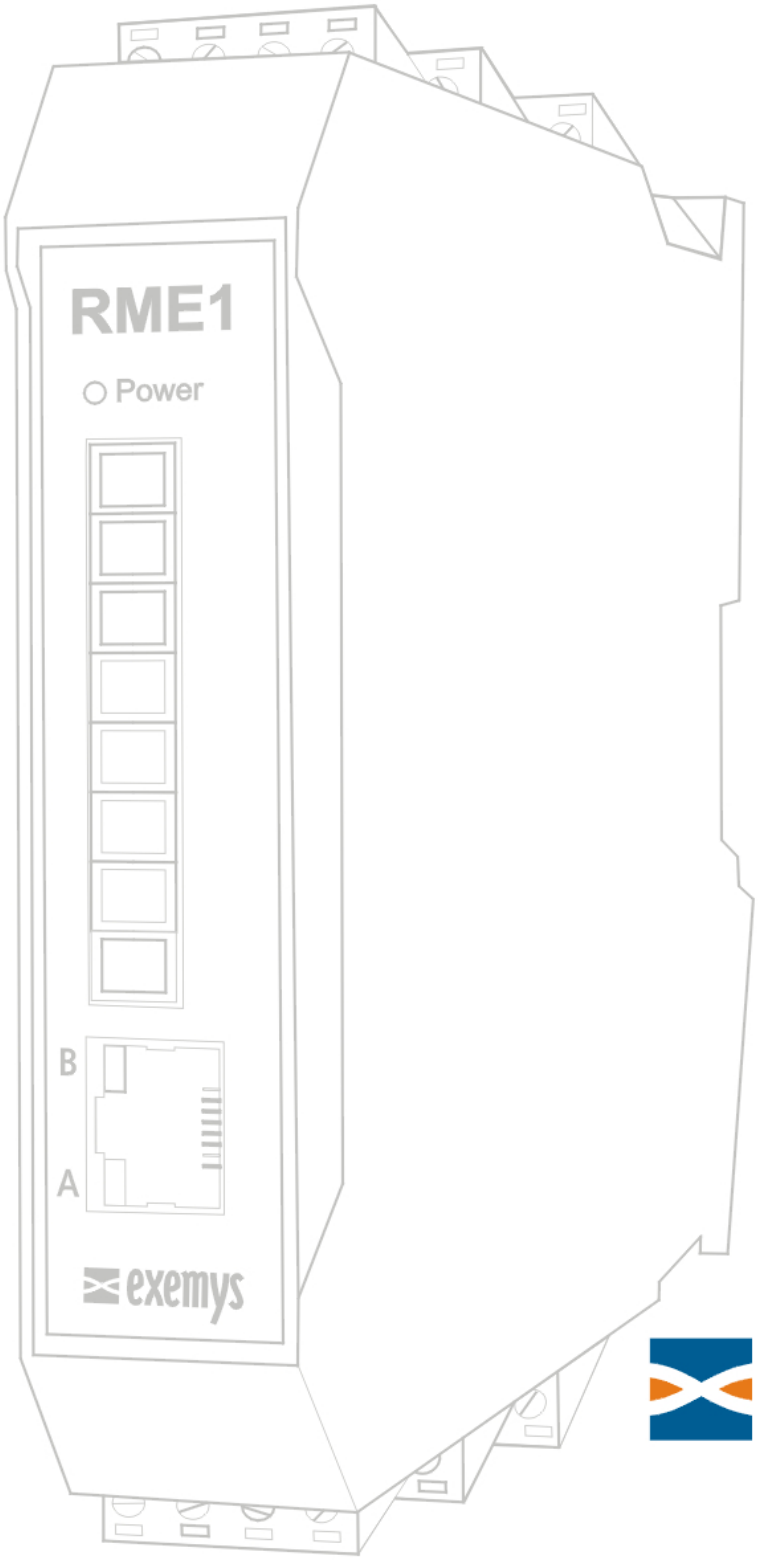
ANALOG VARIABLES ACQUISITION MODULE

RME1-AI



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ISO 9001:2000 Management System

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Updated information can be found at www.exemys.com

Rev. 3.0

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Chapter 1

Introduction

1.1 About this manual

1.1.1 Purpose of this manual

The purpose of this manual is to provide instructions to install and operate the RME1-AI in a quick and easy way.
The manual starts with a general description of the product followed by instructions to install its hardware correctly. Further on the RME1-AI configuration and operation are provided in detail.

This manual can be used for the v2.0.0 or higher firmware version. For previous versions, consult support@exemys.com.

1.1.2 Conventions, terms and acronyms

The acronyms used in this manual are listed below.

Table 1 - Acronyms

Acronym	Description
ARP	Address Resolution Protocol
Bps	Bits per second
HTTP	HyperText transfer Protocol
IP	Internet Protocol
LAN	Local Area Network
NBNS	NetBios Name Server
PC	Personal Computer
UDP	User Datagram Protocol
TCP	Transmission Control Protocol
DHCP	Dynamic Host Configuration Protocol
GND	Ground (Reference)
CSV	Comma Separated Value
XML	Extensible Markup Language
SNMP	Simple Network Management Protocol

Table 2- Terms

Terms	Description
IP Address	A device's logical address within a network.
NetMask	Defines which part of the IP Address belongs to the subnet.
Gateway	Output for other networks.

The conventions listed below are used in this manual.

Table 3 - Conventions

Conventions	Description
A|B|C	A set of possible values for command parameters. You can type A, B or C.
n..m	A range of possible values. You can type any value in the range including n and m.
aaa.bbb.ccc.ddd	An IP address.

1.2 Product General Description

The RME1-AI is a complete interface for your analog sensors. It allows monitoring and supervising, from any PC connected to the same network, analog devices with either current loop or voltage range output.
The RME1-AI works in differential mode, it means it can measure the difference between the absolute values of two signals.

The information can be read by any of the four RME1-AI work modes.

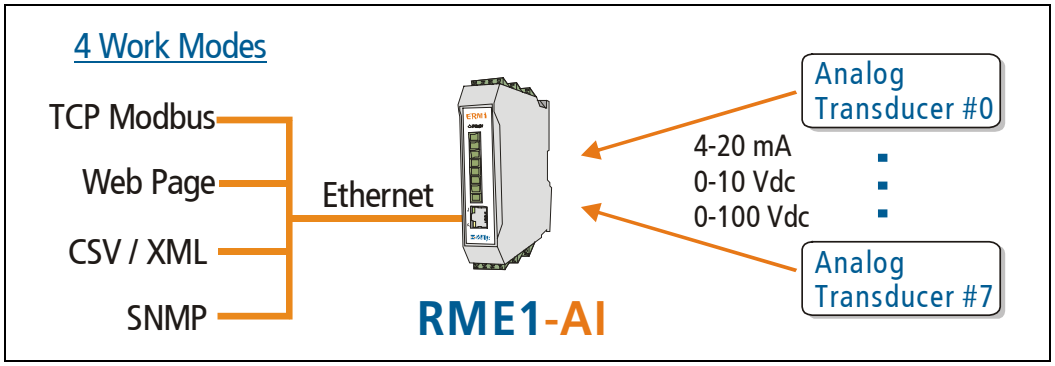

Figure 2 - Usage general diagram

1.3 RME1-AI models codification

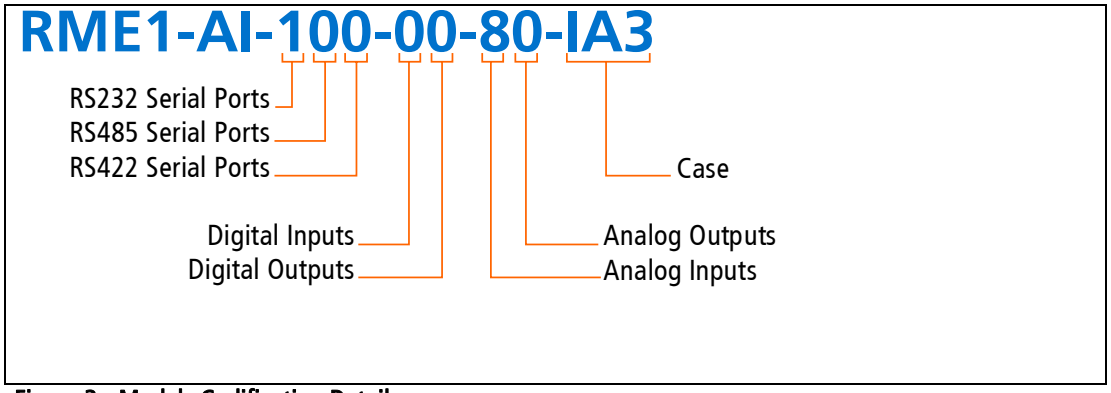

Figure 3 - Models Codification Details

Chapter 2

Installation

2.1 Connectors general diagram

On the device frontal connector there can be found the power input terminals as well as the terminals of the different communication ports.

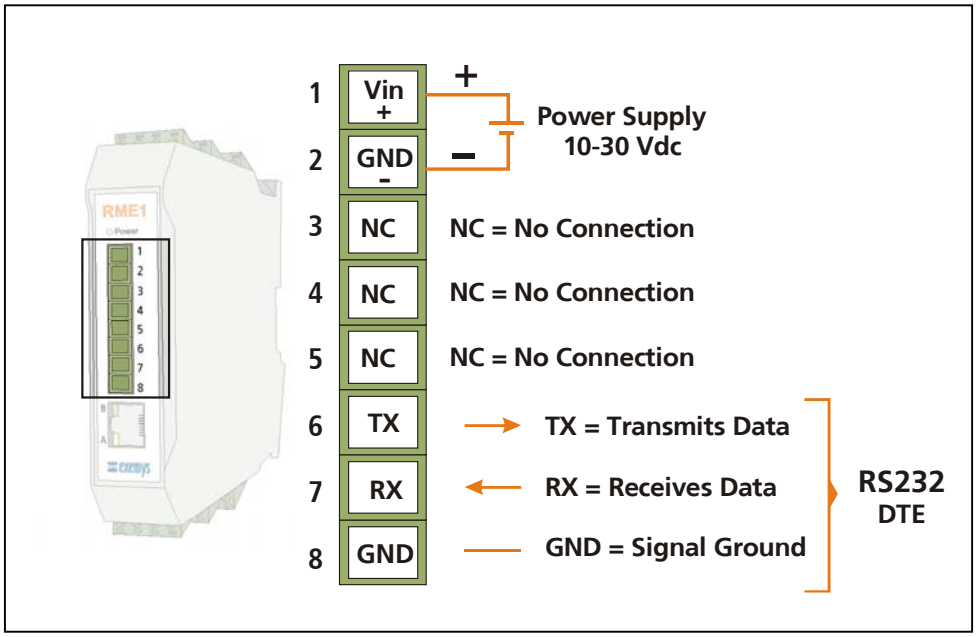

Figure 4 - Connectors general diagram

2.2 Power connection

The picture belows shows the power input connection. It is found in the first two terminals called **Vin (+)** and **GND (-)**.The RME1-AI power connection has polarity and it accepts the range of 10 to 30 Vdc.

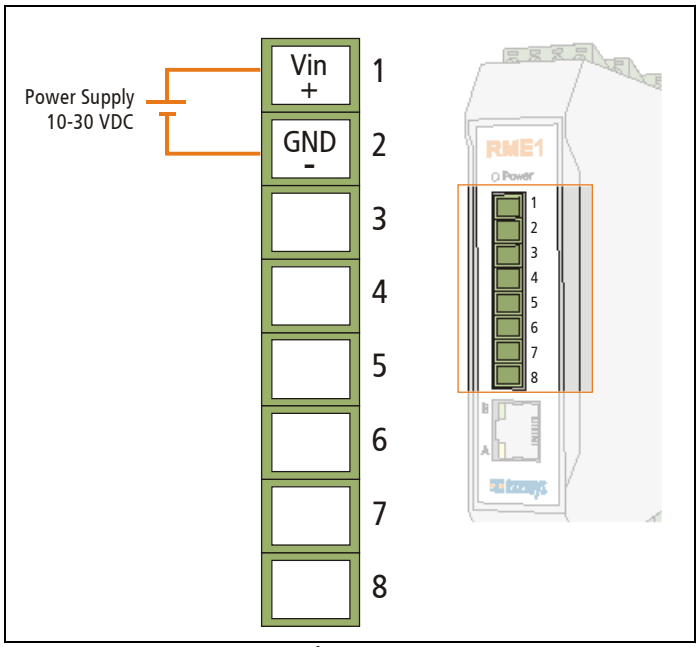

Figure 5 - Power connection diagram

2.3 RS-232 serial port connection (only for configuration)

The RME1-AI has one configuration serial port whose connection terminals are shown in the picture below. The configuration serial port is available for all the RME1-AI models. The same picture also shows where the Ethernet connector is placed.

Note: The configuration method through serial port is an alternative. The suggested method is through the configuration WEB page.

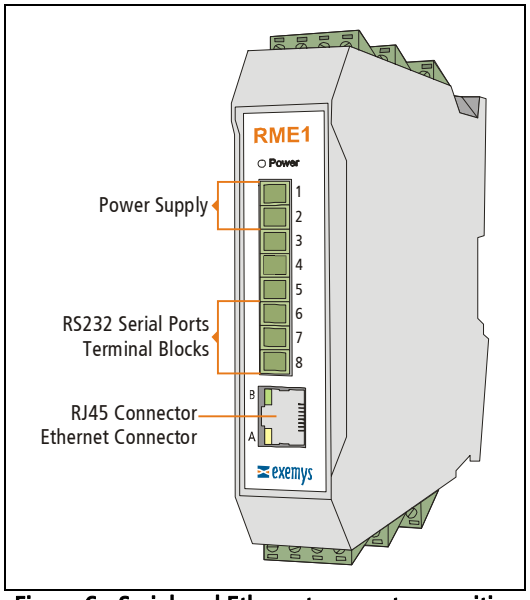

Figure 6 - Serial and Ethernet connectors position.

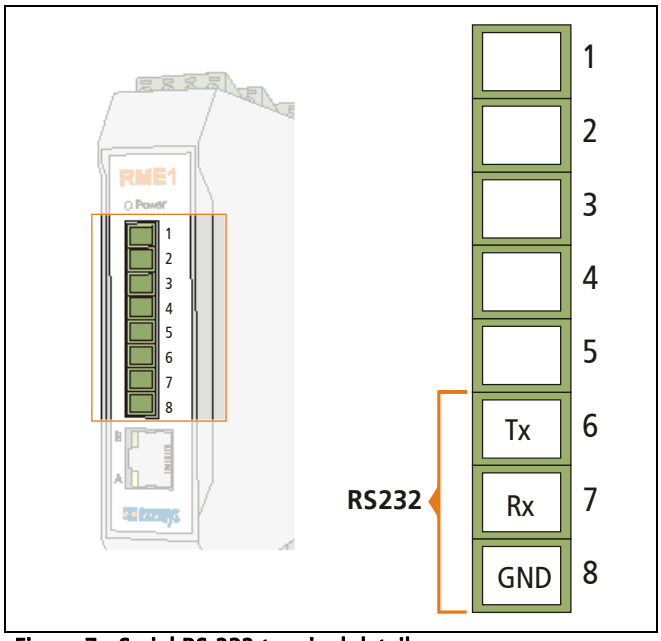

Figure 7 - Serial RS-232 terminal detail.

For configuration, a connection cable can be used as it is shown in picture 7.

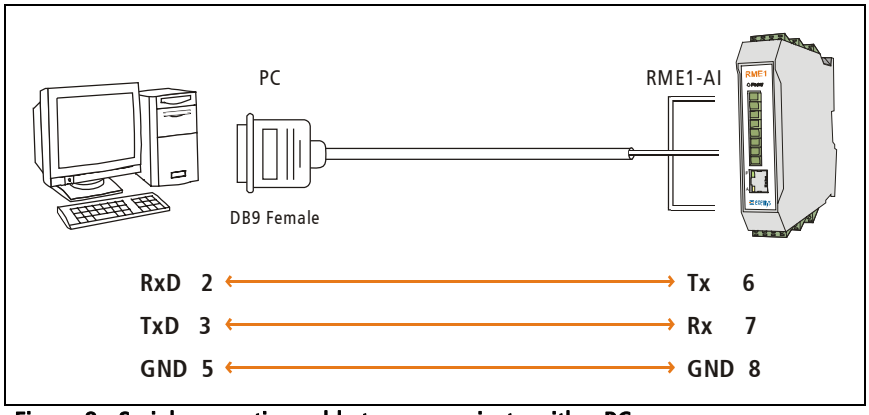

Figure 8 - Serial connection cable to communicate with a PC

2.4 Ethernet connection

The RJ45 connector is for Ethernet connection. This connection is essential for the RME1-AI to work.

2.4.1 Hub or Switch connection

To connect the RME1-AI to Ethernet through a Hub or Switch, it is necessary to use a straight-through UTP network cable.

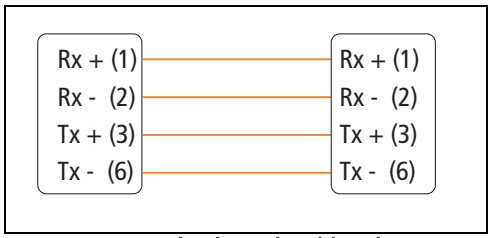

Figure 9 - Straight-through cable scheme

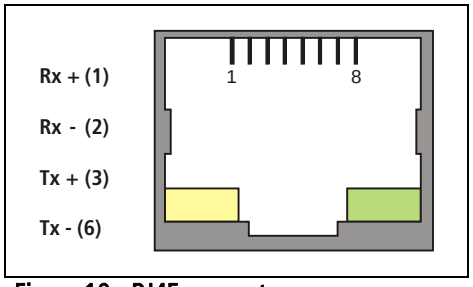

Figure 10 - RJ45 connector

2.5 Analog Inputs Description

In Figure 10 it can be seen where the RME1-AI analog terminals are placed. The inputs are in columns on both sides of the equipment.
The inputs start numbering from 0. So that the first channel is **CH0.**
The same way, each terminal is numbered for its function and the channel it belongs to. So, the RME1-AI first terminal in channel 0 is called **CH0 COM.**

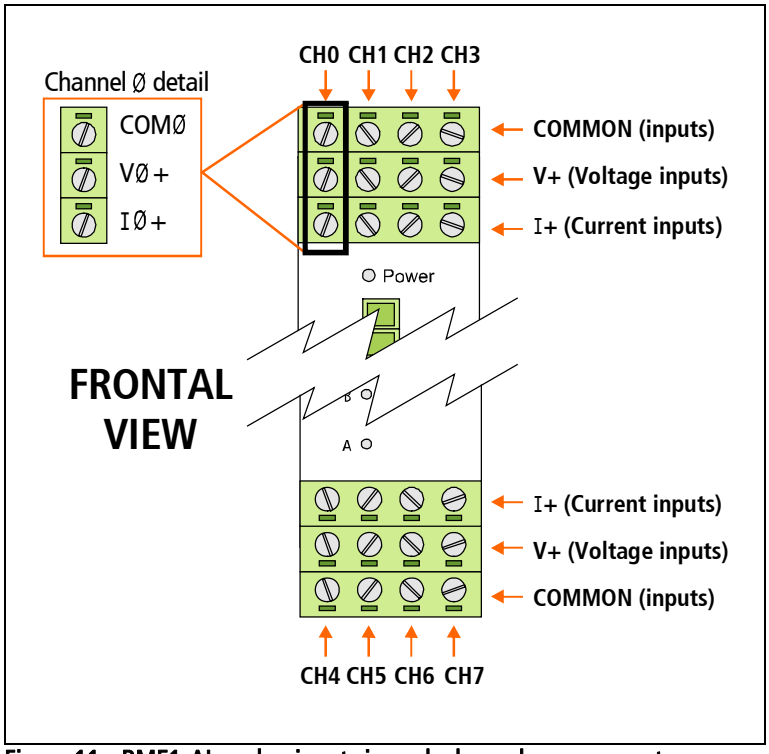

Figure 11 - RME1-AI analog inputs in each channel arrangement

2.6 Analog inputs connection

2.6.1 Voltage output sensor connection

Sensors with voltage outputs (from 0 up to 10 Vdc) must be connected to the RME1-AI as it is shown in the following figure.
All the RME1-AI channels are fit for this kind of sensors.

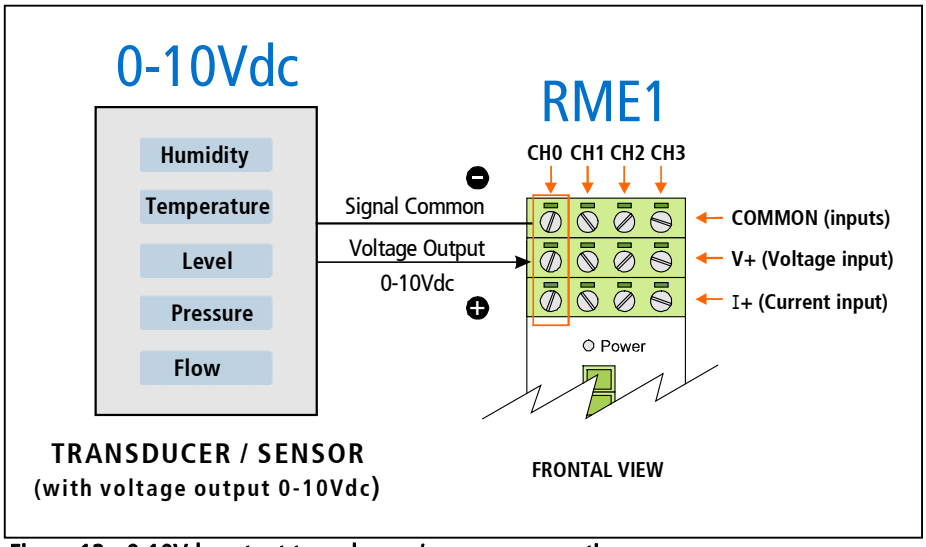

Figure 12 - 0-10Vdc output transducers / sensors connection

2.6.2 Current loop output sensor connection

In this case, the figure shows the way sensors with current loop outputs (4 –20mA) can be connected. All the RME1-AI channels are fit for this kind of usage.
The value of the input impedance for each way is Zi=150 Ω

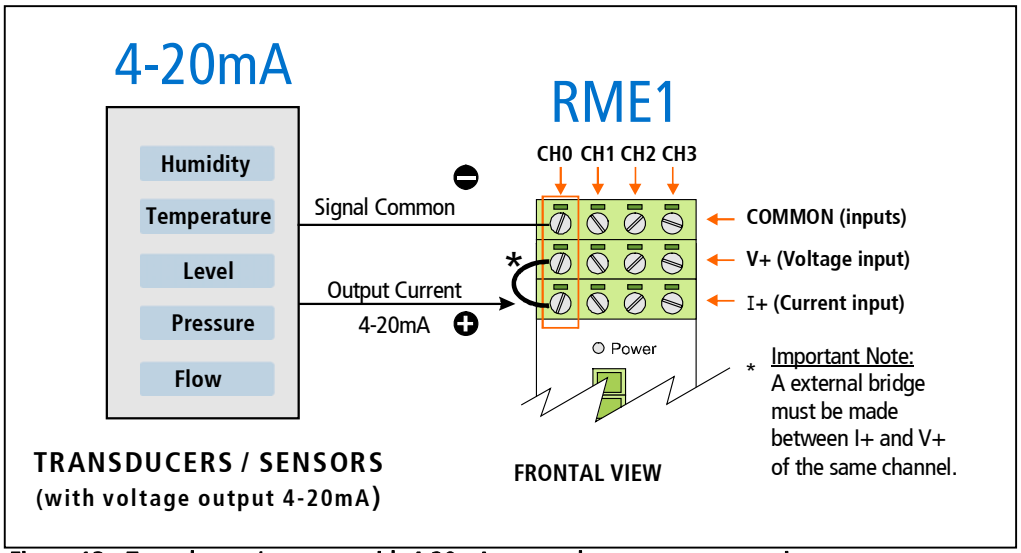

Figure 13 - Transducers / sensors with 4-20mA current loop output connection

IMPORTANT

IMPORTANT

Do not exceed the signal limit for each case (+10 Vdc or 20 mA respectively). Exceeding the signal level may cause malfunctioning or even permanent damage of the device.

2.7 Indicator Leds code

The RME1-AI has three luminous indicators (LEDs)
-The Power LED indicates that the device is turned on
-The yellow LED shows the Ethernet interface status
-The green LED indicates Modbus TCP status

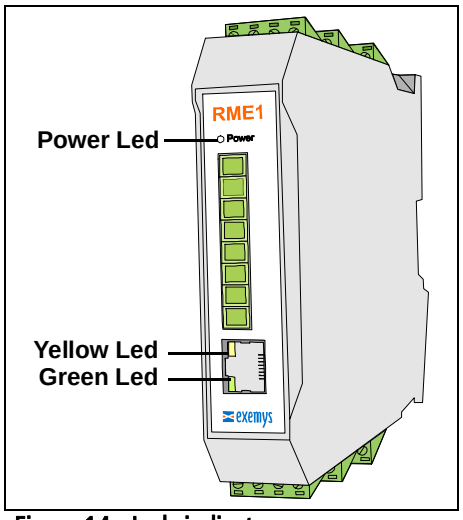

Figure 14 - Leds indicators

Table 4 - Indicator Leds

Yellow Led	Green Led	Description
It is steady on	Do not care	RME1-AI is searching for a DHCP server in the network.
It is ½ second on and ½ second off.	Do not care	RME1-AI is starting. During this period the equipment may be set in serial configuration mood.
It blinks like a beacon, 90% of a second off and the remaining 10% on.	Do not care	RME1-AI has an IP address and a carrier (link) on the connection. This is the normal operation status.
It is 90% of a second on and the remaining 10% off.	Do not care	RME1-AI has no IP address and cannot find a DHCP server. It will search the DHCP server at 60 seconds interval.

It blinks very fast.	Do not care	Absence of Ethernet carrier.
Do not care	It is steady on and it turns off for short periods of time.	RME1-AI has detected a Modbus TCP connection.
It flashes alternately with green led	It flashes alternately with yellow led	Critical failure. (contact technical support at support@exemys.com)

Chapter 3

Configuration

3.1 Basic ethernet configuration

The first step to be taken is the network parameters configuration by any of the following methods:

a) DHCP (AUTOMATIC CONFIGURATION)
b) Exemys Device Locator (Best recommended method)
c) Serial Port
d) ARP Method

a) IP address configuration with DHCP

RME1-AI Default configuration is IP 0.0.0.0, so when turned on, it will search a DHCP server.
RME1-AI tries to negotiate an IP address with the DHCP server for a maximum period of 10 seconds. If the DHCP fails to answer in that period, RME1-AI will show an error code by means of its indicator LEDs (See Table 4) and will try to establish connection with the DHCP server 60 seconds later. This process will be repeated indefinitely until a DHCP server assigns an IP address to RME1-AI or until the user assigns a static IP address.

b) IP address configuration with Exemys Device Locator

The Exemys Device Locator Application software is intended to be used for the basic configuration of any Exemys device over your ethernet network. It allows searching, identifying and configuring the basic network parameters.
This simple application program is distributed with any Exemys product in the accompanying CD. You can also download the latest version of this program from the Exemys Web Site (www.exemys.com).
The Device Locator application must be run from any PC within the network where the Exemys devices to be configured are installed.

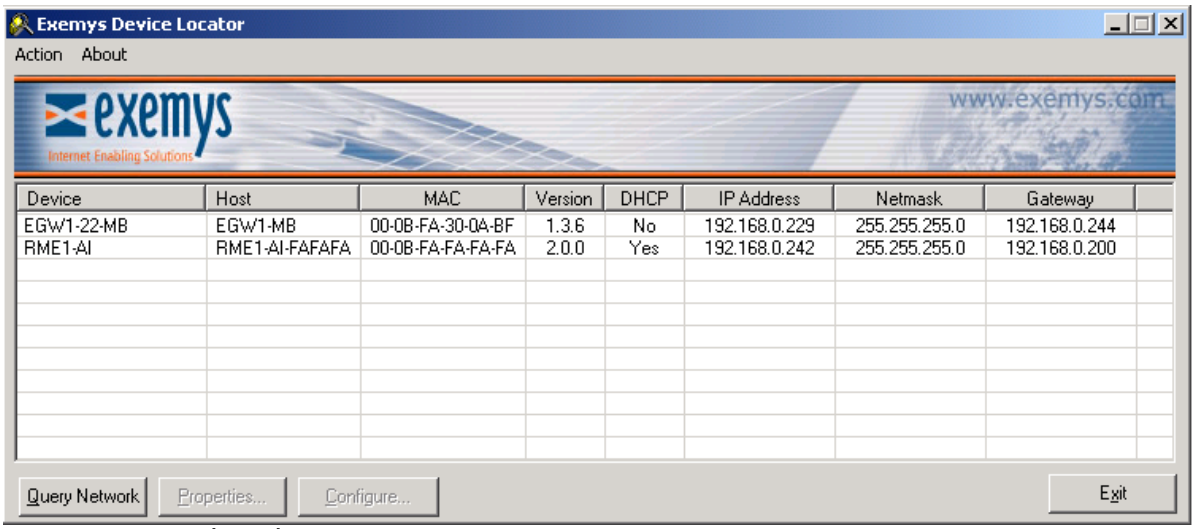

Figure 15 - Exemys device locator

When the Device Locator is run for the first time it will search any Exemys device within the network. If there is an Exemys device in the network it will be shown in Device Locator Grid:

- **Device**: Name of the device, such as RME-1AI or SSE232-ST
- **Mac address**: Hardware Ethernet Address of the device.
- **Version**: Firmware version running in that device.
- **Host:** Name of the equipment of NBNS identification.
- **DHCP:** If the Checkbox is activated, the device net parameters will be obtained from a DHCP server.
- **IP:** IP address configured in the device.
- **Netmask:** Subnet mask configured in the device
- **Gateway:** Output from a net to others.

IMPORTANT

It is not necessary for the device to be properly configured. If the device is correctly connected and working, it will be found by the Device Locator Application Program.

To refresh the grid, click on the "Query Network" button. This action will make the Device Locator search any Exemys device in the network again.
You can change any of these basic network parameters within the Device Locator software.

- Select the device in the grid and click on the "Properties" button, or open the "Actions" menu and select the "Properties" command. You will see the Properties dialog box.

- All Exemys devices provide a Remote Configuration Password. This password is used by the Web configuration page and remote command Console in the device.

- If the device has a configured password, enter the password in the Device Password box. The default value is blank.

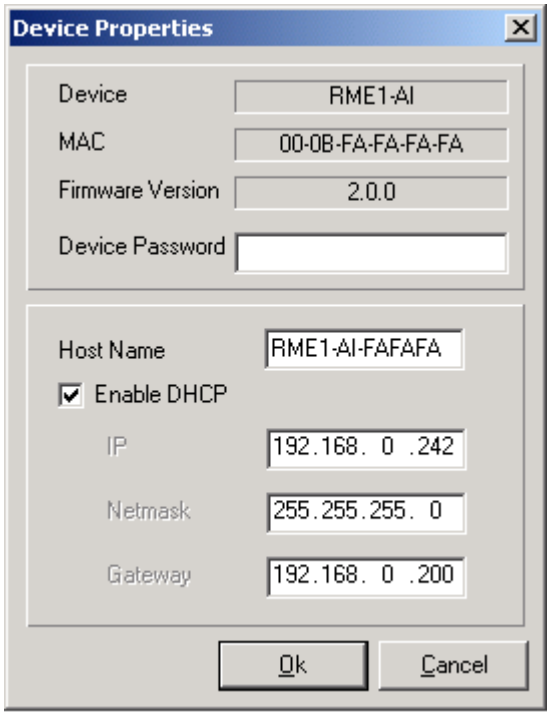

Figure 16 - Device Locator, Properties

- You can type an IP address, Netmask and Gateway IP Address or you can click on the "Use DHCP" check box to make the device search a DHCP Server. The RME1-AI has been manufactured with the DHCP feature activated.

- You can give the device a personal name within the field "Host Name".

- Click on the OK button for the Device Locator send this information to the device.

- If the password is not correct, you will see the message "Error when changing the configuration". Check the equipment to be configured password. The device will not answer any message sent by the Device Locator during the first five seconds after an incorrect password. This is to avoid any brute force method to change the network parameters of the device.
- If the device does not respond, the Device Locator will show a "No Response from Device" message. Make sure the device is turned on and connected to the ethernet network.
- The Exemys device will reset so the changes in the configuration take effect.
- If no change is necessary, click on the "Close" button to close the Properties dialog box.
- After a few seconds the device being reset will answer again to the requests of the Device Locator software. Click on the "Query network" button to refresh the grid and make sure the parameters were changed.

c) IP address configuration with serial port

Connecting the serial port of the PC to the serial port of the equipment (See Chapter II), you can use a software such as the Hyperterminal (Windows) to be connected with the equipment and modify all its parameters . Once the port is opened with the serial parameters configuration at 9600,8,N,1, the RME1-AI must turn on and type "cfg" followed by ENTER with the Hyperterminal before 7 seconds have elapsed from the moment it is turned on. You will get access of the configuration through serial port and will see :

```
RME1-AI – Exemys : (or similar) on the screen
---------------
>_
```

It is important to mention that this way not only the network parameters can be modified but also all the equipment parameters can be reached. For further information consult Appendix D.

d) IP address configuration with ARP method

If RME1-AI receives PING packets after being turned on, it will take the destination IP of these packets and this will start being the device IP address. For further information see appendix E.

3.2 Device parameters configuration

Configuration parameters can be modified by three different ways:

- Web page configuration
- Telnet console configuration (See appendix D)
- Serial console configuration (See appendix D)

Once the RME1-AI has a valid IP address you may access the web page to configure the rest of the parameters.

1. If your web navigator is configured to search for a Proxy server, disable that option.
2. If you have the Exemys Device Locator software, select the device and press the button "Configure".
3. Type the RME1-AI IP address field of your navigator.

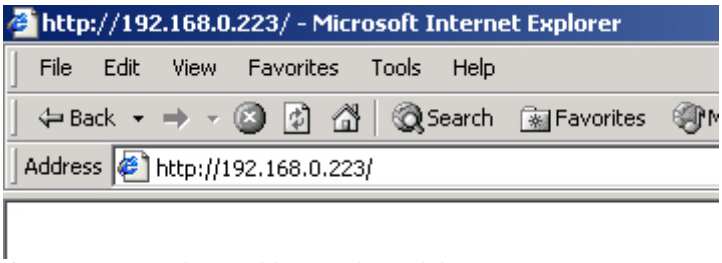

Figure 17 - Enter the IP address in the Web browser.

4. In your web browser you will see the inputs value and a link to configure the device.

If you click on the link the RME1-AI will ask for the password to enter the page. Type "admin" as user name and then the password to enter.
The RME1-AI defaults have no password, so that the device will not ask for it unless the user enables it.

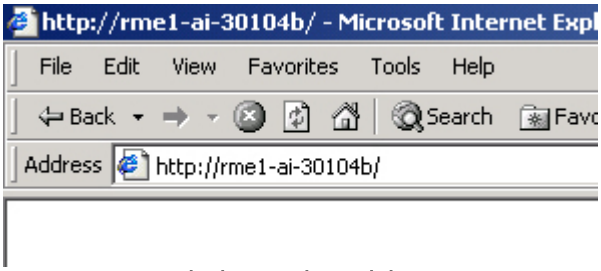

Figure 18 - Enter the host in the Web browser

As it is shown in the above figure, the name of the analog module in the manufacturer's configuration is: RME1-AI (last digits from Mac address) , and this name can be changed using the Exemys Device Locator by means of the Host name parameter, in properties.
For example, if the Mac address of the device is 00:0B:FA:30:10:4b, The name in the manufacturer's configuration will be RME1-AI- 30104B.

NOTE

In several sections of the web interface, the RME1-AI has a help symbol " ". If you click on it, you will get a help window for the configuration section you are.

3.2.1 Network configuration

Network parameters can be configured by all the methods already mentioned but it can be done though the WEB interface too.
It is important to make it clear that the name of the device is useful for two tasks. One of them is to identify each device in the Exemys Device Locator, when a searching is in progress. The other is to use the name of the device instead of its IP address (NBNS protocol)

The NBNS (NetBios Name Server) allows the user, in case of ignoring or simply not remembering the module IP address, search it literally through the name in the LAN net from a web browser.

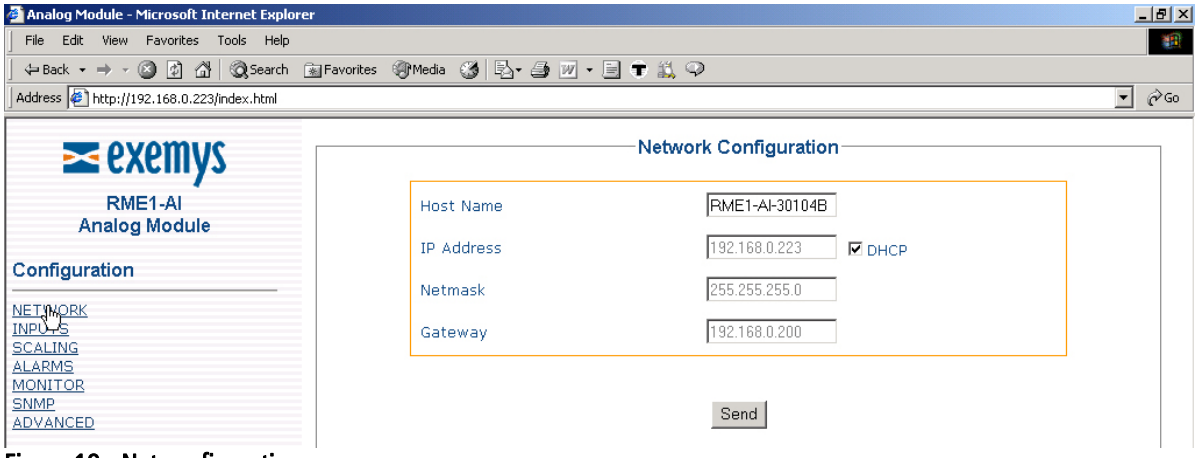

Figure 19 - Net configuration

3.2.2 Analog inputs configuration

Analog inputs have two configuration fields:

- **Input type:** It allows to choosing between voltage input (0-10V) or current loop input (4-20mA).
- **Filter:** It allows selecting the amount of samples to take before determining a readings average for the corresponding input. This average is the value shown by the input when it is consulted. The possible values are: 1, 5, 10, 20, 50 or 100 samples.

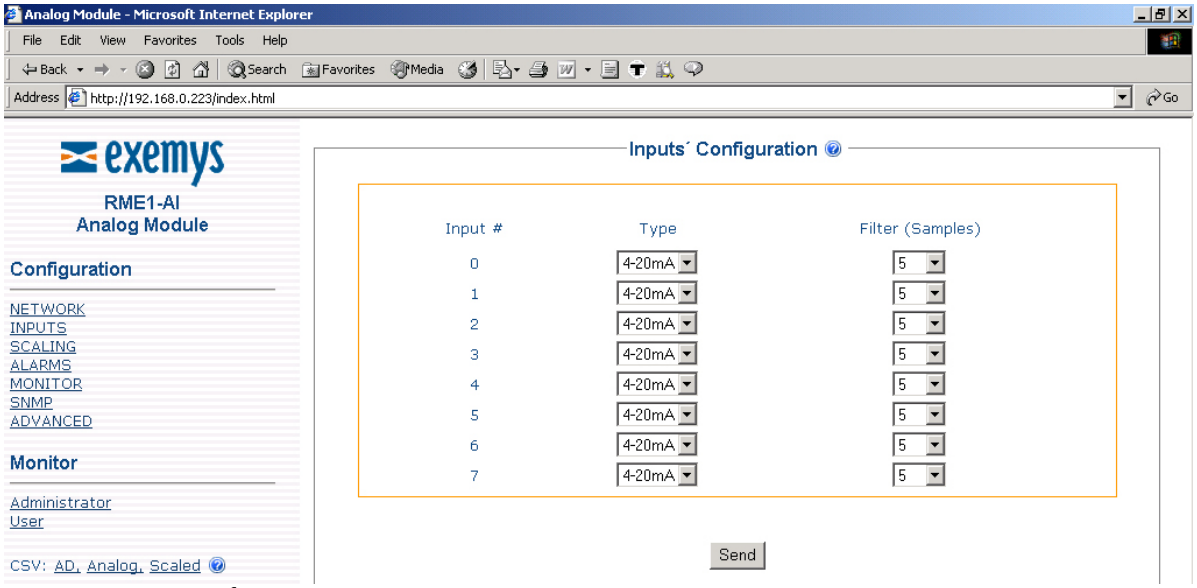

Figure 20 - Inputs configurations

3.2.3 Scaling

The RME1-AI can acquire a value and make a simple calculation before assigning it to the final value. It supports the Linear (Y=Ax+B) functions where X is the acquired value and Y will be the value observed in the field "Scaled Value"
To determine the scaling of an analog input it is necessary to configure 2 coordinates of the plane XY, through which the scaling straight line passes.

The limits for these configuration values are the following:

- **X** values between 0 and 4000 (0 and 10 Vdc and 20 mA respectively)
- **Y** values between –32.767 and 32.767
- **Decimals:** Values between 0 and 4 (only for *"Scaled value "* on the WEB)

The factory default is a straight line with slope 1 and which passes through the origin (X0=0 YO=0 X1=1 Y1=1), and the amount of decimals is zero (0).

To make it clear how to use these parameters, you have this example:
Suppose that you have a sensor that will output 0V for 10ºC and 10V for 100ºC. If you want to see the temperature value in the RME1-AI, the scaling will be:
X0= 0 Y0=10 X1=4000 Y1=100 Decimals=0

As you can see in the following figure, when the RME1-AI gets in the ·Converter Value" 4000, you will see 100 in "Scaled Value".

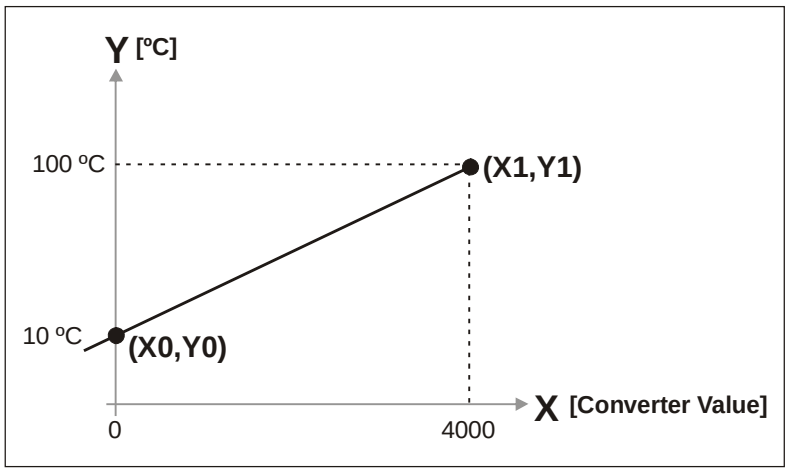

Figure 21 - Scaled value without decimal

If you want to increase the accuracy in the measurement, you can configure the scaling as follows: X=0 Y0=100 X1=4000 Y1=1000 Decimals=1

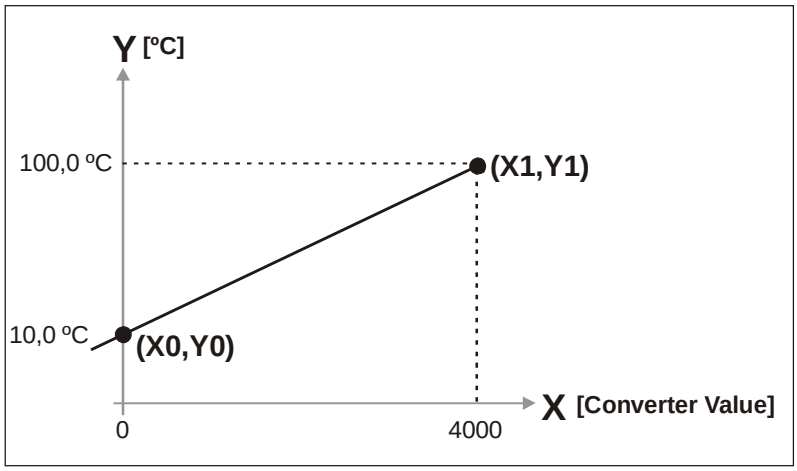

Figure 22 - Scaled value with decimal

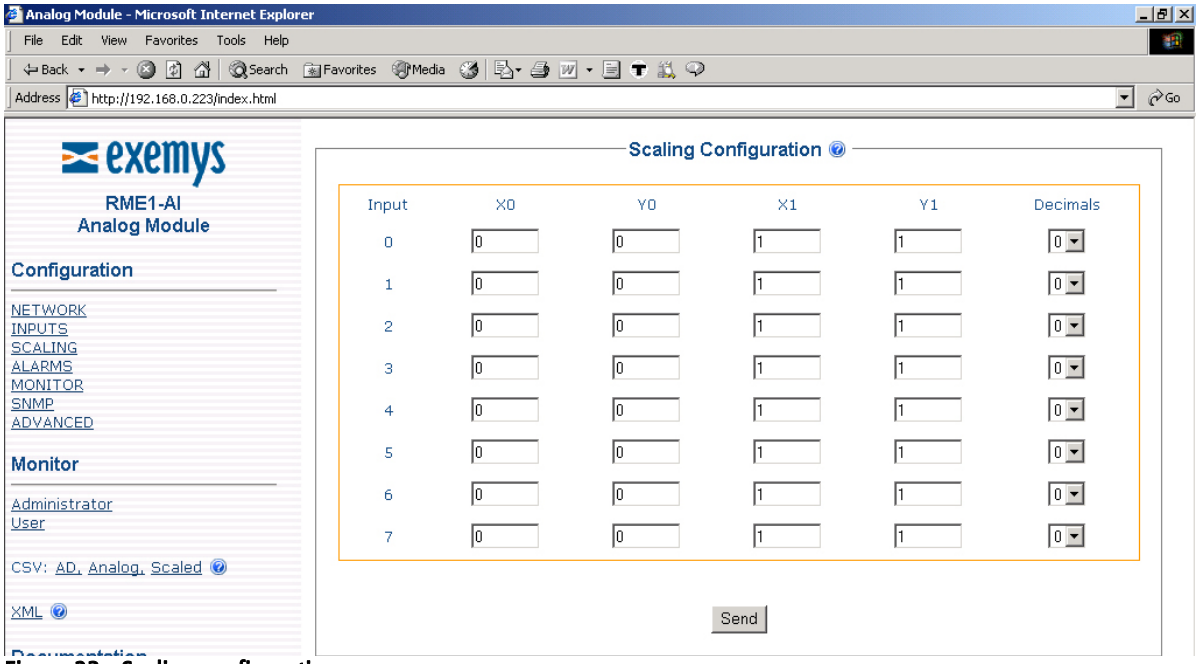

Figure 23 - Scaling configuration

3.2.4 Alarms configuration

The RME1-AI has two alarms for each analog input. You will be able to enable, disable and modify the set point for each one.

IMPORTANT

IMPORTANT: Alarms are compared with the scaled value without decimals.

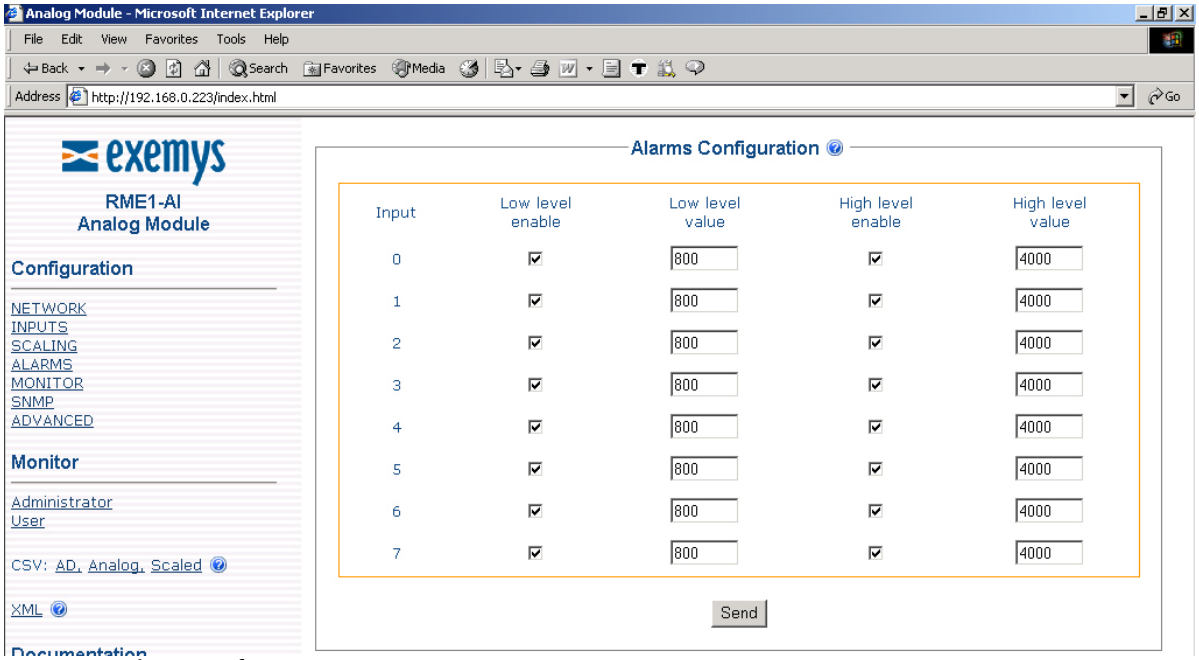

Figure 24 - Alarms configuration

Returning with the example of temperature measurement, if you need the alarm to be activated when the temperature is out of the range 20º C and 85º C (decimals=0), you need to configure the parameters "Low Value" in 20 and "High value" 85. If the range is 20,0º C and 85,0º C (decimals=1), the parameters "Low value" and "High value" have to be configured in 200 and 850 respectively.

3.2.5 Monitor

In the monitor web page you can configure the user's monitor page.
This configuration consists in selecting the inputs you want to visualize, the name you assign to each input, and the data column you want to visualize in this monitor code. (Analog value, Scaled value or Converter value).
The scaled value will show as many decimals such as it has been configured on the scaling screen.
The Converter goes from 0 up to 4000 (4000 = 10V or 20mA respectively).

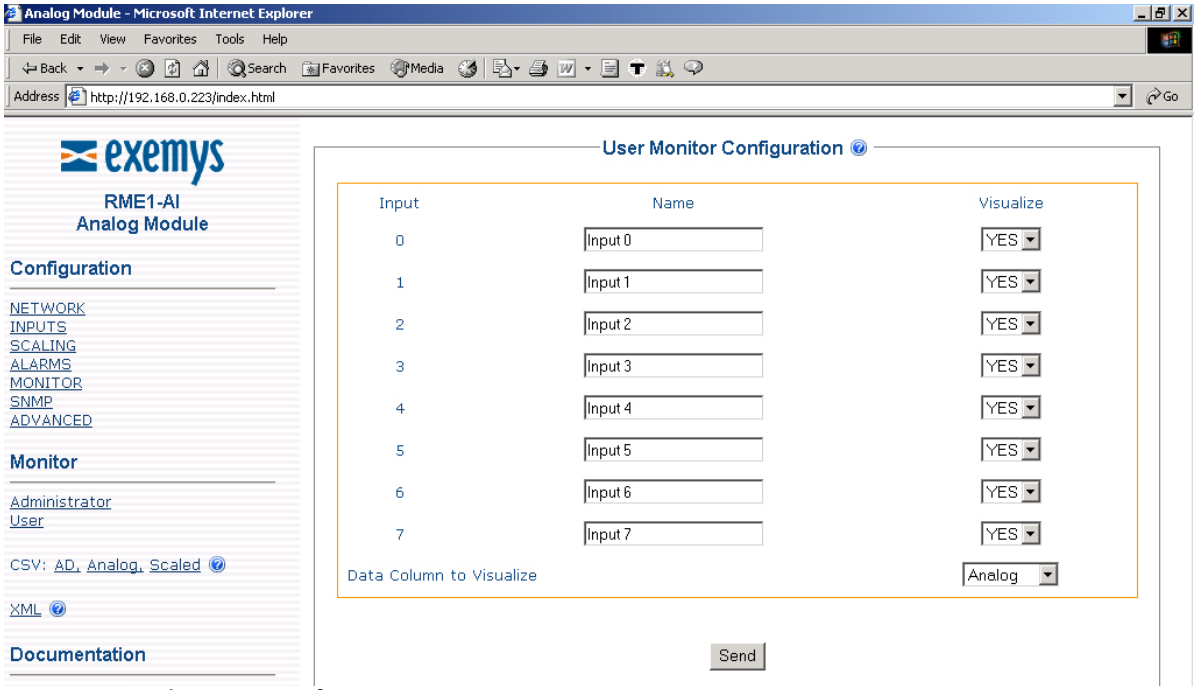

Figure 25 - User's monitor configuration

IMPORTANT

IMPORTANT
Each name can be formed for up to 16 characters.

3.2.6 Advanced configuration

Among the possible advanced configurations you can find:

- **Change password:** It allows changing manufacturer's default password for another one.
  Note: The user name must be "admin"

- **Reset the device:** It can be used to reset the device in the same way it can be done by cutting the power.
- **Set device to factory default:** It allows to change all configuration parameters to manufacturer's default. Be careful. See values in Appendix B.
- **Modbus exceptions:** Enable or disable Modbus exceptions.

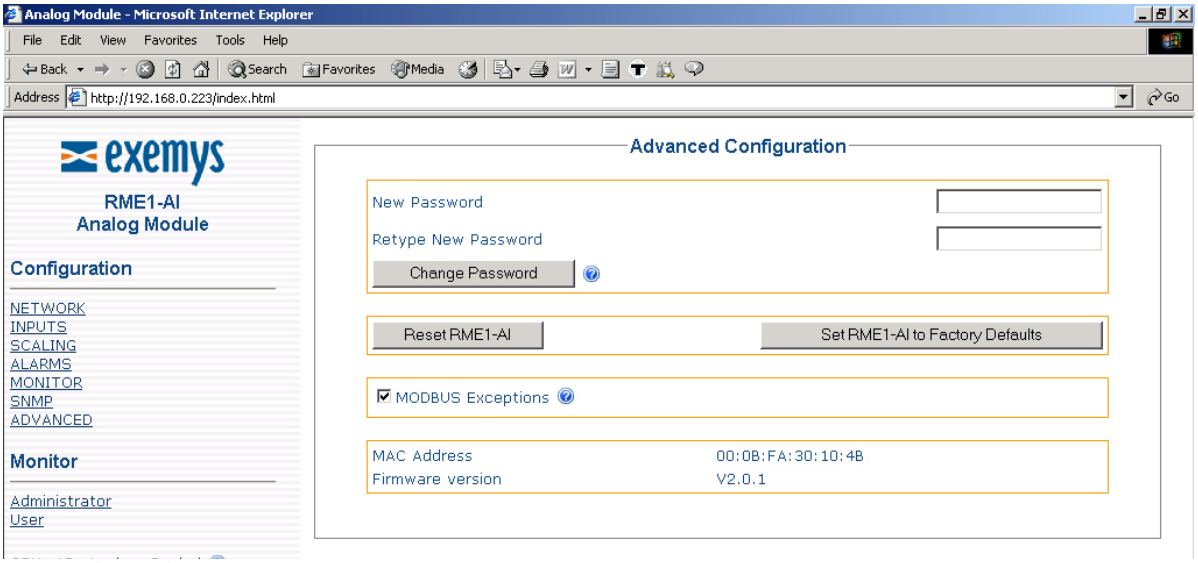

Figure 26 - Advanced options

Chapter 4

Operation

Introduction

The RME1-AI has four different work modes. These are:

- Modbus TCP
- CSV / XML
- SNMP
- Web page (HTTP)

4.1 TCP Modbus operation

In the RME1-AI each analog input, matches with one Modbus TCP Holding Register. This way , once the communication has been established, data is moved in a transparent way from the analog channels to the corresponding Modbus TCP address.

MODBUS TCP Register	Description
40.001 up to 40.008	Analog value (Input value in voltage or current multiplied by 100).
40.009 up to 40.016	Status (Shows the status of each analog input, for current inputs). 0: Normal. 1: Low alarm. 2: High alarm.
40.017 up to 40.024	Scaled value.
40.025 up to 40.032	Value (Analog to Digital converter value, 0 if analog input values is 0V or 0mA, 4000 if analog input values is 10V or 20mA)
40.101	Firmware Version
40.102	Hardware Version
40.103 up to 40.105	Serial Number
40.201 up to 40.208	Input type 0= Current 1= Voltage

40.209 up to 40.216	Filter (Samples) 1, 5, 10, 20, 50, 100
40.217 up to 40.224	Abscissa zero (X0) (between 0 and 4.095)
40.225 up to 40.232	Ordinate zero (Y0) (between -32.767 and 32.767)
40.233 up to 40.240	Abscissa one (X1) (between 0 and 4.095)
40.241 up to 40.248	Ordinate one (Y1) (between -3.2767 and 32.767)
40.249 a 40.256	Alarms enable 0: Both alarms disabled 1: Low alarm enabled 2: High alarm enabled 3: Both alarms enabled
40.257 a 40.264	Low set point (between - 32.767 and 32.767)
40.265 a 40.272	High set point (between - 32.767 and 32.767)

The registers with gray background can be modified with Modbus TCP. All the others are read only registers.

Registers from 40.033 up to 40.100 and from 40.106 up to 40.200 are reserved bank of memory.

Registers from 40.001 up to 40.032 are read only and show information about each analog input status.

Registers from 40.101 up to 40.105 show information about the device (read only).

Registers from 40.201 up to 40.272 are read/write registers and store the following information about the analog inputs configuration:

- **Input type**: Voltage or current loop.
- **Filter**: Samples to take before determining the value.
- **Scaling:** RME1 supports, pointing out two coordinates of a straight line (x0, y0; x1, y1), to make a linear scaling of each one analog input.
- **Alarms enable:** RME1-AI has two alarms for each analog input, and each one can be enabled or disabled.
- **Low alarm:** Low alarm set point.
- **High alarm:** High alarm set point.

4.2 CVS/XML mode operation

4.2.1 CSV

If you want to make an automatic data acquisition through other query method under HTTP, the RME1-AI has 3 web pages where you can get, in plain text format delimited by commas, its analog inputs status

The available information in these pages is as follows:

- **ad. CSV**: Analog to digital converter value for each one of the eight inputs (0 a 4000 for 0V to 10V or 0mA to 20A).

- **analog. CSV**: Analog value multiplied by 100 in mA or in volts depending on the input type configuration.
- **scaled. CSV**: Engineering units value for each analog input.

Any time you access to any of these 3 pages, you can get updated information from the analog module.

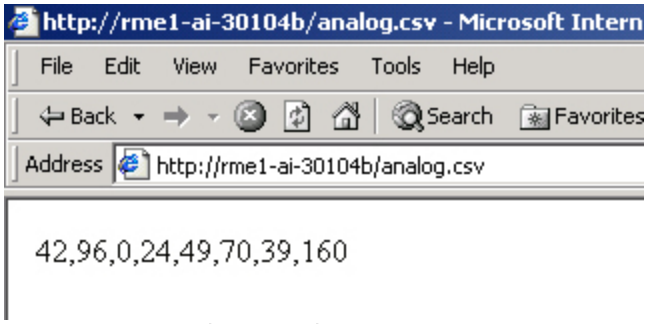

Figure 27 - CSV analog example

For this example if the inputs are configured in voltage type, analog values are:

- Input 0: 0.42V
- Input 1: 0.96V
- Input 2: 0V
- Input 3: 0.24V
- Input 4: 0.49V
- Input 5: 0.70V
- Input 6: 0.39V
- Input 7: 1.60V

Example:
If you want to visualize the scaled value, from a work sheet (Microsoft Excel®), execute the command "Open File" and in its name write:

http://192.168.0.240/scaled.csv (192.168.0.240 is RME1-AI ip address).

Bear in mind that the information belongs to the inputs value at the moment you opened the file.

4.2.2 XML mode operation

To make an automatic information acquisition, the RME1-AI has a web page in which all configuration and status information is available in XML format.
The name of this page is **rme1-ai.xml** (this page is within RME1-AI). Any time you access to this page you can get the following updated information from the analog module:

```
- <RME1-AI>
  - <INFO>
      <FIRMWARE>V2.0.0</FIRMWARE>
      <MACADDRESS>000BFA30104B</MACADDRESS>
    </INFO>
  - <NETWORK>
      <IPADDRESS>192.168.0.223</IPADDRESS>
      <NETMASK>255.255.255.0</NETMASK>
      <GATEWAY>192.168.0.200</GATEWAY>
      <HOSTNAME>RME1-AI-30104B</HOSTNAME>
    </NETWORK>
  - <AINPUTS>
    - <AINPUTSTABLE>
      - <ENTRY-0>
          <NUMBER>0</NUMBER>
          <NAME>Input 0</NAME>
          <AVALUE>00.00</AVALUE>
          <AUNIT>mA</AUNIT>
          <SVALUE>0000</SVALUE>
          <CVALUE>0000</CVALUE>
          <ALARM>LOW</ALARM>
        </ENTRY-0>
      - <ENTRY-1>
          <NUMBER>1</NUMBER>
          <NAME>Input 1</NAME>
          <AVALUE>00.00</AVALUE>
          <AUNIT>mA</AUNIT>
          <SVALUE>0000</SVALUE>
          <CVALUE>0000</CVALUE>
          <ALARM>LOW</ALARM>
        </ENTRY-1>
      - <ENTRY-2>
          <NUMBER>2</NUMBER>
          <NAME>Input 2</NAME>
          <AVALUE>00.00</AVALUE>
          <AUNIT>mA</AUNIT>
          <SVALUE>0000</SVALUE>
          <CVALUE>0000</CVALUE>
          <ALARM>LOW</ALARM>
        </ENTRY-2>
      - <ENTRY-3>
          <NUMBER>3</NUMBER>
          <NAME>Input 3</NAME>
          <AVALUE>00.00</AVALUE>
          <AUNIT>mA</AUNIT>
          <SVALUE>0000</SVALUE>
          <CVALUE>0000</CVALUE>
          <ALARM>LOW</ALARM>
        </ENTRY-3>
      - <ENTRY-4>
          <NUMBER>4</NUMBER>
          <NAME>Input 4</NAME>
          <AVALUE>00.00</AVALUE>
          <AUNIT>mA</AUNIT>
          <SVALUE>0000</SVALUE>
          <CVALUE>0000</CVALUE>
          <ALARM>LOW</ALARM>
        </ENTRY-4>
      - <ENTRY-5>
          <NUMBER>5</NUMBER>
          <NAME>Input 5</NAME>
          <AVALUE>00.00</AVALUE>
          <AUNIT>mA</AUNIT>
          <SVALUE>0000</SVALUE>
          <CVALUE>0000</CVALUE>
          <ALARM>LOW</ALARM>
        </ENTRY-5>
      - <ENTRY-6>
          <NUMBER>6</NUMBER>
          <NAME>Input 6</NAME>
```

```
            <AVALUE>00.00</AVALUE>
            <AUNIT>mA</AUNIT>
            <SVALUE>0000</SVALUE>
            <CVALUE>0000</CVALUE>
            <ALARM>LOW</ALARM>
          </ENTRY-6>
        - <ENTRY-7>
            <NUMBER>7</NUMBER>
            <NAME>Input 7</NAME>
            <AVALUE>00.00</AVALUE>
            <AUNIT>mA</AUNIT>
            <SVALUE>0000</SVALUE>
            <CVALUE>0000</CVALUE>
            <ALARM>LOW</ALARM>
          </ENTRY-7>
      </AINPUTSTABLE>
    </AINPUTS>
</RME1-AI>
```

The RME1-AI also includes the file **crossdomain.xml**. This a reading policy file that allows to read the **rme1-a.xml** from any domain in Action Script applications.

4.3 SNMP mode operation

4.3.1 Introduction

The RME1-AI supports the SNMP supervision protocol. The RME1-AI works as a SNMP agent, this means that it answers queries under this protocol and it is also able to generate unsolicited messages (Traps) for certain events / alarms notification.
In the configuration web page you can enable or disable this service.
With the SNMP service enabled, it is possible to enable or disable SNMP traps. The RME1-AI allows to configure up to 2 IP manager addresses (IP addresses where SNMP traps are to be sent) as a security redundancy method, and to configure the communities of read ,write and traps.
It has to be clear that if you configure the same IP address in both IP manager address fields, alarms will be doubled.
Parameters *"Read community"* and *"Write community"* are passwords to access to the information of the device with read and write permission respectively. Parameter *"Trap community"* is the password sent with each trap from the device.

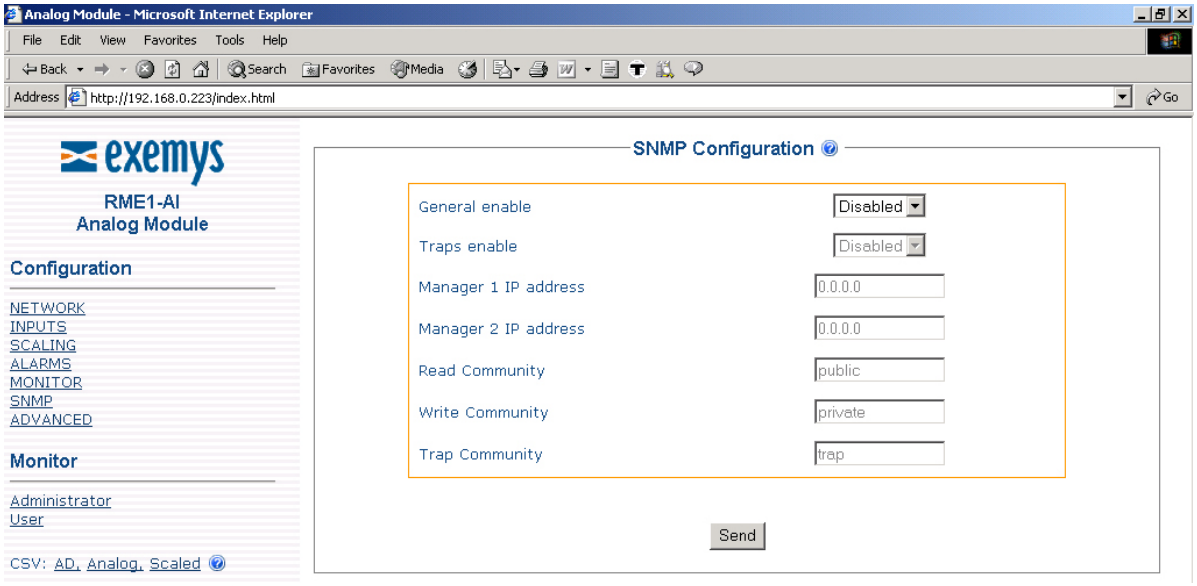

Figure 28 - SNMP configuration

IMPORTANT

IMPORTANT
The passwords of the communities can be up to 15 characters long.

4.3.2 MIB

The MIB file (Management Information Base) describes the set of objects or parameters of the RME1-AI managed under the SNMP protocol. This file has information about the object type, the access level, etc.
The RME1-AI.MIB file is included within the CD accompanying the device. This file has to be loaded in the SNMP manager console for the correct management of the different objects of the RME1-AI.

4.3.3 SNMP tree description

The following information is a detail of the SNMP tree within the RME1-AI: this is only for descriptive purpose, because all this information is in the RME1-AI.MIB file. Fields from Index up to Status form a table with 8 entries, one for each analog input. These values are only read.

Table 5 - SNMP tree description

Variable	OID	Description
sysDescr	1.3.6.1.2.1.1.1 .iso.org.dod.interet.mgmt.mib-2.system.sysDescr	**Device's description**
sysOID	1.3.6.1.2.1.1.2 .iso.org.dod.interet.mgmt.mib-2.system.sysObjectID	It's the OID that enterprise gives for this SNMP device.
Index	1.3.6.1.4.1.18284.1.3.1.1.1.1.1 *.RME1AI.status.aiTable.aiEntry.aiIndex	Input number (from 0 up to 7, not accessible)
Name	1.3.6.1.4.1.18284.1.3.1.1.1.1.2 *.RME1AI.status.aiTable.aiEntry.aiName	Name configured for this input
Analog Value	1.3.6.1.4.1.18284.1.3.1.1.1.1.3 *.RME1AI.status.aiTable.aiEntry.aiAvalue	Analog value in voltage or current depending on the input type configured.
Unit	1.3.6.1.4.1.18284.1.3.1.1.1.1.4	Analog value unit

	*.RME1AI.status.aiTable.aiEntry.aiAunit	
Scaled Value	1.3.6.1.4.1.18284.1.3.1.1.1.1.5 *.RME1AI.status.aiTable.aiEntry.aiSvalue	Input's scaled value
Converter Value	1.3.6.1.4.1.18284.1.3.1.1.1.1.6 *.RME1AI.status.aiTable.aiEntry.aiCvalue	Input's converter value (0 to 4000, 0 to 10V/20mA)
Status	1.3.6.1.4.1.18284.1.3.1.1.1.1.7 *.RME1AI.status.aiTable.aiEntry.alarmstate	Alarm status for this input, it can be: low alarm, high alarm or normal
MAC address	1.3.6.1.4.1.18284.1.3.1.2.1 *.RME1AI.info.macAddress	Device's MAC address
IP address	1.3.6.1.4.1.18284.1.3.1.3.1.1 *.RME1AI.config.net.ipConfigAddress	Device's IP address
Subnet Mask	1.3.6.1.4.1.18284.1.3.1.3.1.2 *.RME1AI.config.net.ipConfigSubnetMask	Device's subnet mask
Gateway	1.3.6.1.4.1.18284.1.3.1.3.1.3 *.RME1AI.config.net.ipConfigGateway	Device's gateway.
Hostname	1.3.6.1.4.1.18284.1.3.1.3.1.4 *.RME1AI.config.net.hostName	Device's host name

Text format OIDs with * begin with:

.iso.org.dod.internet.private.enterprises.exemys.products.analogacq

4.3.4 SNMP Traps

When an analog input scaled value reaches an alarm set point configured for that input, it moves its status from normal to alarm. The RME1-AI notifies this event by sending a SNMP trap to the manager's IP address configured.

The information sent in each trap is explained in the device's MIB file.

Traps RME1-AI sends are the following:

Table 6 - SNMP Traps

Trap	Description
Cold Start	This trap is sent each time the device is powered.
Warm Start	This trap is sent each time the device does a soft reset
New Alarm Enterrpise, Type 1	This trap is sent when an input moves its status from normal to alarm
End Alarm Enterpirse, Type 2	This trap is sent when an input moves its status from alarm to normal

4.4 Web page operation mode (HTTP)

The RME1-AI web interface allows two different types of monitor. In the administrator´s monitor it is possible to visualize the analog value, the alarm status, the scaled value and the converter value for each input. This page is protected by password.

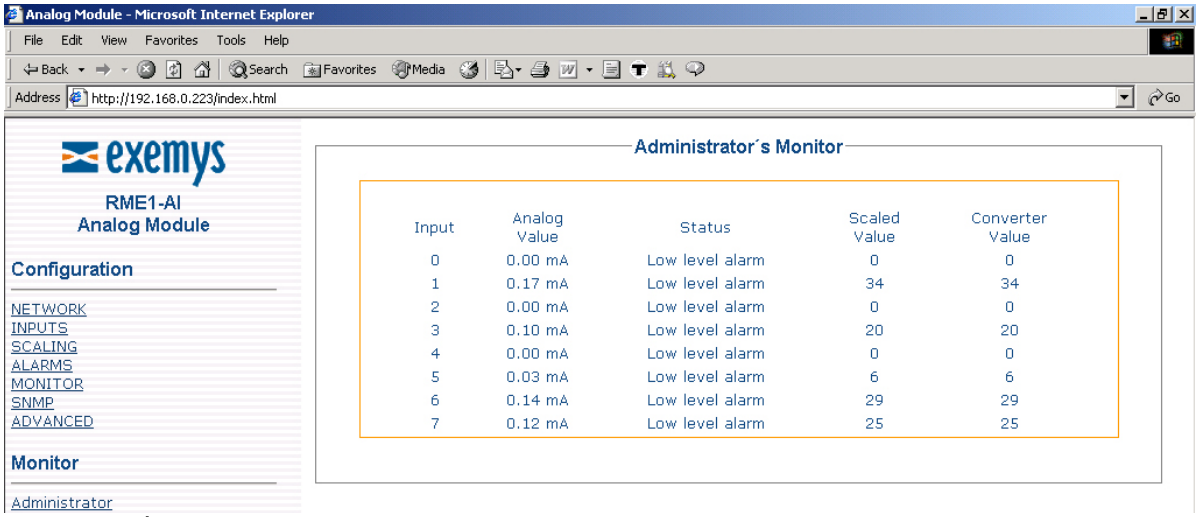

Figure 29 - Administrator Monitor

In the user's monitor it is possible to visualize each input with its name and the data column configures (in the monitor configuration page), and the alarm status for each one. This page is a free access page, it means that it is not password protected.

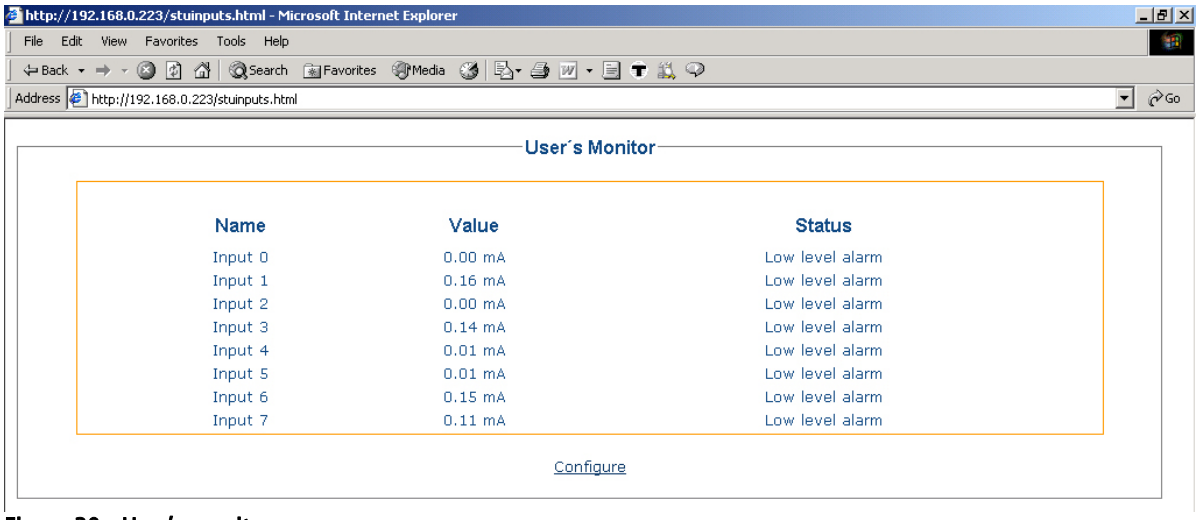

Figure 30 - User's monitor

In the RME1-AI web interface there are several links available with useful information for the user:

- CSV pages: RME1-AI has 3 CSV pages where you can get information about analog input status.
- XML page: RME1-AI has one XML page where you can get information about device's configuration and status.
- User's manual: This link goes to the RME1-AI user's manual in the Exemys web site.
- Exemys web site: This link goes to the Exemys web site where you can get updated information for this and others Exemys products.

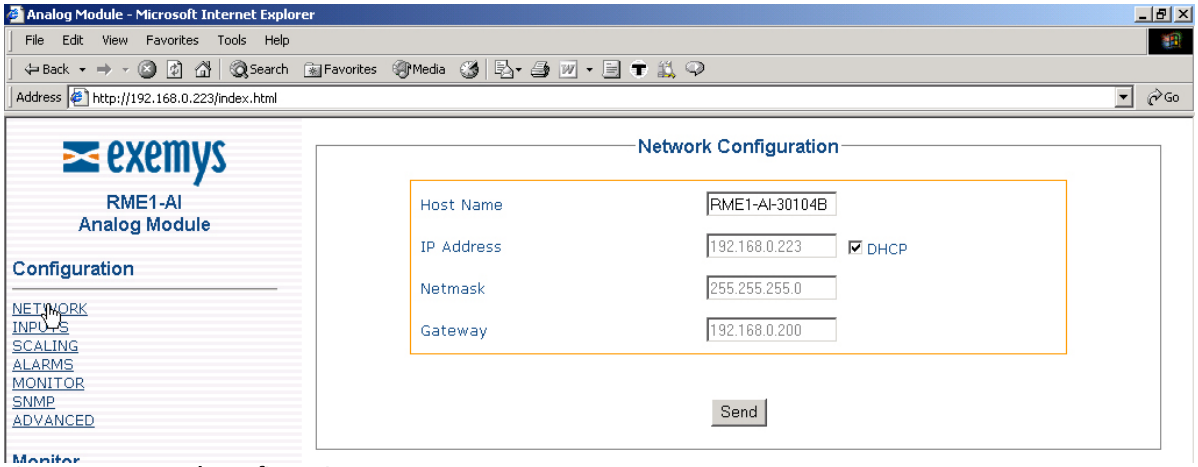

Figure 31 - Network Configuration.

Appendix A

A. The RME1-AI Mounting

A.1. Mounting of the device on DIN rail

The RME1-AI can be mounted on a DIN rail.
To fasten the module to this type of rail, orientate the upper part of the device towards the rail, then fit the slot of the **adapter** on the upper edge, such as it is shown in the figure below. Push the RME1-AI firmly until you hear a click.

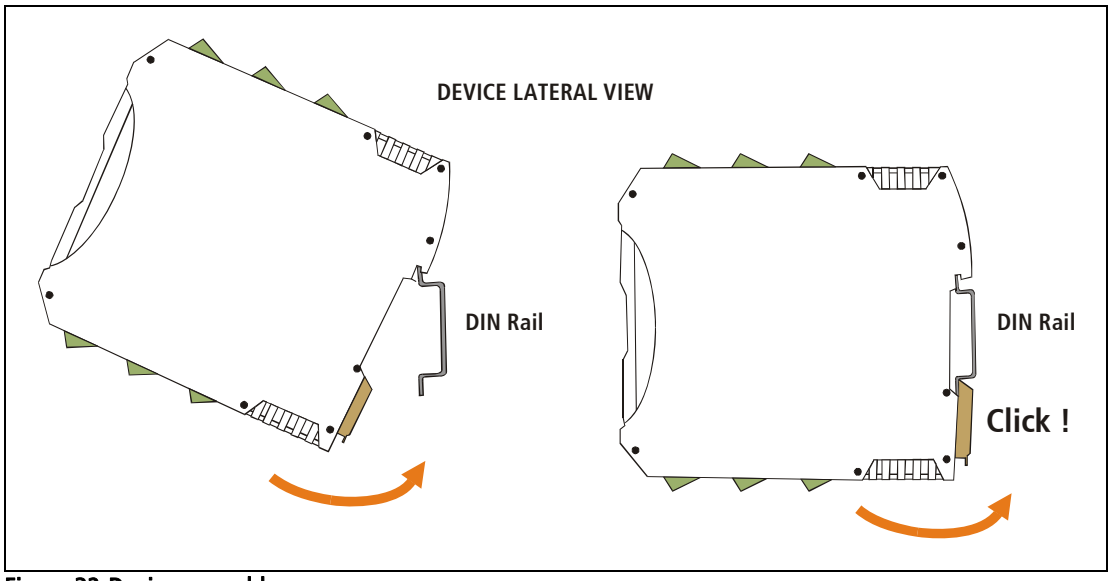

Figure 32-Device assembly

To disassemble the device from the rail, first take the device terminals off. Then introduce a screwdriver in the RME1-AI DIN connector lower clasp and push the connector downwards until the module can be removed from the rail.

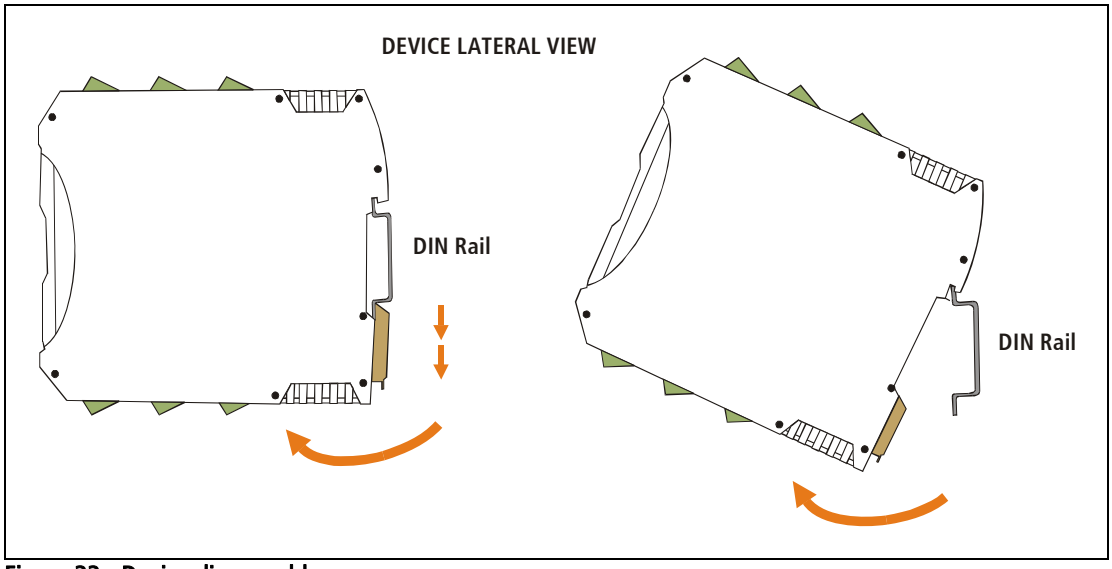

Figure 33 - Device disassembly

Appendix B

B.Original manufacturer's configuration

Table 7 - Original manufacturer's configuration

Menu	Parameter	Value
Network	Hostname	RME1-AI-XXXXXX
	IP Address	0.0.0.0 (DHCP enable)
	Netmask	0.0.0.0
	Gateway	0.0.0.0
Inputs (all inputs)	Type	4-20 mA (current)
	Filter	5 samples
Scaling (all inputs)	Abscissa 0 (X0)	0
	Abscissa 1 (X1)	1
	Ordinate 0 (Y0)	0
	Ordinate 1 (Y1)	1
	Decimals	0
Alarms (all inputs)	Low alarm enable	Yes
	Low alarm set point	800
	High alarm enable	Yes
	High alarm set point	4000
Monitor (all inputs)	Name	Input i (i=input number)
	Visualize	Yes
	Data column to visualize	Analog
SNMP	General enable	No
	Traps enable	No
	Manager 1-- IP address	0.0.0.0
	Manager 2 – IP address	0.0.0.0
	Read community	Public
	Write community	Private
	Trap community	Trap
Advanced	Password	Without password
	Modbus exceptions	Yes

Appendix C

C. Technical specifications

• **Analog / Digital Specifications:**	12bit, 4096 steps.
• **Sampling Rate:**	10 samples per second per channel.
• **Analog Inputs:**	4-20mA (Zi=150□), 0-10V or 0-100V.
• **Input type and quantity:**	8 differential mode analog inputs. *
• **Network Protocols:**	- TCP / IP, ICMP, ARP, DHCP, NBNS, HTTP. - TELNET. - ModBus TCP. - SNMP (version 1). - CSV / XML.
• **Network Interface:**	Ethernet 10BaseT, RJ45 connector.
• **Serial Port:**	RS232 serial port in pluggable terminal blocks for device´s configuration.
• **Supported Devices:**	Any RS232 / RS485 serial port analog device requiring remote Modbus TCP supervision.
• **Managment:**	HTTP Server, password protected. Telnet console , password protected. Serial console.
• **Indicators:**	Power Led, Data Led, Link Led.
• **Power Supply:**	10 a 30 Vdc. Current sink: 200mA @ 10 Vdc 90mA @ 30 Vdc.
• **Dimensions / Weight:**	100mm x 22,5mm x 112mm (Height x Width x Length).
• **Temperature:**	Operating temperature: -5 a 65ºC Storage emperature de : -40 a 75ºC
• **Guarantee / Support:**	1 year guarantee. Technical support included.

Appendix D

D.Configuration Console

D.1. Configuration command console (Serial and TELNET)

Through serial port

Connecting the PC serial port to the device serial port (see Chapter II), you can use a software such as the Hyperterminal (Windows) to connect to the device and modify all its parameters. Once the port is opened with the serial 9600,8,N,1 parameters configuration the RME1-AI must turn on and type 'cfg' followed by ENTER with the Hyperterminal before 7 seconds have elapsed from the moment it was turned on. You will reach the configuration through serial port (no password is required).

Through TCP/IP Ethernet Port (TELNET)

The RME1-A supplies a command console to allow configuration by TCP in the port 23. The device will only administer one TCP connection in this port, preventing the device to be configured in simultaneous consoles.

To enter the command console establish a telnet connection to port 23. In Windows, open a window of commands and type the following command:

```
telnet aaa.bbb.ccc.ddd
```

Where aaa.bbb.ccc.ddd is the RME1-AI IP address to be configured.

When the connection is established, the RME1-AI will show a welcome message to the configuration command console.

```
RME1-AI - Exemys:
---------------
Password:
```

The RME1-AI will ask for a "Password".

You have three opportunities to enter your password. After that, the console will be blocked for 5 seconds before allowing you to re-enter your password.

D.2. Commands

All commands can be entered in capital or lower case letters.

D.2.1. Password Command

The TCP configuration console and Web configuration interface are protected with a password. The device's administrator can assign a password to the device providing a secure method to access the RME1-AI configuration.

With the **PASSWORD** command you can change the password from the TCP configuration console.

Table 8 - PASSWORD Command

Command	Description
PASSWORD:*password*	Changes the access key for remote configuration (TCP command console or configuration Web Page). The key word must not have more than 10 characters

D.2.2. Host Name Command

With this command you can change the device's name. So that as the device works with the NBNS protocol, it will be possible to connect to the device (TCP console or web page) through its name instead of its IP address.

Table 9 - HOSTNAME Command

Command	Description
HOSTNAME:*name*	Changes device's name. The name must not have more than 15 characters.

D.2.3. NetConfig Command

With this command you can change the network configuration parameters (IP address, netmask and gateway).With the NETCONFIG command the device will be restarted to produce the changes. If the console is run from a Telnet session, the communication with the device will be interrupted. You will have to reopen the TCP session using the new IP address.

Table 10 - NETCONFIG Command

Command	Description
NETCONFIG:*IP_addr,NETMASK*	Changes network configuration parameters. Netmask and IP address equal to 0.0.0.0 enables DHCP

D.2.4. Factory Reset command

At any time, the RME1-AI administrator can reset the original manufacturer's configuration. This option can be executed through the command console with the FACTRESET command, this way you will have the original configuration.

Table 11 - FACTRESET Command

Command	Description
FACTRESET	Resets the original manufacturer's configuration.

D.2.5. Reset command

At any time you can restart the RME1-AI.
To restart the device you can execute the RESET command from the command Console.

Table 12 - RESET Command

Command	Description
RESET	Resets RME1-AI.

D.2.6. Analog Input command

You can change the filter and type of each analog input with this command.
From the command console you may type the **AINPUT** command followed by the number of input you want to configure (0-7) and the type of input (0 = 4-20mA, 1 = 0-10V) and filter (1, 5, 10, 20, 50 or 100 samples).

Table 13 - AINPUT Command

Command	Description
AINPUTn:*type,filter*	Changes the type of input and the filter for the analog input n. n=0 up to 7 type: 0 (4-20mA) , 1 (0-10V). Filter: 1,5 , 10 , 20 , 50 or 100 (samples)

D.2.7. Analog List Command

From the command console, you can see all the analog inputs value by executing **ALIST** command.

Table 14 - ALIST Command

Command	Description
ALIST	Lists all the analog inputs status.

D.2.8. Scaling command

You can modify the scaling configuration of each analog input with the **SCALING** command.
You must specify two coordinates of the plane x, y through which passes the scaling straight line, and the amount of decimals you want to visualize.

Table 15 - SCALING Command

Command	Description
SCALINGn:*X0,Y0,X1,Y1,num*	**Changes the scaling of the analog input n to a straight line that passes through the coordinates (X0, Y0) , (X1, Y1) and n (0,7)**

	Range
X0	0 up to 4095 (4000 for 10V or 20mA)
Y0	-32767 up to 32767
X1	0 up to 4095 (4000 for 10V or 20mA)
Y1	-32767 up to 32767

	You must configure how many decimal digits will be displayed on the monitor web page.

D.2.9. Aalarm command

With this command you can enable or disable Low and High alarms and configure its set points.

Table 16 - AALARM Command

Command	Description
AALARMn:*enableL,valueL, enableH,valueH*	For input n enables (1) or disables (0) low alarms (L) or high alarms (H) and configure its set points. Minimum and maximum values for these parameters are: - 32.767 y 32.767 respectively.

D.2.10. Aname Command

With this command you can assign a name to an input, and configure to visualize it or not in the user monitor.

Table 17 - ANAME command

Command	Description
ANAMEn:*name,visualize*	Assigns the name name to the input n and configure it to be visualized (1) or not (0)

D.2.11. Aselect command

With this command you can select the data column to visualize in the user monitor page.

Table 18 - ASELECT command

Command	Description
ASELECT:*n*	Value to visualize in the user monitor page. (0-Analog, 1-Scaled, 2-Converter)

D.2.12. SNMPEnable command

With this command you can enable or disable the SNMP service.

Table 19 - SNMPENABLE command

Command	Description
SNMPENABLE:*n*	n=E Enables or n=D Disables, the SNMP service

D.2.13. SNMPTrapsEnable command

With this command you can enable or disable the SNMP traps delivery.

Table 20 - SNMPTRAPSENABLE command

Command	Description

SNMPTRAPSENABLE:*n*	**n=E Enables or n=D Disables, the SNMP traps delivery**

D.2.14. SNMPManager1 command

With this command you can configure the SNMP manager 1 IP address. It is possible to enter the 0.0.0.0 IP address and it means that the manager doesn't exist.

Table 21 - SNMPMANAGER1 command

Command	Descriptio1n
SNMPMANAGER1:*ip_addr*	**Configures the Manager 1 IP address**

D.2.15. SNMPManager2 command

With this command you can configure the SNMP manager 2 IP address. It is possible to enter the 0.0.0.0 IP address and it means that the manager does not exist.

Table 22 - SNMPMANAGER2 command

Command	Description
SNMPMANAGER2:*ip_addr*	**Configures the Manager 2 IP address**

D.2.16. SNMPReadCN command

With this command you can configure the SNMP read community.

Table 23 - SNMPREADCN command

Command	Description
SNMPREADCN:*com*	**Configures the SNMP read community**

D.2.17. SNMPWriteCN command

With this command you can configure the SNMP write community.

Table 24 - SNMPWRITECN command

Command	Description
SNMPWRITECN:*com*	**Configures the SNMP write community**

D.2.18. SNMPTrapCN command

With this command you can configure the SNMP trap community.

Table 25 - SNMPTRAPCN command

Command	Description
SNMPTRAPCN:*com*	**Configures the SNMP trap community**

D.2.19. More Configuration commands

The following commands allow asking for help, listing the configuration and saving the configuration in device's memory.

Table 26 - More Commands

Command	Description
HELP	Lists help for the configuration commands
LIST	Lists the equipment's configuration
END	Ends configuration and goes to RUN mode.

IMPORTANT
After a configuration change the command END must be entered. Then, the device will restart loosing communication. To reconnect, a new Telnet session must be opened.

Table 27 - Telnet commands

Command: Syntax	Description
END	Ends configuration
HELP	Lists configuration commands
LIST	Shows configuration values
NETCONFIG:*ip_addr,mask,gateway*	IP configuration Netconfig:0.0.0.0, 0.0.0.0, 0.0.0.0 Enables DHCP service
HOSTNAME:*name*	Device's name
PASSWORD:*XXXXXX*	Device's password (XXXXXX is the password to configure)
FACTRESET	Set configuration to factory default
RESET	Restart the device
ALIST	Lists inputs value and status
AINPUTn:*type,filter*	Input 'n' configuration type:0(4-20mA),1(0-10V) filter:1,5,10,20,50 or 100(samples)
SCALINGn:*x0,y0,x1,y1,d*	Input 'n' scaling x0: abcissa0 (0 up to 4095) y0: ordinate0 (-32.767 up to 32.767) x1: abcissa1(0 up to 4095) y1: ordinate1 (-32.767 up to 32.767) d: decimals for web monitor (0 up to 4)
AALARMn:*el,sl,eh,sh*	Alarms enable and set points el: enable low alarm(0,1) (activate for scaled value) sl: set point low alarm eh: enable high alarm(0,1) sh: set point high alarm
ANAMEn:*name,visualize*	Input 'n' name and enable to visualize in web
ASELECT:*sel*	Value to show in web monitor sel: value (0 Analog, 1 Scaled, 2 Converter)
EXCEPTIONS:*option*	Modbus Exceptions option: E(enable), D (disable)
SNMPENABLE:*option*	SNMP enable option: E(enable), D (disable)
SNMPTRAPSENABLE:*option*	SNMP traps enable option: E(enable), D (disable)
SNMPMANAGER1:*ip_addr*	SNMP Manager 1 IP address
SNMPMANAGER2:*ip_addr*	SNMP Manager 2 IP address
SNMPREADCN:*name*	SNMP read community
SNMPWRITECN:*name*	SNMP write community
SNMPTRAPCN:*name*	SNMP trap community

Appendix E

E.ARP method to configure IP address

In case you want the RME1-AI to have a static IP address (no DHCP service), you can assign it to the device using the ARP method.
If RME1-AI receives, within the first 7 seconds after power on, an ICMP packet (ping) it will get that packet destination address.
With this purpose you can force an entry in a PC ARP table within a network.

1. The ARP table has to have at least one IP address different to itself, for the ARP command to work properly. Check the ARP table has at least one entry with the command:

```
arp -a
```

If the only entry is the local PC send a ping to other network device.

2. In Windows, you can force an entry in the ARP table with the following command:

```
arp -s 192.168.0.105 00-90-C2-XX-XX-XX
```

3. In Unix the command to add an entry in the ARP table is:

```
arp -s 192.168.0.105 00:90:C2:XX:XX:XX
```

4. Send a ping to the IP address you forced in the ARP table with the following command:

```
ping 192.168.0.105 -t
```

The –t option will send it continuously.

Turn on the RME1-AI. You will not get any response after a few seconds. When the RME1-AI answers the ping, you can access to the device through the network.

After using this method to assign an IP address you should configure the netmask using any of the other configuration methods.