measuring converter # AD4ETH

4 inputs for standardized signal measuring

0 – 10 V, 0 – 20 mA, 4 – 20 mA, ...

Communication via Ethernet

AD4ETH

Datasheet

Created: 9/1/2007

Updated at 2. March 2023 13:50

Number of pages: 40

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CONTENT

Firmware changes overview

Version 79 (3/2023)

- Options to disable Telnet, Firmware Upgrade and SNMP.

- With a specific press of the Reset button, the IP address can be retrieved from the DHCP server.

- Added DNS server, Mailserver Domain and Mailserver Port settings.

- Extension of fields for entering passwords (length is always specified in title of configuration field), clarification of field titles.

- Possibility to hide inputs 2, 3 or 4.

- The user and administrator each have their own login.

- Sending via http: Change to a single longer field with a relative path to the script. Removed GUID.

FIRST START

1. Connect all connectors according to chapter Wiring on the page 8. (It is sufficient to connect power and Ethernet for the first time.)

2. If the default IP address 192.168.1.254 is not acceptable for your computer network, change it by means described in chapter IP address change on the page 35.

3. Enter the IP address of your AD4ETH to the WEB browser[1]. Default IP address is http://192.168.1.254/ .

4. AD4ETH WEB page in Administrator mode will open. There is an icon of a tool in the upper right corner. You can use this icon to access device settings. You can view help by pointing the cursor at the given text field.

ABOUT THE DEVICE

AD4ETH measuring converter is a 4-input A/D converter which enables the user to measure to four current inputs ranging from 0(4) to 20 mA or voltage between 0 and 10 V. [2] The measured values are then transferred to a superior system in digital form.

AD4xxx has been produced in three versions differing in their communication interface – the data can be transferred via RS232/RS485 lines, over USB interface or the Ethernet. The AD4ETH version communicates via Ethernet. The converter supports the most commonly used communication methods such as **Modbus TCP**, **SNMP**, XML, ...

---
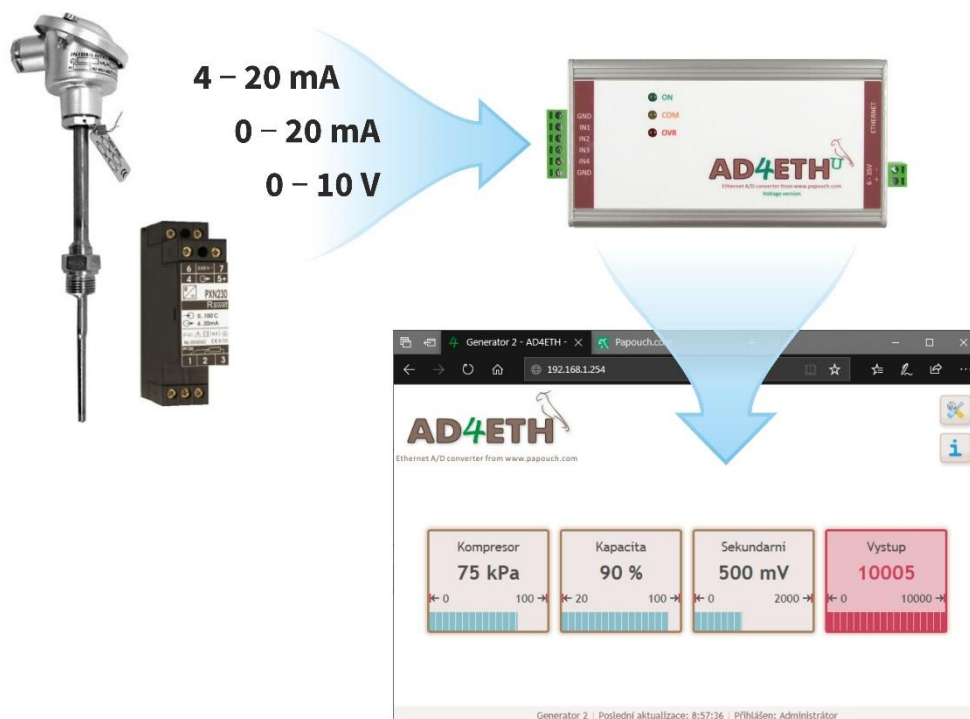
[1] JavaScript must be enabled in your browser.

[2] The basic range (typically 10 V) can be changed to 2.5 to 100 V (including bipolar) or to a current range from 0 to 20 mA, 4 to 20 mA, or other according to your requirement. If you need a range for your application that is not listed here, write it in the order notes or contact us.

Application

- Measurement of values from sensors with voltage or current output.

- Reading of sensors whose output is a standardised current signal

- Digitalisation of measured values from level, pressure, temperature, distance and other sensors

- Remote supervision over applications indicated above.

Features

- Four analogue inputs for current or voltage

- Measuring scale divided into 10 000 divisions

- Full isolation of the measuring part from power supply and communication lines

- Measurements carried out by a multiplex 16-bit sigma-delta A/D converter

- The maximum measuring speed of each input equals 500 ms

- Communication via 10/100 Ethernet (Internet)

- Communication protocols TCP/IP (Spinel), UDP/IP (Spinel), SNMP, MODBUS TCP, HTTP (WEB, WAP, XML, SOAP)

- Two different measuring modes are available for TCP or UDP connection:

  - Single measurement – sends one measured value from each input upon a request.
  - Continuous measuring – measures all inputs in the set interval and regularly sends the measured values via the communication line.

- Internal web site allowing to view current values and settings.

- Measured out values and configuration available in XML format.

- Advanced conversion to user defined ranges and units. (For example, if the pressure sensor is connected to the AD4ETH, it can be transmitted directly as a value in kPa.)

- Measured values can be transmitted as a HTTP GET or POST request.

- Measuring Wix software for temperatures displaying and storing for Windows

- Wide range of power supply voltage (8 to 30 V)

AD4ETH

1) Web page

It is possible to easy monitor the measured values and also to configure AD4ETH over the Intranet interface. The pages are secured by means of user name and password. It is possible to setup a separate password for the configuration and another one for the display of current values. The pages in AD4ETH can be displayed in Czech or English according to the setup. *(See page for more information.)*
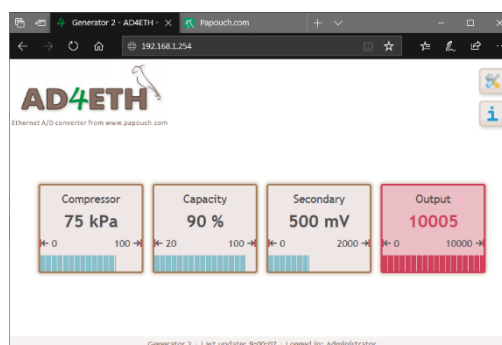
2) XML file

It is also possible to import all the values from AD4ETH in the XML file format. This format is easy to process by the application or to read by the web service. *(See page 14 for more information.)*

```
<input id="2" unit="V" val="375.5" min="370" max="400" name="Generator" ...
```

3) Wap site for older mobile devices

AD4ETH contains a simple WAP page with measured data. It is possible to open this page in a mobile phone, PDA or another mobile device. Thus the current status of the device can be viewed whenever needed. *(See page 12 for more information.)*

4) Inserting the current values into the web sites (HTTP GET)

AD4ETH enables you to periodically call a script (for example PHP) on a selected WEB server and to hand the measured values and other parameters over to the server in the form of HTTP GET parameter. Thus, you can easily include the currently measured values directly into your WEB site. *(See page 15 for more information.)*

```
www.myserver.net/ad4eth.php?ch=1&unit=V&val=375.50&min=370& ...
```

5) Current values handing-over to the WEB service (HTTP POST, SOAP)

AD4ETH is also able to periodically send the measured data as HTTP POST in the format of XML SOAP (Simple Object Access Protocol). This way is ideal for further processing of the measured values by the WEB service waiting in a server on the Internet or Intranet. This data in the XML format can be easily processed, e.g. in the .NET or PHP environment – there is no need to program any communication protocol, etc. The only thing than needs to be done is to process the delivered XML file. *(See page 16 for more information.)*

6) SNMP protocol

The SNMP protocol is used in large companies for the centralized administration and monitoring of all hardware and technologies. AD4ETH is able to communicate via this protocol and, according to the setup, It sends SNMP traps when the pre-set critical limits are exceeded. It is also able to periodically send traps with current values. *(See page 18 for more information.)*

7) Email

According to the setup, AD4ETH is able to inform the user via email that the critical limits, pre-defined for individual channels, have been exceeded. (Thanks to services provided by operators it is possible to forward the email easily to a mobile phone as an SMS message.) *(See page 18 for more information.)*

8) TCP or UDP protocol

AD4ETH is also able to operate as the TCP client or TCP server or to communicate via UDP. The Spinel protocol is used by AD4ETH in these ways of communication. This way of communication is similar to the serial link communication. *(See page 13 for more information.)*

9) MODBUS TCP protocol

AD4ETH is also able to communicate via the standard industry protocol of MODBUS TCP. *(See page 20 for more information.)*

BLOCK DIAGRAM AND OPERATION

The measuring part is fully isolated from the communication line and power supply.
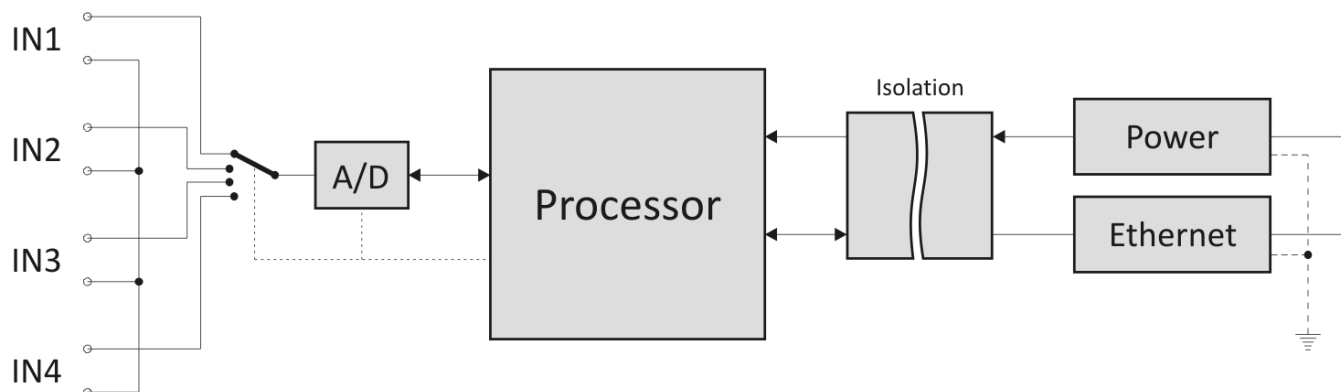

Fig. 1 – Block diagram of AD4ETH

The AD4ETH measuring device uses one switched sigma-delta A/D converter. After switching on the power supply voltage, the processor initiates the A/D converter and set the device parameters according to the data saved in memory. Then the device start to regularly measure the values of voltage found on the analogue inputs and saves the results into the integrated memory.

In the continuous measuring mode AD4ETH sends the measured values in the set interval.

WIRING

Inputs

Note: The input types (voltage or current) are unchangeable and must be specified by the user when ordering the device. Subsequently they can be changed only by the manufacturer.

All four measuring inputs have a common ground. This ground is galvanically isolated from the Ethernet and power supply. (The terminal block is designed for a 2.5 mm flat head screwdriver.)

Fig. 2 – measuring terminals

Power supply

DC supply 8 to 30 V shall be connected to the double terminal shown in Fig. 3. The input has an integrated polarity reversal protection. (The terminal block is designed for a 2.5 mm flat head screwdriver.)

Ethernet

Ethernet (computer network interface) is to be connected to a connector in Fig. 3. It is a standardized RJ-45 connector for 100/10 Ethernet. Connect this connector to the PC via a cross-wired cable or to switch via a direct cable.

Fig. 3 – terminals for power and Ethernet connection; reset button in the middle

Examples of connection structure

The following figures show examples of AD4ETH connection structure.

Voltage measurement

An example of voltage supply connection to AD4ETH terminals. The inputs are fully isolated from the power supply.
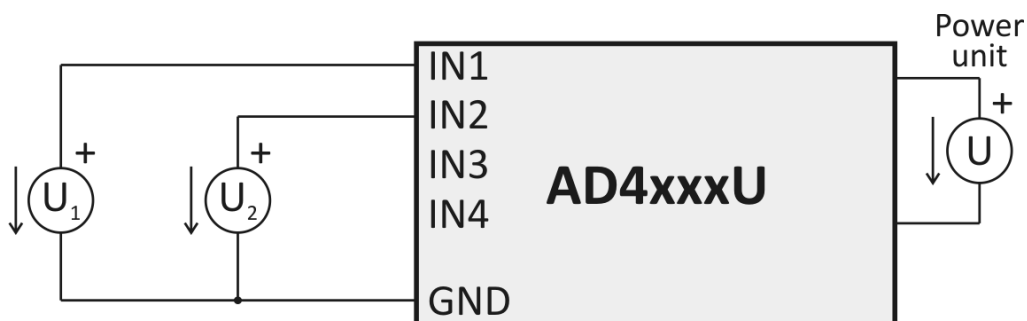
Fig. 4 – Voltage measurement

Sensors with output of 0 to 20 mA and own power supply

Sensors with currents outputs can be connected directly to the inputs with current range and supplied either from their own power supply (in this case, the sensor is isolated from AD4ETH power supply) or from the same supply as AD4ETH (see the dashed lines in Fig. 5; in this case, sensors are not isolated).
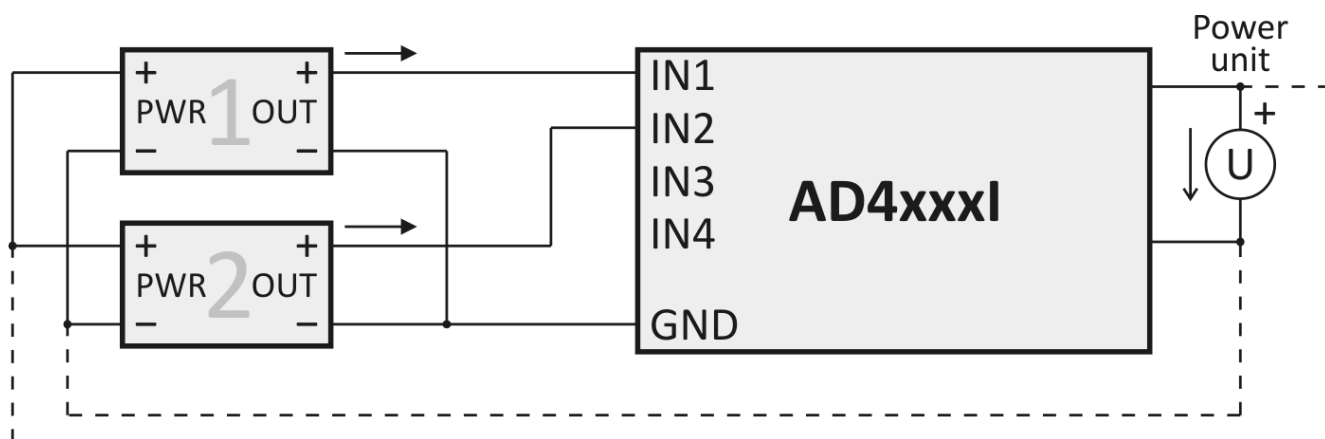
Fig. 5 – Current sensors with their own power supply

Sensors with output of 0 to 20 mA, supplied through current loop

A. With a separate source for sensors

In this case, the sensors are isolated from AD4ETH power supply.
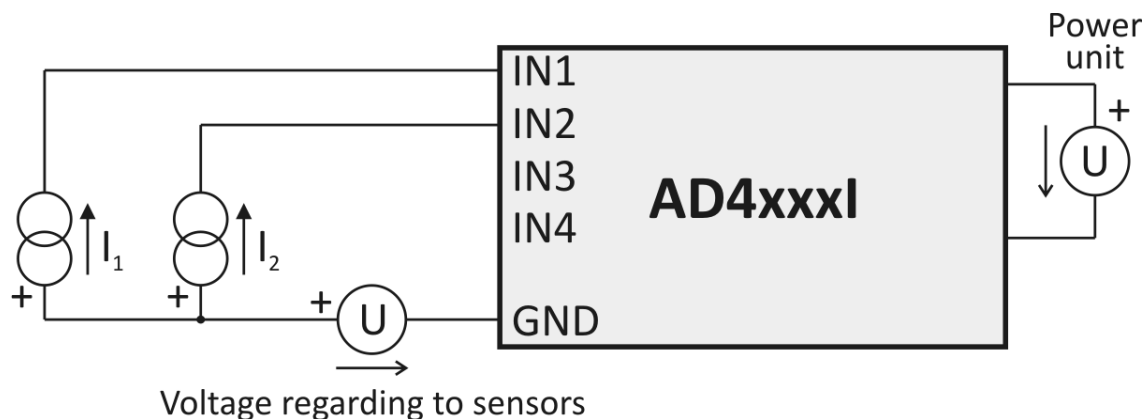
Fig. 6 – Current sensors with separate supply through current loop

B. With a joint source for sensors and AD4ETH

In this case, the sensors are isolated with AD4ETH power supply.

Fig. 7 – Current sensors supplied through current loop from joint source with AD4ETH

WEB INTERFACE

It is possible to monitor the status of all inputs and to configure all parameters of the device via the WEB interface. WEB interface is available on the IP address of AD4ETH. The initial IP address is 192.168.1.254.

The WEB page enables optical highlighting of the value exceeding the set limits or measuring errors (according to the setup, AD4ETH simultaneously sends an email, SNMP trap etc.)
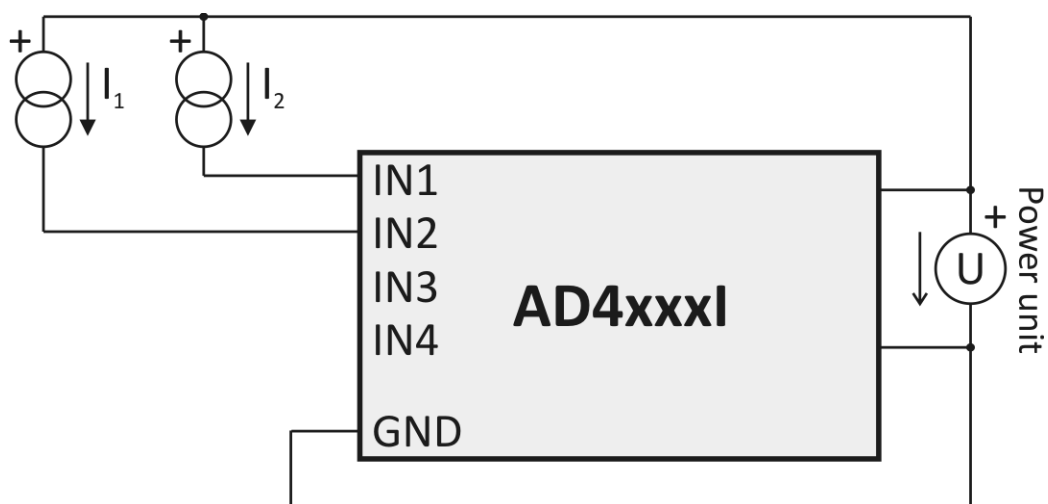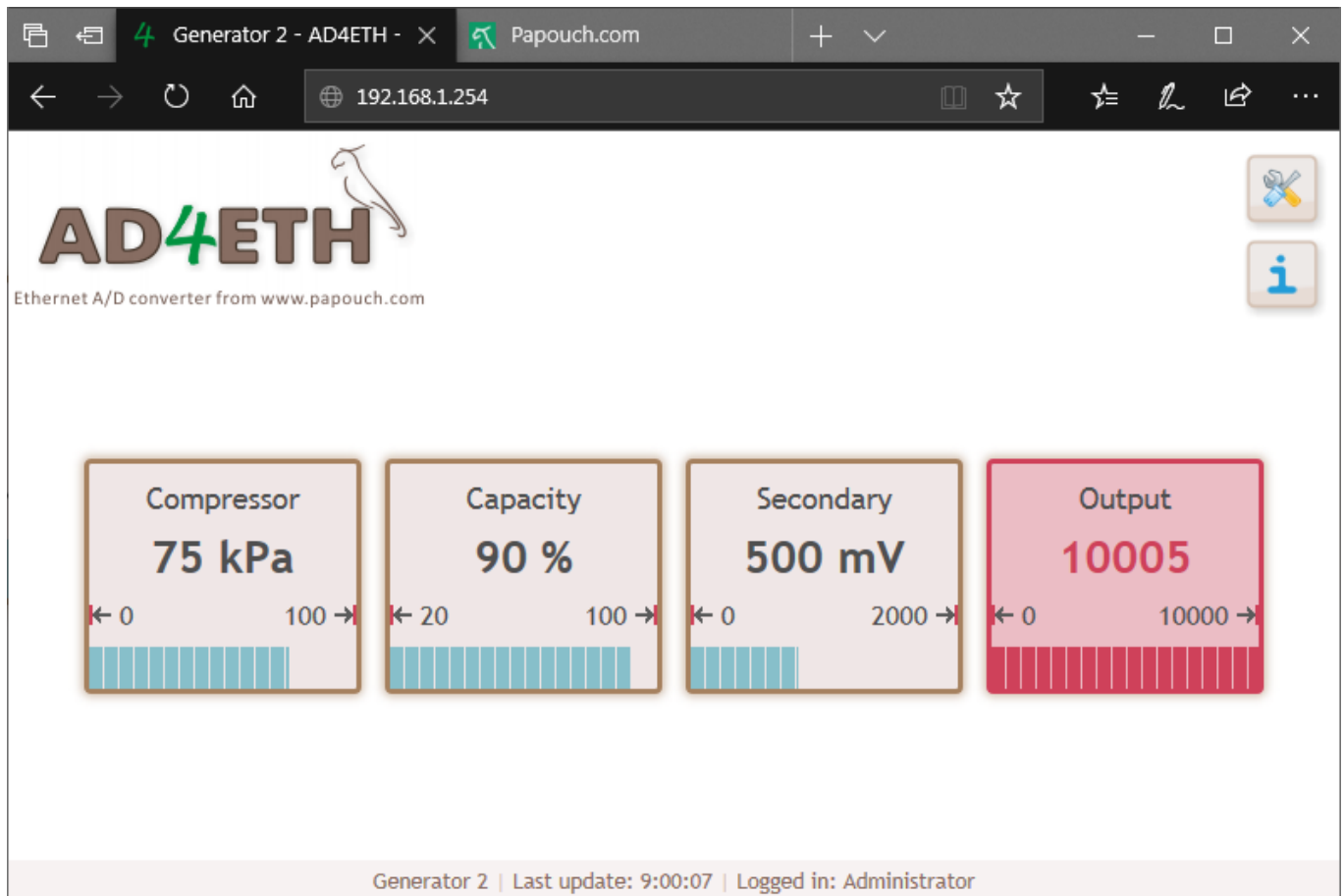

Fig. 8 – Example of WEB interface (three channels are all right, one shows range exceeding)

WEB interface is available in the Czech and English language.

The interface security is divided into two levels (each with an individual password). The "user" level only enables users to view the status of inputs. The "admin" level also enables the configuration of the device.

Quick help for the individual setup items is displayed when you scroll the pointer of mouse over the appropriate input field.

AD4ETH enables the user to enter data (text or HTML) available from the main page. This option is suitable for entering instructions for the operating staff, providing a link to the company WEB, to other devices etc.

Configuration via the WEB interface is available by clicking on the symbol of the tool and is described in chapter Configuration via WEB interface beginning on page 21.

WAP – Simplified view

The WAP interface allows you to monitor the current readings from the AD4ETH via old mobile devices such as a "non-touch" mobile phone, PDA, etc. WAP is designed with minimum functionality with respect to the lowest possible data transmission.

WAP is available on the IP address of AD4ETH in the /wap folder. The initial setup of AD4ETH contains the following address of wap http://192.168.1.254/wap .

It is possible to update WAP automatically after a pre-defined interval. This interval can be set in the WEB setup in the Other settings tab. The default period is 30 sec.[3]

WAP is not secured, there is no user name or password required to access it. It is possible to restrict the display of the values on WAP in the WEB setup in the Security tab.

Fig. 9 – Example of WAP interface opened in a mobile device

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[3] Periodical update is performed by the *refresh* meta tag. This method of update is not supported by all mobile devices.

COMMUNICATION VIA TCP/UDP (SPINEL)

With AD4ETH it is possible to communicate via the TCP or UDP data channel using the Spinel protocol.

Communication protocol Spinel (binary and ASCII format) is described in a separate document including the examples, which is available for downloading from AD4ETH web page.

All commands are well documented including examples for each instruction. Spinel Terminal and online parser is also available for easy debugging. Spinel protocol can also be implemented using Spinel.NET library designed for .NET. It is freely available on GitHub. (Czech documentation only.)
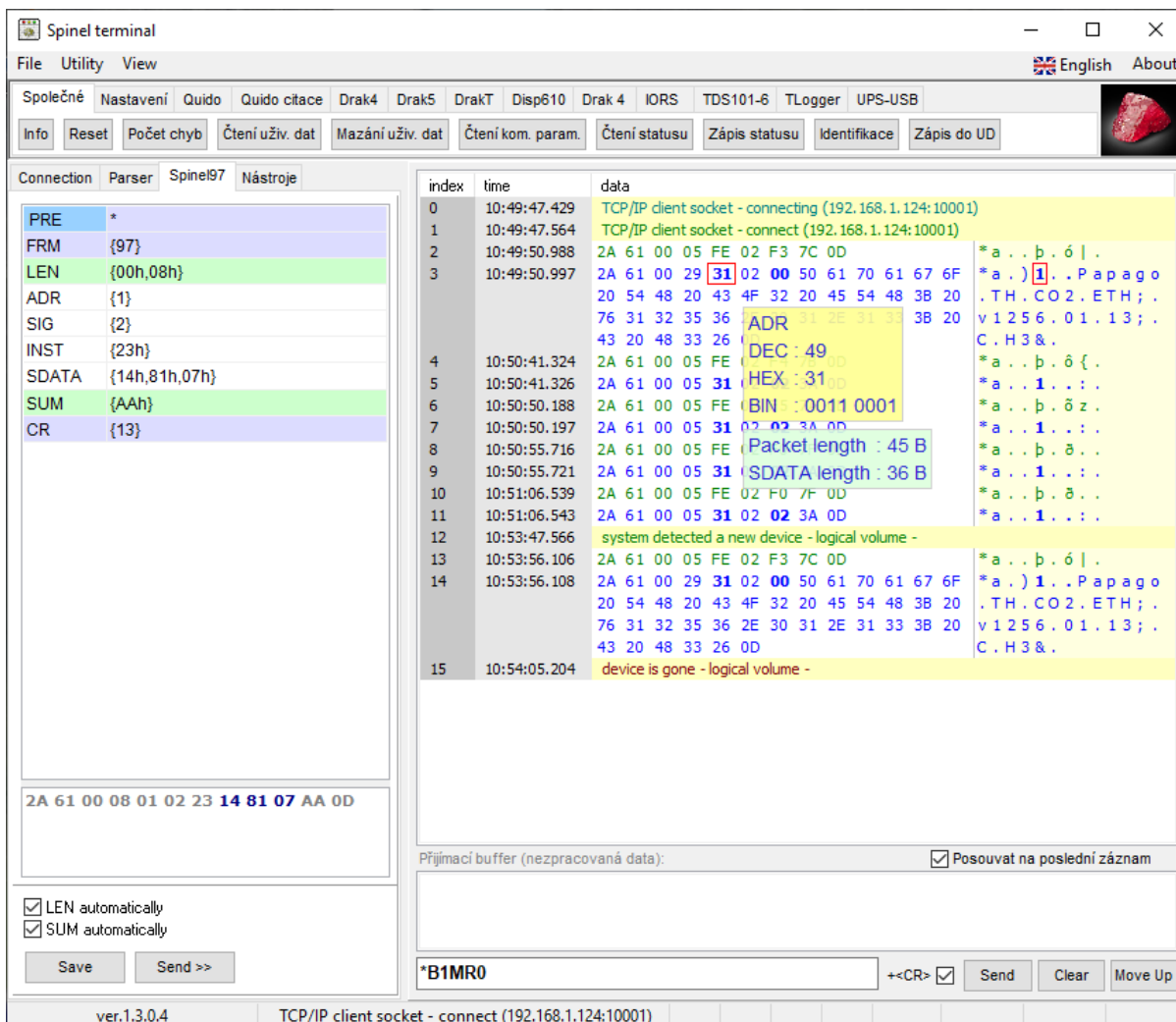
Fig. 10 – Example of the Spinel terminal program, tunning the communication with AD4ETH

AD4ETH allows the following types of data connection:

TCP server

In the **TCP server** mode**,** AD4ETH expects the connection on the data port (set via the WEB interface in the Local port item). AD4ETH uses this TCP connection to communicate with a remote device by means of the Spinel protocol.[4]

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[4] It is not possible to view the currently set values via the WEB in this mode and it is possible to perform only some settings via the WEB.

TCP client

In the **TCP client** mode, AD4ETH connects automatically to a remote IP address (set in the Remote IP address) a the port (set in the Remote port). AD4ETH uses this TCP connection to communicate with a remote device by means of the Spinel protocol.[4]

UDP

In the **UDP** mode**,** the data from AD4ETH is routed to a device with the IP address set in the Remote IP address item or, without routing, to a required address if the broadcast address of your network is set as the Remote IP address (a so called "UDP broadcast"). In this case, AD4ETH communicates with any device which asks.[4]

CURRENT VALUES IN XML FORMAT

After the initialization of AD4ETH, it is possible to get current values in the XML format. The file with the values is available on the IP address of the device in the /data.xml file (the http://192.168.1.254/data.xml file for a device in the default configuration). This file is secured by means of a user name and password according to the setup via WEB.[5]

An example of the file with data in the xml format:

```xml
<?xml version="1.0" encoding="iso-8859-2"?>
<root>
  <input id="1" unit="V" val="375,5" min="" max="" dot="2" bar="1000" stat="0" name="Generator" />
  <input id="2" unit="W" val="450" min="400" max="10000" dot="0" bar="2000" stat="0" name="Test" />
  <input id="3" unit="cm" val="120" min="0" max="400" dot="0" bar="5000" stat="0" name="Hladina" />
  <input id="4" unit="cm" val="73" min="0" max="10000" dot="2" bar="7000" stat="2" name="Rizeni" />
</root>
```

The meaning of individual parameters:

    `id` .... channel number (1 to 4)

    `unit` ..... unit (user defined string with the unit)[6]

    `val` .... measured value (decimal number recalculated according to the user defined range)[7]

    `min` .... lower limit (decimal number or blank value if not pre-defined)[8]

    `max` .... upper limit (decimal number or blank value if not pre-defined)[9]

    `dot` .... number of decimal places the displayed values are to be rounded to (whole number ranging from 0 to 3 according to user setup)[10]

    `bar` .... measured value as a number from the range of 0 to 10 000

---

[5] Basic HTTP authentification (HTTP 401).

[6] See the settings item named Unit on page 36.

[7] See the settings items named Upper range limit and Lower range limit on page 36.

[8] See the settings item named Lower range limit on page 36.

[9] See the settings item named Upper range limit on page 36.

[10] See the settings item named Number of decimal places for math rounding on page 36.

`name`..... channel name (user defined string)[11]

`stat`..... measured value status. The status can be as follows:

status	meaning
0	Value is OK.
1	Value still not available.
2	Input range upper limit has been exceeded.
3	Input range lower limit has been exceeded. (applicable only for the input of 4 to 20 mA)
4	Measurement error. Invalid value.

SENDING THE VALUES BY HTTP PROTOCOL (GET, POST)

AD4ETH is able to send the measured values to a WEB server on the Internet or company intranet. The values are then easy to process using the common scripting language (PHP, .NET, …), to display, store, analyze, etc.

Sending of the values works in the following way – the path to the server script is entered in the setup and AD4ETH sends the measured values to it in a pre-defined interval. It is possible to send values to the server from AD4ETH as a request of the HTTP GET or HTTP POST type (in the SOAP XML format).
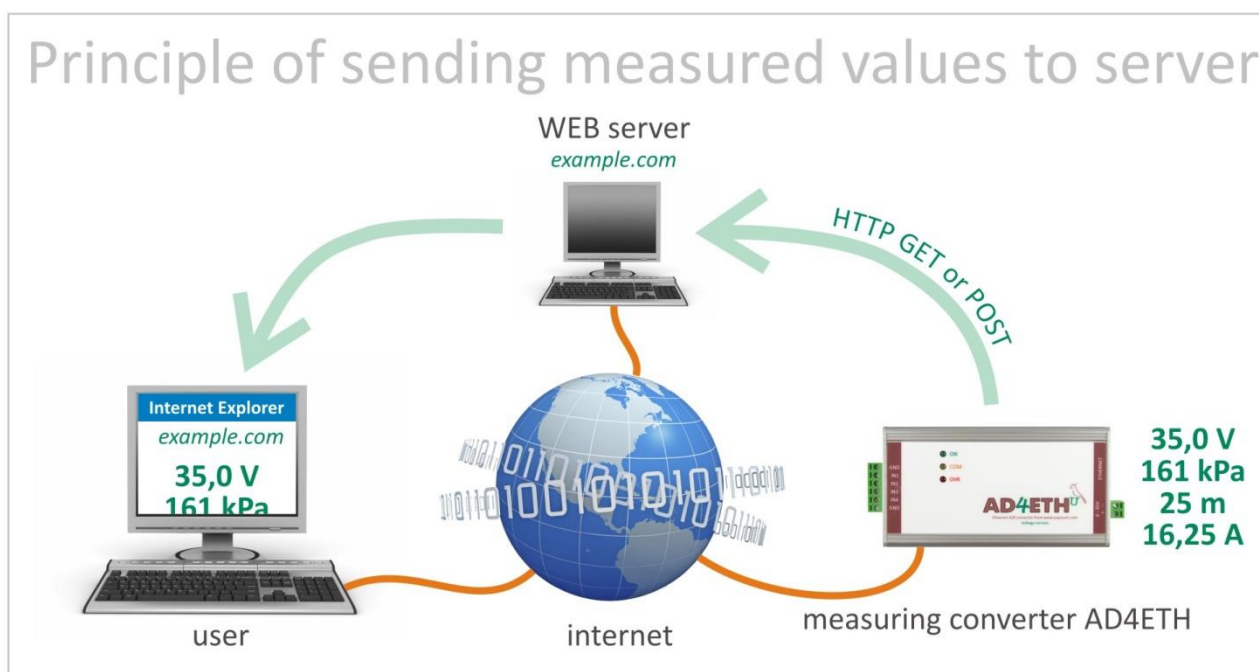

Fig. 11 – Principle of sending the measured values from AD4ETH to a WEB server on the internet and then to User's Web browser

The setup of the sending process is performed in the Sending tab in the configuration via WEB. (AD4ETH is able to send either POST or GET, not both of them simultaneously.)

---

[11] See the settings item named Channel name on page 35.

HTTP GET

The HTTP GET request is sent separately for each channel. The the form of the request is illustrated in the following example:

```
../ad4.asp?chan=1&unit=V&val=375.50&min=&max=&stat=0&name=Generator
```

As evident from the example, the request is in a form well-known to web programmers from the strandard method of form data sending. It eliminates the necessity to learn new methods of programming and the processing can be handled by the mechanism known from web forms processing (`<form name="myform" action=…`).

The request is sent in an interval set in the Sending period item on page 28. Four requests are sent in the intervals, each with the values from one channel.

The parameters in GET are as follows:

`chan` ..... channel number (1 to 4)

`unit` ..... unit (user defined string with the unit)[12]

`val` .... measured value (decimal number recalculated according to the user defined range)[13]

`min` .... lower limit (decimal number or blank value if not pre-defined)[14]

`max` .... upper limit (decimal number or blank value if not pre-defined)[15]

`stat` ..... measured value status. The status can be as follows:

status	meaning
0	Value is OK.
1	Value still not available.
2	Input range upper limit has been exceeded.
3	Input range lower limit has been exceeded. (applicable only for the input of 4 to 20 mA)
4	Measurement error. Invalid value.

`name` ..... channel name (user defined string)[16]

---

[12] See the settings item named Unit on page 36.

[13] See the settings items named Upper range limit and Lower range limit on page 36.

[14] See the settings item named Lower range limit on page 36.

[15] See the settings item named Upper range limit on page 36.

[16] See the settings item named Channel name on page 35.

HTTP POST (SOAP)

The HTTP POST request is sent in an interval set in the Sending period item on the 28 in the form illustrated by the following example:

Header:

```
POST /ad4.asp HTTP/1.1
Host: www.example.com
Content-type: application/soap+xml; charset=iso-8859-2
Content-length: [the real length of the request body]
```

Request body:

```xml
<?xml version="1.0" encoding="iso-8859-2"?>
<soap12:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:soap12="http://www.w3.org/2003/05/soap-envelope">
  <soap12:Body>
    <root>
      <input ch="1" stat="0" unit="" val="0" min="0.000" max="0.000" mode="0" name"---" />
      <input ch="2" stat="0" unit="" val="0" min="0.000" max="0.000" mode="2" name"---" />
      <input ch="3" stat="0" unit="" val="0" min="0.000" max="0.000" mode="1" name"---" />
      <input ch="4" stat="0" unit="" val="0" min="0.000" max="0.000" mode="1" name"---" />
    </root>
  </soap12:Body>
</soap12:Envelope>
```

Meaning of individual parameters:

ch .... channel number (1 to 4)

stat ..... measured value status. The status can be as follows:

status	meaning
0	Value is OK.
1	Value still not available.
2	Input range upper limit has been exceeded.
3	Input range lower limit has been exceeded. (applicable only for the input of 4 to 20 mA)
4	Measurement error. Invalid value.

unit ..... unit (user defined string with the unit)[17]

val .... measured value (decimal number recalculated according to the user defined range)[18]

min .... lower limit (decimal number or blank value if not pre-defined)[19]

max .... upper limit (decimal number or blank value if not pre-defined)[20]

---

[17] See the settings item named Unit on page 36.

[18] See the settings items named Upper range limit and Lower range limit on page 36.

[19] See the settings item named Lower range limit on page 36.

[20] See the settings item named Upper range limit on page 36.

`mode` ..... indicates whether the measured values monitoring is („1") or is not („0") switched on

`name` ..... channel name (user defined string)[21]

SENDING EMAILS

Based on the settings, AD4ETH is able to send emails informing the user that limits defined for individual channels have been exceeded.

The email can be sent to one address. The body of the email contains information defining the channel in problem, showing the value that has been exceeded and the current value.

The emails can be set in the Email tab (see page 25) in the WEB configuration. Here you can find the setup of the email account as well as the SMTP server authorization (if required). The function of value monitoring can be set in the cards of individual channels the user wishes to monitor.

(The email sending feature can only be used with SMTP servers that do not require SSL encrypted communication.)

SNMP PROTOCOL

The SNMP protocol is used in large companies for the centralized administration and monitoring of all hardware and technologies. AD4ETH is able to communicate via this protocol and, according to the setup, it sends SNMP traps when the pre-set critical limits are exceeded. It is also able to periodically send traps with current values.

Tip: If you want to browse the whole SNMP tree using SNMPWALK utility (Linux), you need to specify exactly where the readout should start after the IP address. For example:

snmpwalk -v1 -c public 192.168.1.254 1.3.6.1.4.1.18248

If you only rad with IP address, you will get just basic system IOD objects of the device.

A n a l o g u e   i n p u t   n a m e

ID: 1.3.6.1.4.1.18248.17.3.2.1.1.1.1 - 4
Type: String
Action: Read only

The object contains the current name of the pre-selected analog input.

A n a l o g u e   i n p u t   s t a t u s

ID: 1.3.6.1.4.1.18248.17.3.2.1.1.2.1 - 4
Type: Integer
Action: Read only

The object contains the channel status, representing the current status of the measured value in the following object. Options:

0 … Value is up-to-date and valid
1 … Value is not up-to-date or is not available
2 … Upper limit exceeding
3 … Lover limit exceeding (only for the range of 4 to 20 mA)

---

[21] See the settings item named Channel name on page 35.

4 … Measurement error

Measured value

ID: *1.3.6.1.4.1.18248.17.3.2.1.1.3.1 - 4*
Type: *String*
Action: *Read only*

The object contains the currently measured value form the pre-selected analogue input as a string.

Units

ID: *1.3.6.1.4.1.18248.17.3.2.1.1.4.1 - 4*
Type: *String*
Action: *Read only*

The object contains a string with the definition of units.

Values monitoring

ID: *1.3.6.1.4.1.18248.17.3.3.1.1.1.1 - 4*
Type: *Integer*
Action: *Read only*

The object contains the current status of the value monitoring function for a given channel. Options:

0 … Monitoring switched on
1 … Monitoring switched off

Upper limit

ID: *1.3.6.1.4.1.18248.17.3.3.1.1.2.1 - 4*
Type: *String*
Action: *Read only*

Upper limit of the measured value. A trap is sent when the value is exceeded. (If the value monitoring function is switched on.)

Lower limit

ID: *1.3.6.1.4.1.18248.17.3.3.1.1.3.1 - 4*
Type: *String*
Action: *Read only*

Lower limit of the measured value. A trap is sent when a measuring result drops below this value. (If the value monitoring function is switched on.)

Limits hysteresis

ID: *1.3.6.1.4.1.18248.17.3.3.1.1.4.1 - 4*
Type: *String*
Action: *Read only*

A hysteresis value which shall apply below the upper and above the lower limit.

Device name

ID: *1.3.6.1.4.1.18248.17.3.1.1.0*
Type: *String*

Action: Read only

The object contains the device name.

T r a p   t e x t

ID: 1.3.6.1.4.1.18248.17.3.1.2.0
Type: String
Action: Read only

The object contains the text of the current trap.

MODBUS PROTOCOL

MODBUS TCP is a standard industry protocol. AD4ETH is able communicate via this protocol. For complete information and documentation of the MODBUS TCP protocol see www.modbus.org .

The standard MODBUS port is 502. It can be changed via the web interface on *Network* tab.

I n p u t   R e g i s t e r

Address	R/W	Function	Description
Channel 1			
0 [22]	read	0x04	**Channel 1 – status** This register describes status of value in following register with measured value. It can take the following values: 0x0000..... value is valid and is in the range 0x0001..... value not yet available 0x0002..... overflow 0x0003..... underflow other .... other error
1	read	0x04	**Channel 1 – measured value as integer** Measured value as an integer from 0 to 10 000.
2, 3	read	0x04	**Channel 1 – measured value as float** Measured value as 32 bit floating point number according to IEEE 754 [23]. (Order is: MSW, LSW)
Channel 2			
4 - 7	Values of channel 2		
Channel 3			
8 - 11	Values of channel 3		
Channel 4			
12 - 15	Values of channel 4		

---

[22] It is possible to see registers numbered from one or zero, because this first register has address 0.

[23] A description of the IEEE 754 standard is available, for example, here: en.wikipedia.org/wiki/IEEE_754

CONFIGURATION

AD4ETH can be configured in the following ways:

- **WEB interface:** This interface is accessible from the IP address of the device. The default IP address is 192.168.1.254.

- **Telnet:** Telnet is accessible from the IP address of the device. The default setup is 192.168.1.254, port 9999. The description of Telnet can be found on page 32.

Firmware version information

Clicking on the `i` symbol at the top right of the web interface will bring up a window with this line at the bottom with the current firmware version and release date.
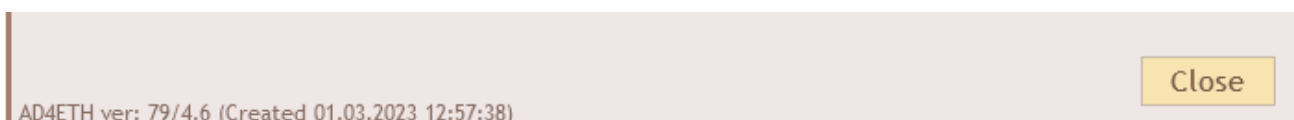

Fig. 12 – firmware version

CONFIGURATION VIA WEB INTERFACE

Web interface is accessible from the IP address of the device. The default IP address is 192.168.1.254. To enter the configuration, click on the tool icon on main web page.

This interface enables the user to monitor the status of all the inputs and to configure all the parameters of the device.

The interface security is divided into two levels (each with an individual password). The "user" level only enables users to view the status of inputs. The "admin" level also enables the configuration of the device.

Quick help for the individual setup items is displayed when you scroll the pointer of mouse over the appropriate input field.

Fig. 13 - example of help for field in configuration

Network

In this part it is possible to set network parameters, such as the IP address etc. including the communication mode. Any changes made in this part require the device to be restarted.

Fig. 14 – Network settings and communication mode configuration

IP address
Default: 192.168.1.254
The network address of AD4ETH. Enter the address in numbers separated by dots. The default address is 192.168.1.254.

Local port
Default: 10001
The data port on which AD4ETH expects the incoming TCP connection in the "TCP server" communication mode.

Netmask
Default: 255.255.255.0
Sets the netmask (the range of IP addresses used within the network segment) containing the AD4ETH. The netmask can also be expressed by means of letters. (A means 255.0.0.0; B means 255.255.0.0; C means 255.255.255.0)

Gateway IP
Default: 0.0.0.0
The IP address of the computer or router that provides the converter with a connection to other (higher-level) networks or a Internet connection. If the converter is on a separate network or should not have access to external networks, enter the address 0.0.0.0.

Remote IP address
Default: 0.0.0.0

The IP address of the device the convertor will connect to in the "TCP client" communication mode.

Remote port
Default: 0

The port of the remote device the convertor will connect to in the "TCP client" communication mode.

WEB port
Default: 80

Here, it is possible to change the default value of the port enabling the access to the WEB site. This option is suitable in case AD4ETH is located behing a firewall or a router with blocked port 80 (standard WEB port). If this is the case, find an unoccupied port to be set as the WEB port. The WEB site will be then accessible from the browser after entering the address in the form of *http://[IP-adresa]:[port]* For example: *http://192.168.1.254:8080* port 8080.

MODBUS port
Default: 502

Port for Modbus TCP protocol.

Communication mode
Default: WEB (HTTP)

Tato volba nastavuje typ komunikace AD4ETH. Jsou k dispozici tyto módy: TCP server, TCP client, UDP a WEB (HTTP).

In the **TCP server** mode, AD4ETH expects the connection on the data port (set via the WEB interface in the Local port item). AD4ETH uses this TCP connection to communicate with a remote device by means of the Spinel protocol. It is not possible to view the currently set values via the WEB in this mode and it is possible to perform only some settings via the WEB.

Warning: This mode does not enable the user to use options configurable in the **Chyba! Nenalezen zdroj odkazů.**, SNMP, Sending and Channel tabs.

In the **TCP client** mode, AD4ETH connects automatically to a remote IP address (set in the Remote IP address) a the port (set in the Remote port). AD4ETH uses this TCP connection to communicate with a remote device by means of the Spinel protocol. It is not possible to view the currently set values via the WEB in this mode and it is possible to perform only some settings via the WEB.

Warning: This mode does not enable the user to use options configurable in the **Chyba! Nenalezen zdroj odkazů.**, SNMP, Sending and Channel tabs.

In the **UDP** mode, the data from AD4ETH is routed to a device with the IP address set in the Remote IP address item or, without routing, to a required address if the broadcast address of your network is set as the Remote IP address (a so called "UDP broadcast"). In this case, AD4ETH communicates with any device which asks. It is not possible to view the currently set values via the WEB in this mode and it is possible to perform only some settings via the WEB.

Warning: This mode does not enable the user to use options configurable in the **Chyba! Nenalezen zdroj odkazů.**, SNMP, Sending and Channel tabs.

Device isn't in WEB mode. On-line view of measurement
values is available only in WEB mode. This mode could be set
in folder Network.

*Fig. 15 – Current values display is not available in the TCP server, TCP client and UDP modes as well as the
options configurable in the **Chyba! Nenalezen zdroj odkazů.**, SNMP, Sending and Channel tabs*

The **WEB (HTTP)** mode enables the user to monitor the currently measured values via the WEB
interface, to send the measured values in the HTTP GET or POST formats (SOAP XML) and to
communicate via the SNMP protocol. This mode also enables AD4ETH to inform the user via
email about any occurrence of critical limits exceeding.

Security

The WEB interface security is set here. The security consists of two levels. Both levels have a
common user name but different passwords. The lower "user" level only enables the user to view
the measured values. The "admin" level also enables the configuration of the device. Any changes
made in this part require the device to be restarted.

Network	Security	Email	SNMP	Sending	IN 1	IN 2	IN 3	IN 4	Other

Security settings

Enable simple page	☑
New user password	
Retype new user password	
New administrator password	
Retype new administrator password	
Current administrator password	
Disable Telnet (advanced users only!)	☑
Disable fw upgrade (advanced users only!)	☐

Save   Close

Fig. 16 – Security Settings

Enable simple page
Default: Enabled
This tick enables the values to be viewed via the WAP interface (accessible at
http:/[ip-address]/wap).
The option for WAP enabling or disabling is here because the WAP interface is always unsecured
and no password is required to access it.

New user password
Retype new user password
Default: (Nothing)
User's password.

New administrator password
Retype new administrator password
Default: (Nothing)
Administrator's password.

Current administrator password
Default: (Nothing)
Whenever there is made any change to the security settings, the system requires the user to enter the relevant administrator password.

Disable Telnet (advanced users only!)

If you disable Telnet protocol and an error occurs during a firmware upgrade, manufacturer service may be required!

Disable fw upgrade (advanced users only!)

If you disable the firmware upgrade, it may be that potential service intervention can only be performed by the device manufacturer.

Email

This part configures the email account used by AD4ETH as well as the email address to which emails about critical limits exceeding shall be sent. (The email sending feature can only be used with SMTP servers that do not require SSL encrypted communication.)

Fig. 17 – Emails configuration

Activate email sending
Default: Disabled

By ticking this field, you will activate the function of channel critical level monitoring. The emails will be sent if the monitoring function is switched on and set for individual channels in the relevant tabs.

SMTP server
Default: 0.0.0.0
Domain name or IP address of SMTP server for outgoing email. (If you specify a domain name, you must also specify the IP address of the DNS server on the Network tab.)

From
Default: (Nothing)
The email address of AD4ETH. Any email address can be entered here (even a nonexistent one). This address will be shown in the sent email as sender's address.

To
Default: (Nothing)
Recipient's email address. Enter the email to which information about exceeding the set limits should be sent.

SMTP authorization
Default: Disabled
Check this box and also fill in the following three fields if the SMTP server requires authentication of the sender's identity by name and password.

Name
Default: (Nothing)
Name for the authorization on the SMTP server.

Password
Retype password
Default: (Nothing)
Password for the authorization on the SMTP server.

After saving configuration, device will send information email
Default: Disabled (cannot be changed)
If this field is ticked during the configuration saving, the device will send a testing email to the entered address in order to verify that the configuration has been done as required.

S N M P

This part sets the parameters for the communication via SNMP.

Fig. 18 – SNMP Settings

Read community
Default: public
The name of the SNMP community for reading.

Write community
Default: private
The name of the SNMP community for writing.

SNMP client IP address
Default: 0.0.0.0
The IP address of the SNMP manager which the traps (automatic messages) are sent to.

Current status sending period
Default: 0
If a number higher than 0 is entered, a trap with the currently measured values is sent in the set interval. The interval can be set in whole minutes ranging up to 3600 minutes.

Activate sending SNMP traps
Default: Disabled
Global activation of the automatic messages (traps) sending via the SNMP protocol.

Sending

Here it is possible to set the automatic sending of the measured values to the WEB server as a request of the HTTP GET or HTTP POST type in the SOAP XML format.

Fig. 19 – Configuration of sending measurements by http get or post

Method of sending
Default: HTTP GET
AD4ETH is able to send the measured values as a request HTTP GET or HTTP POST request (SOAP XML). Detailed information about these methods can be found in chapter Sending the values by HTTP protocol (GET, Post).

URL address of server
Default: (Nothing)
Here enter the URL address of the WEB server to which the measured values are to be sent. The address shall be set in the format: *www.example.com*.

IP address of server
Default: 0.0.0.0
Here enter the IP address of the WEB server (the IP address of the server entered in the URL address of server field).

Path
Default: (Nothing)
Enter the relative path to your script on server here. For example *api/ad4.php*

Server port
Default: 80
Port number on the WEB server.

Sending period
Default: 0

The interval in which the measured values are to be sent. It is possible to set an interval ranging from 10 seconds to 1 hour. If the interval is set to 0, the sending function is switched off.

Channel

Here you can set measuring parameters separately for each channel. The standard output from AD4ETH is a value ranging from 0 to 10 000. AD4ETH is able to recalculate this range into another one according to user setup. For example, if a pressure sensor is connected, it is possible to enter its output range and AD4ETH will directly display the measured value recalculated for example in Pascals. (See the example bellows the figure.)

The input range given by the AD4ETH hardware is displayed next to the channel number.

Fig. 20 – Setup of the measuring input parameters

Example: The pressure sensor with the output of 0 to 10 V is connected to AD4ETH. The sensor measures the pressure in the range of 0 to 100 kPa with the accuracy of 0,1 kPa. Enter *100* into the Upper range limit field (because 10 V from the sensor stands for 100 kPa). Enter *0* to the Lower range limit field (because the sensor measures from 0 kPa). Enter *1* into the Number of decimal places for math rounding field (because the sensor measures with the accuracy of 0,1 kPa). Enter *kPa* into the Unit field (because the output shall be in kilo Pascals).

AD4ETH will then display values within the range 0,0 to 100,0 kPa.

Channel name
Default: ---
Text description of the input.

4-20mA sensor connected to input
Default: Disabled
Check this box if a sensor with a range of 4 to 20 mA is connected to this current input. The AD4ETH selects a different conversion mechanism to use full converter resolution and can also

detect sensor disconnection (underflow). This setting is only visible for a channel with a current range of 0 to 20 mA.

Note: *When switched to 4 to 20 mA, the AD4ETH also indicates the input current is too low. An input current below 4 mA is considered a disconnected sensor because the current is below the lower limit of the sensor range!*

Unit
Default: (Nothing)
Enter here the text description of the unit which is the output of the recalculation specified in the following fields.

Upper range limit
Default: 10000
Enter the positive real number as the upper range limit, corresponding to the maximum input range.

Lower range limit
Default: 0
Enter the positive real number as the lower range limit, corresponding to the minimum input range.

Number of decimal places for math rounding
Default: 0
Enter the number of decimal places for math rounding of the measured value.

Monitoring of measurement value
Default: Disabled
It is possible to switch on the monitoring of measured values from this channel. If the measured value either exceeds the Upper range limit or drops-off below the Lower range limit, the information about it is sent via email, SNMP, … (according to the setup).

Upper limit
Default: 0
Enter the maximum acceptable value. This value exceeding will cause the sending of the information via email, SNMP, etc. according to the setup.

Lower limit
Default: 0
Enter the minimum acceptable value. This value dropping-off will cause the sending of the information via email, SNMP, etc. according to the setup.

Hysteresis
Default: 0
Enter the hysteresis value which will apply below the Upper range limit and above the Lower range limit. (The term hysteresis is explained in the attachment of the document *Communication protocol Spinel*, downloadable from en.papouch.com.)

O t h e r

Here it is possible to set some other parameters of the device.

Fig. 21 – Other Settings

Language
Default: English

This option contains a list of WEB interface language version. Currently, the WEB interface is available in Czech and English languages. Only some of the texts change after selecting the other language and saving the settings. For complete change of all the texts it is necessary to reopen the page.

Device name
Default: AD4ETH

Here is it possible to allocate a name to the device. The name can enable the user to easily identify e.g. the measuring point etc.

Simple page refreshing period
Default: 30

Here you can change the update interval of a simple page.

Minimize main page
Default: Disabled

If this field is ticked, the page size in the browser is automatically reduced to the smallest possible displaying size. This change of the size becomes effective only after the page is reopened in the browser.

Field for user informations
Defualt: (Empty)

This field is available for entering a text or HTML code which is displayed after clicking on the **i** symbol on the main page. This can be used for entering links to the company website or to the intranet, measuring instructions etc.

BASIC SETUP VIA TELNET

Telnet can be disabled using the web interface (see Security tab).

Connection

IP address is not known

1) Open the window of the cmd. command (In OS Windows choose Start/Run, enter `cmd` into the provided line and press Enter.)

2) Make the following entry into the ARP chart:

   a. Enter `arp -d` and confirm by Enter. This will delete the current ARP table.

   b. Use the following command to allocate an IP address to the module MAC address:

   `arp -s [new_ip_address] [MAC_address_AD4ETH]`

   <u>example:</u> `arp -s 192.168.1.254 00-20-4a-80-65-6e`

3) Now open Telnet. (By typing in `telnet` and pressing Enter. [24])

4) Type `open [new_ip_address] 1` and confirm.

5) The terminal will display an error message informing the user that no connection has been established. Still it is necessary to carry out the aforesaid in order to enable the module to enter the required IP address into the ARP table.

6) Connect to the module IP address. (Enter `open [IP address in the dotted format] 9999` and press Enter.)

7) So far you only managed to enter the module configuration. The IP address has not been set yet. It must be set using the relevant item in the Server Configuration > IP Address menu. If the configuration is closed without saving the setup and IP address configuration, it is necessary to repeat the whole process!

8) If the IP address is valid, the device will display introductory information ending with the following text:

   Press Enter for Setup Mode

   Now it is necessary to press Enter within three seconds, otherwise the configuration will be closed.

9) The device will display its complete setup.

10) At the end of the list there is a section called "Change setup:" providing a list of parameter groups which can be set. Changes to network parameters can be made through the "Server" section.

---

[24] In Windows, the client for Telnet is not a standard part of the system. Install it using the following procedure:

    a) Open the "Control Panels/Programs and Features" menu.
    b) On the left, click "Enable or disable features of Windows system " (this option requires the administrator to log in).
    c) The "Features of Windows system" window displays. Here tick the "Telnet service Client" field and click Ok. The client for Telnet will be installed.

IP address is known

1) In OS Windows choose Start/Run, enter `telnet` in the provided line and press Enter. [24]

2) Connect to the module IP address. (Enter `open [IP address in the dotted format] 9999` and press Enter.)

3) If the IP address is valid, the device will display introductory information ending with the following text:

   Press Enter for Setup Mode

    Now it is necessary to press Enter within three seconds, otherwise the configuration will be closed.

4) The device will display its complete setup.

5) At the end of the list there is a section called "Change setup:" providing a list of parameter groups which can be set. Changes to network parameters can be made through the "Server" section.

Main Menu

Individual menu items can be chosen using the numbers written in front of them. Choose the required number and press Enter.

The menu structure is as follows:

```
Change Setup:
  0 Server

  ...
  7 Defaults
  8 Exit without save
  9 Save and exit           Your choice ?
```

Server

Basic Ethernet setups.

The following items can be found in this part:

```
IP Address : (192) .(168) .(001) .(122)
Set Gateway IP Address (N) ?
Netmask: Number of Bits for Host Part (0=default) (16)
Change telnet config password (N) ?
```

IP Address

IP address of the module. The numbers of the IP address shall be entered individually and separated by Enter.

Default value: 192.168.1.254

Set Gateway IP Address

Gateway IP address

In the "Set Gateway IP Address" item enter "Y" to change the Gateway IP address. The system then invites you to change the Gateway IP address. The numbers of the IP address shall be entered individually and separated by Enter.

Netmask

Here you can set the number of bits of the IP address constituting the network part.

The Netmask is set as a number of bits determining the range of possible local network IP addresses. For example, if the value 2 is entered, the Netmask has the following structure `255.255.255.252`. The entered value specifies the number of bits from the right. The maximum is 32.

Default value: 8

Example:

The mask 255.255.255.0 (binary 11111111 11111111 11111111 00000000) corresponds to number 8.
The mask 255.255.255.252 (binary 11111111 11111111 11111111 11111100) corresponds to number 2.

Change telnet config password

Enter new Password

This item can be used to set a new password which is required before any configuration is made via telnet or WEB interface.

In item "Change telnet config password" enter "Y" to change the password. The system then invites you to change the password.

Factory Defaults

By pressing number 7 the device restores the default setting.

Default setting means that the IP address is set to 192.168.1.254, all passwords are cancelled, names and parameters are deleted.

Exit without save

Closing the setting mode without saving the changed parameters.

Save and exit

This option saves the changes. If any parameter has been changed, the device is then restarted. The restart takes several tens of seconds.

IP ADDRESS CHANGE

The IP address can be changed by one of the following methods:

- over the WEB interface
- by Ethernet configurator
- via the ARP protocol and Telnet

The **WEB interface** can be unavailable during the first connection if the initial IP address is not compatible with the network the AD4ETH device is connected to. In this case, the IP address can be set using the Universal Software or via the ARP protocol and Telnet.

The setup **via the ARP protocol and Telnet** is described in the chapter Basic Setup via Telnet on page 32.

Ethernet configurator

If your network range does not match the default IP address (**192.168.1.254**) and subnet mask (255.255.255.0) of the device, change the IP address using the Ethernet configurator software.
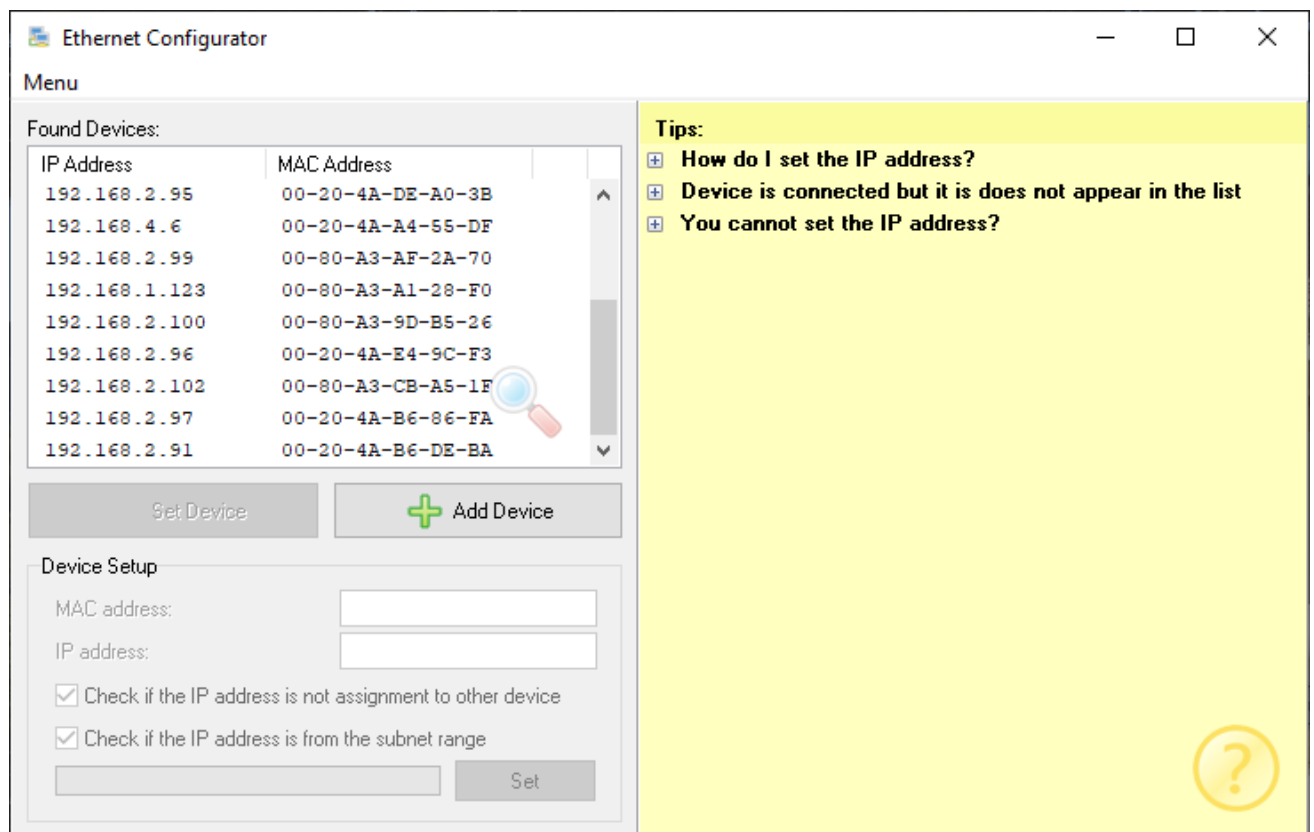

fig. 22 – Ethernet Configurator

INDICATIONS

The device contains three light indicators showing the operational status:

ON

- **Green** light. Lights when the supply voltage is connected.

COM

- **Yellow** indicator. Blinks once after initialization sequence. Then it is flashing during the communication over Ethernet and in WEB communication mode.

OVR

- **Red** light. Flashes repeatedly when the input range of any channel has been exceeded.

- <u>Note for channels with a range of 4 to 20 mA:</u> AD4 indicates not only exceeding the upper limit, but also value dropping below the lower limit if the current is lower than 4 mA. It means that the drop is indicated also when no sensor is connected (because the current is zero).

DEVICE RESET

Use the following procedure to reset the device to "factory settings". Unlike the reset that can be done via the web or Telnet, the IP address will be changed to 192.168.1.254 or assigned by the DHCP server.

1) Disconnect the device from the power supply.

2) Press and hold the Reset button next to the Ethernet connector.

3) Continue according to how you want to assign the IP address:

     a. **IP address 192.168.1.254**:

         i. Turn on the power.

         ii. Wait for a few seconds and release the button between the 5th and 10th sec.

         iii. IP address is set, device is in "factory setting".

     b. **IP address assigned by the DHCP server**:

         i. Turn on the power.

         ii. Wait approx. 25 sec and release the button.

         iii. The device is in "factory setting". The IP address assigned by the DHCP server can be found in your DHCP server (typically in your router). The section with such assigned addresses has different names - for example, *DHCP Client List*, *DHCP Clients*, etc.

TECHNICAL PARAMETERS

Analogous inputs:

Number and type of inputs.......................... 4 × unipolar

Voltage input range .... 0 – 10 V [2]; 10 000 divisions

Maximum allowed input voltage.................. -5 to +30 V

Input impedance (voltage inputs)................ 1 MΩ (100 kΩ / 1 V)

Current input ranges.................................. 0 – 20 mA [2]; 4 – 20 mA [2]; 10 000 divisions

Calibration .... 10 000 divisions/range

A/D converter resolution .... 16 bits

Maximum non-linearity................................ 10 divisions

Maximum zero error .... 10 divisions

Maximum rang error .... 10 divisions

Maximum measuring speed........................ 500 ms (all channels)

Calibration method .... software [25]

Control interface:

Type... 10/100 Ethernet

Default IP address 192.168.1.254

Connector.. RJ45

SSL/TLS .... no

Communication speed of the virtual port ..... 115 200 Bd

Communication protocol.............................. Modbus TCP, Spinel, TCP/IP, UDP/IP, HTTP

Power supply:

Supply voltage .... DC 8 to 30 V (with polarity reversal protection)

Power consumption .... usually 170 mA at 12 V

Other parameters:

Operation temperature................................ -20 °C to +70 °C

Dimensions.. 104 × 55 × 24 mm

Dimensions incl. connectors....................... 121 × 55 × 24 mm

Dimensions incl. DIN rail holder.................. 104 × 55 × 33 mm

IP Code.. IP 30

Weight .... 140 g

---

[25] Calibration is described in greater detail in the communication protocol description which is available to be downloaded from the device web page on papouch.com.

Available Designs

Assembly:

- Without a holder *(standard design)*

- With a DIN rail holder

Fig. 23 - AD4ETH with DIN rail holder
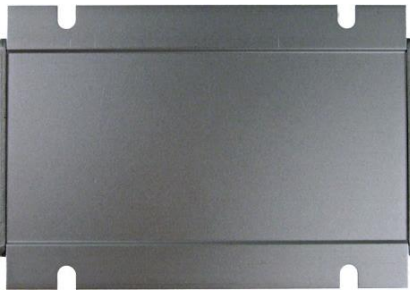
- With a wall holder

Fig. 24 – AD4 with wall holder

Input ranges:

- 0 to 10 V

- 0 to 20 mA

- 4 to 20 mA

- It is possible to deliver another current or voltage range upon request; it is also possible to combine more ranges in one device

Do not hesitate to contact us in case of any other special requirements concerning the AD4ETH module design and functions.

Papouch s.r.o.

Industrial data transmission, line and protocol converters, RS232, RS485, RS422, USB, Bluetooth, Ethernet, LTE, WiFi, measurement modules, smart temperature sensors, I/O modules, custom development and manufacturing.

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