Nesa Srl
Sistemi per monitoraggi ambientali e telecontrolli

# User's manual model TMF100


## Ver. R03.10

English

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# Summary



English

# 1 Content of the package

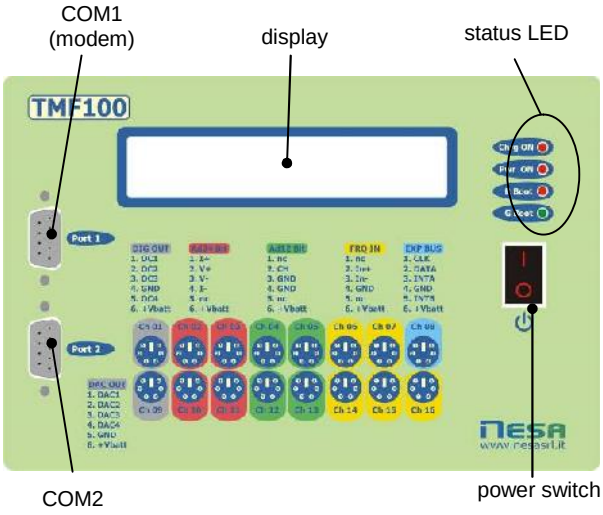
Before installation verify that the contents of the package are as follows:

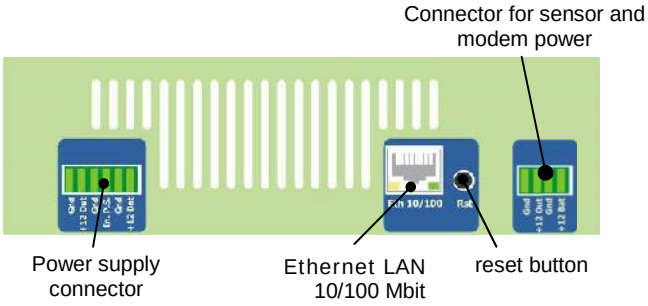
- 1 TMF100 terminal.
- 1 CD complete with documentation and software (EsWeb) to convert the data in Excel format.
- 1 RJ45 Ethernet cross cable.

The data logger is supplied from the factory tested and perfectly ready for operation.

# 2 First start-up

Before connecting the data logger verify that the power switch is in the "0" position (off).




1) Connect the data logger power using the proper connector, utilising a battery (12Vdc min 1Ah) or an external 220Vac/12Vdc power supply according to the following method:

   a) If using only the battery, connect the terminals to inputs +12Batt and Gnd.

   b) If using only the external power supply, connect the terminals to inputs +12Batt and Gnd.

   c) If you are using an external power supply and a battery, connect the battery terminals to the +12Batt and Gnd inputs and connect the power supply to the InPS and Gnd inputs. In this configuration the battery is automatically recharged (max 40Ah) by the data logger, therefore the power supply must have an output of at least 13.5Vdc.

**Power supply connector**

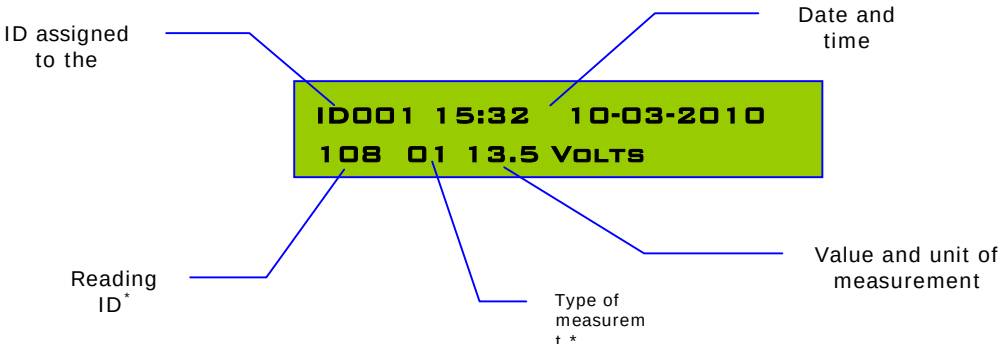
| Name | Function |
|---|---|
| **+12 Bat** | Battery power (+10,5Vdc÷ 15Vdc) |
| **Gnd** | Ground terminal block (3 terminals) |
| **In.P.S.** | Power supply input from solar panel or 220/13.5Vdc Power supply |
| **+12 out** | Auxiliary power output (max 3A) |

**status LED**

| Name | Colour | Function |
|---|---|---|
| Chrg ON | Red | Battery charge LED |
| Pwr ON | Red | Power LED |
| R Boot | Red | Boot anomaly indicator LED |
| G Boot | Green | Boot anomaly indicator LED |

English

2) Move the power switch to the "1" position (On). A display will appear with some machine start up and diagnostics messages (see chapter 8). The first message represents the product serial number.
Wait about 90 seconds until the instant data appear in the following format:




* To decode, see appendixes A and B

The readings are shown for about 2 seconds each, passing from one reading to the next based in the machine configuration.

# 3 Interface with the data logger

The data logger can be immediately connected to a computer via the 10/100Mbit/s LAN interface.
The TMF100 comes from the factory with a pre-configured IP address necessary for connection which can be modified subsequently.

| LAN interface: | | | |
|---|---|---|---|
| IP: | **192.168.1.110** | Subnet mask: | **255.255.255.0** |

To connect with the machine you will need to utilise an Ethernet cross cable following the procedure below:

1. Turn on the data logger.
2. Connect the cable to your computer's LAN port.
3. Connect the other end of the cable to the TMF100 LAN port.
4. Turn on the computer and set an IP address for your network card which is congruent with the data logger's address. For example 192.168.1.255 and subnet mask 255.255.255.0.

At this point the connection between the computer and the TMF has been established and you can proceed to the configuration page or the data viewing page as explained in the next paragraph.

English

# 4 Web access

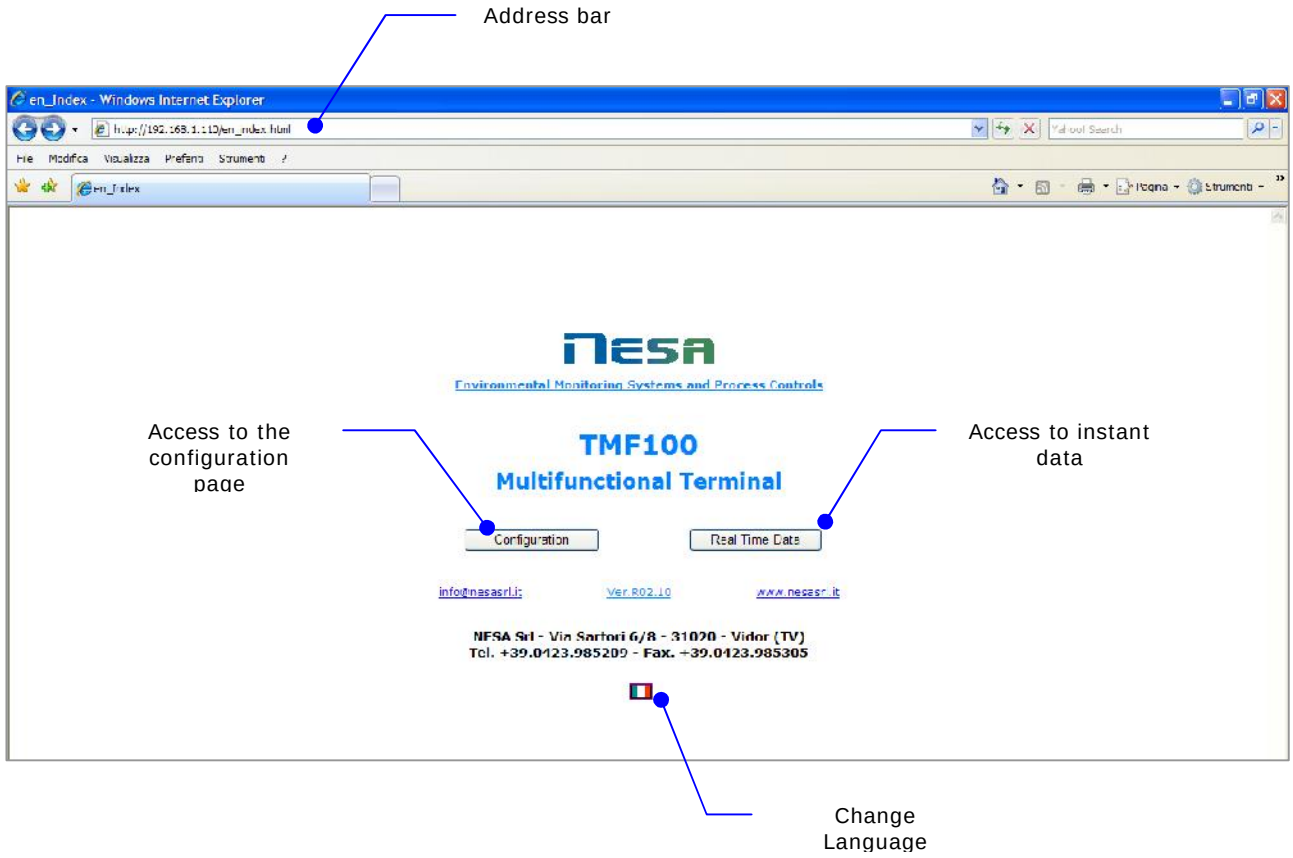
To access the TMF100 configuration and/or data view page, after establishing the connection as described in the previous paragraph, simply open one of the following internet browsers which are compatible with the TMF:

- Internet Explorer (from v. 6, for version 8, use the « compatibility» mode)
- Opera (from v.9.6.2)
- Chrome (from v. 2.0.172.31)
- Firefox (from v.3.03)
- Netscape (from v.9.0.0.6)
- Safari (from v.4 Public beta 528.16)

The configuration procedure of a TMF100 terminal can be done only via web page

To correctly view the pages, enable JavaScript and the option to search for the most recent version of the cached pages in the tools or options menu of each browser.

With the browser open, enter the IP address of the data logger in the browser address bar: http://192.168.1.110 (factory default address) and wait for the first page to open which allows the user to choose between instant data view or configuration (password protected).



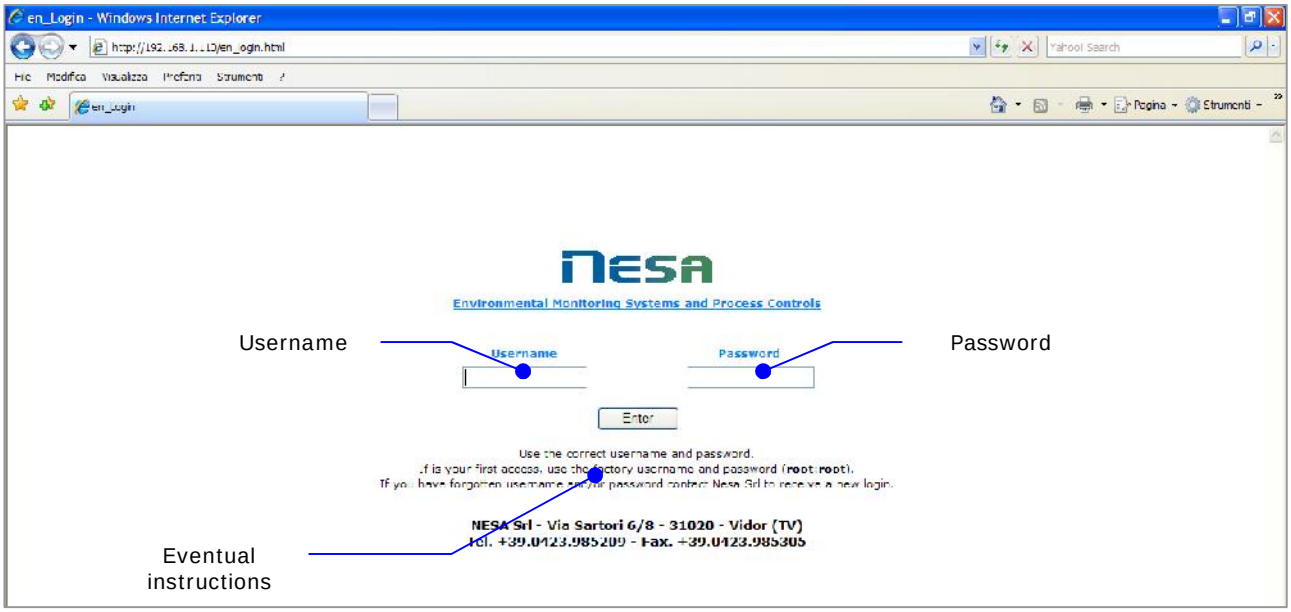

English

## 4.1 Web configuration for acqusition channels

Click on the "configuration" button to go to the user authentication page where the access credentials will be requested. If it is the first access, you can utilise the default credentials defined in the factory configuration.

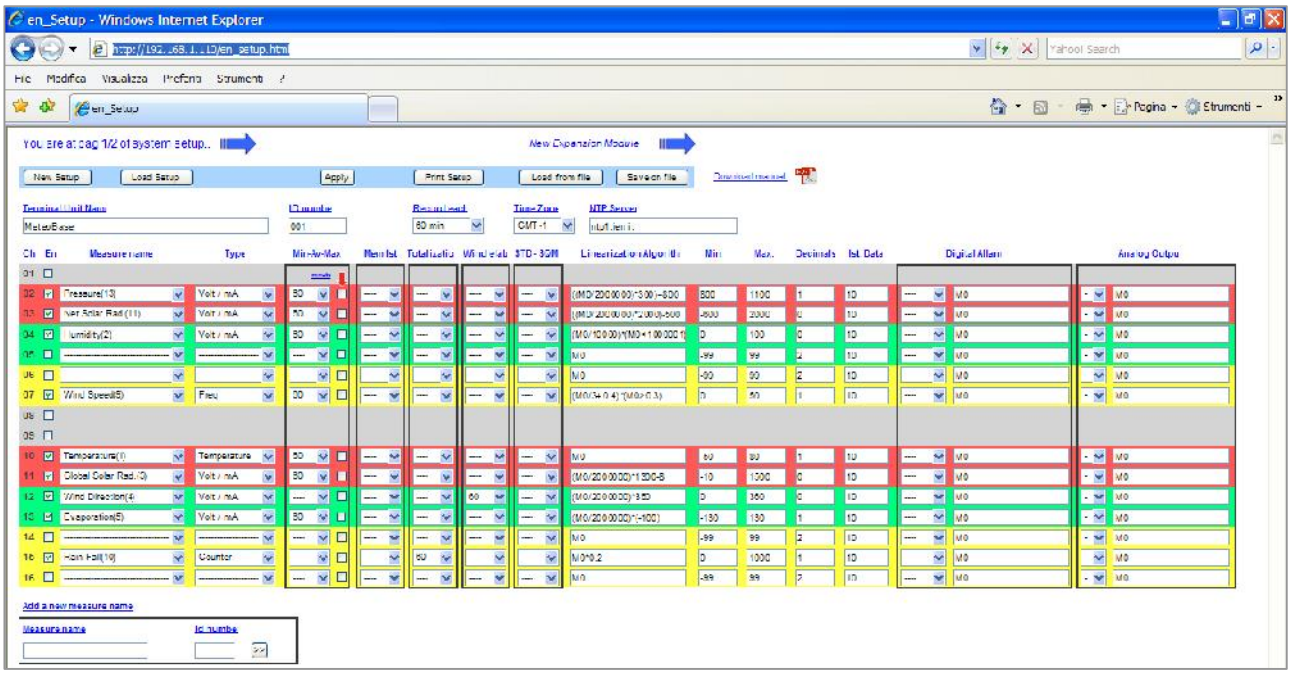
**Factory default configuration**

| | |
|---|---|
| Ip base: | 192.168.1.110 |
| S.Mask: | 255.255.255.0 |
| Username: | root |
| Password: | root |




Only after the first access you can modify/change username and password.

The configuration first page has a modular structure as follows:




English

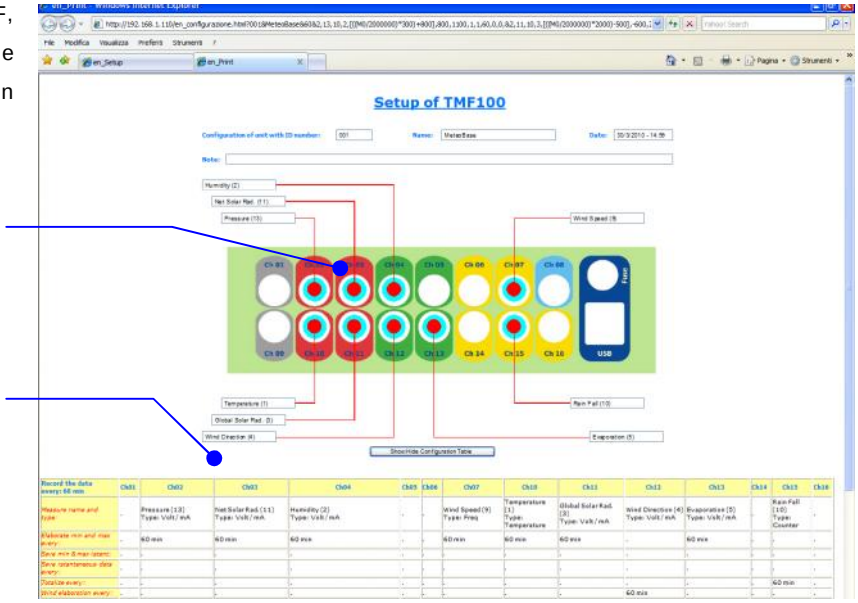

The buttons and fields which appear on the upper part of the page with the following meanings:

New setup: zeros out all configurations and prepares the terminal to be configured as new.

Load setup: loads the previously saved setup. As soon as the page opens the current setup will be automatically loaded.

Apply: Once a configuration has been set up, click this button to save it in the machine and the TMF will be restarted with the new configuration already active.

Print Setup: This option opens a print dialogue window which physically shows how and where to connect the device to the TMF, summarising all of the configuration settings in hard copy format




Load from file: allows the user to load a configuration from an external file (ex: PC) into the TMF.

Save on file: Allows the user to save a copy of the configuration in an external file (ex: PC)

All of the fields on the configuration page are immediately comprehensive thanks to the availability of help windows which can be opened by clicking on the name of each field.

Terminal unit Name: Alphanumeric name associated with the terminal. This is not recorded in the data file and it is not transmitted.

ID number: Identification number of the terminal (max 6 characters) which represents the unique identification of the terminal. This is recorded in the data file also as the name of the file and it is transmitted (if the data transmission option is enabled).

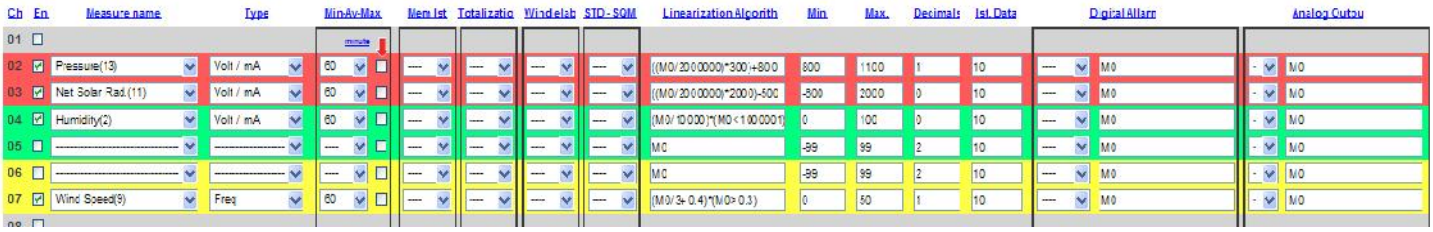
Record each: This is the time interval between one registration of data in the memory and the next or the transmission of the same (if the data transmission option is enabled). This value is expressed in minutes (min. 1 minute) and the logging/transmission is independent from the data sampling and processing. For options with the suffix "cr" see Chapter 7.

Time Zone: This allows the user to define the times zone in order to be able to synchronise the data with the local time.

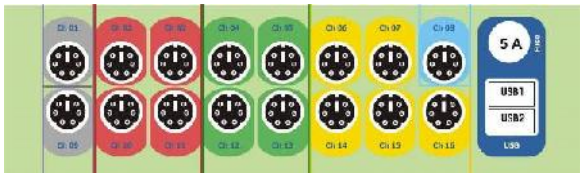
English

NTP Server: If this field is filled in and the TMF terminal is connected to the internet (via cable, GPRS or modem), the time synchronisation of the machine will take place via a Network Time Protocol which ensures precision to within less than one second. Synchronisation of the internal clock with the NTP server takes place once a day. This way several active terminals will always be synchronised down to the second.

The second part of the page allows the user to configure each single acquisition channel of the switchboard:




Ch: Number of the physical channel present on the switchboard. The colour of the line corresponds with the colour of the physical input on the switchboard.




Ab.: Enables or disables the associated physical channel. If this box is not checked the channel configuration will be ignored.

Measure name: This allows the user to select the measurement to be acquired from a drop-down menu, associating a specific name. If a measurement is not present in the list, it can be added at any time, customising it as the user wishes (see explanation later).

Type: This allows the user to select the type of measurement from a fixed list (type of physical size) which is to be acquired from among those which the data logger is able to distinguish (Pt100, current, voltage, high resolution analogue inputs - 100mV, frequency, status and counts).

Min-Av-Max): This is the first of six possible processes. It represents the calculation of the average of the minimum and maximum in the selected interval of time. For example, if the user selects 10 minutes from the drop-down menu, that channel will be configured to acquire the given measurement providing an average, a minimum and a maximum every 10 minutes.

→ Minute: This activates logging of the minute which corresponds with the time of the minimum and maximum of the measurements during the selected process interval time.

Mem Ist.: This enable logging of the last instant value acquired during the selected time interval.

Totalization: This is the second of the possible processes. It represents the accumulation (summary or integral) of all the measurement samples during the selected interval of time.

Wind elab.: This is the third of the possible processes. This allows the user to calculate the trigonometric average of the wind direction (sine and cosine method) and to determine the standard deviation STD, the root-mean-square deviation SQM and the Turbulence of the measurement.

English

STD-SQM: This is the fourth of the possible processes. This allows the user to determine, for each channel, the root-mean-square deviation and the Turbulence of the measurement. This process is already performed if the wind process is enabled.

Linearization Algorithm: This allows each signal coming from a peripheral to be "linearised", inserting the linearisation algorithm (polynome). It also allows the electric signal acquired to be converted into an engineering measurement (ex: from volts to hPa). The M0 value which is set by default represents the base measurement acquired by the data logger expressed in µV (microvolts, from 0~2,000,000) or °C for temperature.

Min: This allows a validation criteria of the measurement to be defined, fixing a minimum value below which the measurement is not considered to be valid (it is therefore replaced with "*" in the data plot).

Max: This allows a validation criteria of the measurement to be defined, fixing a maximum value below which the measurement is not considered to be valid (it is therefore replaced with "*" in the data plot).

Decimal: This defines the number of decimal points with which the measurement will be represented in engineering units.

Ist. Data: This defines the sampling interval of the raw data in seconds. The minimum value is 1 sec.

Digital Alarm: This allows the user to choose from among different alarm signalling methods associated with a measurement, via a specific mathematic relationship or algorithm (ex: M0>35 for temperature indicates the activation of an alarm when the temperature exceeds 35°C).

It is also possible to set the thresholds of warning depending on the result of the corrective formula; when the result is equal to 0, the situation is normal-state, if the result is equal to 1, we are in the pre-alarm, finally when the result is equal to 2 are in alarm condition.

- The values from 1~4 indicate the activation of a control output present on channel 1 of the TMF.
- The values from SMS.1~SMS.4, on the other hand, activate the dispatch of an SMS (which can be configured on the second page of the setup menu when there is an alarm and there is a possibility of transmitting the data via GSM or GPRS (only for SMS.3 SMS.4 and is also sent to the state of alert).

  Where there are multiple measures associated with a single sms while tehre is an alarm, the message sent contains all measures in alarm, with indicated the state of alert ( only for sms slots 3 and 4), the ID and the measure data value in alarm.
- The value MEM records the plot of the alarm data.

Analogu Output: This enables one of the TMF's 4 0-2Vdc analogue outputs on channel 9 according to the specified algorithm. It allows reproduction in output of a signal proportional to one or more measurements, the value of which must be between 0~2000, equivalent to 0~2Vdc.

On the bottom part of the page there is a section for customizing a measurement. Therefore, this allows a specific measurement to be added to the list in the "Misura (Measurement)" column. Besides the name, an identification number must be associated to the measurement which will then be present in the plot of the logged data.


English

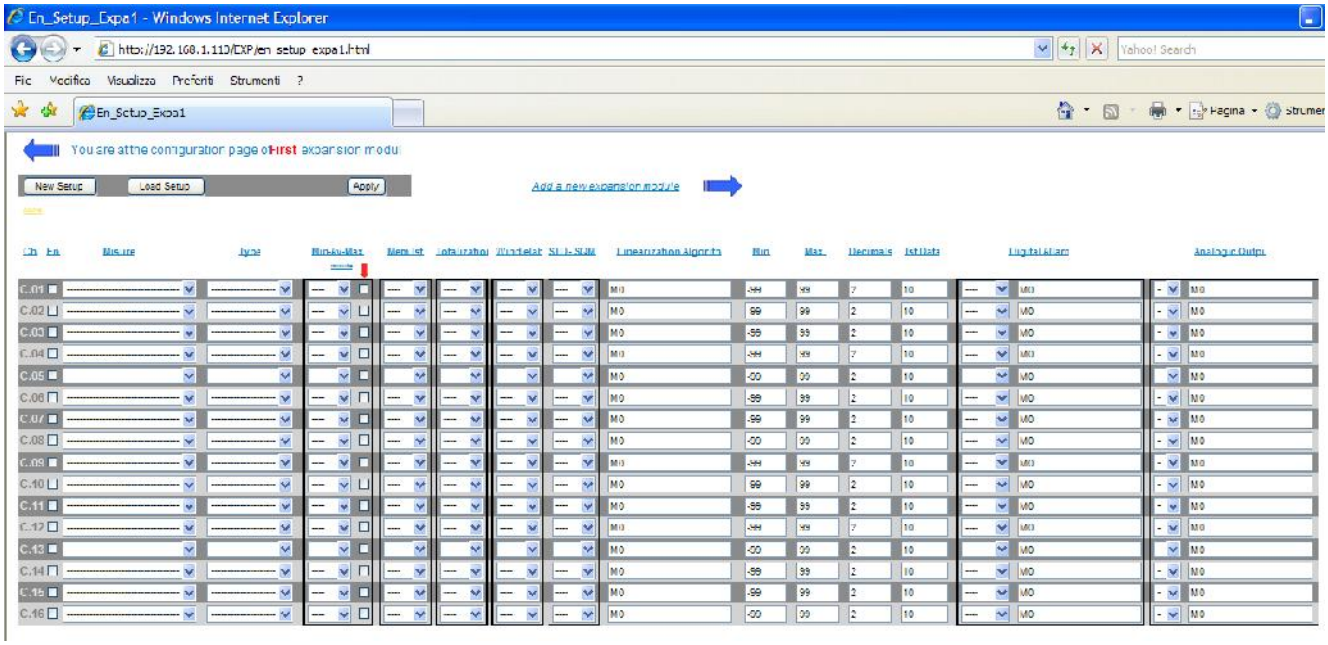
Finally, enabling channel 1, in the switchboard, again on the lower part of the page, a new list of fields to be set will appear in order to enable the data logger's digital outputs (max 4) present on channel 1, independently of the measurements . The alarms will be lost if this channel is enabled in that the channels are the same.


Besides the specific enabling, it is possible to define the initial state of the output (On/Off), the dwell time (switch every) and the pulse duration in seconds.

Once the data logger has been configured as far as acquisition channels on this page, the user can add up to a maximum of 8 analogue or digital expansion modules of 16 channels each.

Simply left click on the right arrow.


A new configuration page will open, entirely similar to the previous one, which can be repeated up to a maximum of 8 times. When passing from one page to another, the configuration on the page being closed is automatically saved.




The various columns have the same meaning as the first page.

On this page the user can configure many other types of measurements with respect to the basic configuration, such as:

Derived measure: this is a measurement which is physically non-existent, but logically obtained (derived) from the combination of several measurements.

Serial 1~10: all of the measurements obtainable from a communication protocol with a digital peripheral (RS232, RS485, USB, Modbus, etc.) from among these examples, the multi-parameter probe.

English

ZigBee 20~255: This represents a measurement which comes from wireless ZigBee sensors which the TMF is able to interface automatically, building a network of more than 200 radio peripherals.

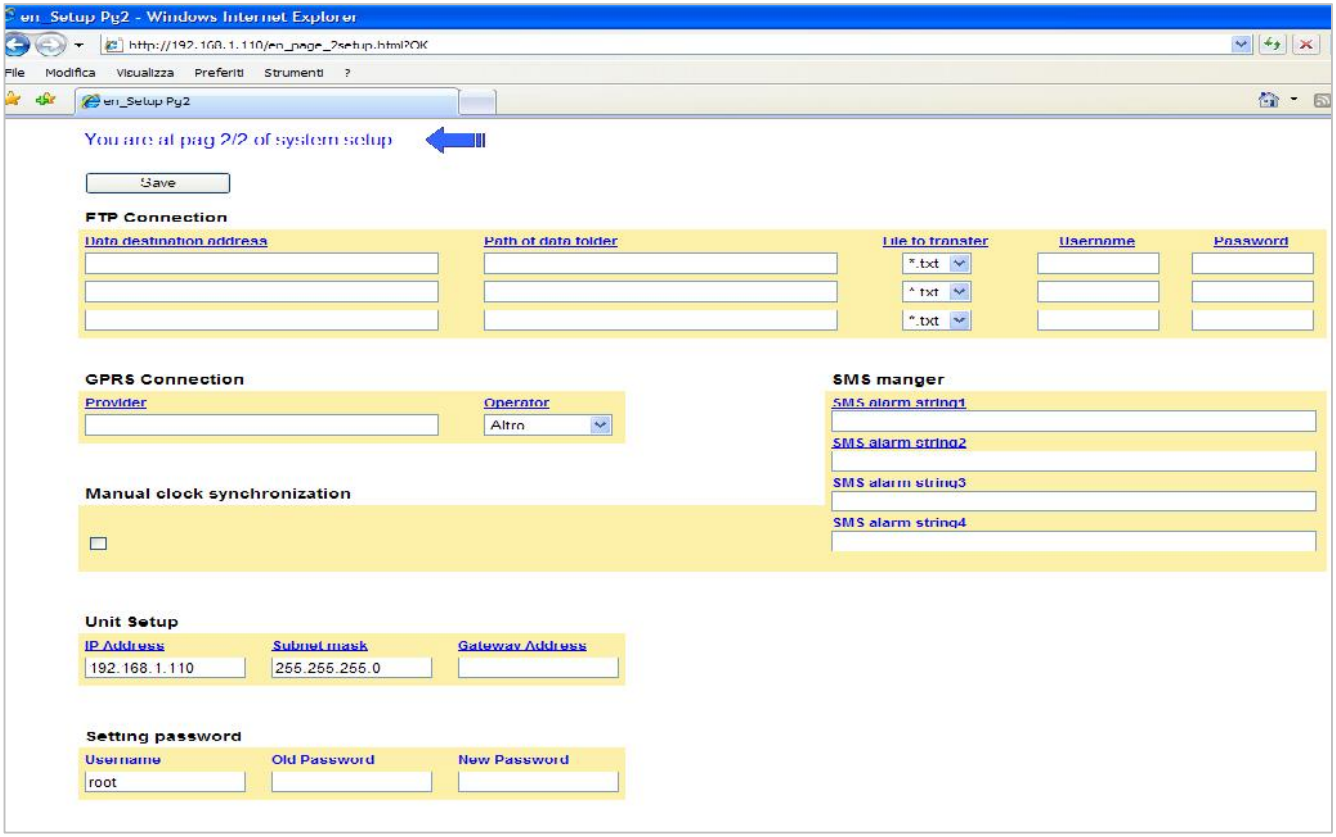
NOTE: The "apply" button may not be present on the first page and on some subsequent pages. This means that there are some active expansions in the machine configuration. Application of the entire configuration is possible only from the last active module.


ATTENTION Expansions active

## 4.2 Web configuration of machine parameters

From the first configuration page, left click on the left arrow to access the IP and access credentials.


All of the functions on the page are easily accessible and described thanks to the availability of help windows which can be opened by clicking on the name of each field.




English

The page is divided into 4 yellow coloured sections:

In the first section the parameters of the FTP connection can be set up. In fact, the machine is capable of transmitting data via FTP protocol to a maximum of 3 internet areas (FTP area).

Data destination address: this is the IP address or DNS (name) associated with the FTP where the data will be sent.

Data folder path: this is the data destination folder (es: /Programs/Nesa/Data)

File to Transfer: this is the type of file that the machine will transfer to the indicated area:

- *.txt These are all of the files containing processed data, written according to the plot described in Appendix A.
- *.ist These are the files containing only instant data, or the last reading made before the data send time.
- *.dat These are the files containing the dynamic IP address that the provider or telephone service operator has assigned the GPRS/GSM connected to the TMF.
- *.jpg These are graphic files of any images which may be captured by a normal IP camera connected to the LAN port on the TMF. At every data send time, besides the data files, the camera image files will also be sent.
- *.* This represents all the files. In this case, the switchboard will sent all types of files to the indicated FTP area at the data send time.

Username: This is the username to access the data destination FTP area

Password: This is the password to access the data destination FTP area

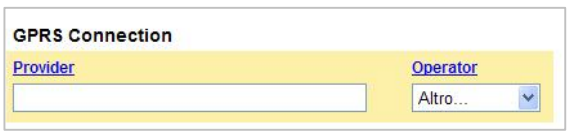
NOTE: The FTP protocol intrinsically anticipates that after correct transfer of a file it will be deleted from the source. In other words, the files in the switchboard will be deleted once they are transferred to the FTP area.

It is technically possible to transfer the same files (same type) from the switchboard to several FTP areas (contact NESA for this), but it requires a "distinction" to be made first which must correctly include:

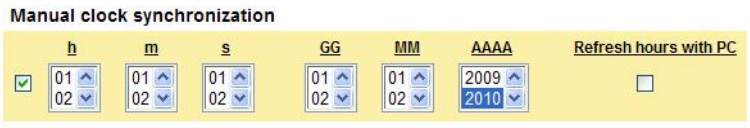
"Which FTP destination area is defined as the area enabled to give the OK for deletion of the original files from the TMF switchboard."

It is obviously opportune to always choose the last of the FTP destination areas, otherwise, after the data has arrived at the first area they would be deleted and would no longer be available for the next areas.

In the second section the mobile telephone operator which offers data transmission service can be chosen. It is important that the "Provider" field contains the exact address of the access portal provided by the operator. For example, for wind business, at the time this manual was prepared, this address was internet.wind.biz. If it is a non-Italian operator, it can still be configured by inserting the correct address of the portal associated with it.




In the third section the TMF switchboard clock synchronisation method can be defined as well as any SMS messages to be sent at each alarm configured on the first configuration page.




By enabling the check box on the left side, the operating system time will be shown in list format. This value can be modified manually or synchronisation with the connected computer

English

clock can be enabled (right hand check box). If none of the check boxes are enabled, the machine will set itself, search for an NTP synchronisation at the default server address ntp1.ien.it or at the address indicated on the first configuration page (see the previous paragraph).

On the right side of this section the SMS management area can be found. The TMF series data logger is capable of sending sms messages to available numbers in the event of a condition in which a monitored measurement generates an alarm.


The sms transmission method is possible only if there is a GPRS communication terminal (modem).

A single sms message can be associated (sms.1~5) both for alert conditions and for alarm reset conditions.

The structure of the text to be inserted in the sms field follows a precise logic as described below:

SMS/number/alarm text/alarm reset text/+/-CH.sms

| | |
|---|---|
| SMS: | fixed field |
| Number: | mobile telephone number entered without spaces and using only numerical characters |
| Alarm Text: | text of the alarm message, max 40 characters |
| Alarm reset Text: | text of the alarm reset message, max 40 characters |
| +: | add the value of the measurement which generated the alarm |
| -: | do not add the value of the measurement which generated the alarm |
| CH.sms: | CH is a number from 1 to 4 which corresponds with the alarm channel enabled on the first configuration page. |

All of the elements are separated by the character "/".

See the next paragraph for an example of alarm configuration.

In the last two sections of the page the IP address and the network configurations of the TMF machine different than the factory defaults can be defined as well as the access username and password customised.


NOTE: to save all modifications on this page pressing the "save" button, the user will be required to enter the access username and password.

English

## 4.3 Configuration for measurement acquisition - example.

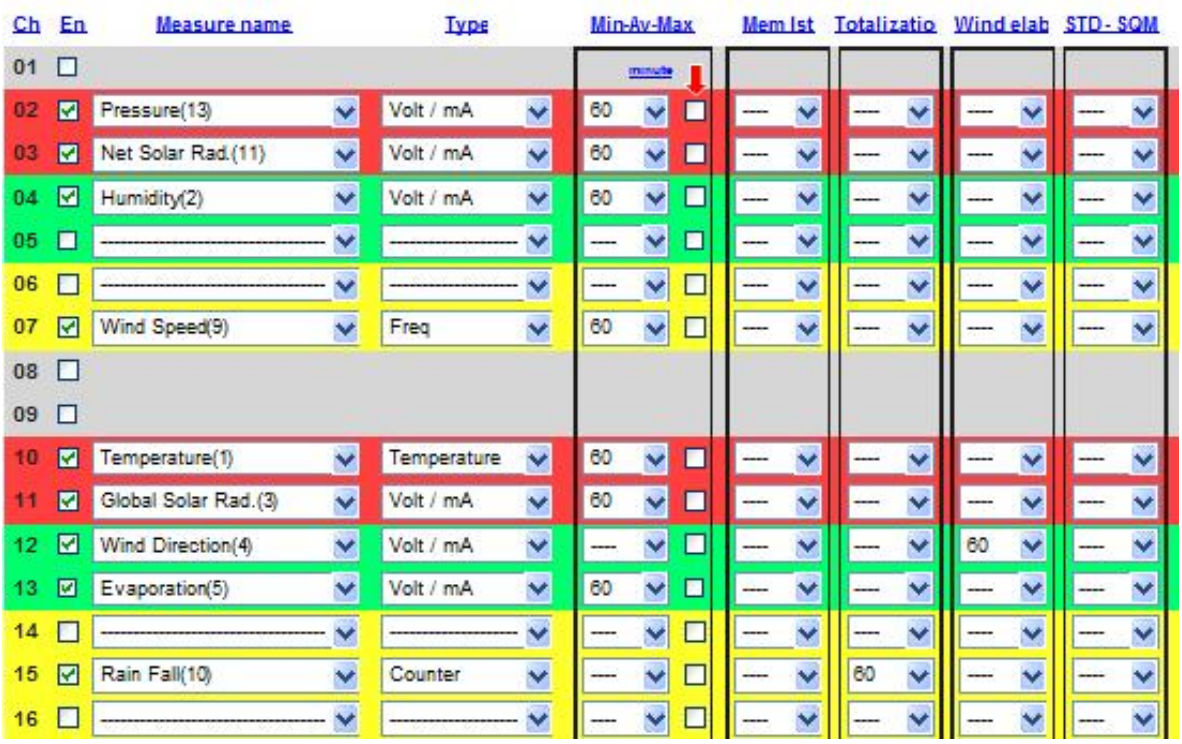
To create a simple configuration, follow the following steps:

Step 1

Access the first configuration page as described in the previous paragraph and set up the parameters at the top of the page:


- Enter the name of the terminal (alphanumeric name) desired. This name will not be listed in the record plot of the memorised or transmitted files (see Appendix A), in this case, "Example".
- Enter the terminal identification number (ID). This will be listed both in the memorised data file name and in the data plot. In this case "000001" or 001
- Select the data logging/sending period (data transmission will occur only if there is a GPRS modem), in this case once an hour, so every "60min".
- Set the time zone or leave the default value (GMT-1 for the Rome time zone) and the NTP server if there is an internet connection (via GPRS, modem or otherwise), in this case we will leave the field blank because we will use the operating system clock.

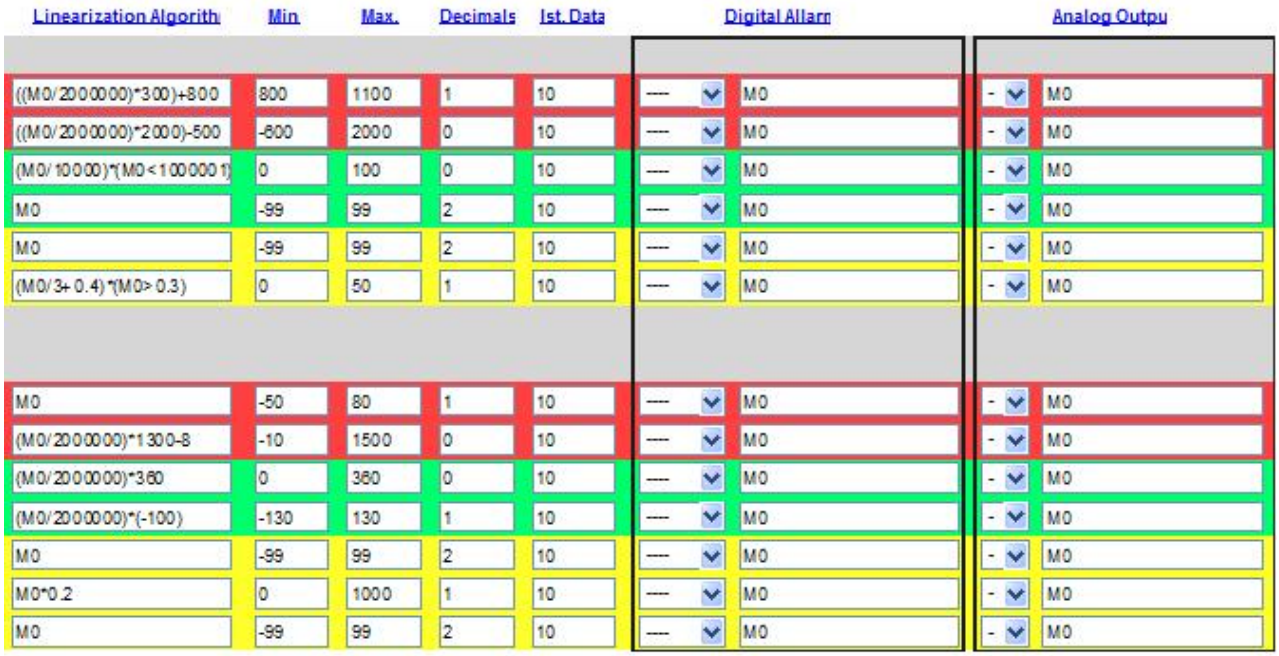
On the second part of the page on the left side, we will set some channels for acquisition of the standard temperature, pressure, humidity, etc. readings:




English

- Beginning on the left, we will enable the channels which we intend to use for our configuration, that is 2, 3, 4, 7, 10, 11, 12, 13, 15.
- Now we will choose from the list of measurements the ones suitable for our application for each channel, so Pressure, Net solar radiation, Humidity, Wind speed, Temperature, Global solar radiation, etc.
- Now we will choose the type of electrical measurement which corresponds to the chosen measurement. We can refer to the technical data sheets of the sensor which we intend to connect. Usually the type of electrical output which the sensor has is indicated on these. For example, for the wind speed sensor, we have a sensor with a frequency signal output, so the type of measurement we choose will be: frequency. On the other hand, for rain measurement, we will always choose count.
- For each measurement we will establish which processes we want the TMF data logger to perform, setting the time interval within which this process should be done. In this case we will choose the average of the minimum and maximum each hour for almost all of the measurements, so every 60min. NOTE: the time chosen for the process must not exceed the data logging/sending time. For the wind direction and rain measurements we choose two different processes: wind and accumulation respectively, both every 60min.

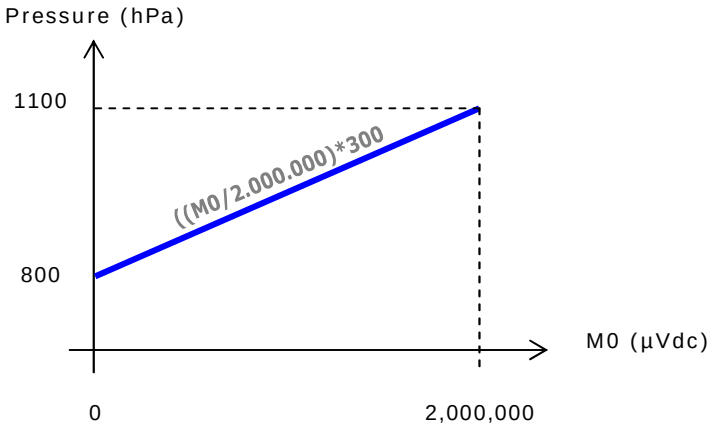
On the right side of the page we set up the corrective formulas and the measurement validation parameters, remember that they are expressed in Engineering units.



| Linearization Algorith | Min | Max. | Decimals | Ist. Data | Digital Allarm | | Analog Outpu | |
|---|---|---|---|---|---|---|---|---|
| ((M0/2000000)*300)+800 | 800 | 1100 | 1 | 10 | --- | M0 | - | M0 |
| ((M0/2000000)*2000)-500 | -600 | 2000 | 0 | 10 | --- | M0 | - | M0 |
| (M0/10000)*(M0<1000001) | 0 | 100 | 0 | 10 | --- | M0 | - | M0 |
| M0 | -99 | 99 | 2 | 10 | --- | M0 | - | M0 |
| M0 | -99 | 99 | 2 | 10 | --- | M0 | - | M0 |
| (M0/3+0.4)*(M0>0.3) | 0 | 50 | 1 | 10 | --- | M0 | - | M0 |
| M0 | -50 | 80 | 1 | 10 | --- | M0 | - | M0 |
| (M0/2000000)*1300-8 | -10 | 1500 | 0 | 10 | --- | M0 | - | M0 |
| (M0/2000000)*360 | 0 | 360 | 0 | 10 | --- | M0 | - | M0 |
| (M0/2000000)*(-100) | -130 | 130 | 1 | 10 | --- | M0 | - | M0 |
| M0 | -99 | 99 | 2 | 10 | --- | M0 | - | M0 |
| M0*0.2 | 0 | 1000 | 1 | 10 | --- | M0 | - | M0 |
| M0 | -99 | 99 | 2 | 10 | --- | M0 | - | M0 |

- The corrective formula is an algorithm which is used both to linearise a measurement and to convert the electrical size into Engineering units. M0 represents the raw measurement expressed in µV (micro volts) which goes from 0 to 2,000,000 or centigrade for only the temperature. In order to determine the correct algorithm we first need to know the measurement range of the instrument which we will be connecting to our data logger. Beginning from the first channel, we have a pressure reading barometer with a range from 800~1100hPa in Engineering units and a 0~2Vdc output signal. Therefore, we have an range of 300hPa (1100-800) and an initial reading point of 800hPa. The angular coefficient of our linearisation line will be given by the relationship between M0 and the maximum range in µV (2,000,000) multiplied by the range in Engineering units (300). To this an initial offset of 800 will then be added which represents the minimum value measured by the sensor with the 0Vdc output.

English




The final formula which represents the linearisation line will therefore be: hPa=((M0/2.000.000)*300)+800.

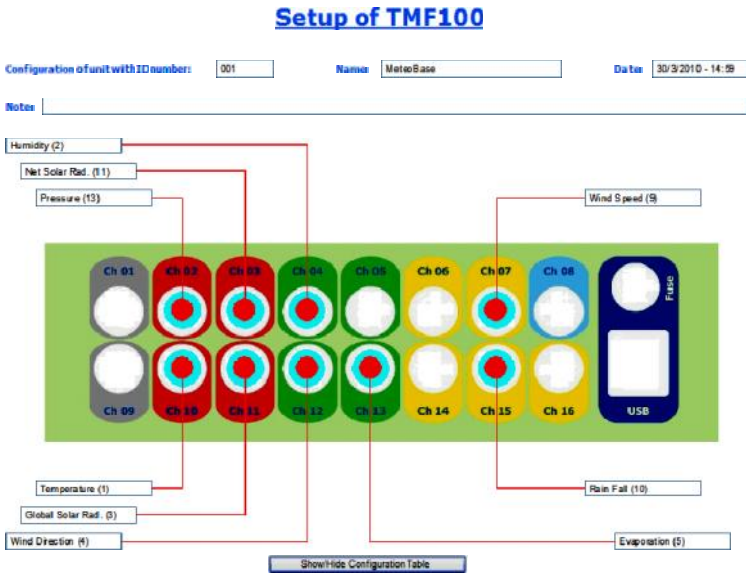
In the same way for the net solar radiation with a measurement range from -500~1500W/m$^2$ also with a 0~2Vdc output signal, for the same considerations we will have: W/m$^2$= ((M0/2000000)*2000)-500.

- Again starting with the technical specifications of the sensors we wish to connect, we define the minimum and maximum acceptable values in Engineering units, therefore 800 minimum and 1100 maximum for pressure and -500 minimum and 1500 maximum for net solar radiation.
- We will choose the number of decimal points with which we want the measurement to be represented in engineering units (max 4 characters).
- We will leave the default setting for the instant data sampling at 10 seconds.
- If we do not need to set the alarms, we can move on to the next step, otherwise follow the indications in the next paragraph.

Step 2

Once the first configuration page has been completed, move on to the second page if you need to set data transmission parameters (see the previous paragraph), or click the apply button to activate the switchboard with the new configuration. In this case, the machine will restart and you must wait about 30 seconds before it reconnects.

If desired, you can print out the configuration first in order to correctly connect the sensors to the switchboard's physical channels as explained in chapter 5.



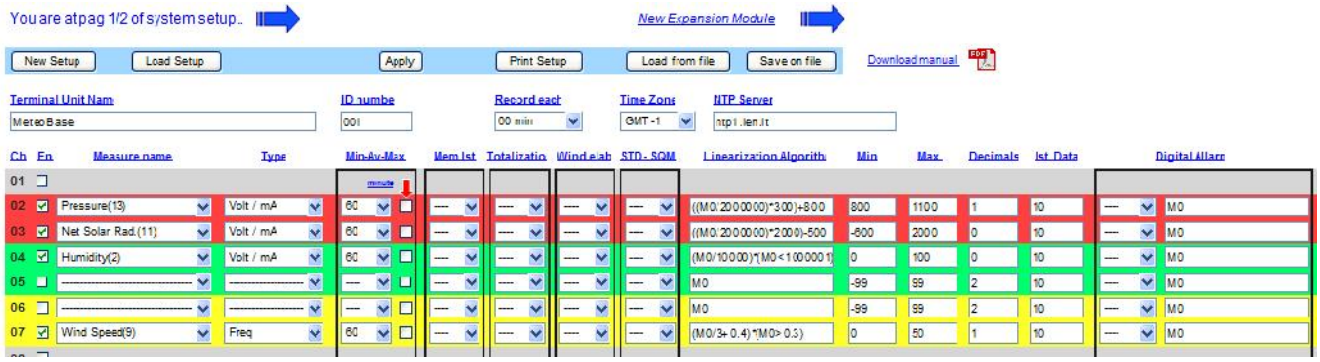

English

## 4.4 Alarm configuration - example.

As previously described, the TMF is capable of controlling and generating different types of alarms for each channel. Let's say that we want to activate an alert sms on the minimum battery voltage. Remember that the reading is always expressed in Engineering units after the application of the corrective formula, so in Volts.

Step 1

Open the switchboard configuration page where we'll say that there is a configuration of 4 channels as shown below.




In the digital alarm column of channel No. 5 (Battery Voltage) we select the SMS alarm, setting Sms.1

We enter the Boolean condition which will generate the alarm (algorithm). In this case we want an sms to be sent when the battery voltage drops below 15 Volts.

We will enter: M402<15, where:

(M402<15) = 1 (true) ⇒ send sms with alarm message

(M402<15) = 1 (false) ⇒ send sms with alarm reset message

The value M402 represents a precise location of machine memory to which the battery voltage reading is associated, that is, it represents the result of a process which is obtained with the corrective formula, or the value of the measurement in Engineering units, in this case Volts.

The value of the location which must be entered is obtained by positionally following the measurements in the configuration. The battery voltage in our case is the fourth measurement, therefore we will enter M4. The other two digits are obtained by entering the process code associated with the measurement which the machine will recognise:

02: instant
12: average
13: minimum
15: maximum
48: accumulation in the last hour (for rain)

Therefore, in our example, M402 is the location which contains the instant data of the fourth measurement, which is the battery voltage.

English

If you need to associate an hysteresis for a measure for pre-alarm or alarm, you can insert it into the formula of activation. The memory location to be used is the Mx98 that contains this state of measurement:

0 -> normal

1 -> preallarm

2 -> allarm

In the example shown above, we have to write, in case of pre-alarm threshold: (M402 <(12 + M498 * 0.2))

The system will activate an alarm for battery voltages less than 12V (because M402 and M498 = 12V = 0), subsequently M498 is set to 1 and therefore the threshold of the return will be at 12 + 1 * 0.2 = 12.2 V.

Above this threshold the alarm will retract and the location M498 is brought back to 0.

Step 2

Move on to the second configuration page and go to the third section where there is an "SMS Management" area. Enter the programming string in the first free field of the 4 which are available.


For example, the string:

[SMS/123456789/Low Battery Alarm/Reset Battery Alarm/+/1.sms]

The meaning, as described in the previous paragraph is:

Send an SMS to phone number 123456789 with the Low Battery Alarm text if the value is less than 15V and send the Reset Battery Alarm text if the value is higher. Add to the text the value of the battery voltage reading

In fact, the first field is the SMS directive which tells the data logger that everything which follows has to do with the sms messages.

The second field is the mobile number of the on call personnel.

The third field is the alert message (max 40 characters).

The fourth field is the alarm reset message (max 40 characters).

In the fifth field, "+" indicates that the measurement will be added, or "-" in order not to include the value in the sms.

The sixth field is the indication of which sms slot is occupied, in this case 1.sms associated with Sms2 of the previous web configuration page.

Note: At machine start up, the data logger always sends an alarm reset sms with a value of -9999.

In detail, an example of composition of the SMS that is sent to a mobile phone is as follows:

PA 01 - 49.7 – ID026

Where:

- PA is the stringted as SMS text(Pre-allarm, Allarm)
- 01 is the result of the formula of alerting, in this case we are in the pre-alarm
- 49.7 is the measure value who generated the alarm
- ID026 is the ID's measure who generated the alarm (in this case 26 = Estensimetr)

English

Addendum: modification of the sending time for the data as a function of an alarm condition

A further evolution linked to alarm conditions, is the ability to change the recording time of the measures, as a function of alarm events.

In the main configuration page, next to the station name, you can insert between braces, four parameters, which are intepretati by datalogger.


The first parameter is the period of observation that, in case of alarm, will be the new recording time and then sending the data record processed. The value is in seconds.

The second parameter is the period of observation that, in case of pre-alarm, will be the new recording time and then sending the data record processed. The value is in seconds.

The third parameter acts only on the extent of precipitation (Rain Gauge), and represents the moving window of observation for the extent accumulated. Time is in seconds. If within this window, an alarm event occurs, determined by the formula of an alarm, then you have a recording of the alarm..

The fourth parameter indicates whether, in addition to storing the alarm it should be also transmitted. If this parameter is 1 then, in case of alarm, all data records will be immediately transmitted, without wait the timing scheduled in “Record each”.

If this parameter is 0 then, in case of alarm, all data records will be transmitted, as the timing scheduled in “Record each”.

English

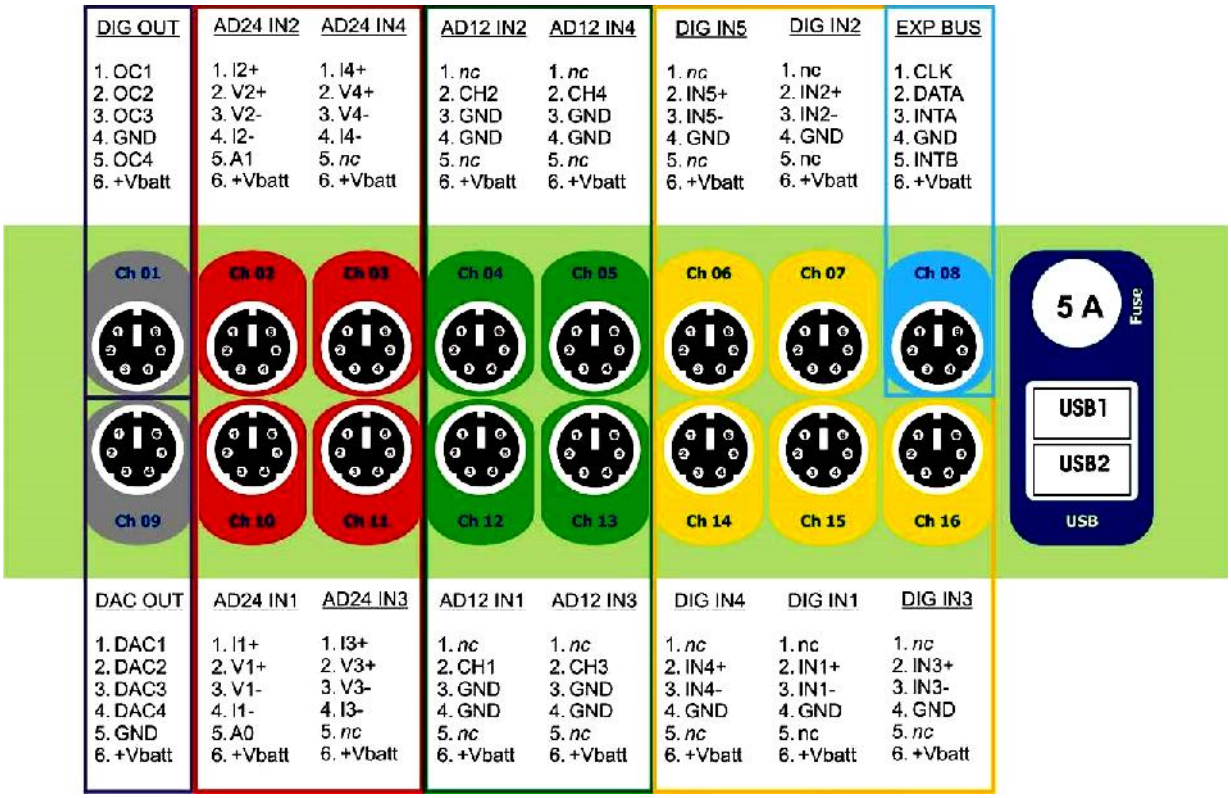
# 5 Physical connection of the sensors to the TMF

An Nesa TMF100 terminal is able to manage, in its basic configuration, the following acquisition channels:

- 8 analogue inputs configured as follows:
  - 4@24 bit precision analogue inputs
  - 4@12 bit precision analogue inputs
- 5 digital inputs, counter and frequency type
- 4 powered analogue inputs with 12 bit precision
- 4 digital outputs, open drain for relay command
- Measurement of the battery voltage and the solar panel (burglar alarm), always present.

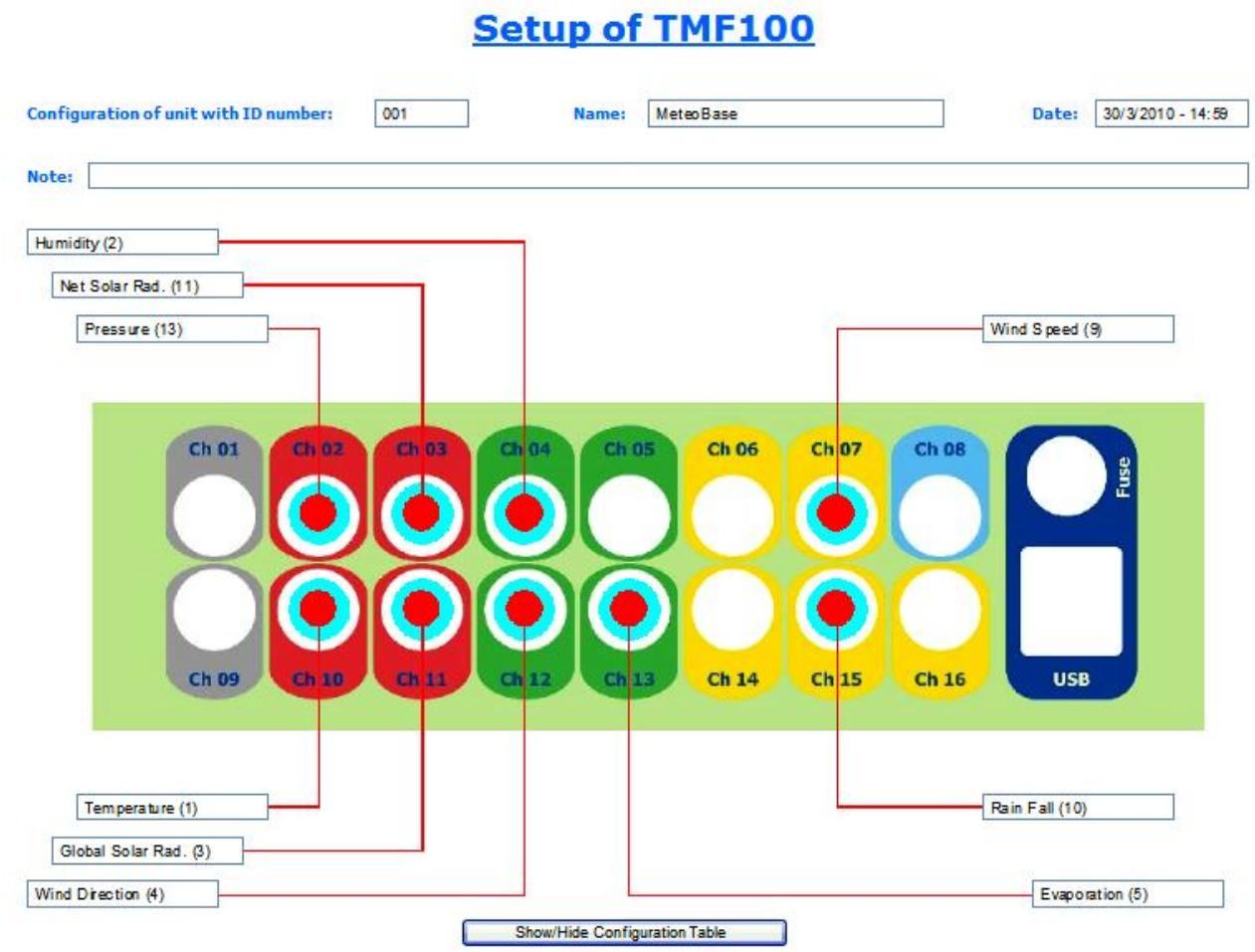
NOTE: Before connecting a sensor to the switchboard, ensure that it is switched off. Only switch on the switchboard after the sensor is connected in order to avoid electric shock which could irreparably damage it.

Each acquisition channel has pins according to the electrical amount to be acquired as better specified below.
The connectors are Ps2 standard type connectors. If using Nesa cables, they need to be equipped with the relative connector, otherwise you can use the diagram below to make your own connector.
The colour of each channel physically corresponds to the colours on the configuration page.

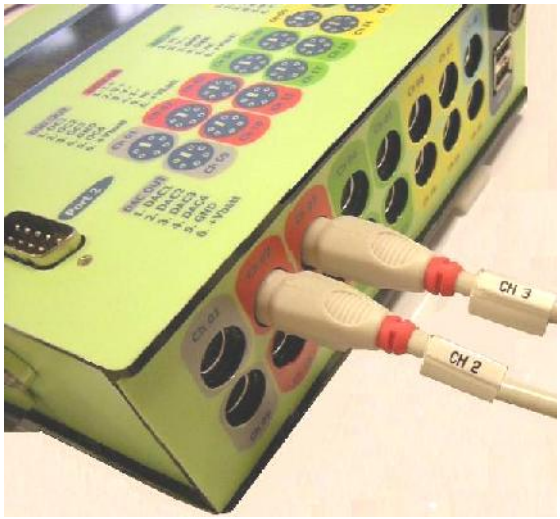



With reference to paragraph 4.3, the relative configuration printout anticipates the connection of nine sensors to the respective PS2 inputs.

English




If using assembled Nesa or Ps2 cables, insert them one at a time with the machine off into the relative channel, pushing the connector the whole way in so that the plastic of the connector is touching the TMF terminal. Pay close attention to the orientation of the connectors without forcing them and without damaging the connectors themselves.




We recommend that you number or mark the cable with a code which allows them to be easily identified even from a distance.

Only after having connected all the sensors can the machine be turned on.

If you are not using Nesa or if you are using particular sensors, it may be necessary to use an interface between the Ps2 and the sensor which, besides aiding the mechanical connection, also represents an electrical adjustment. For more details see paragraph 5.1 .

English

## 5.1 M2Ch sensors interface.

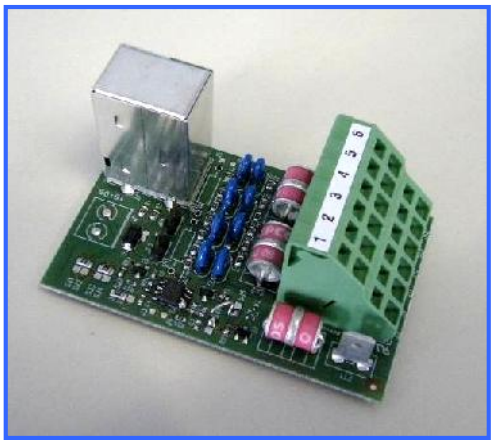
The Nesa M2CH sensor protection board is configured as an accessory to the TMF series data logger in order to make the wiring of the connected sensors more flexible and to increase protection against overvoltage in the data logger's acquisition channels.

Using a single board, two acquisition channels can be acquired and protected.

The board is made up of three main parts:

1) double clip terminal block to allow easy wiring even of non NESA sensors
2) a double PS2 connector for direct connection to the TMF family data logger
3) a protection against overvoltage via gas diodes and varistors

A reference voltage of 2 Volts has also been introduced, available on pin 5, in order to improve non- Nesa potentiometric sensor interfacing; the minimum load on this pin must be greater than 2Kt. There is also a ground connection available on the board via a "faston" connector which is necessary to make the overvoltage protection effective.

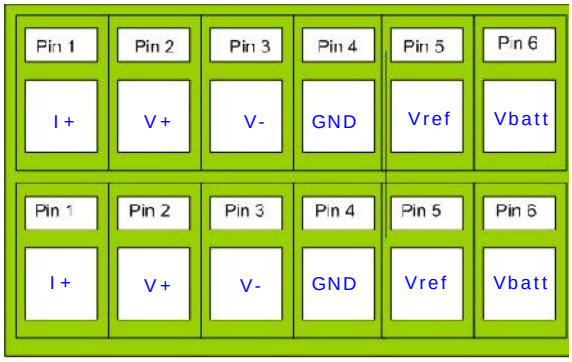


The board power supply is provided directly by the data logger's battery or power supply, or optionally, where it is necessary to use a separate power supply, via the use of a screw terminal block.

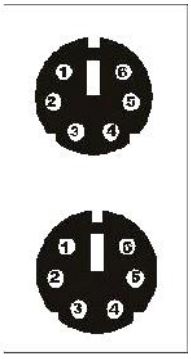
The M2CH board comes with a DIN bar mounting adaptor. The use of the M2CH protection board is recommended for installations in sites which are particularly subject to overvoltages due to lightning, such as raw in acquisition systems (wind towers) or for otherwise difficult to connect sensors.

### Electrical connection of the sensors

The clip type connector pins are PS2 on one side and the signals present are the following:




Upper Terminal Block



Lower Terminal Block

| | Signal |
|---|---|
| 1 | I+ |
| 2 | V+ |
| 3 | V- |
| 4 | GND |
| 5 | Vref (2Vdc) |
| 6 | +Vbatt |

Technical characteristics:

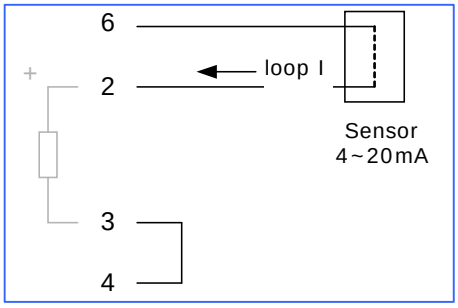
| | |
|---|---|
| Sizing voltage discharger: | 25V max |
| Atmospheric test current (10/350uS): | 500A |
| Current rating: | 300mA |
| Temperature range: | -40÷+85°C |
| Insulation class: | IP20 |

English

Connection examples

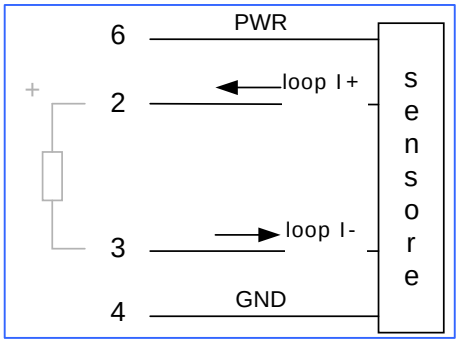
4~20mA loop power 2 wire sensor

Pin 1: not connected
Pin 2: V+
Pin 3: V-
Pin 4: connected to Pin 3 + shielding
Pin 5: not connected
Pin 6: +Vbatt



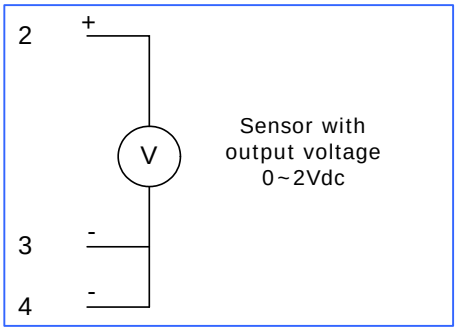

4~20mA loop power 4 wire sensor

Pin 1: not connected
Pin 2: V+
Pin 3: V-
Pin 4: connected to Pin 3 + shielding
Pin 5: not connected
Pin 6: +Vbatt



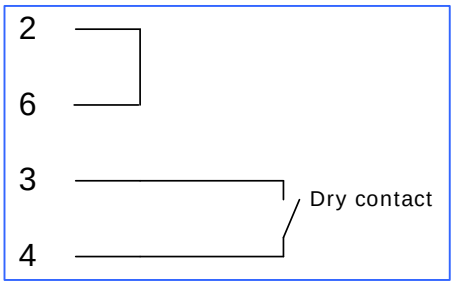

0÷2V sensor

Pin 1: not connected
Pin 2: V+
Pin 3: V-
Pin 4: connected to Pin 3 + shielding
Pin 5: not connected
Pin 6: not connected




"Open collector" frequency sensor

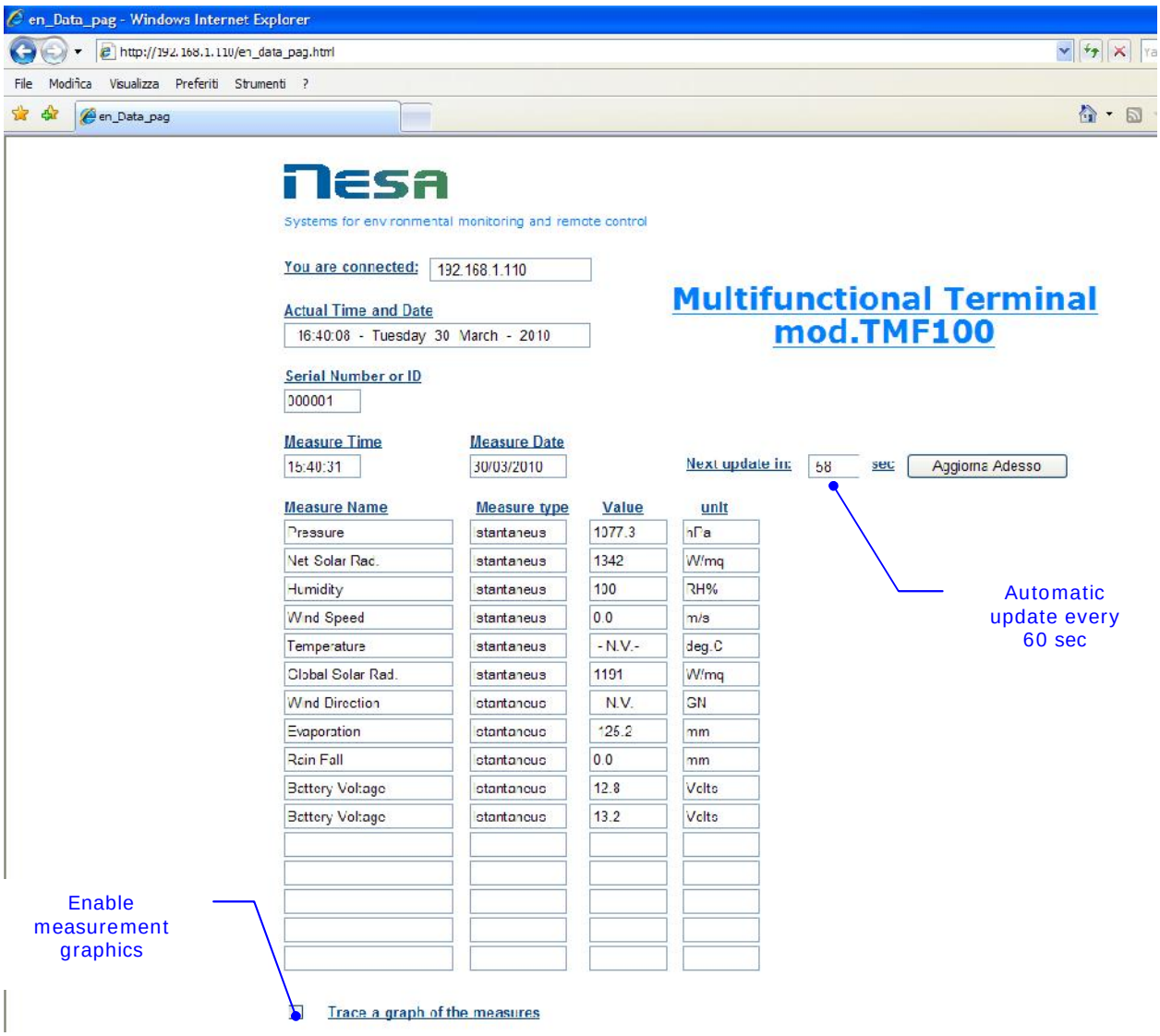
Pin 1: not connected
Pin 2: connected to Pin 6
Pin 3: frequency input
Pin 4: GND + shielding
Pin 5: not connected
Pin 6: connected to Pin 2




English

# 6 Access to the data page and the graphics via Web

Following the indications in chapter 4 from the first configuration page, click on the instant data button.
A page will open which shows, depending on the configuration set, the value of the instant data acquired by the TMF.

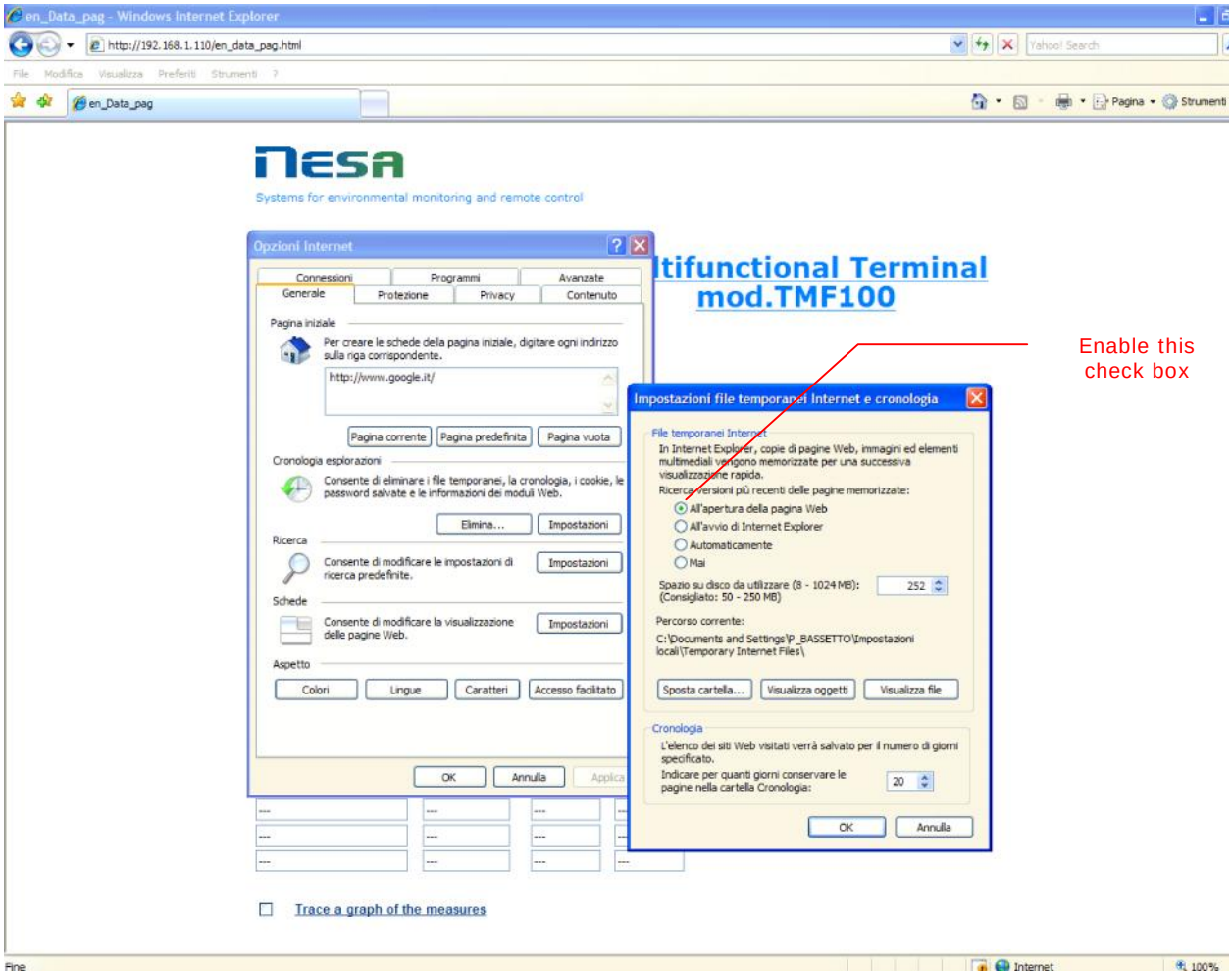



The measurement list follows the measurements in the configuration sequentially (see paragraph 4.1), showing the associated identification number for each one (see Appendix A). Besides the type of measurement (instant), the acquired values already in Engineering units and their units of measurement will be shown.
This measurement table which only shows the first 16 configurable channels of the TMF, updates automatically every 60 seconds. For a more frequent update, click on the "Update now" button. Besides the data, the data and time of the measurement with respect to the date and time of the connected PC as the IP address associated with the machine will be shown.

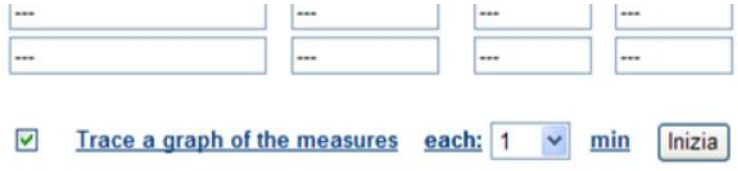
NOTE: in order to always have updated measurements, the browser cache must be deleted via the appropriate browser tools menu. We recommend enabling the option to always search for the most recent version of the web page

English

each time the page is opened. This option is present in all browsers and for Internet Explorer it is in the tools →internet options →history and navigation settings menu as show in the figure below:




On the bottom part of the page there is a check box which, if enabled, shows an option which anticipates the possibility of plotting the graphics and measurements. The graphics will be plotted by points at selectable time intervals starting from 1 minute upt o one data every 1440 minutes for particularly slow measurements. Click the "start" button to move to a page for the representation of the graphics as shown in the next figure.




The graphics are plotted on the instant data and not the historical data, therefore they begin to be plotted from the moment in which the page opens and the validity ends when the page closes. This is why we talk about "graphically following the measurements".

English

The advantage of a page with graphics lies in the immediacy of discovering anomalies in the measurements which would otherwise not be noticeable from only numerical representations. Alsoit allows a comparison to be made between the measurements, for example in the event of maintenance operations.

The option to print out the page allows the user to have a report on the operational status of the machine with the connected sensors without having to use other processes.

Up to four double axis Cartesian diagrams are viewed in order to represent up to two measurements simultaneously on the same diagram with two colours and two line thicknesses of different demarcations.

Each axis bears the name of the measurement, the unit of measurement and its identification number.

Therefore, 8 measurements are represented in all.

For rain and wind direction, the representation is made via a cup and a compass respectively.


To return to the first page (home), you must repeat the operation from the beginning, re-entering the IP address of the TMF terminal in the address bar.

English

# 7 Data encryption

On the TMF configuration page in the "Log Every" selection, in the options list there are time intervals followed by the suffix "cr".

These intervals allow the file to be logged/sent in encrypted format in order to guarantee maximum data security.

The double Hash key 128 bit encryption algorithm allows completely illegible files to be generated unless the reader has the public and private key and the relative deciphering program.

The public key is normally communicated to upon delivery of the TMF terminal, while, in order to have the private key and relative deciphering program, you must contact NESA Srl at 0423.985209 or via e-mail at tecnico@nesasrl.it, providing your personal details and the product serial number, in order to be able to identify the private key which is then sent via registered mail.

# 8 Operational diagnostics

After start up of the TMF machine, the following messages appear in order on the display:

**oooooooooooo**

**Attendere prego...**

| | | | |
|---|---|---|---|
| **SN123456** | | : | Serial number of the TMF terminal |
| **Parametri** | **OK** | : | Machine parameters Test |
| **Fuso orario** | **OK** | : | Time zone set up Test |
| **Ciclo LCD** | **OK** | : | LCD commands Test |
| **Expa** | **OK** | : | Test of any expansion modules |
| **SysLogd** | **OK** | : | System log Test |
| **AD24** | **OK** | : | 24 bit analogue/digital acquirers |
| **Sec. Giuliano** | **OK** | : | Date and time Test |
| **Digitali** | **OK** | : | Digital inputs and outputs Test |
| **Acq. Oggetti** | **OK** | : | Object acquisition cycle Test |
| **Costanti** | **OK** | : | System fixed values Test |
| **Start ciclo** | **OK** | : | Correct acquisition cycle Test |

**Attesa dati istantanei...**

If any of the tests fail, the machine will stop and the last correct test performed will be shown on the display. Depending on the configuration, the configured measurements will begin to appear in sequence on the display.

Troubleshooting table

| Problem | Possible causes | Solution |
|---|---|---|
| The machine does not turn on. | No voltage power, dead battery, incorrect power connection. | Check the wiring and the presence of at least 12Vdc power over the +Vbatt and Gnd terminals of the power connector. |
| The machine stops in one of the tests during start up. | Internal hardware error. | Repeat machine start up. If the problem persists contact Nesa technical support. |
| The measurements appear on the display but not the data. | Incorrect configuration or incorrect connection of the sensors | Check the configuration, check correct insertion of the Ps2 plugs which connect the sensors or check the sensor wiring. Ensure that the sensor is not damaged |
| Only some measurements appear on the display but not all. | Damaged sensors or plugs which are not fully inserted, incorrect configuration. | Check the sensors, their wiring and connection, and check the configuration. |
| The measurements of channels 2, 3, 10 and 11 do not appear. | Hardware problem with the high resolution acquisition system (24bit). Breakdown due to overvoltage or incorrect connection. | Contact Nesa technical support for repair. |
| I am not able to connect with the switchboard. | Unsuitable network cable (not crossed), incorrect configuration of the IP address class in your computer, firewall or other devices designed to block external connections. | Check the type of Ethernet cable and its correct insertion into the PC and TMF plugs.<br>Verify that your computer's IP address is in the same range as the TMF address (default is 192.168.1.110, subnetmask 255.255.255.0) |
| I always see the same data on the web page | browser cache is not updated | Delete the browser cache from the tools menu and set the browser to always search for an updated version of the page every time it is opened. |

English

| | | |
|---|---|---|
| The configuration which is loaded does not correspond to the one set | browser cache is not updated | Delete the browser cache from the tools menu and set the browser to always search for an updated version of the page every time it is opened. |
| Even though the sensors are working, the data on the plot appears as asterisks "*". | Possible configuration error of the minimum and maximum validation parameters. Sensor out of scale or functioning incorrectly. | Check the values set for the minimum and maximum measurements in the TMF configuration. Verify that the sensor functions correctly. |
| After start up the display stays off. | Standby activated, display possibly broken, possible hardware breakdown. | Turn the machine off and on or try to connect to it with a LAN cable via web. If necessary, contact Nesa technical support for repair. |

# 9 Converting data to Excel® format with web Export

The TMF series switchboards acquire, process and store/transmit data according to the set configuration.
In case of storage, the data files in text format ("*.txt") are stored in a back-up area of about 32mb inside the machine. Besides this area, the files are stored in an industrial type external USB storage device connected to one of the two USB ports of the machine.
This memory has a market capacity of anywhere from 512MB to 4GB.
If there is a GPRS communication terminal connected to the TMF, a copy of the data is sent via FTP protocol to a predisposed internet area.
In other words, there are always at least 2 or 3 (in case of GPRS) areas where all of the historical data acquired can be found.
The files have a format, or a plot described in Appendix A, which is in standard ASCII format.
Together with the switchboard a software application is provided which works only in Internet Explorer, which allows the historical data files to be downloaded and converted from ASCII into Excel® format for immediate processing and interpretation. Besides the conversion, this application allows a backup to be made of the data, dividing it by switchboard ID, year and month.
This application is called "Esporta Web" (Web Export). Suitable for operating systems with UTF 8 encoding.

## 9.1 Installation

Installation of the application is quite simple and requires the "setupEW.exe" file which is found on the CD which came with the TMF terminal to be launched. Simply follow the on-screen instructions.
The installation takes place in to parts: the first one copies the web page from the application into the selected folder (usually "C/Program Files/Nesa/ EsWeb), and a second part to install ActiveX FathFTP which is necessary for the correct execution of the program. In this case also, simply follow the on-screen instructions.

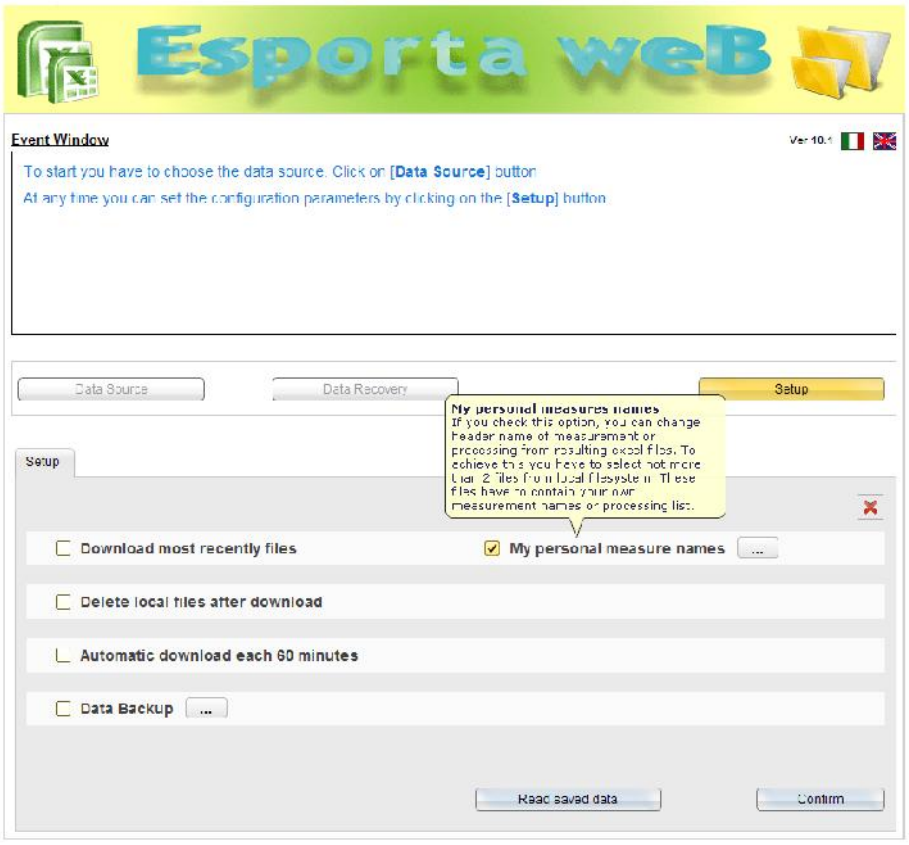

Once the installation is complete, launch the program either from the Programs menu or by double clicking the icon on the desktop.
The program requires that Internet Explorer (version 6 or higher) be installed. It will not work with other browsers. Upon start up, it may ask permission to execute ActiveX which would otherwise be blocked ("allow execution of blocked content - allow").

## 9.2 Configuration

Upon start up the program appears as a simple window with a log to indicate the operations to be performed.


English

If it is the first use, we recommend setting some configuration parameters.




Click on the Configuration button. A second part of the window in the lower part will open up to allow enabling/disabling of some options described below. In order to understand what each option means, simply place the mouse over the text and a brief call-out will appear with all of the information necessary for the use or function.

Once the desired options have been selected, click on the "Confirm" button. The configuration will be automatically saved after confirmation to be reused for subsequent use of the program.

Options Description:

| | |
|---|---|
| Download most recently files: | If selected, this allows only the most recent data to be downloaded from the source (TMF; External Memory, FTP Area) which have not yet been downloaded, otherwise, all content will be downloaded from the source folder. |
| Delete local files after download: | All of the files downloaded from the source (TMF; External Memory, FTP Area), will normally be placed in a local folder where they can be maintained in storage or deleted after conversion to Excel format if this option is enabled. |
| Automatic cycle each 60 minutes: | If you keep the program active (web page open), every 60 minutes an automatic download and conversion cycle will be performed on the data from the same source only if this option is selected. |
| Data backup: | Allows an organised backup of the data to be performed. A folder will be created with a name which corresponds to the ID of the TMF terminal which generated the data and all of the original *.txt files will be subdivided by year and month in this folder: C:/Program Files/ Nesa /ESweb/Backup/ ST000001/Year/month..). Right click on this option to browse the backup folder directly. |
| My personal measure names: | The Excel file which is created lists, in each column, the name of the measurement, the ID and the type of measurement. The list of names which the program uses to create the file Excel is a standard list by default. This can be customised (it is a simple text file) by giving personal |

English

names to the measurements. for example, if there are two temperatures in the data plot, in the standard configuration the Excel file will be created with two columns generically called Temperature (they will differ only in the numerical identification associated), while in the customise configuration, you can name them, for example, Ground Temperature and Temperature at 2 metres.

Several customised files can be created and selected by right-clicking the option.

## 9.3 Use of the program

Export Web allows you to:

- manually or automatically download from any source (TMF terminal, USB external memory, remote FTP area) all of the processed or historical *.txt files created by the TMF series switchboards.
- Create a copy of an organised backup by TMF terminal ID, year and month of all the original files downloaded.
- Create an Excel with a name which corresponds to the date of creation, which contains all of the data already in columns in numerical format by date and time with the possibility of customising the names of the columns.

NOTE: the program only works with non-encrypted files, see chapter Errore. L'origine riferimento non è stata trovata..

Use of the program is immediate. Simply follow the instructions written on the upper part of the window (operations log). The first operation to be performed (after any necessary configuration) is to choose the source of the data to be imported:


Click on the button at the bottom of the sub-window which allows you to choose from 3 possible data sources:

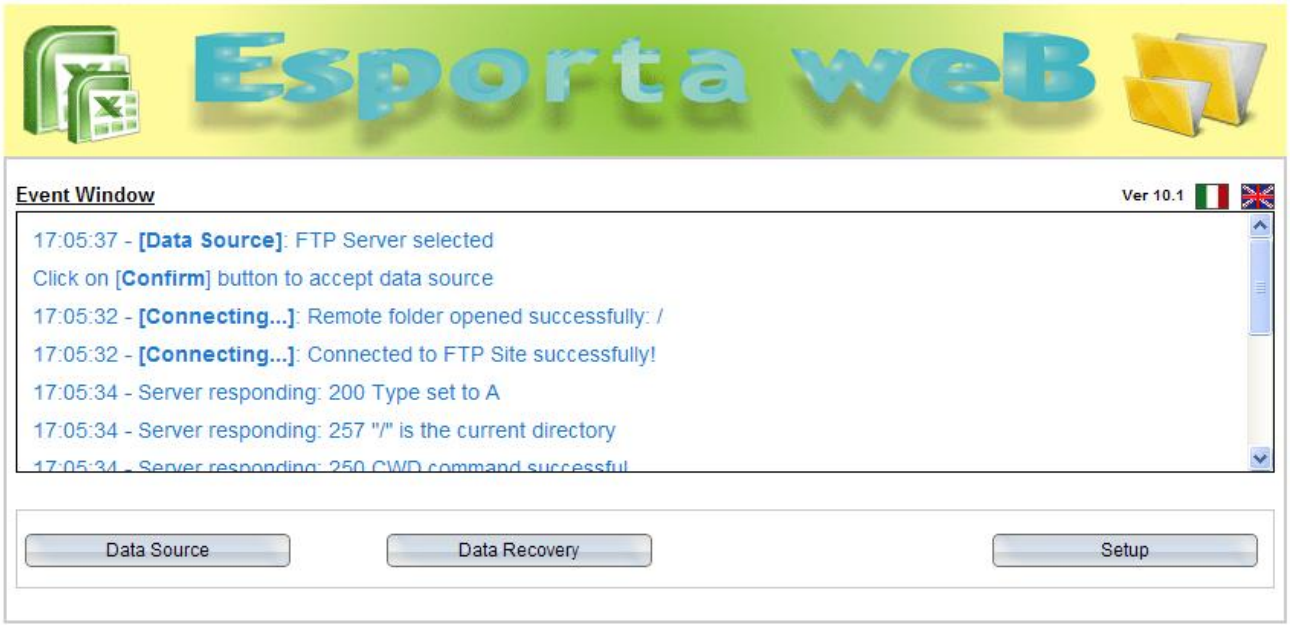
FTP Server: this is a remote area which contains data sent from the TMF terminals (ex: via GPRS). Access to this area requires connection parameters to be configured.

Local TMF terminal or station: this is a direct connection to a TMF terminal, realised with a cross Ethernet LAN cable. Simply enter the address of the terminal.

USB key or Local Drive: this is a local folder on the PC or a generic peripheral connected to it.

English

After clicking the "Connection" button, wait until the log shows the successful connection message and then click on



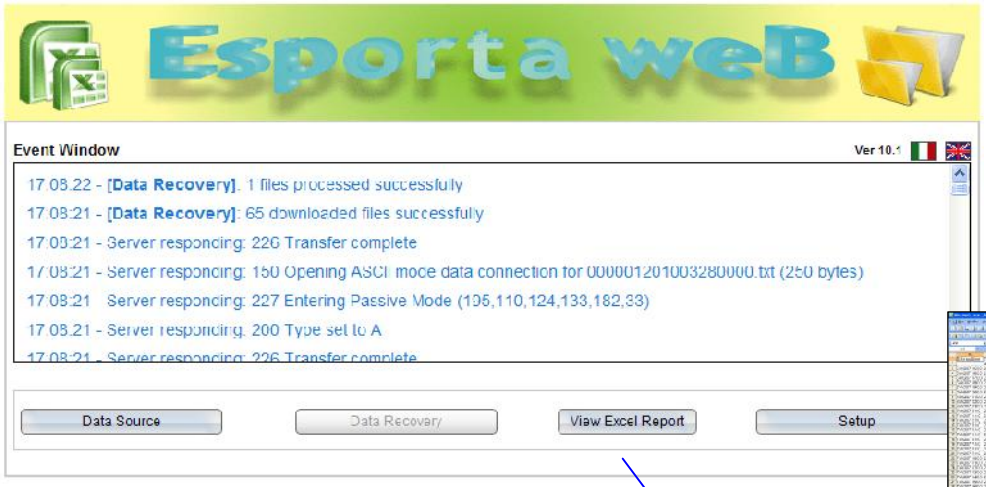

the "Confirm" button.

Then click on the "Data Recovery" button to download the data from the source and store it in a temporary folder called "input" for conversion. During the transfer, which can last from a few seconds to several minutes depending on the configuration settings and the quantity of the data files present at the source, you will be asked whether or not to delete the data from the source after download.

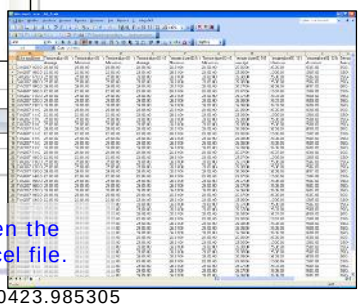
If you accept deletion, all of the files at the source will be physically deleted only after successful transfer from the source to Esporta Web, otherwise they will remain available at the source for future download.

During the download, the Excel file will automatically be generated. At the end of the download the .... button will appear which allows you to open the Excel file which has just been created.

NOTE: More than one Excel file could be created if there are more than 20,000 rows in a single file. This decomposition of the files, performed to overcome a technical limit in Excel which does not manage high numbers of rows, allows you to manage extremely large data tables.




In the operations log the number of files downloaded and the number of recently processed files will be indicated.



Button to open the generated Excel file.

English

# 10 Technical specifications

The Nesa model TMF100 acquisition terminals used as a programmable data acquisition switchboard for data acquisition in environmental monitoring and distance-control networks. Model TMF100 is able to process complex algorithms based on the acquired data thanks to a 32 bit microprocessor

Model TMF100 is able to interface with numerous peripherals if necessary, thanks to numerous analogue and digital inputs/outputs, as well as a channel expansion, all without having to structurally modify the terminal.

The communication protocols utilised for data transfer and communication with the terminal are:

FTP (File Transfer Protocol)

HTTP (Hyper Text Transfer Protocol).

Telnet

NTP (Network Time Protocol)

Modbus

The terminal can be connected to one or more data collection centres via common transmission systems (Ethernet LAN, RS232/RS485, modem, radio, mobile telephone, satellite, wireless, etc...) allowing complex monitoring networks to be realised and absorbing minimum operational energy. In fact, it is possible to use the terminal even in areas where supply voltage is not available, but with alternative power supply systems (ex: solar panel, wind generator).

The management unit is also equipped with:

- LCD Display 2 rows 24 characters which typically allow local viewing of instant data, date/time and any operation parameters.
- Date time high precision programmable quartz clock with remote server synchronisation feature; the clock has a lithium backup battery.
- Reset and watchdog hardware for accidental system arrest and automatic reset with storage of a log file with the restart event.
- 2 RS232 serial communication interfaces (optionally RS485).
- 2 USB ports hotplug with automatic recognition of the flash drives, wireless ZigBee device, etc.
- 1 LAN interface for 10/100Mbit Ethernet communication.

Detail:

| | |
|---|---|
| Processor: | ARM9 (166MHz |
| Analogue inputs:<br>Pt100/0÷2Vdc/4÷20mA | 4 @ 12bit<br>4 @ 24bit |
| Analogue Outputs:<br>(Vmax 0~2Vdc) | 4 @ 12bit |
| Digital inputs: | 5 frequency inputs |
| Digital outputs: | 4 open drain |
| Communication ports: | 2 RS232<br>2 USB Host<br>1 LAN Ethernet 10/100Mb |
| Internal data memory: | From 32MB |
| External data memory: | Industrial USB flash drive 256~4GB |
| Date clock | quartz with battery backup and automatic update via NTP |
| Consumption: | 80mA (stand by <20mA) |
| Power: | 10,5Vdc ÷ 15Vdc |
| Dimensions: | 177x118x60mm |
| Operating temperature: | -30 ÷ 70 °C |
| Weight: | 0,8 Kg |
| Dimensions: | 177x118x60mm |

English

# Appendix A Summary of the data record plot

The TMF series data logger stores or transmits a text file in ASCII format which, in its minimal form, has a structure defined as follows:

S, ID_SENS, ORA, DATA, ID_MIS1, Tipo_ELAB_MIS1, DATO, ID_MIS1, Tipo_ELAB_MIS2, DATO, ... , ID_MIS1, Tipo_ELAB_MISn, DATO, ... , ID_MISm, Tipo_ELAB_MISn, DATO, #

The various fields of the plot have the following definitions:

ID_SENS: this is an entire long and is unique for each data logger terminal/station manufactured by Nesa srl

ORA: time of the record in hh,mm,ss format

DATA: date of the record in gg,mm,aa format

ID_MISm: ID of the same measurement associated with the station/sensor.

Example:
1 = Temperature
2 = Humidity
3 = Pressure
4 = Wind direction
5 = Wind speed
6 = …..

Tipo_ELAB_MISn: ID of the same process provided by the switchboard associated with the same measurement acquired.

Example:
1 = Instant
2 = Average
3 = Minimum
4 = Maximum
5 = Min. Minimum
6 = Min. Maximum
7 = …..

DATO: data associated with the same process provided by the switchboard associated with the same measurement acquired. The nature of the data and the relative formatting depend on the type of signal acquired. The record ends with # .

If in the same file several records are present, they are stored on different lines, therefore at the end of each line the characters CR (0xA) and LF (0xD) are present.

If there are several measurements of the same type, the identifier of the second measurement will be inserted with an offset of 50 (fifty) added to the identifier of the previous one: for example, if there are three temperatures in a configuration and the first identifier is 1, the second will be 51 and the third will be 101.

In storing the data, if there are measurements outside of the interval of acquisition, a * (asterisk) will be inserted in the plot instead of the data.

Example:

S,000001,00,05,00,12,03,2006,1,1,16.8,1,2,16.8,#

S,000001,00,10,00,12,03,2006,1,1,16.8,1,2,16.9,#

In the above example, you will notice that the file is made up of two records from different times, coming from TMF terminal No. 0000001: two temperature data were sent, instant and average.

English

# Appendix B Table of measurements and processes

## Measurements

| ID | Measurement | Unit of measurement |
|---|---|---|
| 1 | Temperature | °C |
| 2 | Humidity | RH% |
| 3 | Global solar radiation | $W/m^2$ |
| 4 | Wind direction | GN |
| 5 | Evaporation | mm |
| 6 | Hydrometric Level | cm |
| 7 | Phreatic Level | cm |
| 8 | Battery Voltage | Volt |
| 9 | Wind speed | m/s |
| 10 | Precipitation | mm |
| 11 | Net solar radiation | $W/m^2$ |
| 12 | Snow Depth | cm |
| 13 | Pressure | hPa |
| 14 | Voltage | mV |
| 15 | Evapotranspiration | mm |
| 16 | Leaf Soaking | min |
| 17 | pH | pH |
| 18 | Conductivity | uS |
| 19 | Counter (digital) | pulses |
| 20 | Crack Gauge | mm |
| 21 | Slope Gauge | Degrees |
| 22 | Load Cell | KN |
| 23 | Redox | mV |
| 24 | Oxygen released | % |
| 25 | Turbidity | NTU |
| 26 | Strain Gauge | mm |
| 27 | Linear displacement | mm |
| 28 | Frequency | Hz |
| 29 | CH4 | ppm |
| 30 | THC | ppm |
| 31 | NMHC | ppm |
| 32 | Current | mA |
| 33 | Capacity | $m^3/s$ |
| 34 | CO | ppm |
| 35 | NO | ppb |
| 36 | $NO_X$ | ppb |
| 37 | $NO_2$ | ppb |
| 38 | $O_3$ | ppb |
| 39 | $SO_2$ | ppb |
| 40 | Energy | $KJ/m^2$ |

## Processes

| ID | Process |
|---|---|
| 1 | Instant |
| 2 | Average |
| 3 | Minimum |
| 4 | Maximum |
| 5 | Min. Minimum |
| 6 | Min. Maximum |
| 7 | Accumulation |
| 8 | Standard Deviation |
| 9 | Root-Mean-Square Deviation |
| 10 | Delta M1-M2 relative to T1-T2 |
| 11 | Daily Average |
| 12 | Daily Minimum |
| 13 | Daily Maximum |
| 14 | Status 0=OK 1=Pre 2=All |
| 15 | Status Measurement Value |

English