IO.RAPORT 2*(ENG)*

APLISENS

MANUFACTURE OF PRESSURE TRANSMITTERS
AND CONTROL INSTRUMENTS

USER'S MANUAL

"RAPORT 2" SOFTWARE

Edition B

WARSAW MARCH 2014

APLISENS S.A., 03-192 Warszawa, ul. Morelowa 7
tel. +48 22 814 07 77; fax +48 22 814 07 78
www.aplisens.pl, e-mail: aplisens@aplisens.pl

CONTENTS

1 Introduction to Raport 2

The program Raport 2 was designed for communication and data exchange with intelligent devices (pressure and temperature transmitters, etc.) produced by Aplisens.
The program is also compatible with other producers' devices, provided that they support basic commands of HART protocol.

The program communicates with intelligent devices through a serial port RS232.

It allows to perform the following tasks:

- read device parameters;
- configure device parameters;
- save device parameters configuration to file;
- read current measurements of process quantities and their visualization in the form of a chart;
- device calibration;
- configure device display, if applicable;
- generate a device configuration report.

2 Installation

Hardware requirements

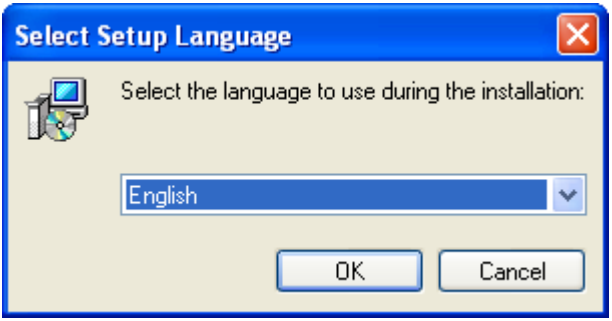
- Windows XP / Vista / 7 / Serwer 2003 / Serwer 2008
- *Microsoft .NET Framework 3.5.*
- PC x86/x64, 512MB RAM or higher.

Note: Before installation, uninstall earlier versions of the program. The installer will report an error, if it detects that another version of the program is installed.

To install the application, run Setup.exe. Before installing the application, the installer will checks, if . NET Framework 3.5. is installed in the system. If necessary, appropriate files will be downloaded from the network.

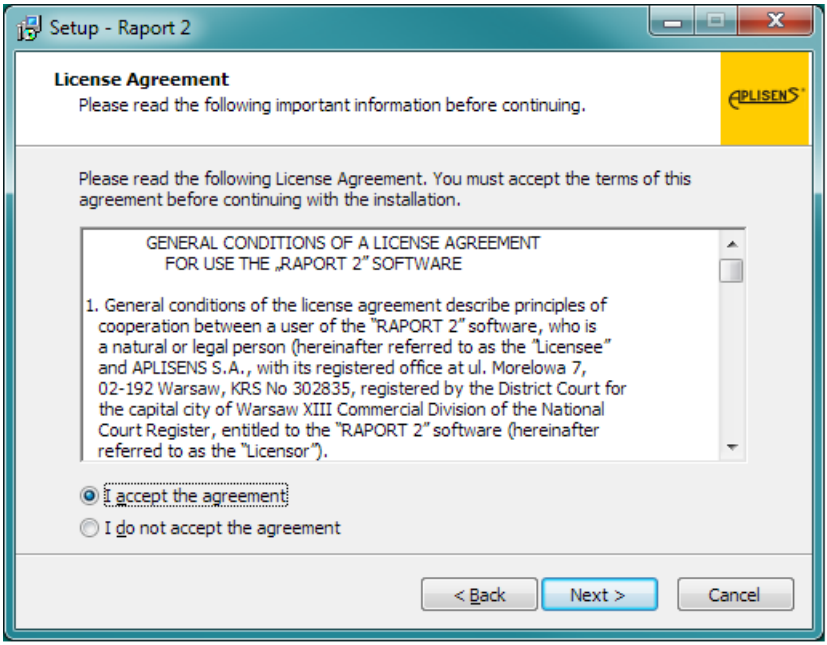
After you run the installer, a window is displayed to select the installation language.

Note: This is the language used for installation only. Selection of a Language used in the program is defined in further installation steps.

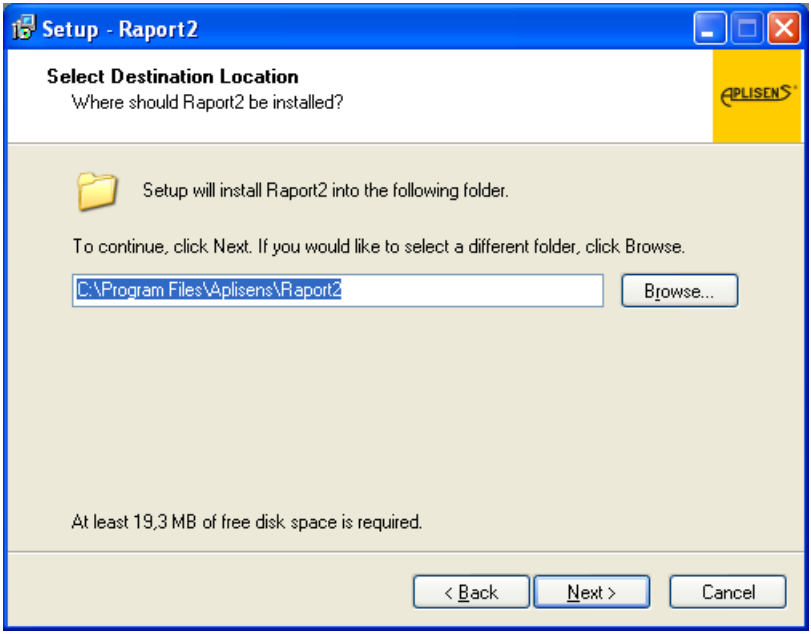


After selecting the installation language, the installation wizard will be displayed.

A licence agreement text is displayed.

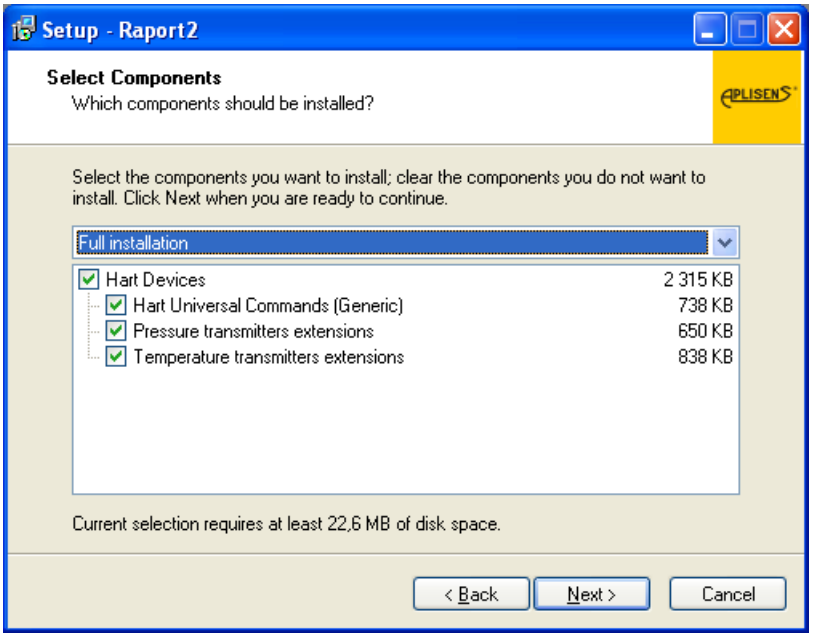


When you accept the agreement, select a folder on a hard drive, in which the application will be installed.

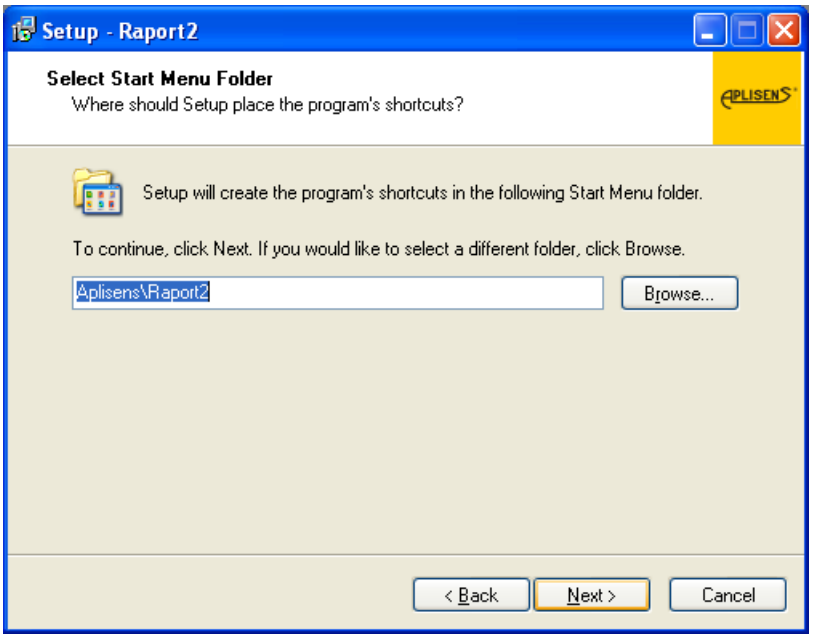


In the next window, you can select the type of installation and any additional components you want to install.

Full installation is recommended and all additional components should be checked, as shown in the below picture.



The next window allows you to select the Start Menu folder.



In the next window, you can choose additional tasks.

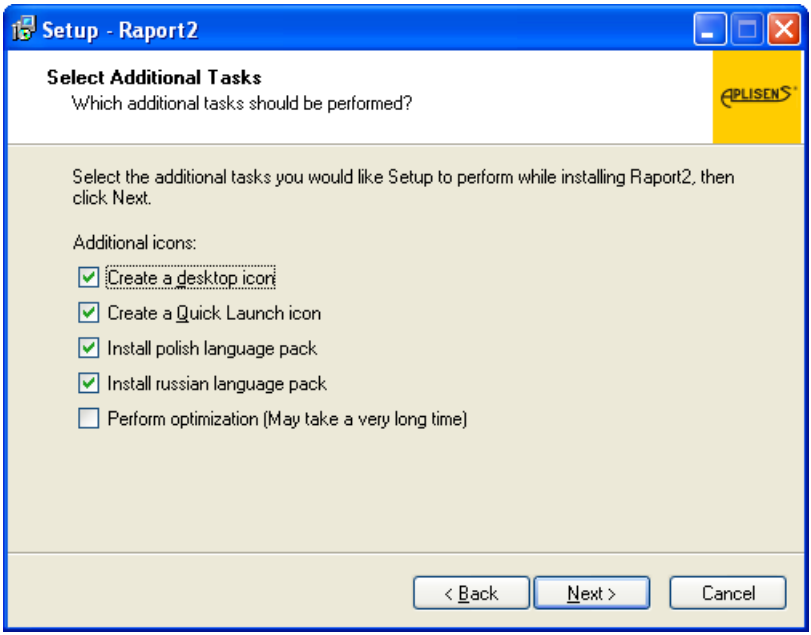
It contains options used for the application language selection:

Install Polish language pack - for Windows with Polish language version, it sets the application language to Polish.

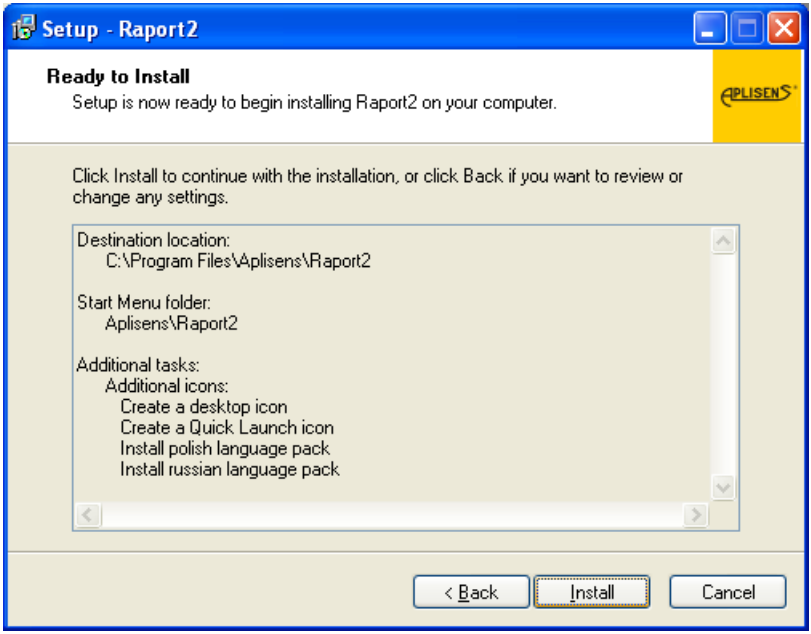
Install Russian language pack - for Windows with Russian language version, it sets the application language to Russian.

If neither of the above options is checked, the program will be run in **English** language version.

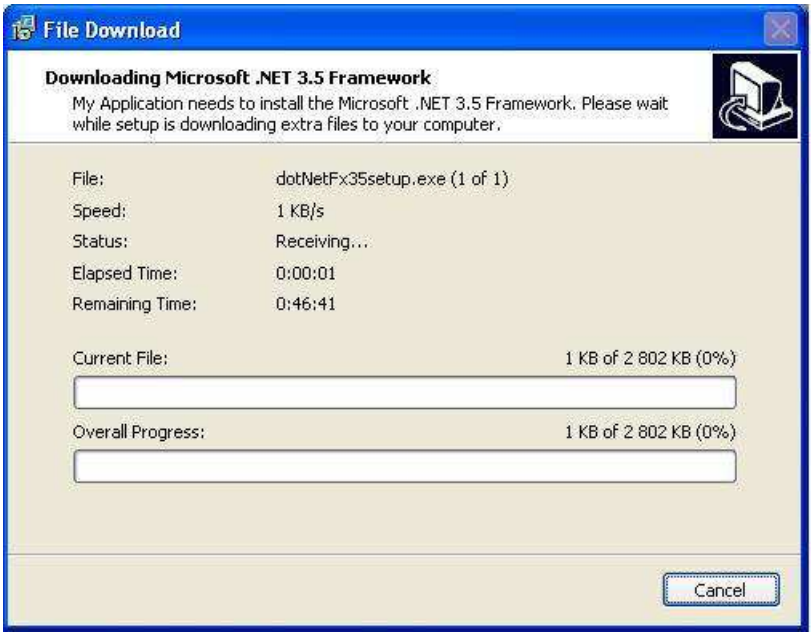
Optimize - the program will be optimized for a particular PC. This option allows to accelerate the program operation.



The next window displays the setting wizard. Press the **Install** button to start installation.



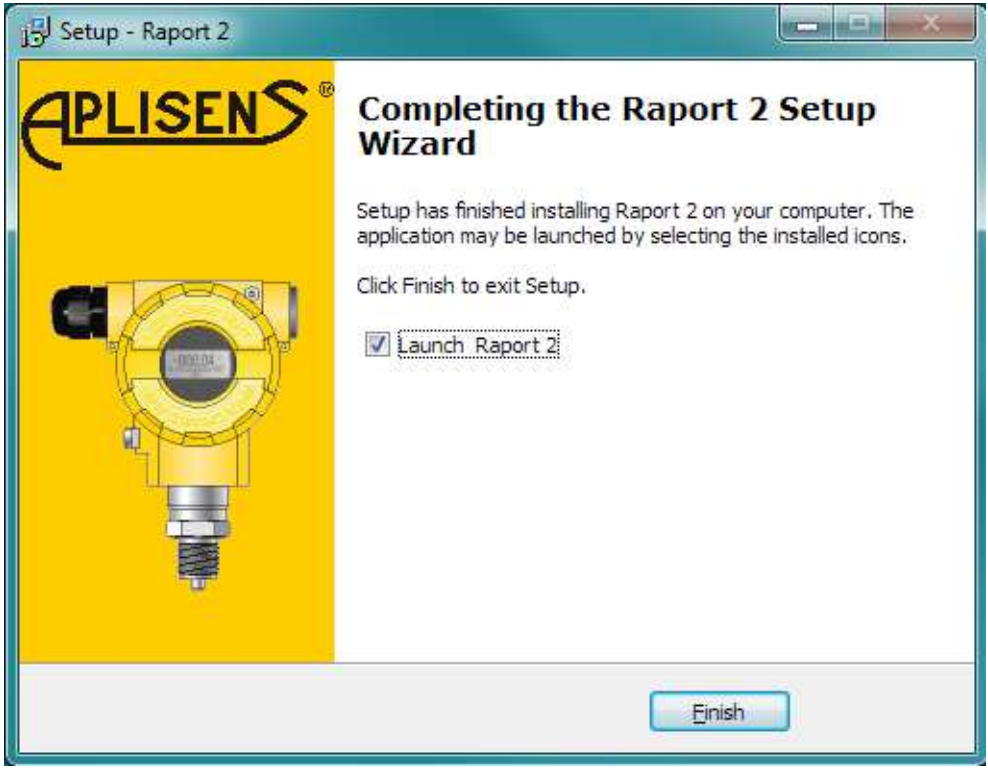
Note: If the installer detects that DotNetFramework3.5 package is not installed, it will start the downloading procedure from the web. Your PC must have an Internet connection.



Note: When DotNetFramework 3.5 is installed, you must cancel the installation with the **Cancel** button. Then run the installer again.

After installation, the program displays the message shown in the below picture..

If you select **Launch Raport 2** the program will start immediately after you close the installer window.


Setup - Raport 2
APLISENS
Completing the Raport 2 Setup Wizard
Setup has finished installing Raport 2 on your computer. The application may be launched by selecting the installed icons.
Click Finish to exit Setup.
Launch Raport 2
Finish

3 Program description

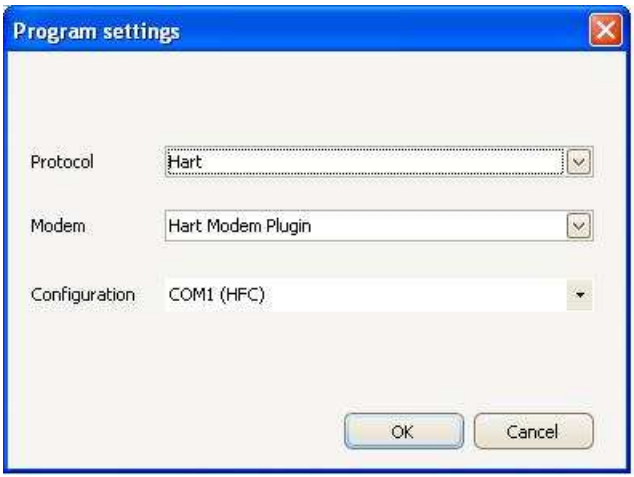
3.1 How to start using the program

To start using the program, you must perform the following steps:

1. **Set program parameters responsible for communication with transmitters:**
   - Communication protocol;
   - Modem;
   - Port;

   Change of program settings can be performed with the tool: Settings
   During the first run after installation, the setup tool will run automatically.

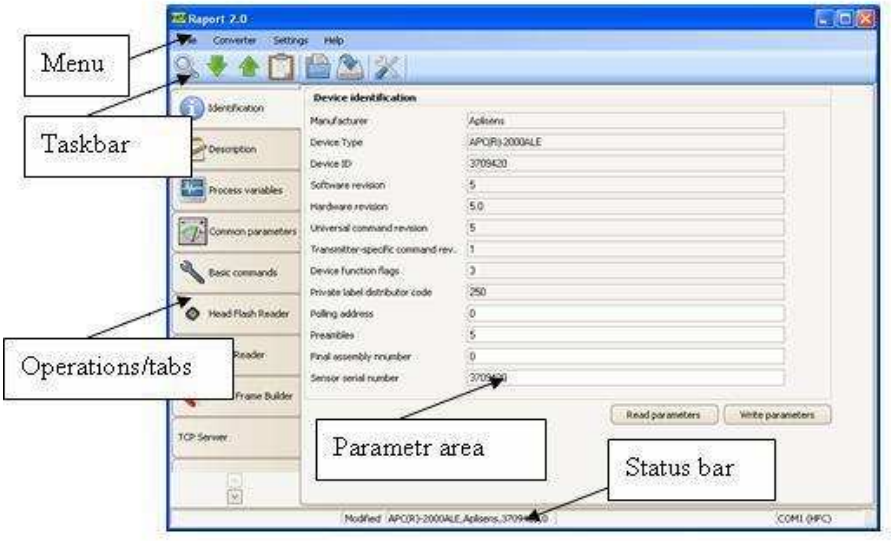
he below picture shows sample settings for HART transmitter connected to a port COM1:



2. **Search for transmitters connected to a PC serial port.**

It can be performed with: *Transmitter Search*.

The Raport 2 main window is divided into the following sections:



3.2 Menu

Commands are grouped in categories. Most menu items have their equivalents in the form of buttons on the toolbar. Some commands are available as buttons located directly on the form, next to the edit fields related to them.

A list of menu commands:

1. File:
   - *New transmitter* - creates new transmitter template,
   - *Import configuration* - imports transmitter configuration from file,
   - *Export configuration* - saves current configuration to file,
   - Close – Raport 2 exit

2. Transmitter:
   - *Transmitter search* - searches for transmitters connected to a PC,
   - *Read configuration* - reads transmitter configuration,
   - *Write configuration* - writes configuration to transmitter,
   - *Generate report* - creates a transmitter configuration report,
   - *APC/APT/Li24 calibration* - calibration of a transmitter input signal.

3. Settings:
   - *Settings* - communication protocol and serial port settings, etc.

4. Help:
   - Help - opens the help file,
   - Automatic update - enables/disables automatic updates. If this option is enabled, the program automatically checks at start-up, if a new version of the program is available,
   - *Check for updates* - checks, if a new version of the program is available.
   - About the program – displays the program version information.

3.3 Taskbar

Toolbar buttons allow easy access to the most frequently used commands:

	*Transmitter search*	Runs a tool searching for transmitters connected to a PC
	*Read configuration*	Reads all parameters of a previously identified (searched) transmitter.
	*Write configuration*	Writes all parameters into a previously identified (searched) transmitter
	*Import configuration*	Reads selected transmitter parameters from file
	*Export configuration*	Saves selected transmitter parameters to file
	*Generate report*	Generates a transmitter parameters report.
	*Settings*	Settings of serial port, communication protocol, etc.

3.4 Operations/tabs

Available operations are grouped and placed on tabs according to their functionality. After reading the device configuration, the program displays only those tabs that a given device supports.

Basic - available for all devices:

	*Identification*	Parameters identifying a transmitter.
	*Description*	Parameters related to a transmitter description.
	*Process variables*	Reading and visualization in the form of process variables chart (e.g. current, pressure, temperature).
	*Basic parameters*	Basic transmitter parameters (i.e. adjusted range, unit).
	*Basic functions*	Set of functions that allow transmitter parameters configuration.

Device-dependent - availability dependent on a connected device:

	*Transmitter parameters*	Additional parameters. Restores factory settings.
	*Li-24/Hart / APT-2000ALW*	Temperature transmitter settings.
	*LCD*	Transmitter LCD display settings.
	*Linearization*	Configuration of user characteristics.
	*Input linearization*	Configuration of input user characteristics.
	*Output linearization*	Configuration of output user characteristics.
	*Write lock*	Sets a lock on user-made changes of transmitter settings.
	Transmitter status	Displays detailed transmitter status.
	*Material data*	Information on applied accessories, connections, etc.
	*Factory settings*	Factory settings.

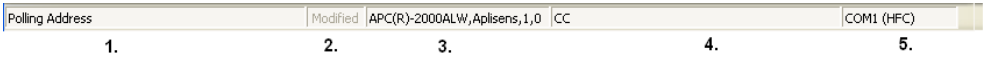
3.5 Parameter area

It displays transmitter parameters depending on a selected *operation*.
Change of an edited field value will alter the field colour into yellow.

If the inserted value is incorrect, it will be highlighted in red.
At the same time, a parameter change flag (2.) will be placed on a status bar.

3.6 Status bar

The status bar is located at the bottom of the program window; it displays key information about the status of the program and a connected temperature transmitter.



The status bar is divided into sections:

1. Context-sensitive help,
2. Parameter change flag (change of values in fields related to a transmitter parameter),
3. Transmitter name, serial number, address,
4. Transmitter status flag. If you put the cursor over the flag, a drop-down list is displayed, containing description of separate flags:

FDM
- Device failure – indicates failure of one of device hardware modules.

CC
- Modified configuration – one of transmitter parameters has been changed. The flag can be *deleted*.

CS
- Cold start - this flag is set after you power on a transmitter. It is deleted automatically during data transmission.

MSA
-Available extended status – details are described in the transmitter *status* tab.

AOFix
- Output current blocked - when function *Direct current mode in the line* is enabled

PVS
- Analog output saturated - when a transmitter generates a signal exceeding normal range.

NPVOoL
- Second (and/or subsequent) process variable out of range,

PVOoL- First process variable out of range - PV value exceeds threshold values of an adjusted range.

5. A serial port used by the program and its mode (e.g. software control SFC).

3.7 Transmitter search

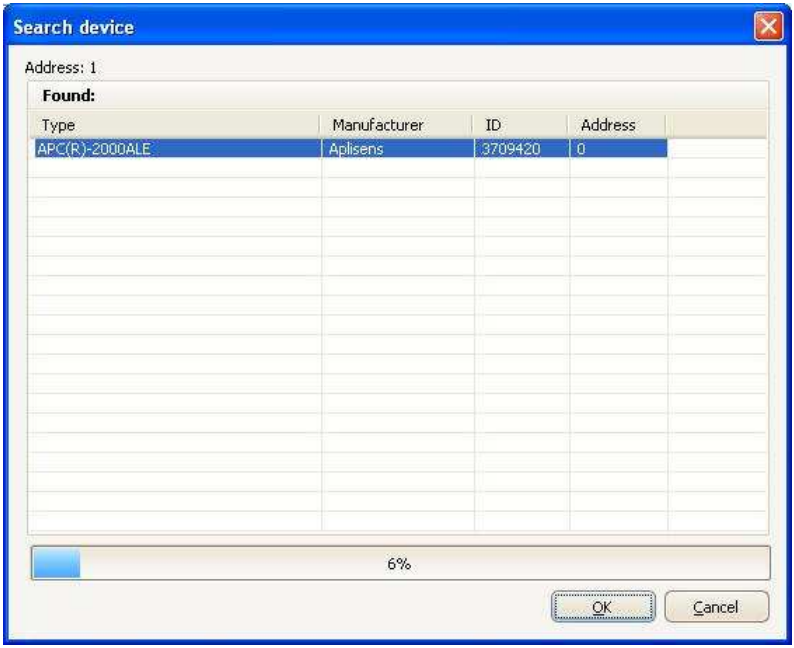
Before you start working with the program, it is necessary to search a device connected to a PC.

Note: the program will search for a device on the basis of parameters set in the program settings.

The program allows to search for transmitters in the following way:

- Click the icon  on the taskbar,
- Choose keyboard shortcut Ctrl+I,
- Choose menu *Transmitter->Transmitter search*

The program will search for transmitters starting from address 0. The transmitters identified by the program will be one by one placed on the list of searched transmitters.



Next, select a transmitter you want to work with. Left-click on a selected transmitter, and click **OK**.

The program will read all parameters of a selected transmitter.

3.8 Program update

The program has a mechanism of automatic new version download from Aplisens server. To perform this operation, internet PC connection is required.

To check, if there are new software updates, choose:

- *Menu*->Help->**Check for updates**.

If an update is available, the appropiate message will be displayed.

Confirmation of the message will start software update process.

If you select the option *Menu*->Help->**Automatic update** the program will check for updates on a server each time you run the program.

4 Program settings

To enable communication between the program and a device connected to a PC, it is necessary to set data transmission parameters. To do that, use a program setting tool.

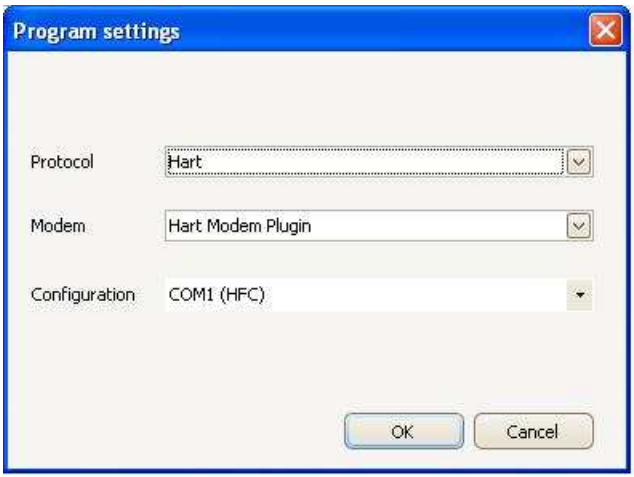
The program settings window will be displayed when you choose:

- An icon  on a *toolbar*,
- *Menu*-> Settings->settings.

Information: a program settings window will be displayed, if the application was installed for the first time on a given PC.

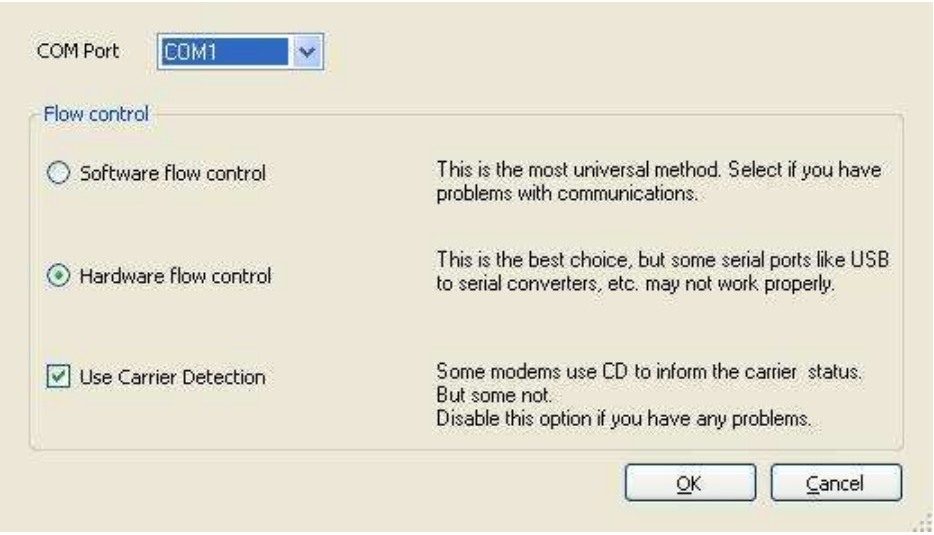
Below, a program settings window is presented:

Note: a list of available protocols and modems depends on components selected during program installation.



Available settings allow configuration of the following program parameters:

- **Protocol:** contains a list of supported protocols, e.g. Hart, Modbus,
- **Modem:** contains a list of supported modems,
- **Settings:** necessary for configuration of a serial port used by the program.

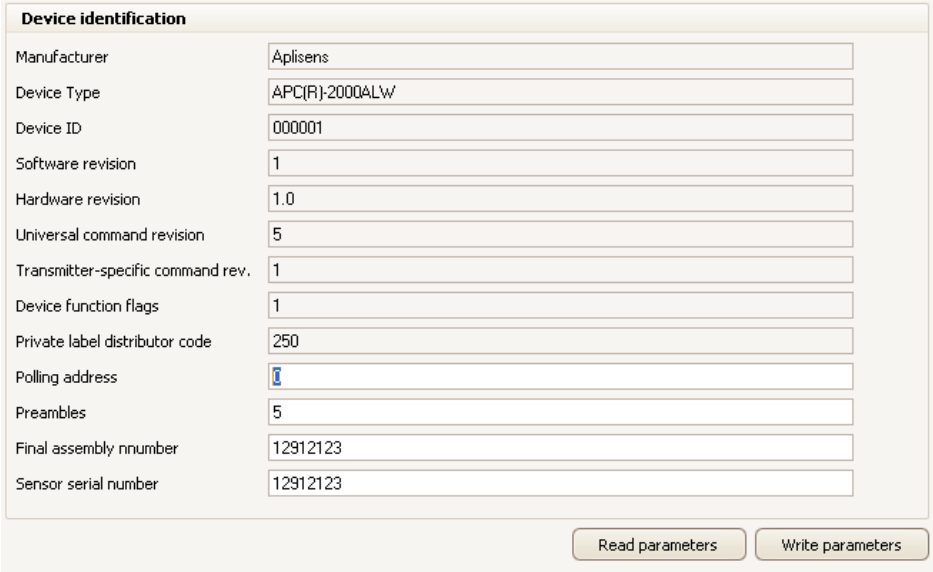


Choose an appropriate serial port COM, protocol, and modem depending on a device type connected to a PC. The settings should be confirmed with the button **OK**.

5 Operations/tabs

5.1 Identification

It contains parameters identifying a transmitter in a network.



Flags – transmitter configuration flags.

Distributor code – Distributor's code.

Device address – transmitter's address in the network. For a HART network, the address may have values form 0 to 15. The transmitter must have a device address set to 0 for operation with current output 4-20mA and during calibration. Address other than 0 is reserved for digital mode operation **(multidrop),**

Number of preambles – an be from 3 to 20. Higher values gives more time for modem to set appropatiate communication parameters, but also will lengthen the time needed for a modem to establish connection with a transmitter. Default is 5.

Registration number – it is an integer with a maximum value of 16777215, it can be used e.g. example for a register.

Sensor number – serial number of a sensor.

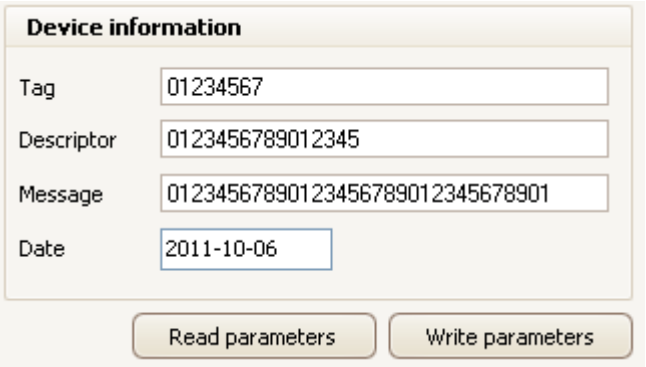
Content of fields, in which value can be entered, can be transfered to the transmitter with a command **Write parameters**.

The command **Read parameters** allows to read only those parameters, which are shown in the above window.

To read all transmitter parameters, you should use the command Read configuration.

5.2 Description

It contains auxiliary parameters, which enable to set own description.



Tag - eight alphanumeric characters, which may be used for transmitter description e.g. Id of place in which it is installed.

Description – sixteen alphanumeric characters for user comment.

Message – thirty two alphanumeric characters, which may be used depending on user's needs.

Date – date in the format dd-mm-yy. Number of days from 1 to 31. Number of months from 1 to 12. Maximum value of year is 2155.

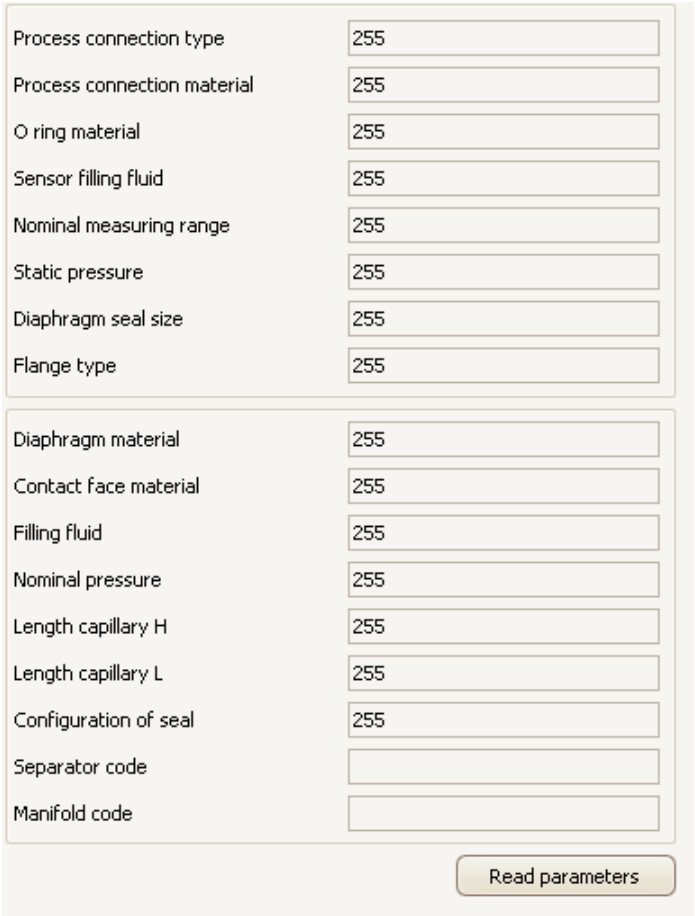
Parameters can be transferred to the transmitter with a **Write parameters** command.

The command **Read parameters** allows to read only those parameters, which are shown in the above window.

To read all transmitter parameters, you should use the command Read configuration.

5.3 Material data

It contains information about materials and components used in transmitter construction.

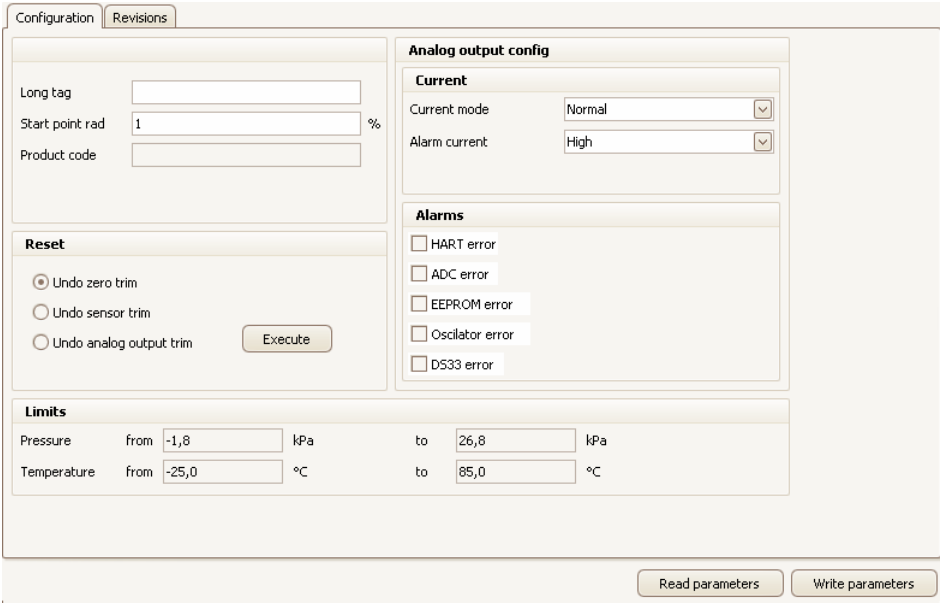


The command **Read parameters** allows to read only those parameters, which are shown in the above window.

To read all transmitter parameters, you should use the command Read configuration.

5.4 Transmitter parameters

It contains additional transmitter parameters. The window layout depends on a transmitter type. Below you can see a window containing settings of one of the transmitters.



Long tag
- a message field for any content, cannot be longer than 24 characters..

Product code - a product description.

Restore factory settings:

If any of the following operations is carried out incorrectly, the program allows to restore factory settings:

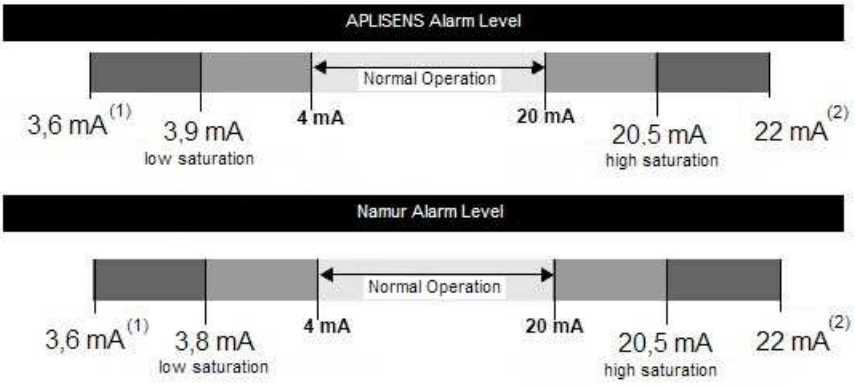
Undo zero calibration
- concerns zeroing operation run by *Operations*->*Basic functions*->Zeroing.

Undo sensor calibration
- concerns the operation *transmitter input signal calibration*.

Undo analog output calibration
- concerns the operation *analog output calibration*.

Analog output configuration:

- **Operation mode** - alarm limits depend on a selected mode:
    - Normal - standard alarm limits.
    - Namur - Namur-compliant alarm limits.
- **Alarm current** - define current to be set in case of an transmitter failure (depends on Alarm at):
    - High - 22,0 mA current will be set.
    - Low - 3,6 mA current will be set.
- **Output operation limit** - a read-only parameter, visible only for some transmitters.
- **Alarm at** - select which module errors activate the transmitter's alarm.



(1) Transmitter Failure, hardware alarm in LO position.
(2) Transmitter Failure, hardware alarm in HI position.

Limits:

Pressure
- transmitter compensation limits.

Temperature
- permissible operating temperature.

Version information - software and transmitter electronics versions.

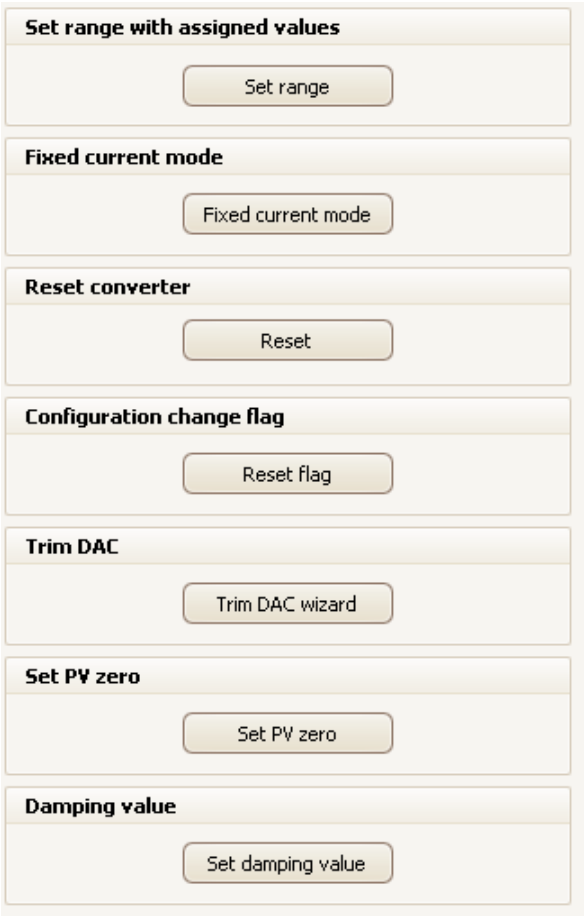
Content of fields, in which value can be entered, can be transfered to the transmitter with a command **Write**

The command **Read** allows to read only those parameters, which are shown in the above window.

To read all transmitter parameters, you should use the command Read configuration.

5.5 Basic functions

This operation displays a basic functions window.



Available functions allow the following operations:

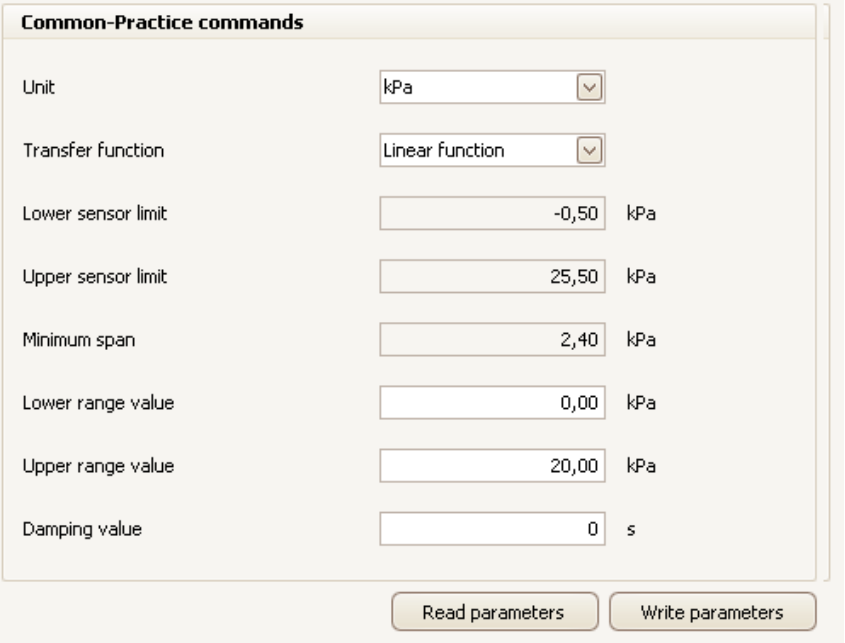
1. *Change of range set-value*
2. *Direct current mode in the line*:

- Transmitter reset - Soft transmitter reset.

3. Configuration change flag:
- It allows to delete hardware configuration change flag. The flag is set in transmitter memory at each transmitter parameters change.
4. *Analog output calibration*
5. *Zeroing:*
- Zeroing of the first process variable. **It does not apply to absolute pressure transmitters**.
6. Change of time constant:
- Allows reading or changing transmitter time constant.

5.6 Basic parameters

It contains transmitter basic parameters.



Unit
- Current unit of PV (first process variable).

Transfer function
- Linear
- Square Root (See *Change of transfer function*).
- Square
- User function (table)
  - if enabled, a transmitter operates on the basis of characteristics defined in the operation: *Linearization* or *Output linearization for Li24*.

Lower, upper sensor limit sensor limits.

Lower, upper range value - Start and end of an measuring range. The limits for the start and end of measuring range are limited by sensor limits.

Minimal range width - Minimal width of the setting range.

Damping value - Transmitter's time constant (damping time).

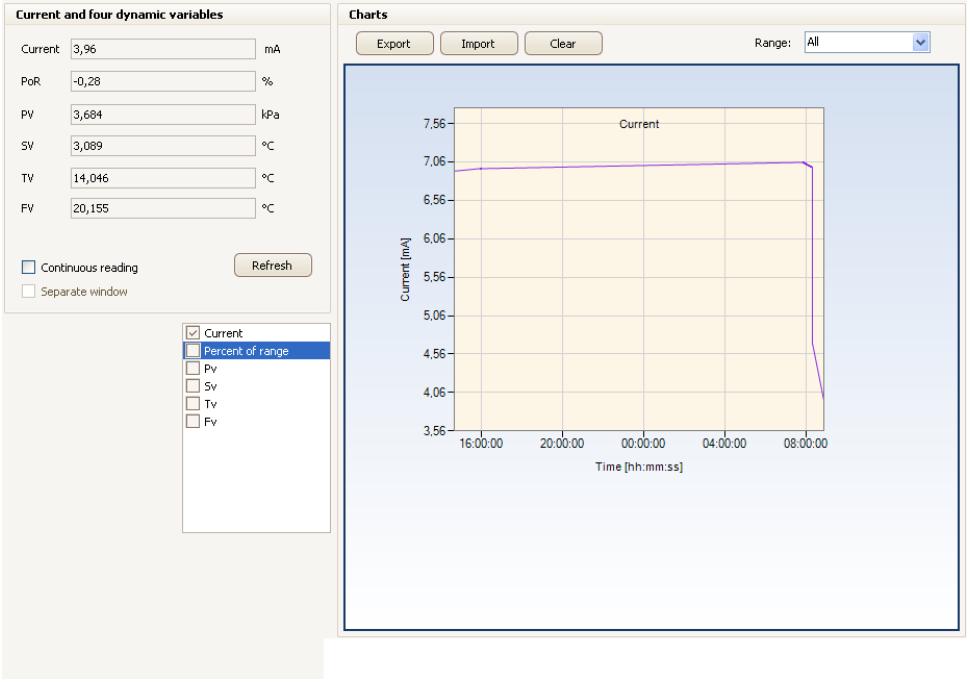
Content of fields, in which value can be entered, can be inserted to the transmitter with a command **Write**

The command **Read** allows to read only those parameters, which are shown in the above window.

To read all transmitter parameters, you should use the command *Read configuration*.

5.7 Process variables

It allows to view electric current and transmitter process variables in the form figures and charts.



The area **Current and four process variables** contains:

1. Current values.
2. Button **Refresh:**

- it downloads current values from a transmitter.

3. Button **Continuous reading:**

- continuous reading mode for process values.

4. Button **External window:**

- it displays values in a separate window, while in continuous reading mode (see picture below).

The area **Charts** contains:

Charts for process variables and electric current – the charts are visible after selecting visibility of separate charts on a legend placed on the left side of a chart.

Chart area has a cursor and a zoom function.

- To see a cursor, put the mouse over a data point in a chart line
- To activate zoom, left-click on a chart area, and keeping the button pressed, drag the mouse in any direction.

1. Button **Export:**

- saves charts to a text file (csv).

2. Button **Import:**

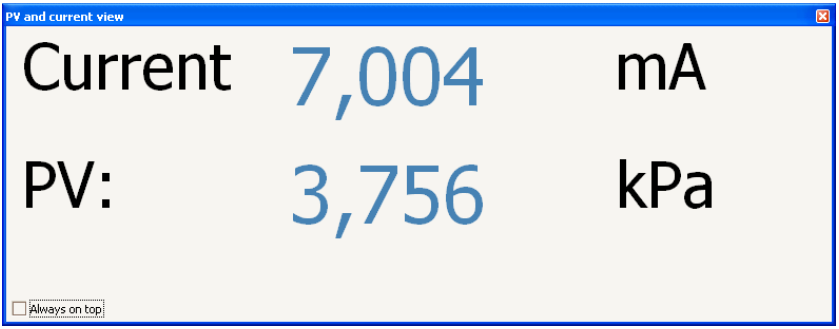
- imports previously saved charts from a text file (csv).

3. Button **Clear:**

- deletes chart data.

4. Button **Time base:**

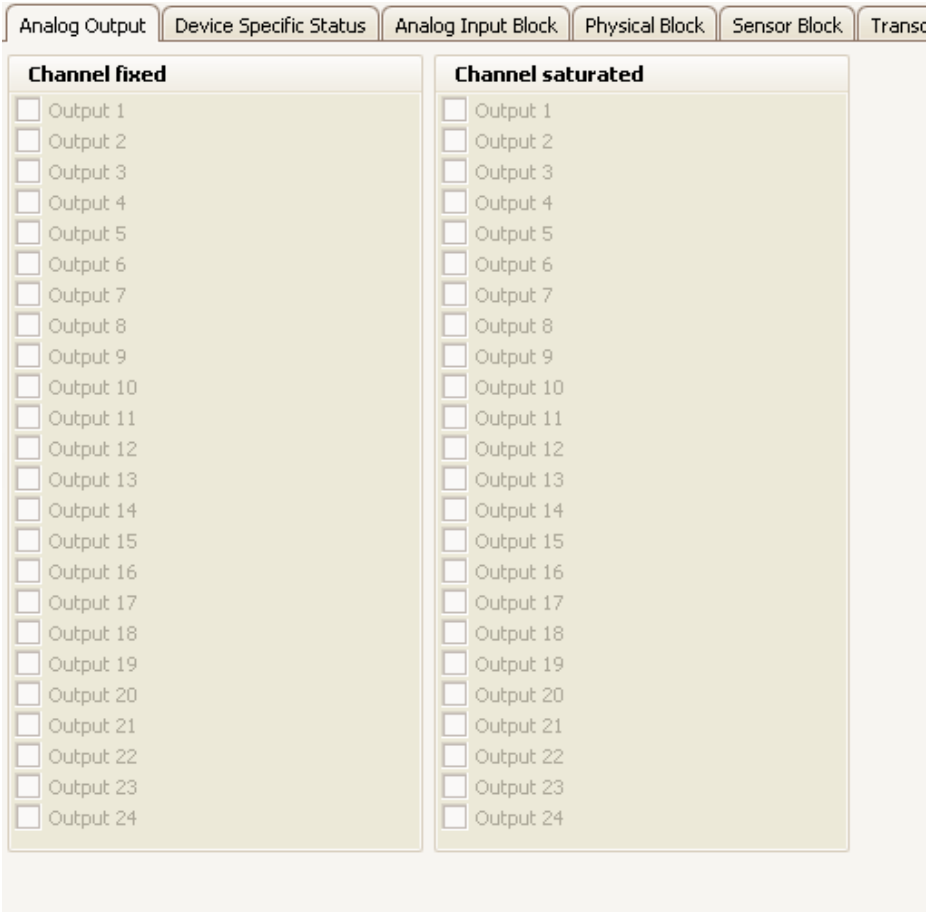
- it allows to change, in continuous reading mode, the time interval of viewed charts.



Selecting the option **Always on top** will cause that the window will always be displayed over other system windows.

5.8 Transmitter status

It contains a full list of diagnostic flags and parameters related to the transmitter status. Below, you can see a model window of a transmitter status. The window layout may vary depending on a device connected.



5.9 Write protection

The transmitter allows to block the possibility of changing its parameters by unauthorized users. With this tool you can manage transmitter access passwords and the lock status.

Lock status

Unblocked
- access to transmitter settings changes is **unprotected**.

Blocked
- access to transmitter settings changes is **protected**.

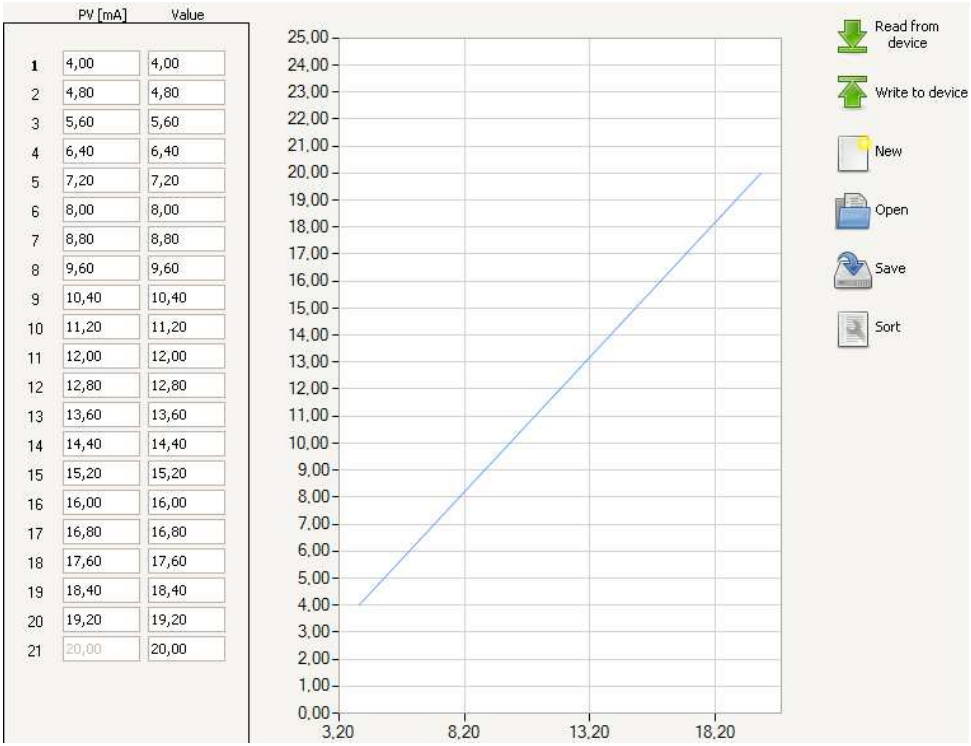
Blocked(spec)
- access to transmitter settings changes is **protected**. This option is available for MID transmitters only.

To change the lock settings, you must define the lock status, and then click a **Set** button. The program will ask for an access code currently entered into a transmitter. Password for brand-new transmitters is 00-00-00-00.

To change a transmitter lock password, choose the **Change password** button.

5.10 Linearization

Segmental linearization function allows to insert user's individual characterization into intelligent transmitters. Typical application of this function is measurement of liquid volume in tanks of irregular shape. User has 21 linearization points available. The function supports transmitters from the third version of software.



In the above picture, you can see a user interface window. It contains the following subareas (from the left):

1. Values table
2. Graphic representation of values

   The Y-axis - Value

   The X-axis - Process variable (PV)[mA]

Buttons:

 Read from device - reads current linearization table from a transmitter.

 - Write to device - saves a linearization table in a transmitter.

 - New - creates a new linearization table. The table is filled up with default values.

 - Open - import a table from file.

 - Save - exports a table to file

 - Sort - sorts table values ascending. The program requires that each point has a value (pv(mA) and a value) larger than the previous one.

1. Selection of linearization points

Linearization points data can be calculated on the basis of a tank shape or experimentally. In the table on the left side of the window, you can describe relations between an electric current value delivered by a transmitter and volume expressed in any units. During selection of linearization points, it is recommended to condense measuring points in an area of non-linear volume changes from liquid column level (pressure).

2. Setting minimum and maximum pressure (level)

The transmitter's measuring range should be set in such a way, that it corresponds with values entered in the table. The measuring range can be set by transfer parameters or by set values, so that the electric current value = 4 [mA] corresponds with an empty tank, and value 20 [mA] corresponds with a full tank.

3. Inserting linearization data to a table

On the basis of tank characteristics or by an experimental method, enter an electric current value, shown by a transmitter operating in linear characteristics, into **PV[mA]** fields, and then enter related tank liquid volume in the fields **Value**. Because of metrological reasons, it is useful to use all 21 points for characterisation description. If a table is only partially filled up, the remaining fields should be filled up with values identical as the last entered value pair. An example is presented in the above picture.

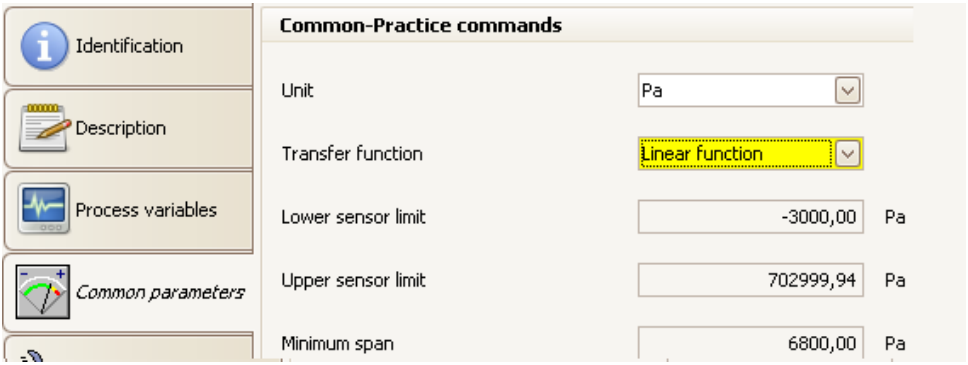
4. Saving data in a file, reading data from a file

A table with linearization data can be read or write from/to a file. To do this, you have to choose  or  ,respectively.

5. Transfer data to a transmitter

Data from a correctly filled table can be inserted into a transmitter by clicking the button  .

Note: To activate linearization in a transmitter, you must set conversion characteristics into **User's function**, as shown below.



The procedure of characteristics change is described in Conversion characteristics change.

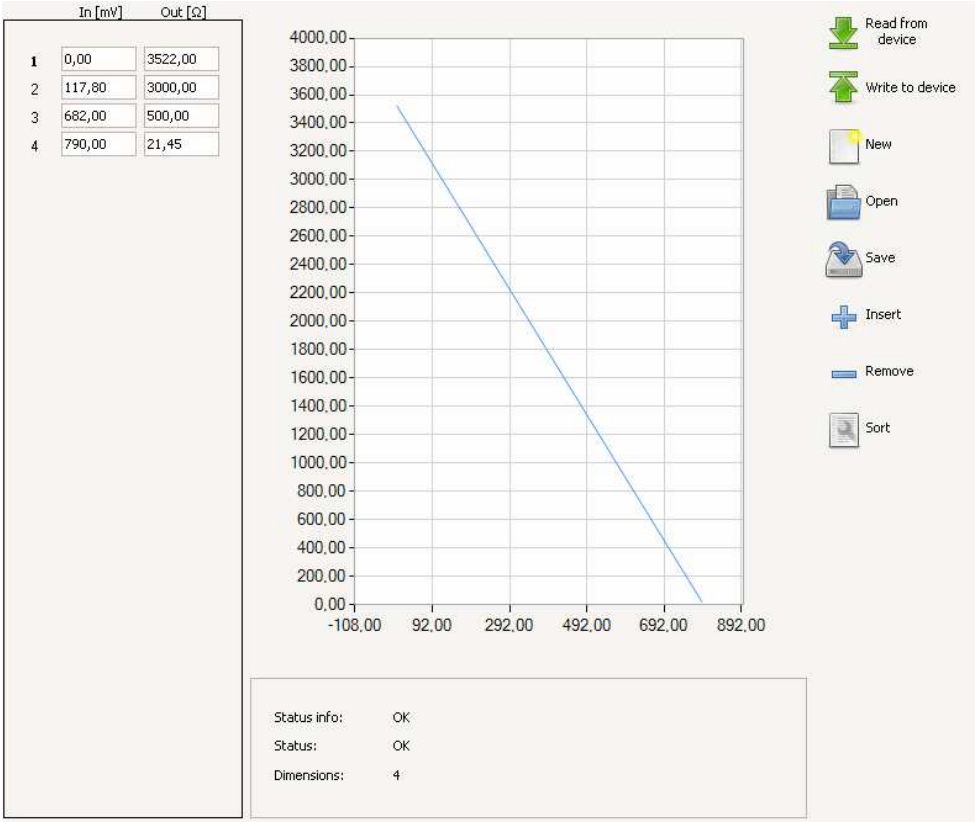
6. Reading coefficients from a transmitter to linearization table

A table with linearization data can be read from a transmitter by clicking the button  . After being read, the coefficients can be saved to file or inserted into another transmitter.

Note: A transmitter stores linearization table data as scaled values. After reading the data previously sent to a transmitter, the program will show scaled values. It is a normal operation, because for a transmitter not only values, but also user function characteristics are important.

5.11 Input linearization

Segmental linearization function allows to insert individual input user characteristics into intelligent transmitters (Sensor).



The above picture presents a user interface window. It contains the following subareas (from the left):

1. Values table
2. Graphic representation of values

   The Y - axis - input (mV)

   The X - axis - output (mV)

Buttons:

- Read from a device – reads current linearization table from a transmitter

- Write to a device – writes a linearization table in a transmitter

- New - creates a new linearization table. The table is filled up with default values.

- Open – imports a table from file

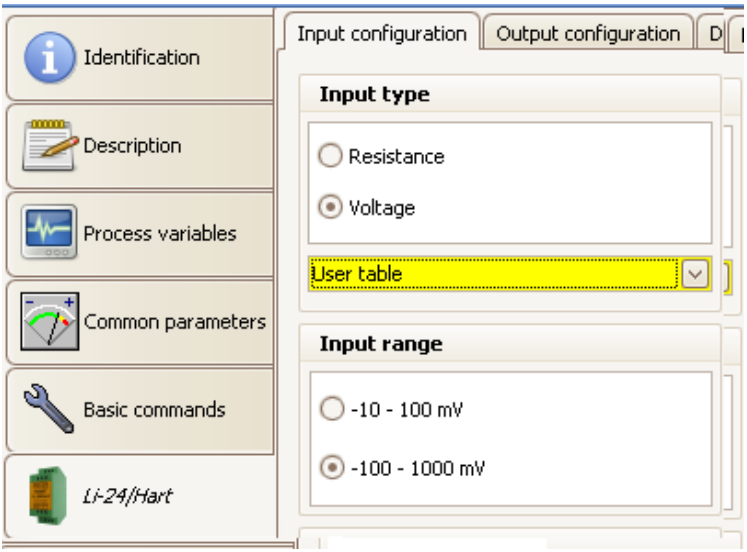
- Save – exports a table to file

- Insert – adds a row to a table

- Delete – removes a row from a table

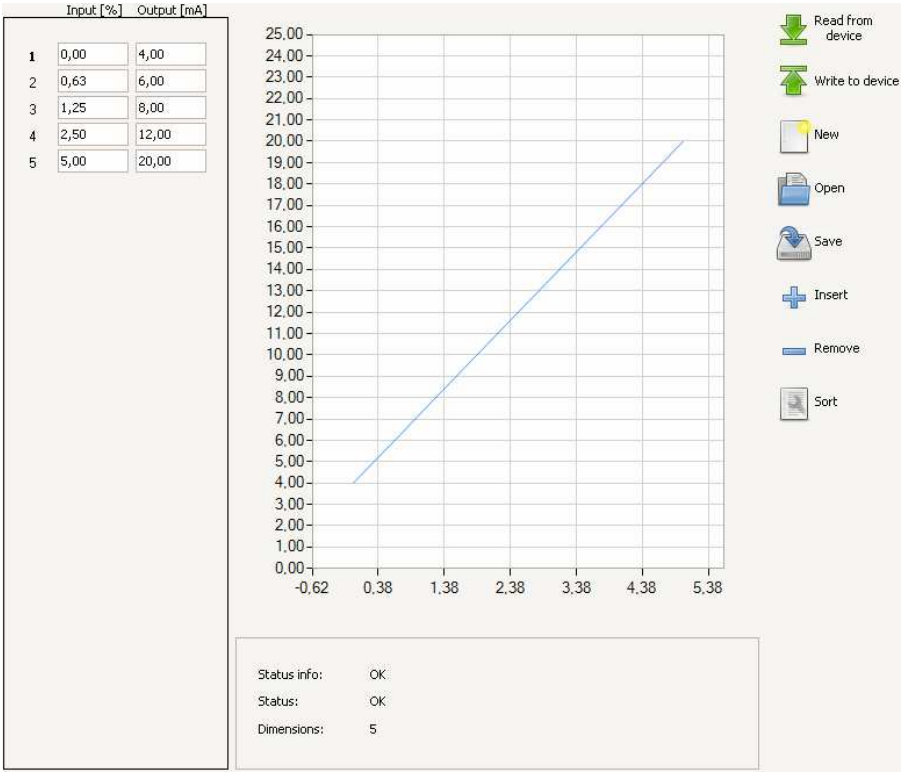
- Sort - sorts table values ascending. The program requires that each point has a value (pv(mA) and a value) larger than the previous one.

Note: To activate input linearization, input type must be set to **User's table**, as show below



5.12 Output linearization

Segmental linearization function (output track) allows to insert individual output user characteristics into intelligent transmitters.



The above picture presents a user interface window. It contains the following subareas (from the left):

1. Values table
2. Graphic representation of values

   The Y-axis - input (%)

   The X-axis - output (mA)

Buttons:

 - Read from a device – reads current linearization table from a transmitter

 - Write to a device – writes a linearization table in a transmitter

 - New - creates a new linearization table. The table is filled up with default values

 - Open – imports a table from file

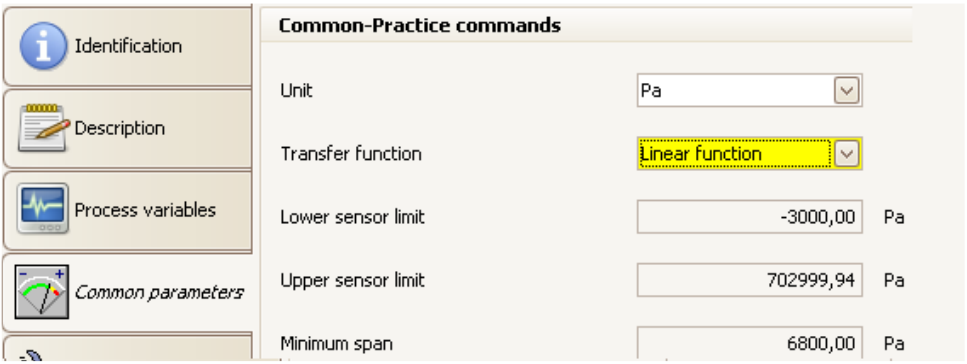
 - Save – exports a table to file

 - Insert – adds a row to a table

 - Delete – removes a row from a table

 - Sort - sorts table values ascending. The program requires that each point has a value (pv(mA) and a value) larger than the previous one.

Note: To activate transmitter's linearization, conversion characteristics must be set to **User's function**, as show below.



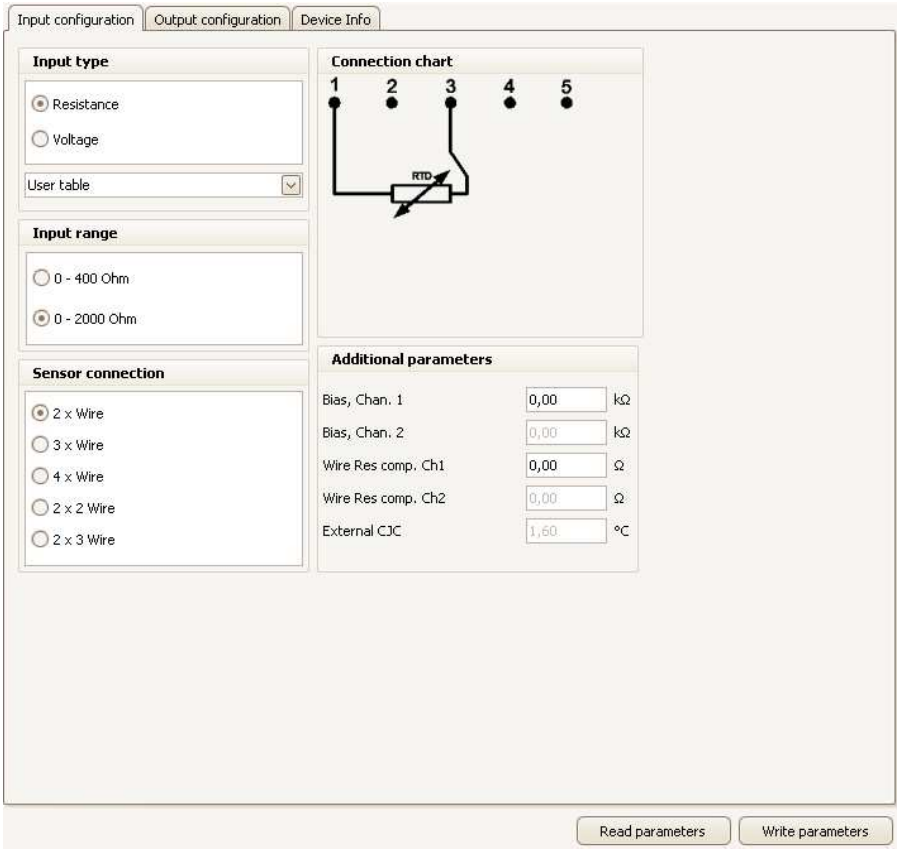
The procedure of characteristics change is described in Conversion characteristics change.

5.13 Li-24/Hart / APT-2000ALW

It contains additional transmitter parameters. Description of individual fields can be found in the product's valid Operation and Maintenance Manual.

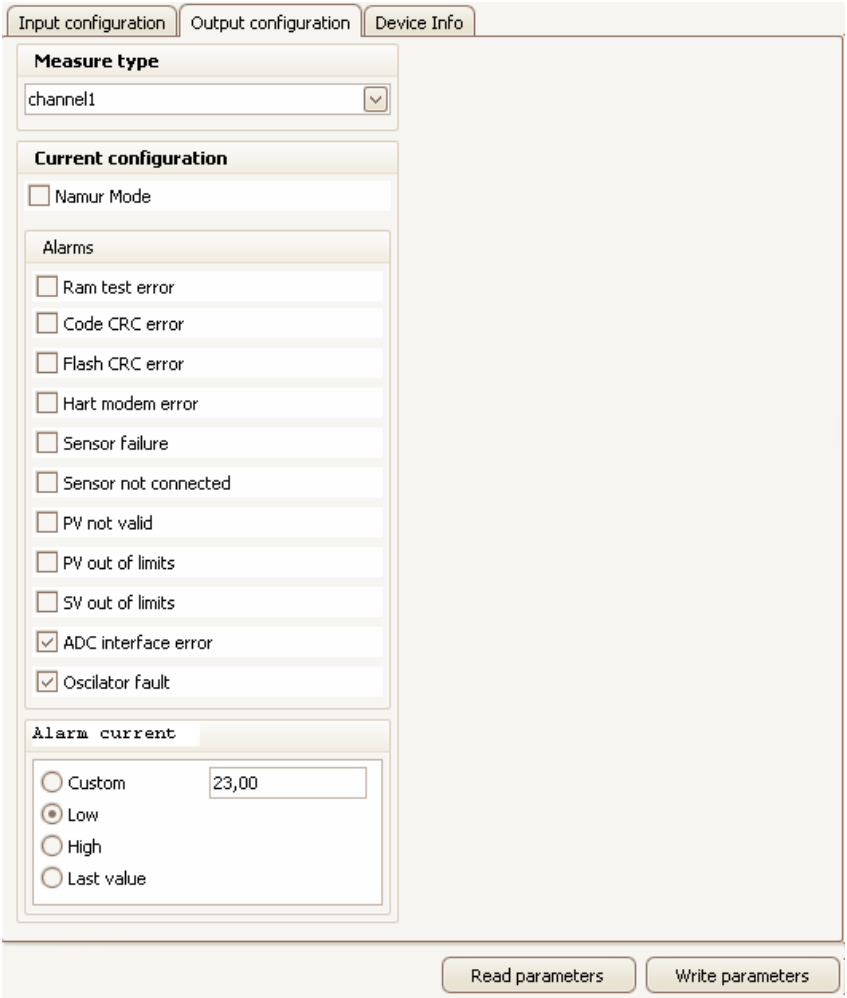
The first tab allows to set the following parameters:

1. Input type;
2. Range;
3. Connection type;
4. Additional parameters;



The second tab allows to set the following parameters:

1. Measurement type;
2. Electric current configuration. Namur mode field
   - checked - alarm current compliant with NAMUR.
   - unchecked - Normal mode. Electric current values described in OM Manual.
3. Alarms;
4. Alarm current;



Content of fields, in which value can be entered, can be transfered to the transmitter with a command **Write parameters**.

The command **Read parameters** allows to read only those parameters, which are shown in the above window.

To read all transmitter parameters, you should use the command Read configuration.

6 Configuration of the transmitter

6.1 Change of adjusted range by entering numbers

To change the transmitter's adjusted range, perform the following operations:

1. If a transmitter was not found in the network, you must *search* for it.
2. Go to *Basic parameters* tab.
3. Adjust unit.
4. Set start and end of the adjusted range. Permissible values are limited by the basic range and minimal range width.
5. Save changes in a transmitter by clicking **Enter**.

See also: *Set range with assigned values.*

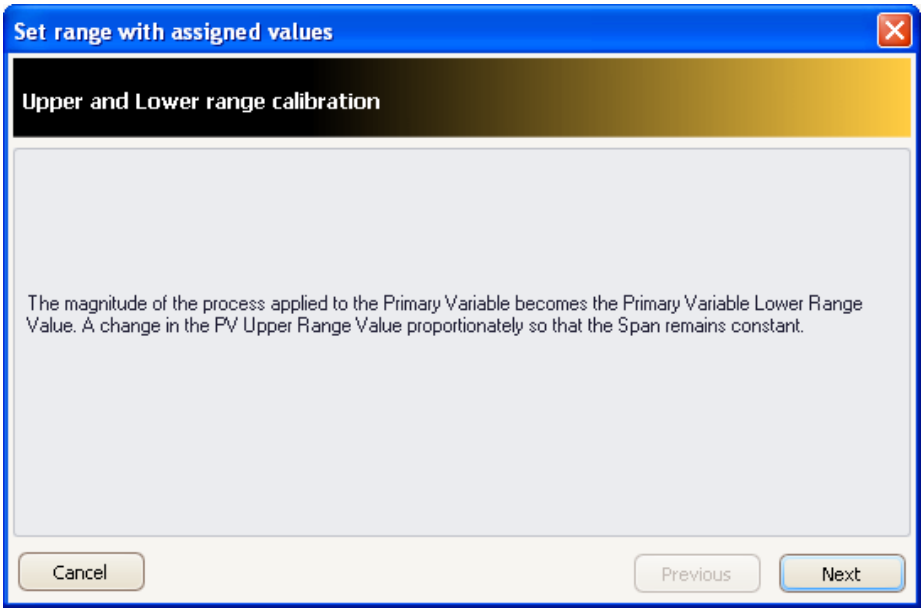
6.2 Set range with assigned values

This function is enabled by:
Operations -> *Basic functions* -> Set range with assigned values -> Set range.

Setting range adjusted with a set value (e.g. pressure) means saving a transmitter's set value as start or end of adjusted range.
Be careful not to exceed permissible range width.

1. Start

After running the wizard, the main window is displayed.

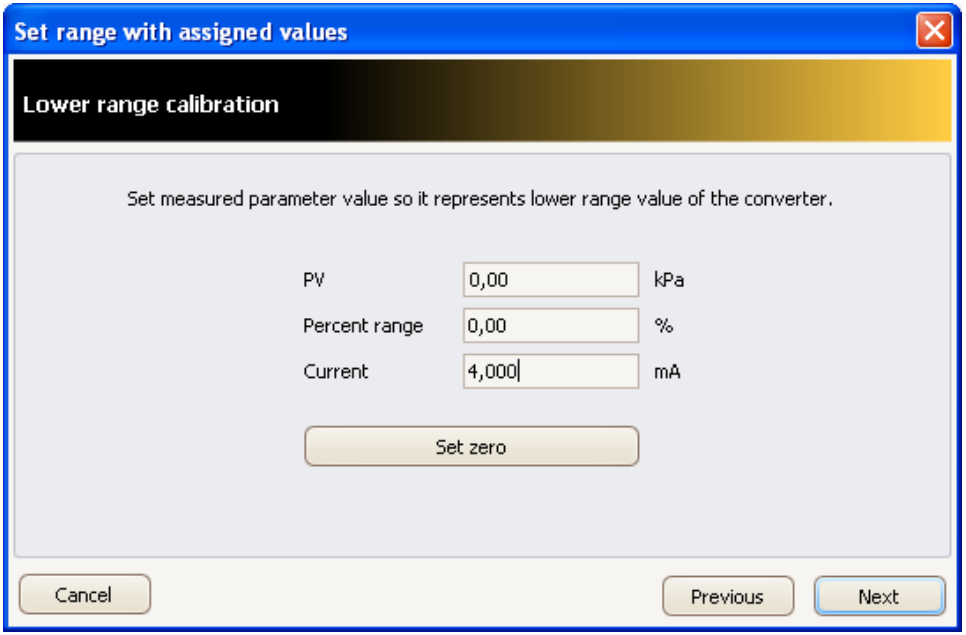


Click the button **Next**, and the wizard will go to step 2.

If you choose **Cancel**, the wizard will be closed and you will return to the main window.

2. Setting lower range value (zero).

Change of the range start set value will cause a shift of the range end set value by the range width. So it must be remembered, that the adjusted range end must not exceed the upper limit of the basic range, otherwise the width of the adjusted range will be automatically decreased.



You should follow the wizard instructions. When current measurements and the first variable are stabilized, click the button **Set zero**.

In the above example, the following values will be changed: Range percentage (from 0.50 to 0.00) and Current (from 4,080 to 4,000).

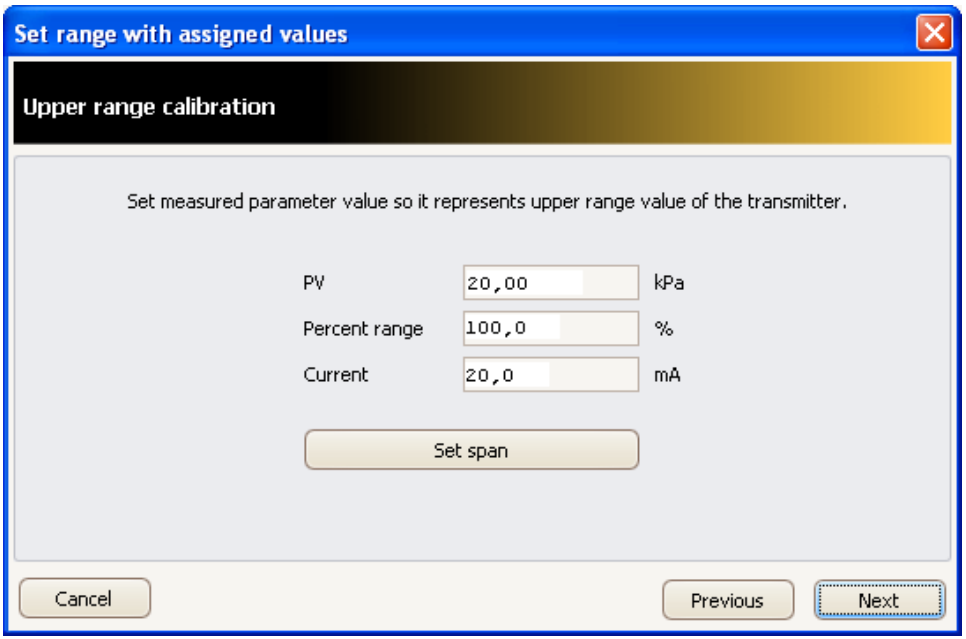
Click the button **Next**, and the wizard will go to step 3.

If you choose **Back**, the wizard will come back to the previous step

Note: this will not delete the command **Set zero.**

If you choose **Cancel**, the wizard will be closed and you will return to the main window.

3. Setting upper range value (span).



You should follow the wizard instructions. When current measurements and the first variable are stabilized, click the button **Set span.**

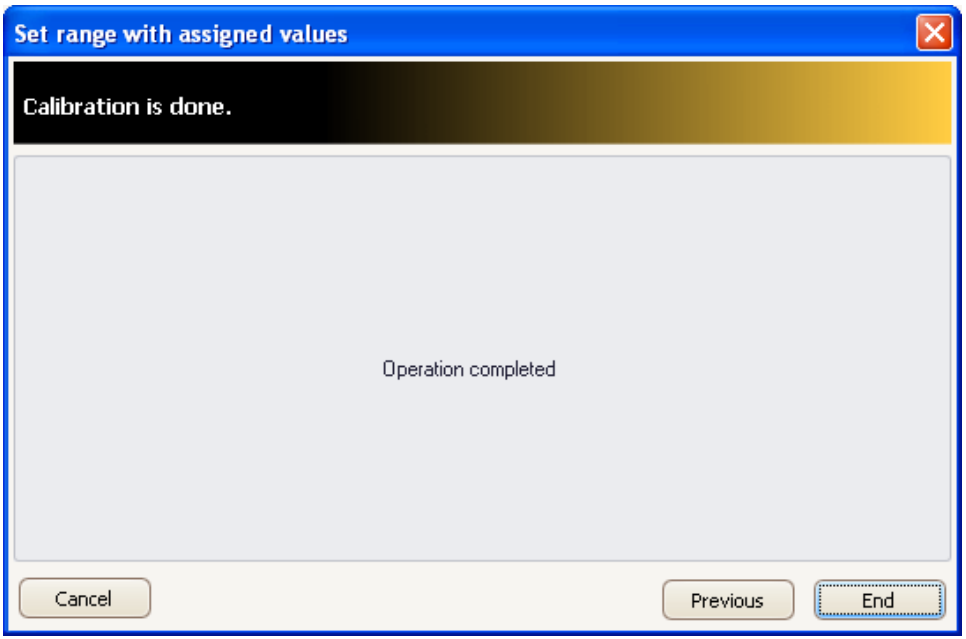
In the above example, the following values will be changed: Range percentage (from 88.15 to 100.00) and Current (from 18,030 to 20,000).

Click the button **Next**, and the wizard will go to step 4.
If you choose **Back**, the wizard will come back to the previous step.

Note: this will not delete the command **Set span.**

If you choose **Cancel**, the wizard will be closed and you will return to the main window.

4. Final step.



A message on the operation completion will be displayed.
The button **End** finishes calibration.
The button **Back** returns to the previous step of the wizard.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

See also: *Change of adjusted range by entering numbers*.

Additional information:
Change of measuring range start and end (especially for a pressure difference transmitter with distance separators) can be performed in two ways:

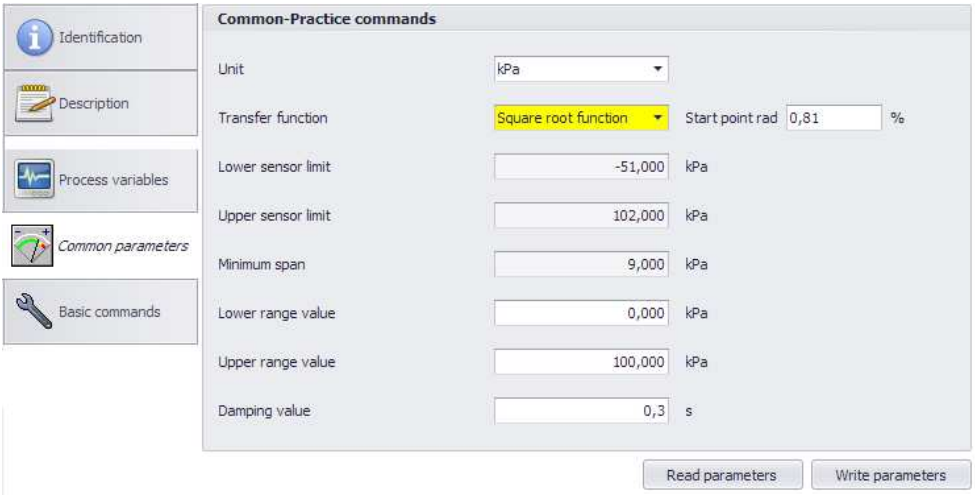
- If measuring range width is known, first set the range start to zero by a command “enter numbers”, and the range end to a value equal to the range width. Next, after the transmitter installation, adjust only the range start with a set value.
- If measuring range width is not known (e.g. measurement of medium level of undetermined density) than after installation, set the transmitter’s pressure by e.g. filling the tank up to the lower, and then up to the upper level. Set start and end.

6.3 Change of transfer function

To change transmitter's transfer function, do the following steps:

1. If a transmitter was not found in the network, you must *search* for it.
2. Go to *Basic parameters* tab.
3. Set transfer function.
4. Write changes to the transmitter with a command **Write parameters**.

Start point rad (Inflection point) - relates to square root function.
The range percentage from which this transfer function is enabled.
Below this value, the transmitter operates as a square transfer function.



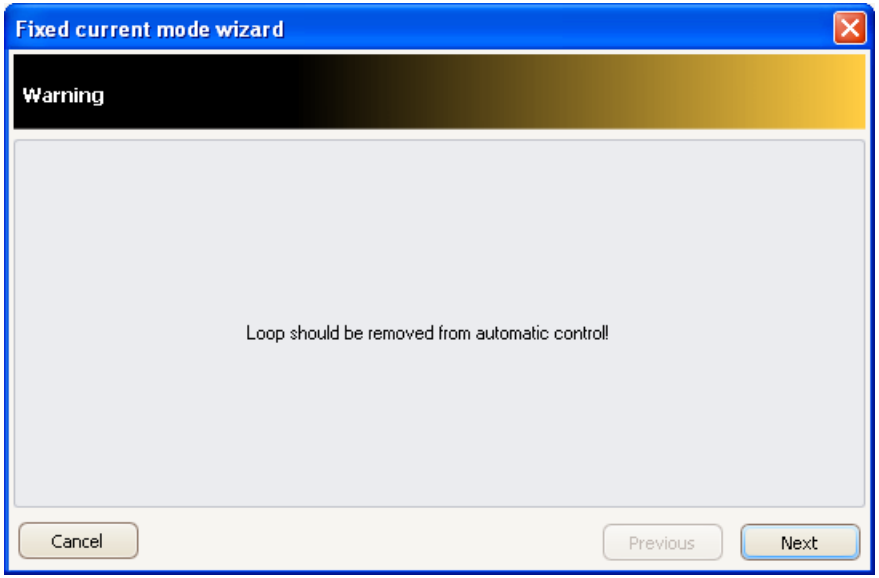
6.4 Fixed current mode in the line

This function is enabled by:

Operations -> Basic functions -> fixed current mode.

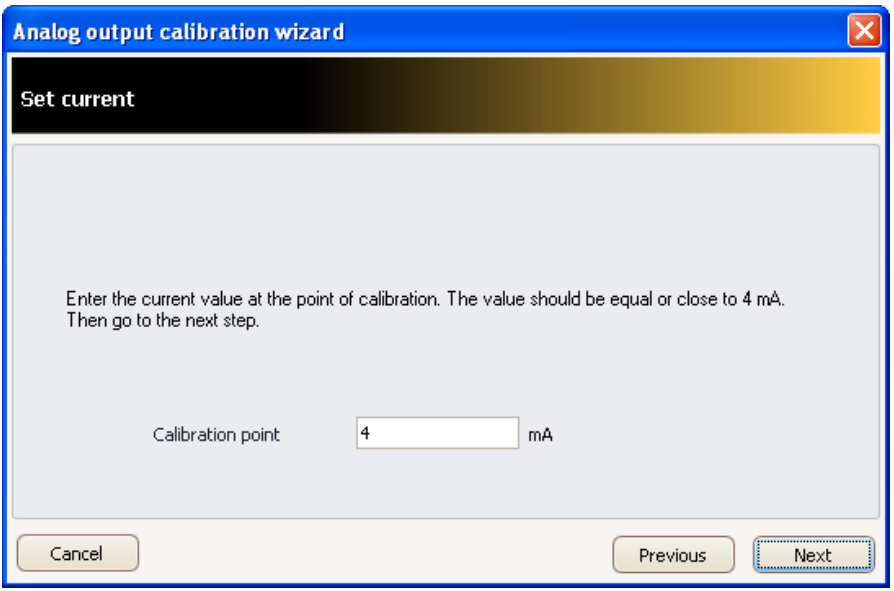
1. **Start**

After running the wizard, the main window is displayed.
The transmitter must not be connected to a control loop.



Click the button **Next**, and the wizard will go to the next step.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

2. Current calibration – lower calibration point.

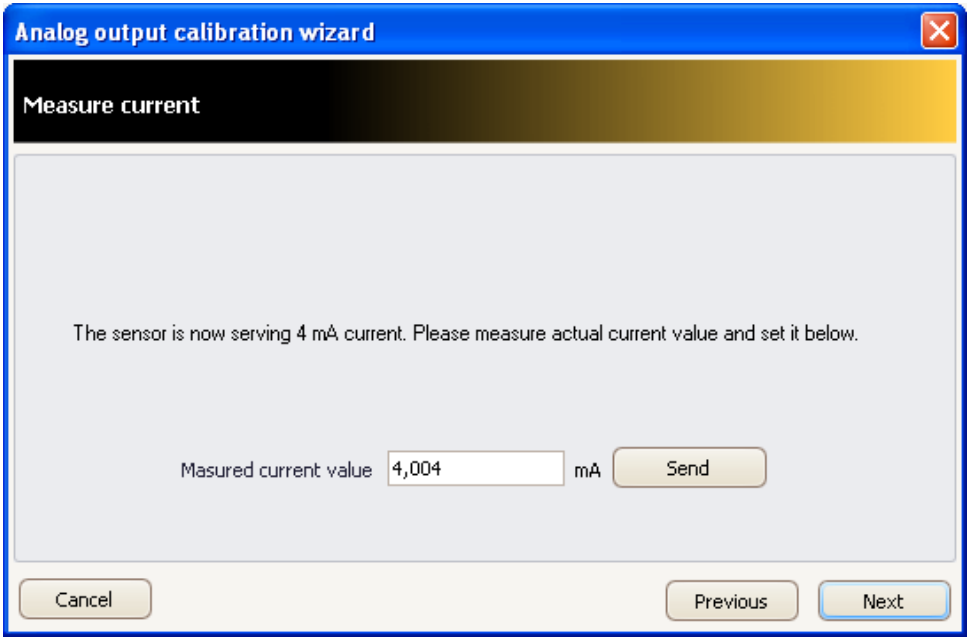


You should follow the wizard instructions.

After entering electric current value for lower calibration point in the field **Calibration point**, choose the button **Next**.
The transmitter will produce the adjusted current value. The transmitter can reject the adjusted value; this will indicate that the value is too high or too low.
If you choose **Back**, the wizard will come back to the previous step.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

Example: For a transmitter with 4...20mA output, the value must equal 4 mA

3. Current calibration – lower calibration point – continuation.

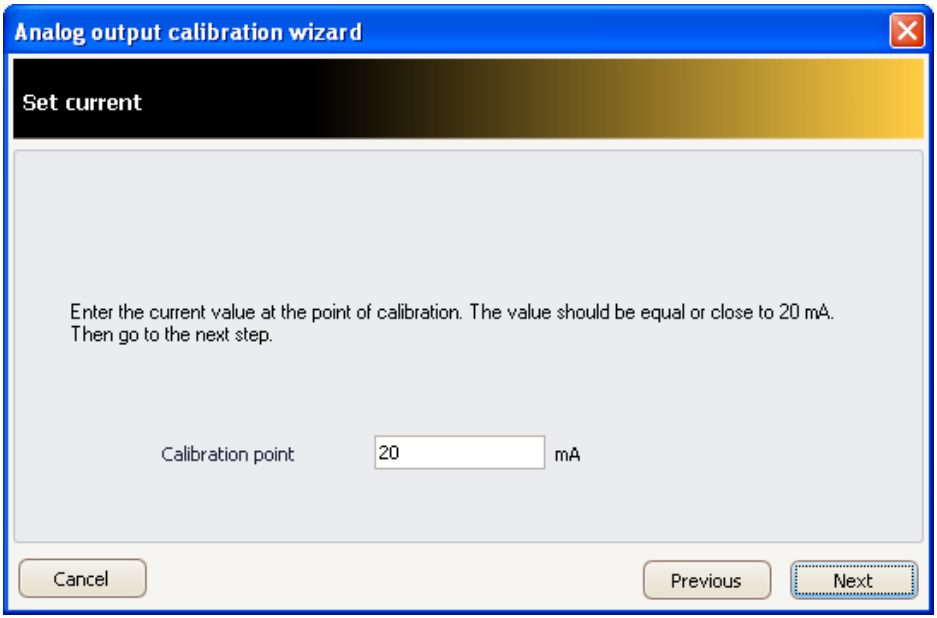


You should follow the wizard instructions.
When miliammeter readings are stabilized and entered into the field **Measured current value**, choose the **Send** button.
The transmitter can reject the value. This can indicate incorrect configuration, or improper transmitter / ammeter operation.
Click the button **Next**, and the wizard will go to the next step.
If you choose **Back**, the wizard will come back to the previous step.

Note: this will not delete the command **Send**.

If you choose **Cancel**, the wizard will be closed and you will return to the main window.

4. Current calibration – upper calibration point.

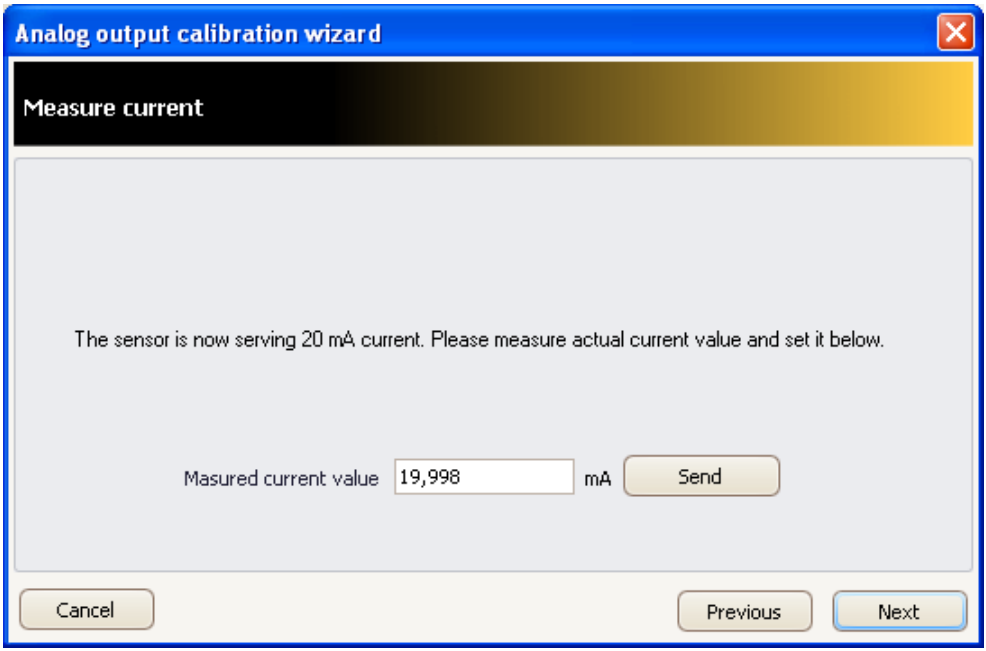


You should follow the wizard instructions.

After entering electric current value for upper calibration point in the field **Calibration point**, choose the button **Next**.
The transmitter will produce the adjusted current value. The transmitter can reject the adjusted value; this will indicate that the value is too high or too low.
If you choose **Back**, the wizard will come back to the previous step. If you choose **Cancel**, the wizard will be closed and you will return to the main window.

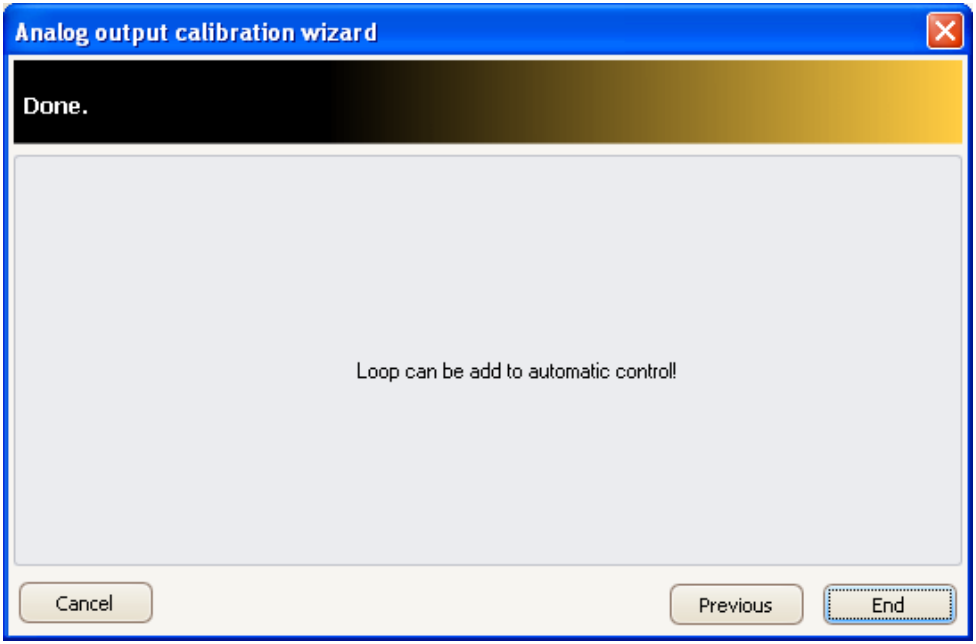
Example: For a transmitter with 4...20mA output, the value must equal 20 mA

5. Current calibration – upper calibration point - continuation



You should follow the wizard instructions. When miliammeter readings are stabilized and entered into the field **Measured current value**, choose the **Send** button.
The transmitter can reject the adjusted value. This can indicate incorrect configuration, no zeroing, or improper transmitter / ammeter operation.
Click the button **Next**, and the wizard will go to the next step.
If you choose **Back**, the wizard will come back to the previous step.
Note: this will not delete the command **Send**.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

3. Final step



At the end, a summary is displayed.
The button **End** finishes calibration.
The button **Back** returns to the previous step of the wizard.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

Note: Cancelling calibration is possible with the command:

- For pressure transmitters **Cancel analog output calibration** in *Transmitter parameters* window
- For temperature transmitters **Analog output trim** in *Factory settings* tab.

6.5 Zeroing first PV process variable

Transmitter zeroing is used to eliminate characteristics shift after a transmitter assembly on an object.
Transmitter readings will be corrected, if the following function will be enabled at zero installation pressure:

- *Operations* -> *Basic functions* -> Zeroing -> **Zero PV**.

It does not apply to absolute pressure transmitters.

6.6 Transmitter input signal calibration

This function is enabled by:

- Menu->Transmitter->APC calibration

Note: Procedure presented below concerns pressure transmitter. For temperature transmitter the procedure is identical.

Calibration is performed on the input signal received from a sensor. Calibration eliminates errors, e.g. sensor and whole computing track aging errors. It is performed in selected points, in which it is required and possible to precisely define upper and lower standard signal (e.g. standard pressure). After input signal calibration, it is recommended to perform also *analog output calibration*.

Note: Values accepted for calibration points does not have to equal upper and lower limit of the basic range, but they cannot exceed them, and the width of calibration range cannot be lower than minimal adjusted range width. To obtain maximum accuracy, calibration points should coincide or be close to adjusted range start and end.

Note: Before input signal calibration (e.g. pressure, in case of pressure transmitters) it is recommended to perform *zeroing* of the transmitter first process variable.

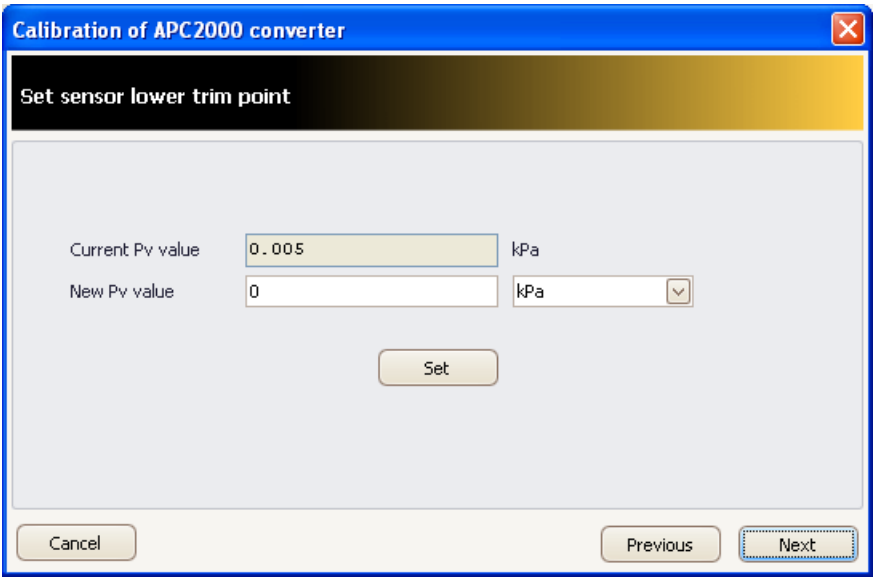
1. Start

When you start a calibration wizard, a widow is displayed, in which you should enter a randomly generated code.

Note: the text is case sensitive.

Click **Next**. After the code verification, the wizard will go to step 2. If you choose **Cancel**, the wizard will be closed and you will return to the main window.

2. Lower point calibration.



It is necessary to adjust standard input signal, for which you want to perform lower point calibration, and then wait for stabilization of the signal read by the transmitter and indicated in the field **Current PV value**.

New PV value should be filled up with a value equal to the standard input signal. The program allows to enter that value in any unit.

The above picture presents a situation, in which the standard input signal equals 0 kPa.

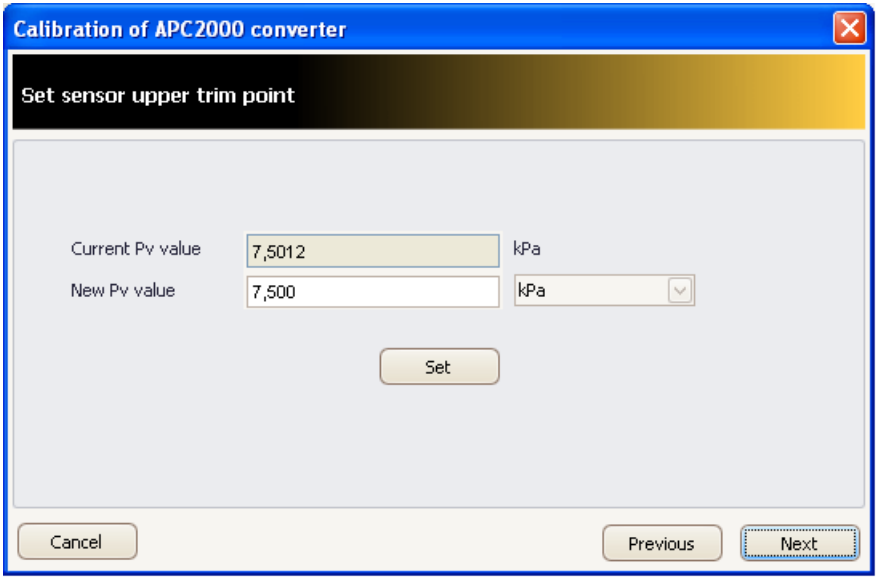
If values in both fields are stabilized, click the button **Adjust**.
If both values (current and new) differ widely, the transmitter may reject the values.
This can indicate incorrect configuration, no zeroing, or improper transmitter operation

Click the button **Next**, and the wizard will go to step 3.
If you choose **Back**, the wizard will come back to the previous step.

Note: this will not delete the command **Adjust.**.

If you choose Cancel, the wizard will be closed and you will return to the main window.

3. Upper point calibration.



It is necessary to adjust standard input signal, for which you want to perform upper point calibration, and then wait for stabilization of the signal read by the transmitter and indicated in the field **Current PV value**.
New PV value should be filled up with a value equal to the standard input signal.

The above picture presents a situation, in which the standard input signal equals 7.5 kPa.

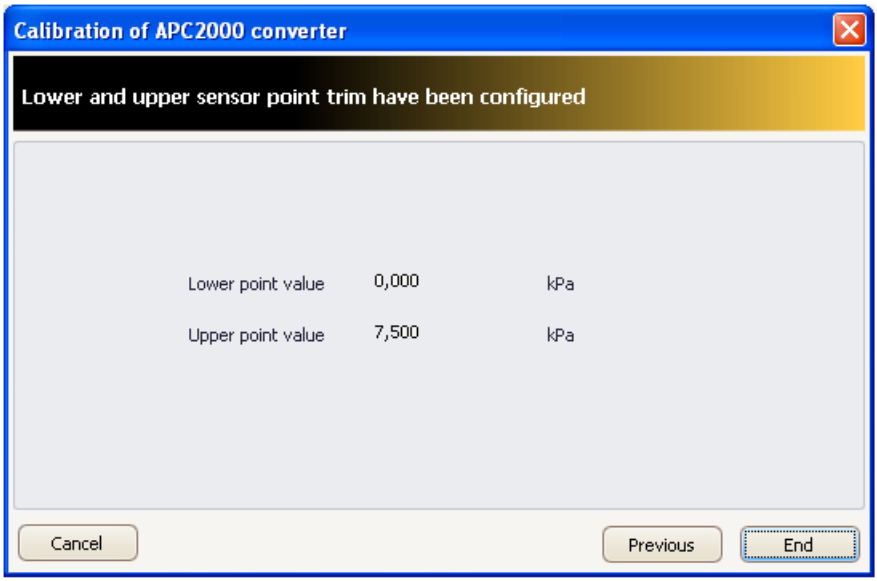
If values in both fields are stabilized, click the button **Adjust**.
If both values (current and new) differ widely, the transmitter may reject the values.
This can indicate incorrect configuration, or improper transmitter operation.

Click the button **Next**, and the wizard will go to step 4.
If you choose **Back**, the wizard will come back to the previous step.

Note: this will not delete the command **Adjust**.

If you choose **Cancel**, the wizard will be closed and you will return to the main window.

4. Final step.



At the end, a summary is displayed.
The button **End** finishes calibration.
The button **Back** returns to the previous step of the wizard.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

Note: Cancelling calibration is possible with the command:

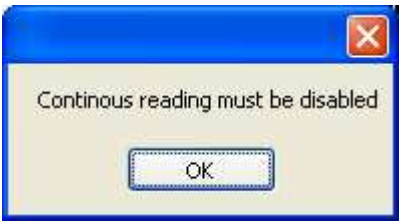
- **For pressure transmitters:** *Cancel sensor calibration.*
- **For temperature transmitters:** Sensor trim in a tab *Factory settings*.

6.7 Analog output calibration

This function is enabled by:

Operations->*Basic functions*->Analog output calibration.

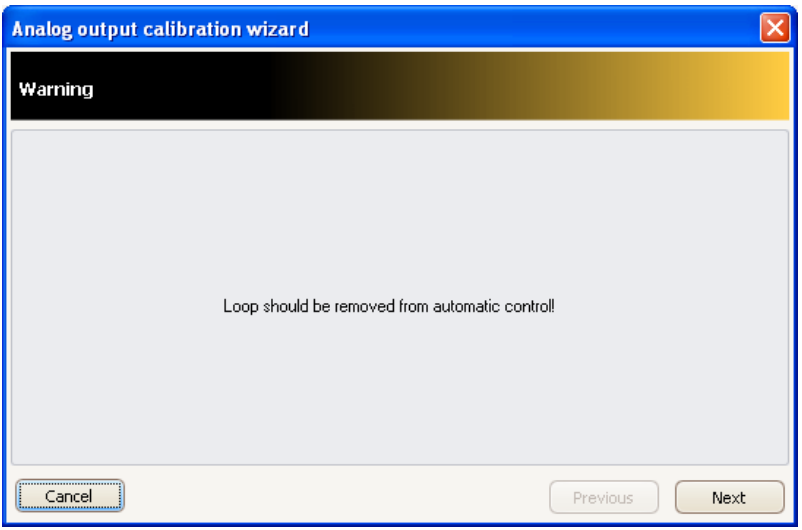
If process variables continuous reading is enabled, a warning message will be displayed. To continue, un-check the continuous reading in the field **Continuous reading** in the process variables window.



Calibration eliminates errors e.g. sensor and whole computing track aging errors.

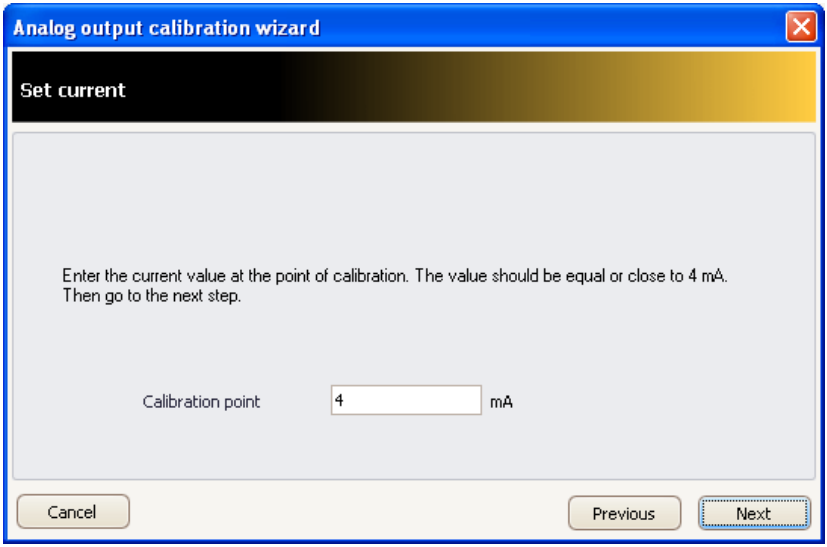
1. Start

When you start a calibration wizard, a start-up widow is displayed.
The calibrated transmitter cannot be connected to a control loop.



Click the button **Next**, and the wizard will go to the next step.
If you choose **Cancel**, the wizard will be closed and you will return to the main window

2. Current calibration – lower calibration point.



You should follow the wizard instructions.

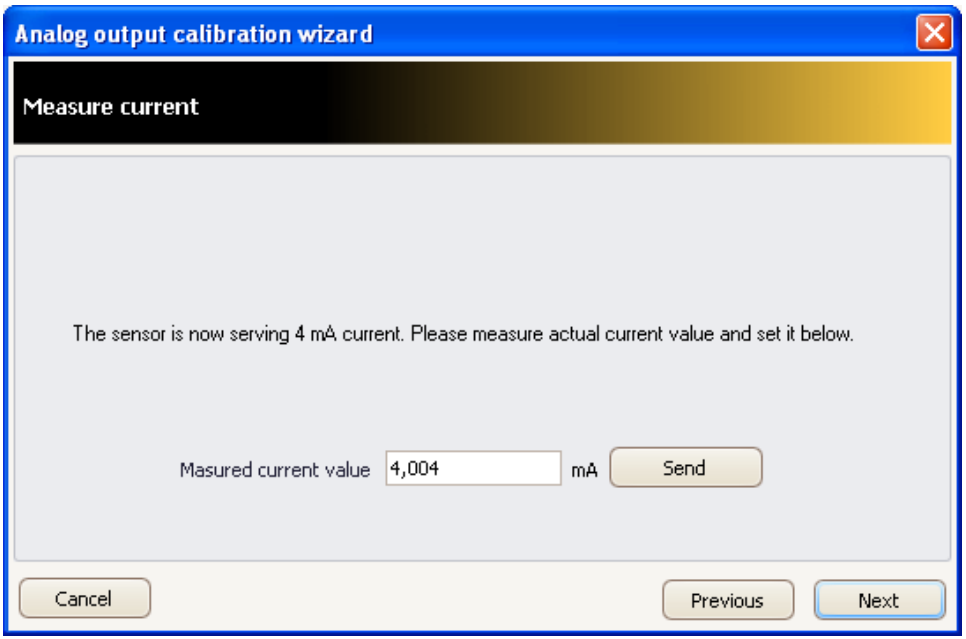
After entering electric current value for lower calibration point in the field **Calibration point**, choose the button **Next**.

The transmitter will produce the adjusted current value. The transmitter can reject the adjusted value; this will indicate that the value is too high or too low.

If you choose **Back**, the wizard will come back to the previous step.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

Example: For a transmitter with 4...20mA output, the value must equal 4 mA.

3. Current calibration – lower calibration point - continuation.



You should follow the wizard instructions.

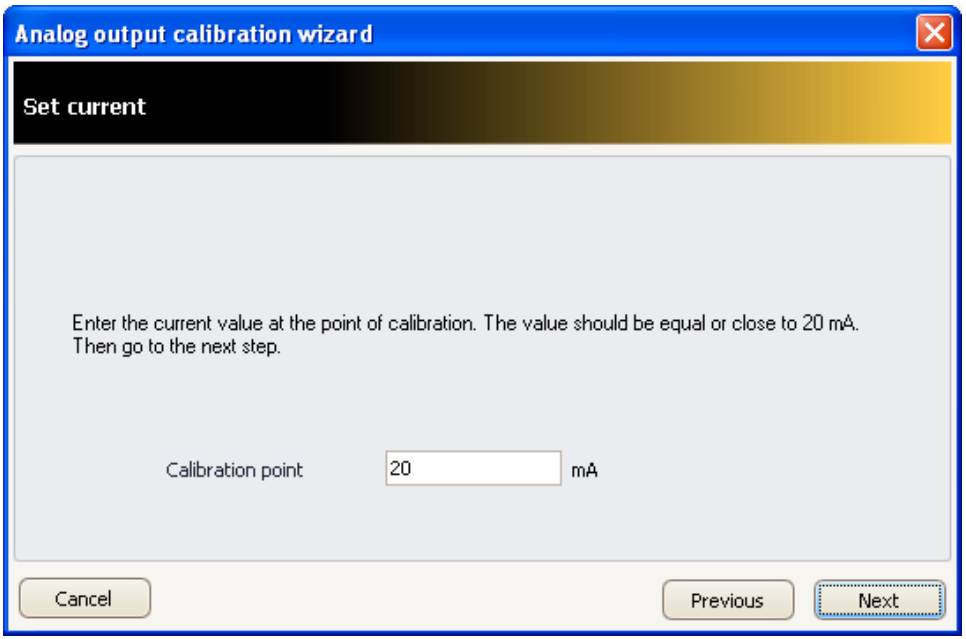
When miliammeter readings are stabilized and entered into the field **Measured current value**, choose the **Send** button.
The transmitter can reject the value. This can indicate incorrect configuration, or improper transmitter / ammeter operation.

Click the button **Next**, and the wizard will go to the next step.
If you choose **Back**, the wizard will come back to the previous step.

Note: this will not delete the command **Send.**

If you choose **Cancel**, the wizard will be closed and you will return to the main window.

4. Current calibration – upper calibration point.



You should follow the wizard instructions.

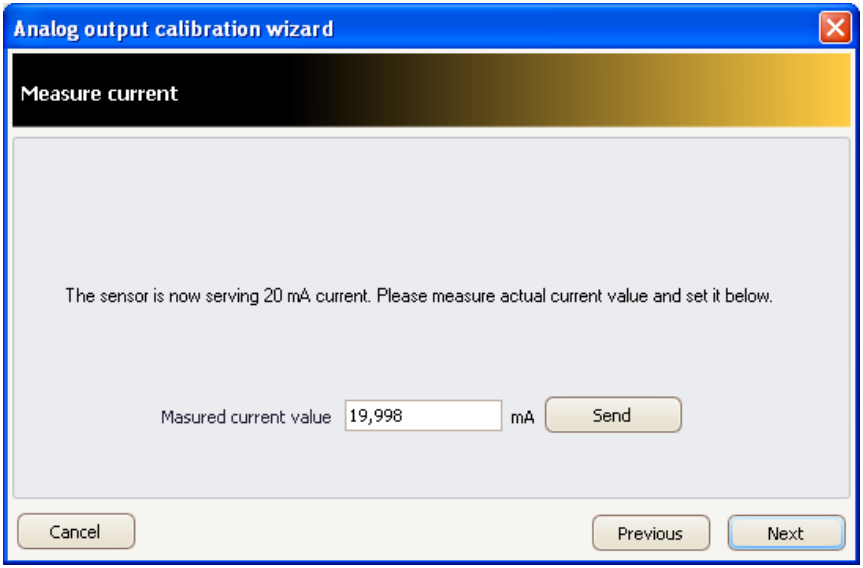
After entering electric current value for upper calibration point in the field **Calibration point**, choose the button **Next**.

The transmitter will produce the adjusted current value. The transmitter can reject the adjusted value; this will indicate that the value is too high or too low.

If you choose **Back**, the wizard will come back to the previous step.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

Example: For a transmitter with 4...20mA output, the value must equal 20 mA.

5. Current calibration – upper calibration point - continuation.



You should follow the wizard instructions.

When miliammeter readings are stabilized and entered into the field **Measured current value**, choose the **Send** button.

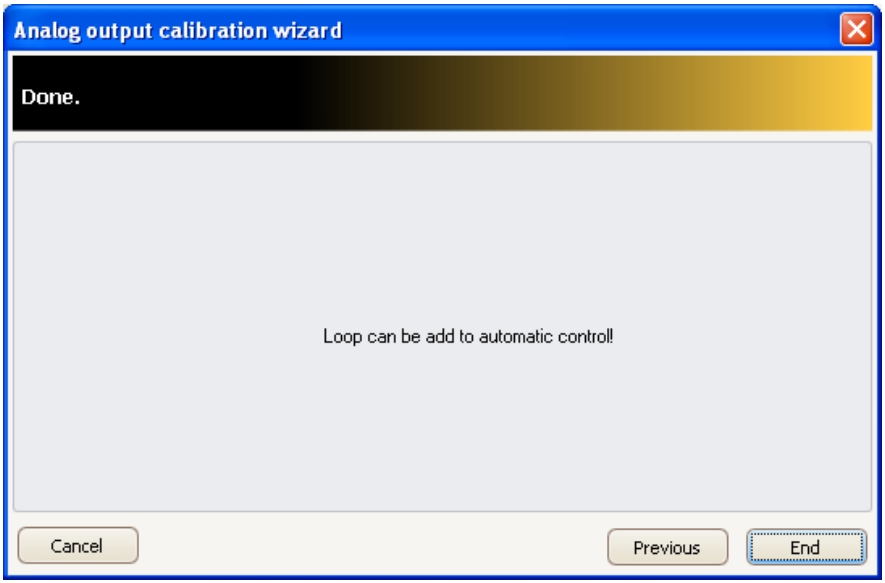
The transmitter can reject the adjusted value. This can indicate incorrect configuration, no zeroing, or improper transmitter / ammeter operation.

Click the button **Next**, and the wizard will go to the next step.
If you choose **Back**, the wizard will come back to the previous step.

Note: this will not delete the command **Send.**

If you choose **Cancel**, the wizard will be closed and you will return to the main window.

6. Final step



At the end, a summary is displayed.
The button **End** finishes calibration.
The button **Back** returns to the previous step of the wizard.
If you choose **Cancel**, the wizard will be closed and you will return to the main window.

Note: Cancelling calibration is possible with the command**:**

- For pressure transmitters **Cancel analog output calibration in Transmitter parameters** window
- For temperature transmitters **Analog output trim in Factory settings** tab.

6.8 Restore factory settings

It is possible to restore factory settings of transmitter calibration, provided that a transmitter enables such operation.
In case of incorrect calibration, or when a transmitter cannot be calibrated, perform the following operations:

- Pressure transmitters:
  - Choose *Operations*->*Transmitter parameters*.
  - Depending on parameters you want to restore, choose respectively:
    - Cancel zero calibration - to restore factory settings of *zeroing*.
    - Cancel sensor calibration - to restore factory settings of input signal calibration.
    - Cancel analog output calibration - to restore factory settings of input signal calibration.
  - Choose the button **Perform**

- Temperature transmitters:
  Choose one of the option in the *Factory Settings* tab.

6.9 Cancelling a configuration change flag

To cancel a transmitter's configuration change flag, perform the following operations:

1. Open *tab* -> *Basic functions*.
2. In the area *Configuration change flag* choose **Cancel flag**

7 Converter HART/RS232

The Hart/RS232 Converter software configuration Raport 2 provides communication and data exchange using a computer with smart pressure transmitters type APC-2000 and APC-2000ALW, smart differential pressure transmitters type APR-2000, APR-2000ALW, APR-2200 and APR-2200ALW, hydrostatic level probes type SG-25.SMART and APR-2000Y and the temperature transmitters type LI-24, LI-24ALW and APT-2000ALW produced by APLISENS.

7.1 Communication with the transmitter allow to:

- Identify the transmitter;
- Configure the output parameters:
  - unit and the value of the beginning and ending of the measuring range;
  - damping time constant;
  - processing characteristic (line, square root, special, square);
- Read the currently measured value (e.g. pressure, output current, output control level in %);
- Force an output current a given value;
- Calibration the transmitter with respect to the pattern;
- Zeroing.

7.2 Related documents

The user receives:

- Converter Hart / RS232 (1);
- Communication cable with terminals for connecting the converter to the transmitter (2);
- RS-232 cable to connect the converter to your computer (3);
- Software Report 2;
- User Manual.

Fig. 1. Converter HART/RS232

If the computer is not equipped with a RS-232 port is recommended to use HART/RS232/USB Converter available in the offer Aplisens.

7.3 The way of connecting converter to the transmitter

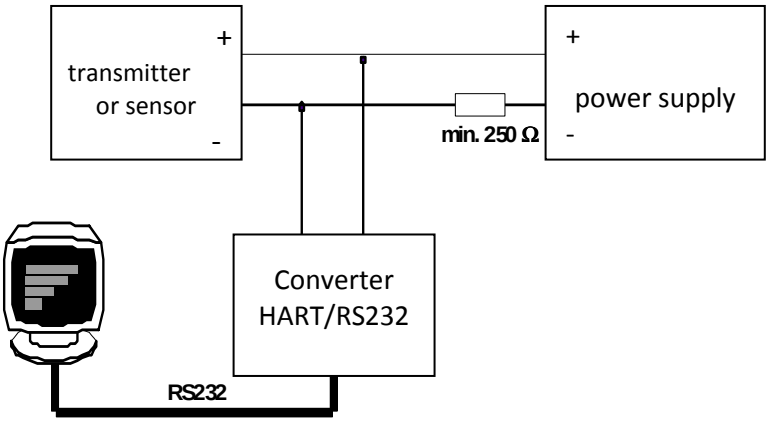


Fig. 2. Connection diagram HART/RS232 Converter to the supply-measuring transmitter or sensor to the computer.