2CSG445012D0201

M2M ETHERNET

EN **ETHERNET interface user manual**

M2M

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ABB

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1 GENERAL INFORMATION

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M2M ETHERNET is a product belonging to the M2M network analyser family, equipped with an Ethernet interface with the following main functionalities:

- Integrated webserver for the management of several simultaneous accesses from different browsers through http protocol;
- MODBUS-TCP communication protocol.

Both functionalities are available at the same time.

1.1 ETHERNET NETWORK CONNECTION

M2M ETHERNET allows interfacing with the Ethernet network via a RJ45 female connector, isolated and positioned on the rear part of the casing.
The Ethernet interface has also the MDI/MDX auto-crossover functionality, which is the reason why patch cables and cross cables can be used without distinction.

1.2 SELF-DIAGNOSIS

At power-on, the M2M ETHERNET carries out the hardware interface self-diagnosis procedure.
If hardware interface initialisation faults are detected, the instrument will display the message ETH MODULE ERROR. In this case, contact the ABB service assistance.
The self-diagnosis procedure carried out by the instrument at power-on is related to the internal hardware initialisation, therefore any possible error connected to the integration of the instrument into a network is not detected.

ABB cannot be held liable for any damage or personal injury arising from incorrect or improper use of its equipment.

This document is subject to changes without prior notice.
This manual refers to the instrument firmware version of V. 2.20 or later.

2 CONFIGURATION

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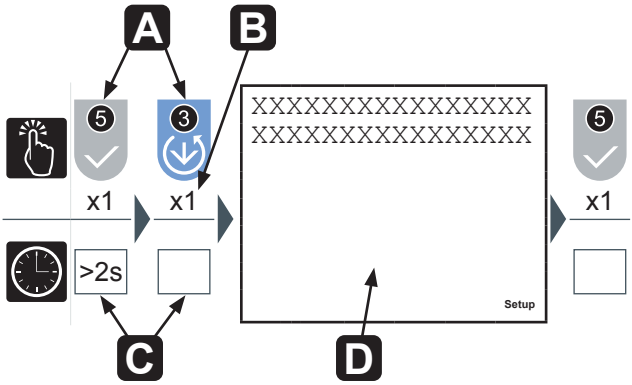
2.1 PAGES ACCESS

The access to the device page can be done by pressing, in sequence, the control keys.
The following layout explains the meaning of the symbols used in this chapter.



A	Control key sequence
B	Number of times to press the control key
C	How long to press the control key
D	Page shown after having carried out the sequence at point A

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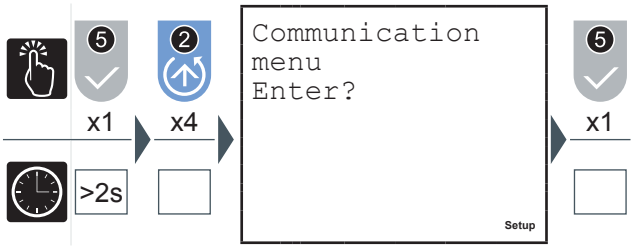
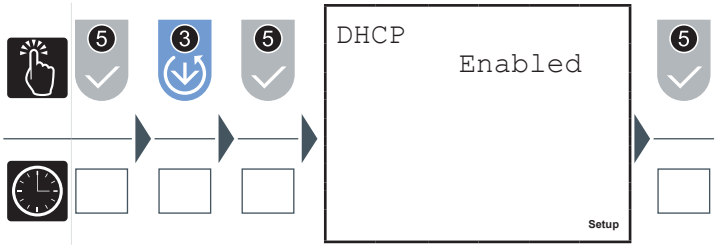
2.2 INSTRUMENT SETUP

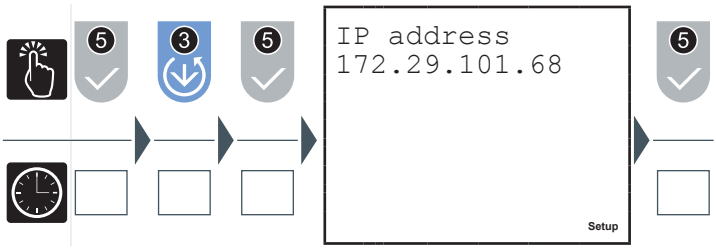
The M2M ETHERNET set-up requires a few simple configuration steps in order to give to the instrument a location on the network and an ID for its recognition.



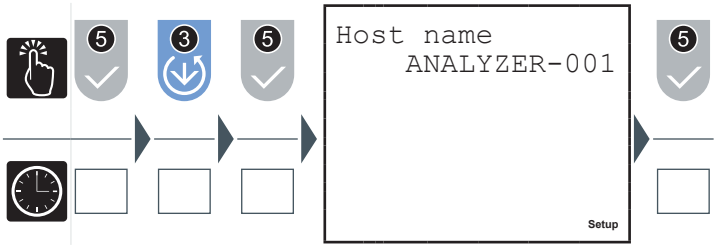
In the COMMUNICATION MENU it is possible to enable/disable the DHCP (Dynamic Host Configuration Protocol) selecting:



- **"Enabled"** to enable the device dynamic addressing in the network;
- **"Disabled"** to disable the device dynamic addressing in the network and assign a static address to it.



If the DHCP is disabled, it is possible to set the instrument IP address browsing in the COMMUNICATION MENU using the 3 button until the IP ADDRESS screen. When the DHCP is enabled, the IP address obtained from the DHCP is shown on this page.



Browsing in the COMMUNICATION MENU with the 3 button until the Host name configuration menu allows to assign an identification text to the instrument.
It is possible to change the last 3 numeric characters within the range 001 ÷ 999; therefore, the host name is ANALYZER-xxx (xxx = 001 ÷ 999). The Host name is used to access to the instrument using the name instead of the IP address, which is especially useful when the address is obtained dynamically (DHCP enabled).

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NOTES:

- The instrument does not accept an IP address such as: 0.0.0.0;
- Each time the network cable is disconnected from the instrument or if, with DHCP enabled, it cannot be reached or as long as it has not assigned any address, the IP address is automatically set on 255.255.255.255;
- The Host name is managed by the NetBios service. In the networks that do not have this service, it is possible to access to the instrument by means of its IP address.

All set-up settings can be configured also using the Ethernet interface via browser, accessing to the “Network” Webserver menu.

2.3 DEFAULT SETTINGS

The instrument default settings are the following:

- DHCP = Disabled
- IP = 192.168.1.239
- Host name = ANALYZER-001

2.4 CONFIGURATION

When first configuring the instrument, it is possible to proceed in one of the following ways:

1) Enable the DHCP from the instrument set-up menu, connect the M2M ETHERNET to the Ethernet network and then access to the instrument using any Browser (Internet Explorer, Mozilla Firefox, etc.) from a PC connected to the network, typing **http://analyzer-001** (default Host name).

Access to the instrument via its Host name is only possible if the NetBios service is enabled on the PC.

At this point it is possible to conveniently change the different configuration parameters. If the Host name is not available, check from the instrument set-up menu the IP address assigned to it (IP ADDRESS page in the COMMUNICATION MENU) and use it to access.

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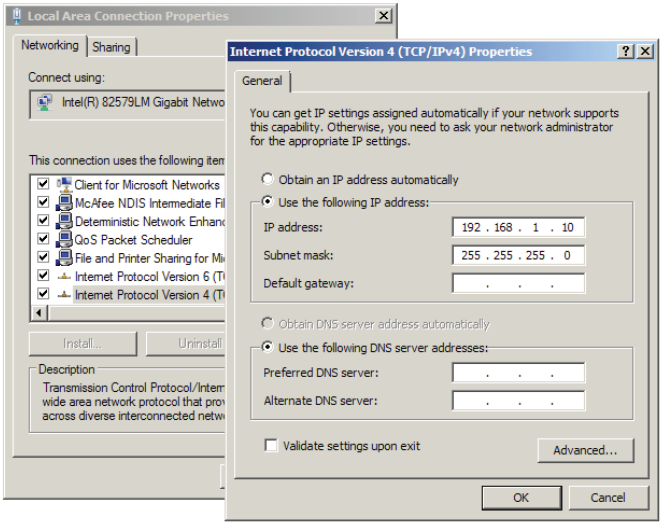
2) Preliminarily configure the PC with IP address = 192.168.1.xxx, where xxx is a value different from 239, and Subnet mask = 255.255.255.0. In order to do this, access the *Control Panel → Network and dial up connections → Local Area Connection (LAN) → Properties → Internet Protocol (TCP/IP)* (*Properties*) and select "*Use the following IP address*". Set IP and Subnet mask with the values indicated above, press OK and confirm all the settings. Restart the PC to enable the changes made.



After restarting the PC, with the instrument DHCP disabled, it is possible to access to the Webserver in one of the following ways:

- Connecting the PC directly to the M2M ETHERNET using a network cable, making a point-to-point connection;
- Connecting the PC to the Ethernet network, if no devices with IP address = 192.168.1.239 and 192.168.1.xxx (xxx = address previously set on the PC) are present in the network.

After that it will be possible to access to the instrument by using any Browser (Internet Explorer, Mozilla Firefox, etc.) and typing **http://192.168.1.239** or **http://analyzer-001**.

At this stage it is possible to conveniently change the different configuration parameters.

If there are problems when it is opened the Web page, check that the proxy server is disabled.

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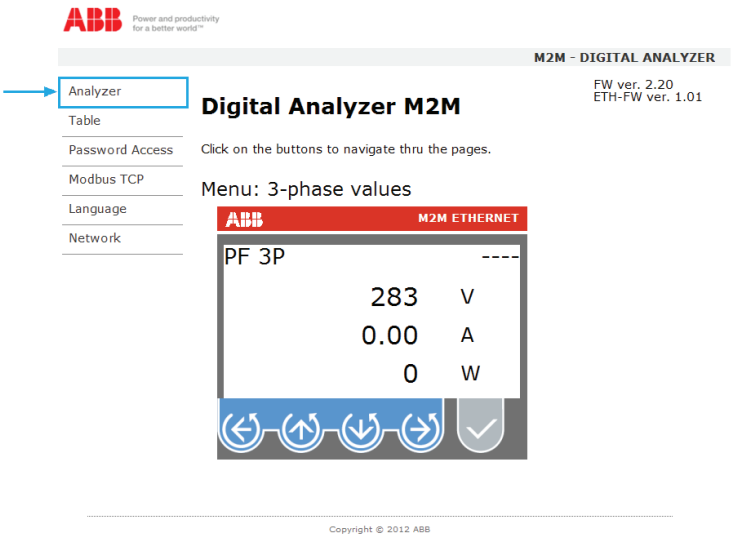
3 ACCESS TO PAGES WEBSERVER FUNCTION

The instrument has an internal Webserver to make some of the display and configuration pages available for the user.
The Webserver makes available a virtual instrument on the remote user PC. It is possible to access the instrument by using any Browser (Internet Explorer, Mozilla Firefox, etc.) and typing **http://instrument -IP-address** or **http://instrument-host-name**.
The first page that is displayed after the access to the instrument is the ANALYSER MENU, where you can navigate the instrument in the same way used for field navigation.

3.1 ANALYSER MENU



Navigation in the display pages is practicable by means of the keys on the instrument, in the same way used for the real instrument.

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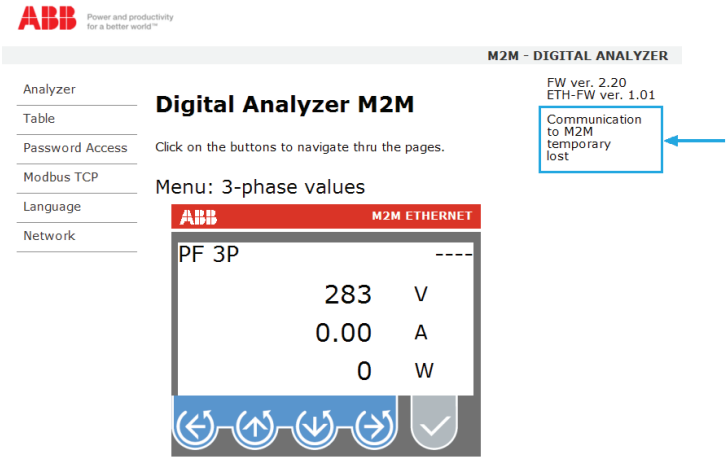
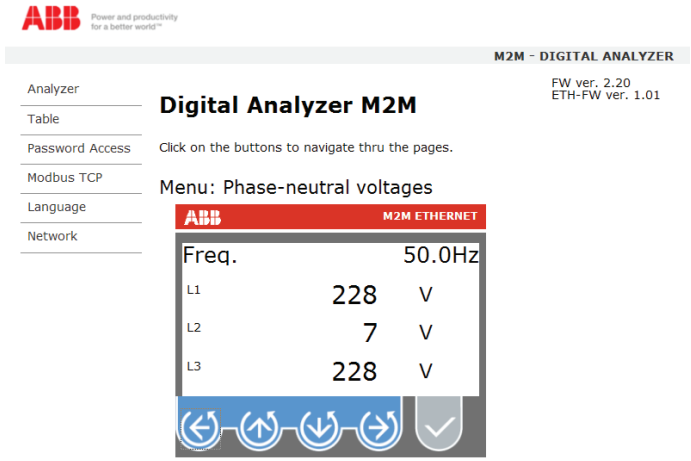
Some display visualisations from the browser are shown in the following examples. If there are errors in the communication, the corresponding error message will be displayed.



Rated voltage display

The display of phase-neutral voltages is performed by pressing key on the instrument navigation template once.



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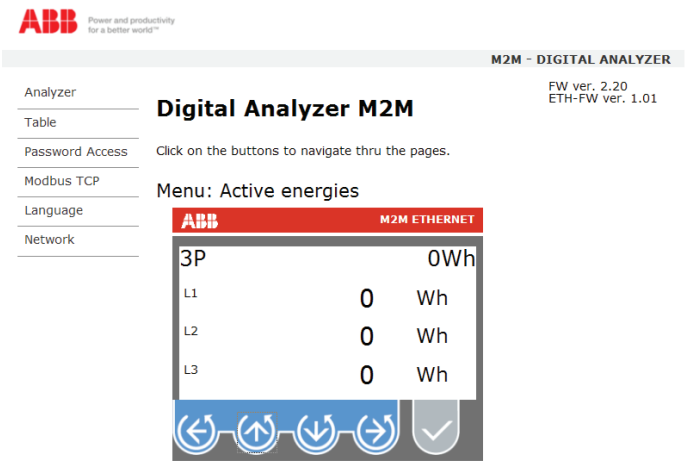
Active energies display

Energy display is performed by pressing key on the instrument navigation template.



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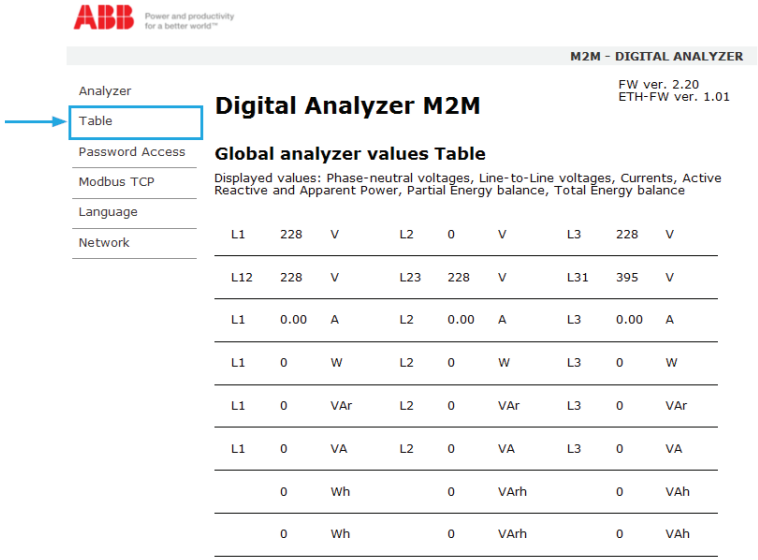
3.2 TABLE MENU

Selecting TABLE MENU on the top left, it is possible to display the main quantities measured by M2M in a tabular format.



Following the order presented in the visualization above, the parameters in the table represent:

- Rated voltages;
- Linked voltages;
- Currents;
- Active power;
- Reactive power;
- Apparent power;
- Partial energy balance;
- Total energy balance;

The total energy balance represents the difference between absorbed and generated energy, whereas the partial energy balance represents the difference between absorbed and generated power during a lapse of time defined by the user on the field instrument.
If the measurement function on four quadrants is not active and the instrument is set for measuring only absorbed or consumed energy, partial and total energy balances represent the produced or consumed energy only.

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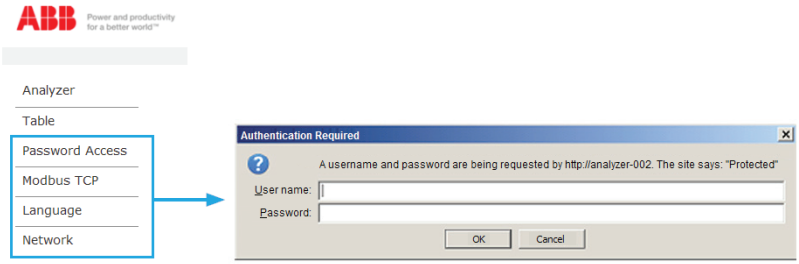
3.3 AUTHENTICATION MENU

The ANALYSER and TABLE menus are menus for the access to the display of electric parameters measured on the field by M2M. The access to these two pages is possible through a connection via browser in the ways described in chapter 2.
The access to MODBUS TCP, LANGUAGE and NETWORK menus is protected by authentication with User name and Password since they allow to access configuration pages.
Selecting the AUTHENTICATION MENU it is possible to display the page for the modification of Password and User name.



The access to the AUTHENTICATION MENU is also protected, to allow only administrator users to modify the credentials.
The access credentials set by default are:

- User name: **admin**;
- Password: **admin**.

After entering the correct access data valid for the session open in the Browser, it is possible to modify Password and User name and access to the other configuration menus.

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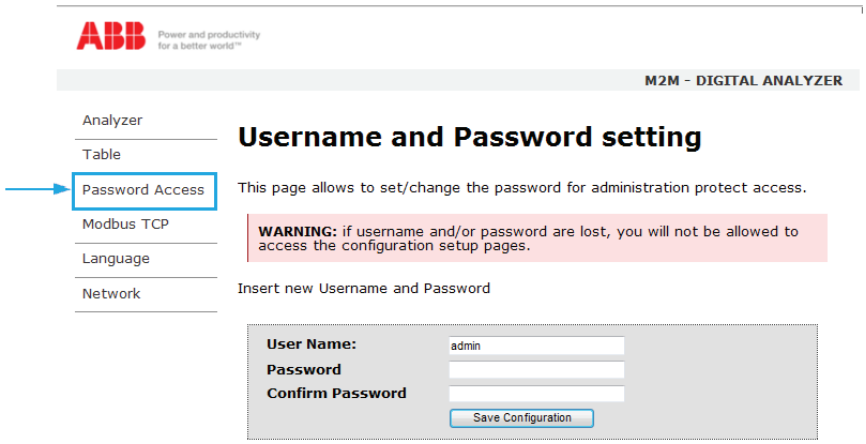
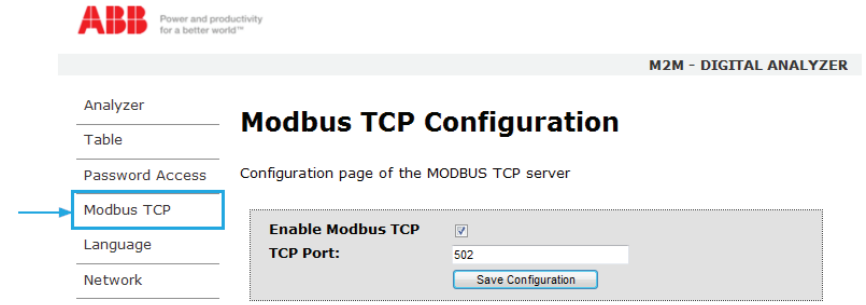


If the Password is forgotten, it is possible to perform a password reset to default settings.
For the password reset procedure, refer to paragraph 3.7.

3.4 MODBUS TCP MENU

Selecting the MODBUS TCP MENU (protected by a password), it is possible to enable the protocol on the instrument and to configure the TCP Port address (default value = 502).
Once enabled the Modbus TCP communication it is possible to communicate with M2M ETHERNET by means of a software specifically realised in compliance with the Modbus TCP protocol specifications.



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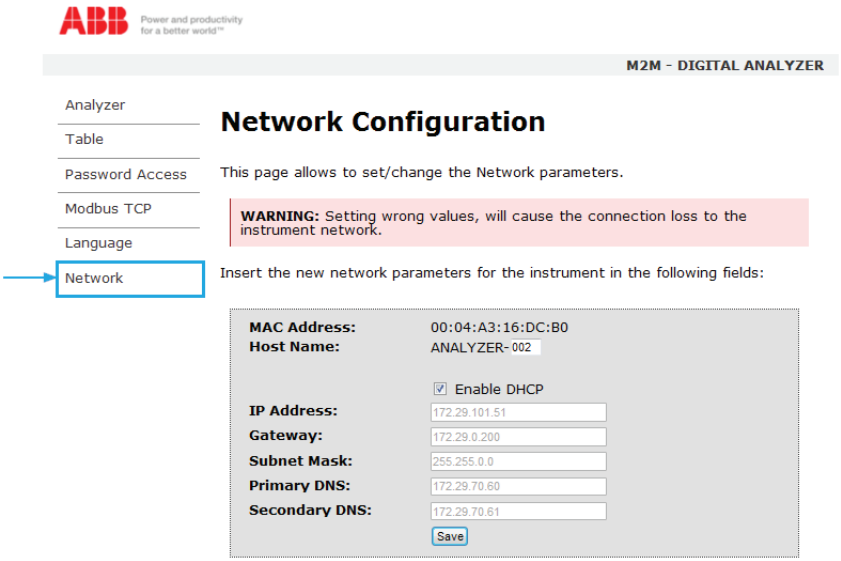
3.5 LANGUAGE MENU

Selecting the LANGUAGE MENU (protected by password) it is possible to modify the interface display language (English by default) loading the language file with .bin extension, available on the ABB site (**http://www.abb.com/AbbLibrary/DownloadCenter**). The procedure consists of downloading the necessary file on the PC, then select it in the page that is shown in the following figure.

3.6 NETWORK MENU

Selecting the NETWORK MENU (protected by password) it is possible to modify the parameters of the instrument network interface controller: Host name, IP address, etc.



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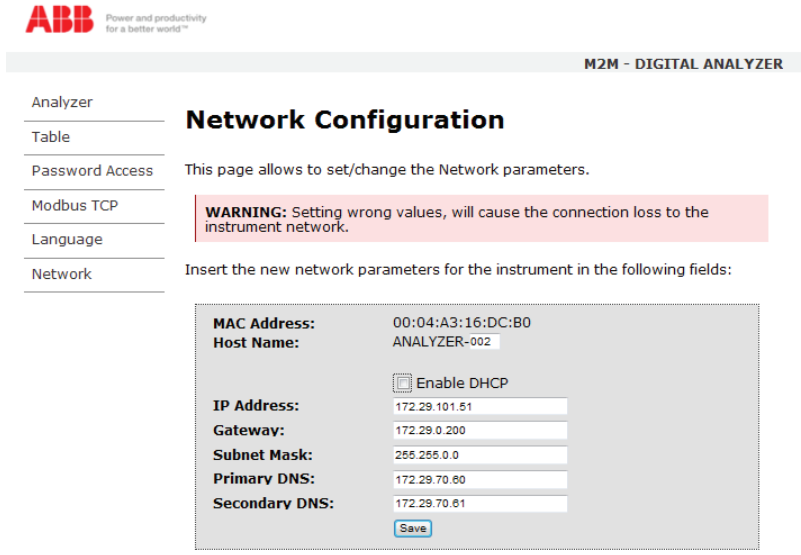
The Host name is used to access to the instrument using the name instead of the IP address, which is especially useful when the address is obtained dynamically (DHCP enabled). The Host name is managed by the NetBios service; in the networks that do not have this service, it is however possible to access the instrument by means of its IP address.
Disabling the DHCP, network parameters must be entered manually.



The Primary DNS and Secondary DNS parameters are not used.

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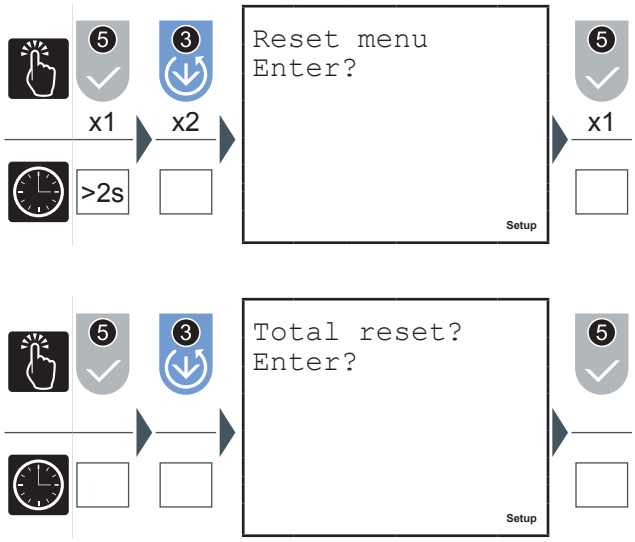
3.7 PASSWORD RESET PROCEDURE

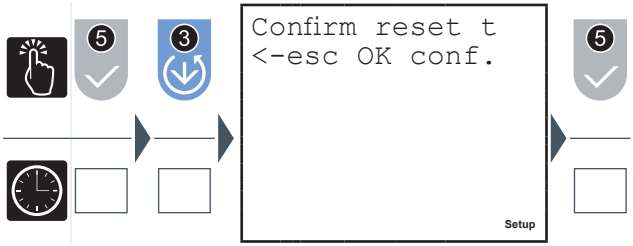
The default credentials for the access to configuration pages are:

- User name = **admin**;
- Password = **admin**.

In case the password and/or user name are lost, it is necessary to perform the "Total reset" procedure in the set-up menu of the field instrument.
It is however necessary to consider that, apart from all instrument configuration parameters, this procedure resets also peak values, average values and all energy counters of the instrument.
The procedure consists in accessing the reset menu:



Press key until the TOTAL RESET page is displayed.
After that press key to confirm the access to total reset page.



Press key ✓ to confirm the total reset.

4 MODBUS-TCP PROTOCOL

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4.1 READ HOLDING REGISTERS FUNCTION (03h)

The following pages show the quantities that the user can read from the instrument by means of the READ HOLDING REGISTERS (03h) function.
The READ HOLDING REGISTERS function reads single WORDS; Signed Long and Unsigned Long represent 2 consecutive WORDS.
Unsigned Long format indicates an unsigned binary number of 2 words (32 bit).
Signed Long format indicates a binary number of 2 words (32 bit) that, when negative, is expressed with 2's complement notation.
For example, to read the equivalent three-phase voltage, it is necessary to read the 1000h and 1001h registries consecutively, where the 1000h register is the MOST significant and the 1001h register is the LEAST significant.

Generally, with the exception of what is indicated for the power factor, if a size cannot be calculated or exceeds the allowed input measure range, an invalid value FFFF FFFFh is sent and it is shown on the display as " - - -".

Register	Quantity	Unit of measure	Variable
1000h	Three-phase system voltage	V	Unsigned Long
1002h	Rated Voltage L1	V	Unsigned Long
1004h	Rated Voltage L2	V	Unsigned Long
1006h	Rated Voltage L3	V	Unsigned Long
1008h	Linked Voltage L12	V	Unsigned Long
100Ah	Linked Voltage L23	V	Unsigned Long
100Ch	Linked Voltage L31	V	Unsigned Long
100Eh	Three-phase system current	mA	Unsigned Long
1010h	Line Current 1	mA	Unsigned Long
1012h	Line Current 2	mA	Unsigned Long
1014h	Line Current 3	mA	Unsigned Long
1016h	Three-phase system Power Factor	* 1000	Signed Long

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Register	Quantity	Unit of measure	Variable
1018h	Power Factor Line 1	* 1000	Signed Long
101Ah	Power Factor Line 2	* 1000	Signed Long
101Ch	Power Factor Line 3	* 1000	Signed Long

In reading the registries concerning the power factor, it is important to note that:

- In case of an inductive power factor, the value is positive, whereas when the power factor is capacitive, the value is negative;
- when the power factor is not defined (no current), the registries concerning the power factor return the value 2000 to indicate this particular condition, which is indicated on the M2M display as “---“.

Register	Quantity	Unit of measure	Variable
1026h	Three-phase system Apparent Power	VA	Unsigned Long
1028h	Apparent Power Line 1	VA	Unsigned Long
102Ah	Apparent Power Line 2	VA	Unsigned Long
102Ch	Apparent Power Line 3	VA	Unsigned Long
102Eh	Three-phase system Active Power	W	Signed Long
1030h	Active Power Line 1	W	Signed Long
1032h	Active Power Line 2	W	Signed Long
1034h	Active Power Line 3	W	Signed Long
1036h	Three-phase Reactive Power	Var	Signed Long
1038h	Reactive Power Line 1	Var	Signed Long
103Ah	Reactive Power Line 2	Var	Signed Long
103Ch	Reactive Power Line 3	Var	Signed Long
103Eh	Three-phase active energy	Wh * 100	Unsigned Long
1040h	Three-phase reactive energy	Varh * 100	Unsigned Long

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Register	Quantity	Unit of measure	Variable
1046h	Frequency	mHz	Unsigned Long
1060h	Max. Current L1	mA	Unsigned Long
1062h	Max. Current L2	mA	Unsigned Long
1064h	Max. Current L3	mA	Unsigned Long
1066h	Max. Three-phase Active Power	W	Signed Long
1068h	Max. Three-phase Apparent Power	VA	Unsigned Long
1070h	Aver. Three-phase Active Power	W	Signed Long

For example, if the 103Eh register reading (three-phase active Energy) has a value of 325, the active energy corresponds to 32500 Wh.

Register	Quantity	Unit of measure	Variable
1072h	Aver. Three-phase Apparent Power	VA	Unsigned Long
1074h	Active Energy L1	Wh * 100	Unsigned Long
1076h	Active Energy L2	Wh * 100	Unsigned Long
1078h	Active Energy L3	Wh * 100	Unsigned Long
107Ah	Reactive Energy L1	Varh * 100	Unsigned Long
107Ch	Reactive Energy L2	Varh * 100	Unsigned Long
107Eh	Reactive Energy L3	Varh * 100	Unsigned Long
1080h	Max. of three-phase average Active Power	W	Signed Long
1082h	Voltage THDF of Line1	* 100	Unsigned Long
1084h	Voltage THDF of Line 2	* 100	Unsigned Long
1086h	Voltage THDF of Line 3	* 100	Unsigned Long
1088h	Current THDF of Line 1	* 100	Unsigned Long
108Ah	Current THDF of Line 2	* 100	Unsigned Long
108Ch	Current THDF of Line 3	* 100	Unsigned Long
108Eh	Maximum active power demand Line 1	W	Signed Long
1090h	Maximum active power demand Line 2	W	Signed Long

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Register	Quantity	Unit of measure	Variable
1092h	Maximum active power demand Line 3	W	Signed Long
1094h	Maximum three-phase apparent power demand	VA	Unsigned Long
1096h	Maximum apparent power demand Line 1	VA	Unsigned Long
1098h	Maximum apparent power demand Line 2	VA	Unsigned Long
109Ah	Maximum apparent power demand Line 3	VA	Unsigned Long
109Ch	Aver. Active Power from pulse input CH1	W	Unsigned Long
109Eh	Aver. Reactive Power from pulse input CH2	Var	Unsigned Long

In case the THDF is not calculable, the instrument returns two words equal to FFFFh corresponding to an invalid data; this particular condition is indicated on the display with “- - -“.

Register	Quantity	Unit of measure	Variable
10A0h	Active Energy from pulse input CH1	Wh * 100	Unsigned Long
10A2h	Reactive Energy from pulse input CH2	Varh * 100	Unsigned Long
10A4h	Current threshold for timer 2 activation	mA	Unsigned Long
10A6h	Three-phase Apparent Energy	VAh * 100	Unsigned Long
10A8h	Apparent Energy Line 1	VAh * 100	Unsigned Long
10AAh	Apparent Energy Line 2	VAh * 100	Unsigned Long
10ACh	Apparent Energy Line 3	VAh * 100	Unsigned Long
10AEh	Generated three-phase Active Energy	Wh * 100	Unsigned Long

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Register	Quantity	Unit of measure	Variable
10B0h	Generated Active Energy Line 1	Wh * 100	Unsigned Long
10B2h	Generated Active Energy Line 2	Wh * 100	Unsigned Long
10B4h	Generated Active Energy Line 3	Wh * 100	Unsigned Long
10B6h	Generated three-phase Reactive Energy	Varh * 100	Unsigned Long
10B8h	Generated Reactive Energy Line 1	Varh * 100	Unsigned Long
10BAh	Generated Reactive Energy Line 2	Varh * 100	Unsigned Long
10BCh	Generated Reactive Energy Line 3	Varh * 100	Unsigned Long
10BEh	Generated three-phase Apparent Energy	VAh * 100	Unsigned Long
10C0h	Generated Apparent Energy Line 1	VAh * 100	Unsigned Long
10C2h	Generated Apparent Energy Line 2	VAh * 100	Unsigned Long
10C4h	Generated Apparent Energy Line 3	VAh * 100	Unsigned Long
11A0h	Current Transform. ratio	Units (range 1-2000)	Unsigned Long
11A2h	Voltage Transform. ratio	Units (range 1-600)	Unsigned Long
11A4h	Output pulses weight	Units (range 1-4)	Unsigned Long

The 11A4h register (Output pulses weight) presents the following possible values:

- 1: 10 Wh/Varh each pulse;
- 2: 100 Wh/Varh each pulse;
- 3: 1000 Wh/Varh each pulse;
- 4: 10000 Wh/Varh each pulse.

If the instrument uses digital outputs in Alarm mode, i.e. it does not use the pulse function, the register indicates the weight value programmed previously.

Register	Quantity	Unit of measure	Type
1200h	Partial active energy balance	Wh * 100	Signed Long

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Register	Quantity	Unit of measure	Type
1202h	Partial reactive energy balance	Varh * 100	Signed Long
1204h	Partial apparent energy balance	VAh * 100	Signed Long
1206h	€/energy factor	Cents €/kWh	Unsigned Long
1208h	CO2/energy factor	CO2 * 100/kWh	Unsigned Long
120Ah	Timer 1 free running	hh*100 + mm	Unsigned Long
120Ch	Timer 2 count-down	hh*100 + mm	Signed Long
120Eh	Aver. Active Power Line 1	W	Signed Long
1210h	Aver. Active Power Line 2	W	Signed Long
1212h	Aver. Active Power Line 3	W	Signed Long
1214h	Aver. 3-phase system reactive power	Var	Signed Long
1216h	Aver. Reactive Power Line 1	Var	Signed Long
1218h	Aver. Reactive Power Line 2	Var	Signed Long
121Ah	Aver. Reactive Power Line 3	Var	Signed Long
121Ch	Aver. Apparent Power Line 1	VA	Unsigned Long
121Eh	Aver. Apparent Power Line 2	VA	Unsigned Long
1220h	Aver. Apparent Power Line 3	VA	Unsigned Long
1222h	Max. Active Power Line 1	W	Signed Long
1224h	Max. Active Power Line 2	W	Signed Long
1226h	Max. Active Power Line 3	W	Signed Long
1228h	Max. Apparent Power Line 1	VA	Unsigned Long
122Ah	Max. Apparent Power Line 2	VA	Unsigned Long
122Ch	Max. Apparent Power Line 3	VA	Unsigned Long
122Eh	Wiring configuration	Units (range 1-4)	Unsigned Long

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Register	Quantity	Unit of measure	Type
1230h	Status	-	Unsigned Long (4 bytes)
1232h	IP address	-	Unsigned Long
1234h	Host Name	Units	Unsigned Long
1236h	Slave-ID + Ver. FW	-	Unsigned Long
1238h	Max. three-phase current	mA	Unsigned Long
123Ah	Minimum three-phase current	mA	Unsigned Long
123Ch	Min. Current L1	mA	Unsigned Long
123Eh	Min. Current L2	mA	Unsigned Long
1240h	Min. Current L3	mA	Unsigned Long
1242h	Maximum three-phase system voltage	V	Unsigned Long
1244h	Max. Voltage L1	V	Unsigned Long
1246h	Max. Voltage L2	V	Unsigned Long
1248h	Max. Voltage L3	V	Unsigned Long
124Ah	Min. three-phase system voltage	V	Unsigned Long
124Ch	Min. Voltage L1	V	Unsigned Long
124Eh	Min. Voltage L2	V	Unsigned Long
1250h	Min. Voltage L3	V	Unsigned Long

The 122Eh register (Wiring configuration) presents the following possible values

- 1: Generic insertion;
- 2: Three-phase insertion;
- 3: Balanced three-phase insertion;
- 4: Single-phase insertion.

The 1230h register (Status) respects the following logic:

BYTE	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Not used				Status OUT3	Status OUT2	Status OUT1	Status OUT0
1	Not used							DHCP
2	Not used							
3	Not used							

OUTX status = 1 → X-output active
OUTX status = 0 → X-output not active
DHCP = 1 → DHCP enabled
DHCP = 0 → DHCP disabled
The bits 2 and 3 (OUT2 and OUT3) indicate the value 0 since the M2M ETHERNET model is not equipped with the electro-mechanical outputs 3 and 4.

The 1232h register (IP Address) is composed by 4 byte; each of them describes a field of the IP address.
For example, the address 192.168.1.10 consists of:

- Byte 3 = 10;
- Byte 2 = 1;
- Byte 1 = 168;
- Byte 0 = 192.

The 1234h register (Host Name) is a number composed of 1 to 3 digits which is added to the name of the instrument for the Host-Name service (NetBios).
For example, the analyser with Host Name ANALYZER-014 returns a value of 14.

The 1236h register (Slave_ID + ver. FW) consists of the following fields, which correspond to the four bytes composing the Unsigned Long data.

BYTE	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Ver. FW (Low Byte)							
1	Ver. FW (High Byte)							
2	Slave ID							
3	00h							

For display reasons, the Ver. FW field must be divided by 100.
For example, the information 0047 012Ch corresponds to:
Slave ID = 71 (0047h)
Ver. FW = 3.00 (012Ch / 100)

EN

4.2 WRITE MULTIPLE REGISTERS (10h) FUNCTION

The following table describes the possible controls that the user can send to the instrument by means of the WRITE MULTIPLE REGISTERS (10h) function.

Register	Quantity	Unit of measure	Type
11B0h	Energy Reset Control	-	2 Word
11B2h	Min/max Peak Reset Control	-	2 Word
11B4h	Average Reset Control	-	2 Word
11COh	Output status Set Control	-	2 Word
11A0h	Current transform. ratio	Units (range 1-2000)	Unsigned Long
11A2h	Voltage transform. ratio	Units (range 1-600)	Unsigned Long
11A4h	Output pulses weight	Units (range 1-4)	Unsigned Long

To carry out a Reset Control or to pilot an Output (Output status Set Control), the user must use the Write Multiple Register control (Function 10h) in the addresses above, writing the specific value indicated in the following table:

Address	Word	Description	MS Word	LS Word
11B0h	2	Energy reset	11B0h	55AAh
11B2h	2	Peak reset	11B2h	55AAh
11B4h	2	Average reset	11B4h	55AAh
11C0h	2	Enable Output 1	11C0h	55B1h
11C0h	2	Enable Output 2	11C0h	55B2h
11C0h	2	Disable Output 1	11C0h	55A1h
11C0h	2	Disable Output 2	11C0h	55A2h

For example, to activate Output 1, it is necessary to write the value 11C055B1h (297817521 decimal) in the 11C0h address.
Generally, if it is sent a value different from those indicated in the table, the slave answers with the message: 03 “ILLEGAL DATA VALID”.

EN

The following notes refer to Output management:

- Outputs can be controlled only individually.
- Outputs can be controlled only if they have been set as Alarm function in the instrument (and not as pulse outputs).
- An output can be piloted only if it has not been activated yet due to an alarm. If the output is in alarm status, it cannot be deactivated from a remote control.

4.3 REPORT SLAVE ID (11h) FUNCTION

It is possible to obtain the ID of the queried instrument by means of the REPORT SLAVE ID (function 11h) function.
This function makes possible to obtain the FW version and ID.
The format is the one indicated in Function 3, at location 1236h, with descriptive note.
The M2M ETHERNET instrument has Slave ID = 71 (47h).

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