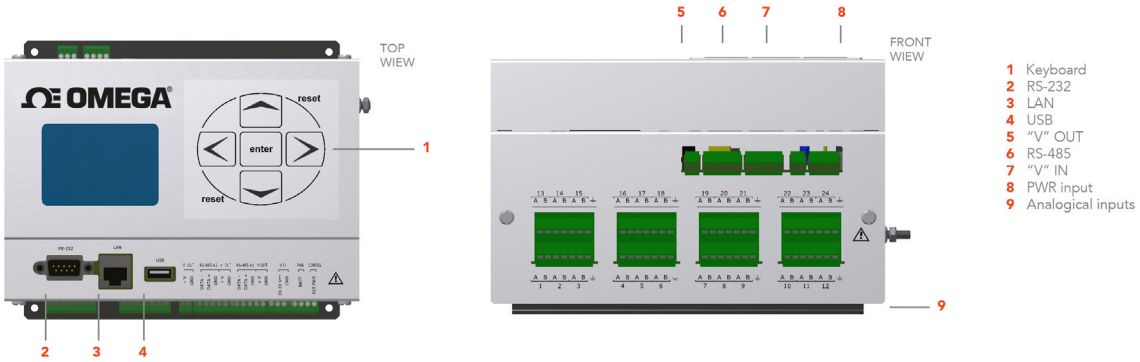
Analog Initialization: 115mA
Measurement: 123mA (with 12mA @ 24 V sensor consumption)

Environmental Conditions

Operating Temperature: -30 to 70°C (display -20 to 70°C)
Storage Temperature: -40 to 85°C (display -30 to 80°C)
Relative Humidity: 80 %RH
Overvoltage Category: II
Pollution Degree: 2
Sound Levels: < 74 dBA
Maximum Height of Use: 3000 m (9800 ft)

Physical Characteristics

Weight: 980 g (2.16 lb)
Dimensions: 231 L x 138 W x 117 mm H (9.09 x 5.43 x 4.61")
Material: Plastic and metal
Wiring: Removable screw terminal connectors



To Order Model No.	Description
OM-240	24-channel Ethernet data logger with embedded web server
OM-240-MODEM	GSM/3G modem for OM-240
OM-240-PS	Spare 12 Vdc power supply for OM-240
OM-240-CHARTS	Charts License for OM-240

Comes with Ethernet cable and USB thumb drive.

Ordering Example: OM-240 24-channel Ethernet data logger with embedded web server and OCW-1 OMEGACARE SM 1-year extended warranty for OM-240 (adds 1 year to standard 1-year warranty).

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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