

IO.RAPORT 2(ENG)

APLISENS

MANUFACTURE OF PRESSURE TRANSMITTERS AND CONTROL INSTRUMENTS

USER'S MANUAL

"RAPORT 2" SOFTWARE

Edition B

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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.

j号 Setup - Raport 2	
License Agreement Please read the following important information before continuing.	(Plisen S'
Please read the following License Agreement. You must accept the terms of agreement before continuing with the installation.	of this
GENERAL CONDITIONS OF A LICENSE AGREEMENT FOR USE THE "RAPORT 2" SOFTWARE	^
 General conditions of the license agreement describe principles of cooperation between a user of the "RAPORT 2" software, who is a natural or legal person (hereinafter referred to as the "Licensee" and APLISENS S.A., with its registered office at ul. Morelowa 7, 02-192 Warsaw, KRS No 302835, registered by the District Court for the capital city of Warsaw XIII Commercial Division of the National Court Register, entitled to the "RAPORT 2" software (hereinafter referred to as the "Licensor"). 	
 I accept the agreement I do not accept the agreement 	
< <u>B</u> ack Next >	Cancel

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

🕞 Setup - Raport2	
Select Destination Location Where should Raport2 be installed?	isenS'
Setup will install Raport2 into the following folder.	
To continue, click Next. If you would like to select a different folder, click Browse.	
C:\Program Files\Aplisens\Raport2 Browse Browse	
At least 19,3 MB of free disk space is required.	
< <u>B</u> ack <u>N</u> ext > Cance	1

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.

🕞 Setup - Raport2	
Select Components Which components should be installed?	(Plisen s:
Select the components you want to install; clear the components install. Click Next when you are ready to continue.	you do not want to
Full installation	<u>~</u>
Hart Devices	2 315 KB
🔤 🗹 Hart Universal Commands (Generic)	738 KB
- 🗹 Pressure transmitters extensions	650 KB
Temperature transmitters extensions	838 KB
Current selection requires at least 22,6 MB of disk space.	
< <u>B</u> ack	Next > Cancel

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

谩 Setup - Raport2	
Select Start Menu Folder Where should Setup place the program's shortcuts?	EPLISENS.
Setup will create the program's shortcuts in the following Start Menu folder	
To continue, click Next. If you would like to select a different folder, click Browse. Aplisens\Raport2 Browse	<u></u>
< <u>B</u> ack <u>N</u> ext >	Cancel

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.

1 ² Setup - Raport2				
Select Additional Tasks Which additional tasks should be performed?				
Select the additional tasks you would like Setup to perform while installing Raport2, then click Next.				
Additional icons:				
Create a desktop icon				
✓ Create a Quick Launch icon				
🔽 Install polish language pack				
🔽 Install russian language pack				
Perform optimization (May take a very long time)				
< <u>B</u> ack <u>N</u> ext > Cancel				

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

🕼 Setup - Raport2 📃 🗖 🔀			
Ready to Install Setup is now ready to begin installing Raport2 on your computer.	(PLISENS)		
Click Install to continue with the installation, or click Back if you want to review or change any settings.			
Destination location: C:\Program Files\Aplisens\Raport2	<u> </u>		
Start Menu folder: Aplisens\Raport2			
Additional tasks: Additional icons: Create a desktop icon Create a Quick Launch icon Install polish language pack Install russian language pack			
< >>			
< <u>B</u> ack Install (Cancel		

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.

My Application needs	oft .NET 3.5 Framework s to install the Microsoft .NET 3.5 Framework. Please wait ading extra files to your computer.
File:	dotNetFx35setup.exe (1 of 1)
Speed:	1 KB/s
Status:	Receiving
Elapsed Time:	0:00:01
Remaining Time:	0:46:41
Current File:	1 KB of 2 802 KB (0%)
Overall Progress:	1 KB of 2 802 KB (0%)
. L	

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.



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:

Program setti	ngs	
Protocol	Hart	
Modem	Hart Modem Plugin	
Configuration	COM1 (HFC)	*
	ОК	Cancel

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:

	Raport 2.0				
Menu	le Converter Setting	- mo 1 2 2 X			
Operations/tabs	Sdentification Oreconstant Process variables Process variables Common parameters Press Commands Press Fluch Reader Press Builder Press Builder Press Builder	Device identification Manufacture Device Type Device Type Software revision Verversal command revision Verversal verversion Verversal verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion Verversion	Actions APD/PD/2000uLE 3709420 5 5 5 5 5 3 250 6 5 0 370940 Ea		
		Nodred APCR3-2000ALE	Apkens, 3709	Status bar	COMI (HPC)

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:

Q	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.
X	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:

1	Identification	Para	meters identifying a transmitter.
	Description	Para	meters related to a transmitter description.
	Process variables		ding and visualization in the form of process bles chart (e.g. current, pressure, temperature).
$\overline{\checkmark}$	Basic parameters		c transmitter parameters adjusted range, unit).
2	Basic functions		of functions that allow transmitter parameters guration.
Device-d	ependent - availability	deper	ident on a connected device:
•	Transmitter parameter	rs	Additional parameters. Restores factory settings.
2	Li-24/Hart / APT-2000ALW		Temperature transmitter settings.
28.1	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.
733	Transmitter status		Displays detailed transmitter status.
	Material data		Information on applied accessories, connections, etc.
う	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.

Polling Address	Modified APC(R)-2000ALW,Aplisens,1,0 CC		COM1 (HFC)
1.	2. 3.	4.	5.

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.

СС

- 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+l,
- 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.

ress: 1				
ound:				
уре	Manufacturer	ID	Address	
C(R)-2000ALE	Aplisens	3709420	0	
	6%		<u>ok</u>	

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 appropriate 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 $\overset{-}{\swarrow}$ 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.

Program settin	ıgs	
Protocol	Hart	
Modem	Hart Modem Plugin	
Configuration	COM1 (HFC)	•
	0	K Cancel

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.

low control	
Software flow control	This is the most universal method. Select if you have problems with communications.
Hardware flow control	This is the best choice, but some serial ports like USB to serial converters, etc. may not work properly.
Use Carrier Detection	Some modems use CD to inform the carrier status. But some not. Disable this option if you have any problems.

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.

Device identification	
Manufacturer	Aplisens
Device Type	APC(R)-2000ALW
Device ID	000001
Software revision	1
Hardware revision	1.0
Universal command revision	5
Transmitter-specific command rev.	1
Device function flags	1
Private label distributor code	250
Polling address	Ĩ
Preambles	5
Final assembly nnumber	12912123
Sensor serial number	12912123
	Read parameters Write parameters

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.

Device info	ormation
Tag	01234567
Descriptor	0123456789012345
Message	01234567890123456789012345678901
Date	2011-10-06
(Read parameters Write parameters

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.

Process connection type	255
Process connection material	255
O ring material	255
Sensor filling fluid	255
Nominal measuring range	255
Static pressure	255
Diaphragm seal size	255
Flange type	255
Diaphragm material	255
Contact face material	255
Filling fluid	255
Nominal pressure	255
Length capillary H	255
Length capillary L	255
Configuration of seal	255
Separator code	
Manifold code	
	Read 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.

5.4 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.

			Analog	g output conf	ig		
Long tag		Curre	ent				
			, Curren	t mode	Normal	\checkmark	
Start point rad Product code	1	·	 Alarm c 	turrent	High	\checkmark	
			Alarn				
Reset				RT error			
🖲 Undo zero	o trim		AD AD	C error			
🔘 Undo sen	sor trim		EEF	PROM error			
				a .			
🔿 Undo ana	log output trim	Execute	Osc Osc	ilator error			
🔘 Undo ana	log output trim	Execute		alator error			
O Undo ana	log output trim	Execute					
	log output trim	Execute			kPa		

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

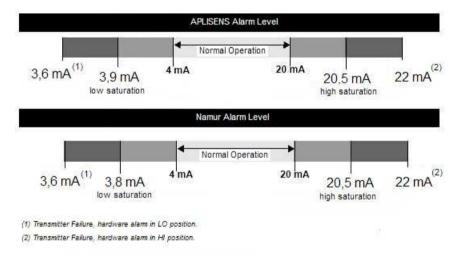
- concerns the operation *transmitter input signal calibration*.

Undo analog output calibration

- concerns the operation analog output calibration.

Analog output configuration:

- Operation mode alarm limits depend on a selected mode:
 - o Normal standard alarm limits.
 - o Namur Namur-compliant alarm limits.
- Alarm current define current to be set in case of an transmitter failure (depends on Alarm at):
 - o High 22,0 mA current will be set.
 - o 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.



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 $\ensuremath{\textbf{Write}}$

The command $\ensuremath{\text{Read}}$ 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.

Set range with assigned values			
Set range			
Fixed current mode			
Fixed current mode			
Reset converter			
Reset			
Configuration change flag			
Reset flag			
Trim DAC			
Trim DAC wizard			
Set PY zero			
Set PV zero			
Damping value			
Set damping value			

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.

Common-Practice commands		
Unit	kPa 🗸	
Transfer function	Linear function	
Lower sensor limit	-0,50	kPa
Upper sensor limit	25,50	kPa
Minimum span	2,40	kPa
Lower range value	0,00	kPa
Upper range value	20,00	kPa
Damping value	0	s
	Read parameters	Write 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).

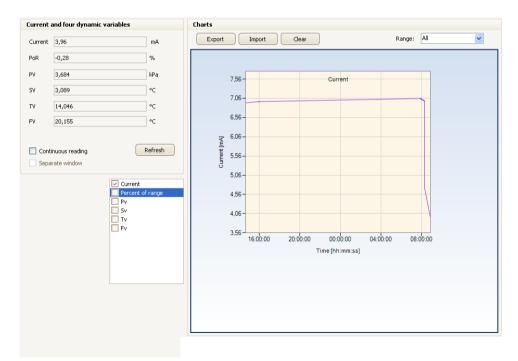
Content of fields, in which value can be entered, can be inserted to the transmitter with a command **Write**

The command $\ensuremath{\text{Read}}$ 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.

Current	7,004	mA
PV:	3,756	kPa
Always on top		

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.

Analog Output Device Specific Status A	nalog Input Block Physical Block Sensor Block	Transo
Channel fixed	Channel saturated	
Output 1	Output 1	
Output 2	Output 2	
Output 3	Output 3	
Output 4	Output 4	
Output 5	Output 5	
Output 6	Output 6	
Output 7	Output 7	
Output 8	Output 8	
Output 9	Output 9	
Output 10	Output 10	
Output 11	Output 11	
Output 12	Output 12	
Output 13	Output 13	
Output 14	Output 14	
Output 15	Output 15	
Output 16	Output 16	
Output 17	Output 17	
Output 18	Output 18	
Output 19	Output 19	
Output 20	Output 20	
Output 21	Output 21	
Output 22	Output 22	
Output 23	Output 23	
Output 24	Output 24	

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.

Write protection				
Write protect	Unblocked	~	Set	
			Change password	

Lock status

Unblocked

- access to transmitter settings changes is unprotected.

Blocked

- access to transmitter settings changes is protected.

Blocked(spec)

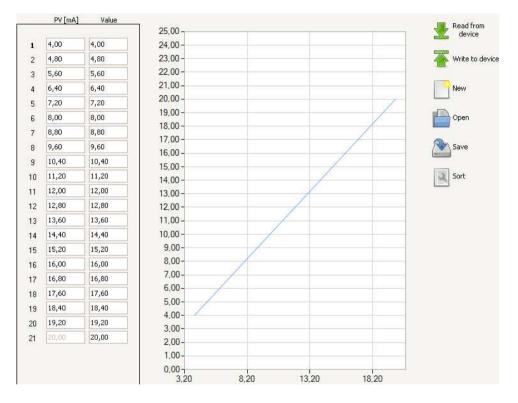
- access to transmitter settings changes is **protected**. This option is available for MID transmitters only.

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.

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.



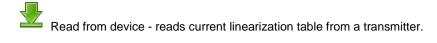
In the above picture, you can see a user interface window. It contains the following subareas (from the left):

- 1. Values table
- 2. Graphic representation of values

The Y-axis - Value

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

Buttons:



- 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 have to choose 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.

T dan biling bing	Common-Practice commands		
Identification	Unit	Pa 🗸	
Description	Transfer function	Linear function	
Process variables	Lower sensor limit	-3000,00	Pa
Common parameters	Upper sensor limit	702999,94	Pa
	Minimum span	6800,00	Pa

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

6. Reading coefficients from a transmitter to linearization table

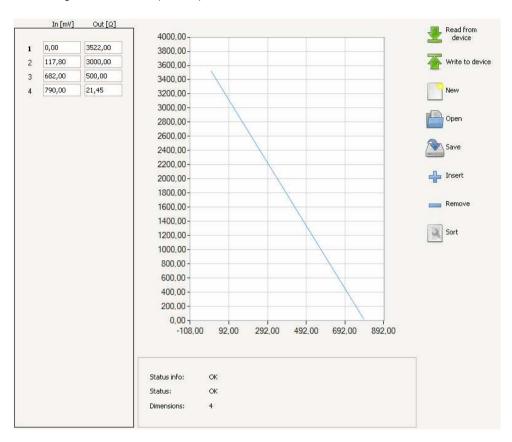
A table with linearization data can be read from a transmitter by clicking the button

. 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).

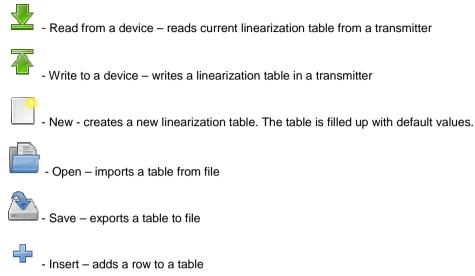


The above picture presents a user interface window. It contains the following subareas (from the left):

- 1. Values table
- 2. Graphic representation of values

```
The Y - axis - input (mV)
The X - axis - output (mV)
```

Buttons:



- Delete - removes a row from a table

1		3
	1	

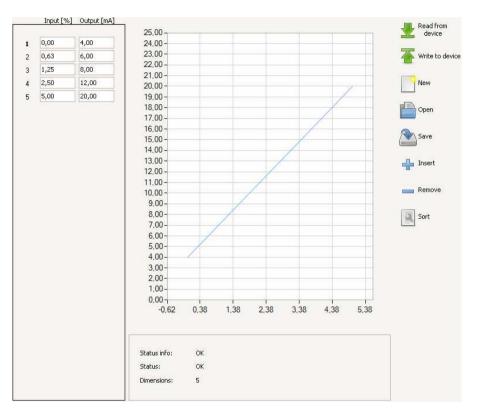
Sort - sorts table values ascending. The program requires that each point has a value (pv(mA) and a value) larger than the previous one.

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

Identification	Input configuration Output configuration D
	Input type
Description	Resistance
Process variables	Voltage
	User table 🛛 🗸 🔤
Common parameters	
	Input range
Basic commands	O -10 - 100 mV
Li-24/Hart	● -100 - 1000 mV

5.12 Output linearization

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



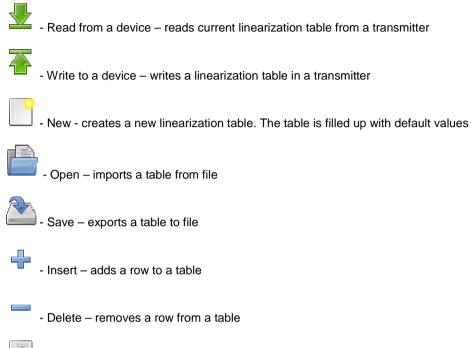
The above picture presents a user interface window. It contains the following subareas (from the left):

- 1. Values table
- 2. Graphic representation of values

The Y-axis - input (%)

The X-axis - output (mA)

Buttons:



- 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.

	Common-Practice commands		
	Unit	Pa	
Description	Transfer function	Linear function	
Process variables	Lower sensor limit	-3000,00	Pa
Common parameters	Upper sensor limit	702999,94	Pa
	Minimum span	6800,00	Pa

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;
- Connection type;
- 4. Additional parameters;

nput type	Connection chart		
Resistance Voltage		4 5 ● ●	
ser table			
nput range			
0 - 400 Ohm 0 - 2000 Ohm			
ensor connection	Additional parameter	5	
2 x Wire 3 x Wire 4 x Wire	Bias, Chan. 1 Bias, Chan. 2 Wire Res comp. Ch1	0,00 kΩ 0,00 kΩ 0,00 Ω	
2×2 Wire 2×3 Wire	Wire Res comp. Ch2 External CJC	0,00 Ω 1,60 ℃	

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;

Input configuration C	output configuration	Device Info		
Measure type				
channel1	(~		
Current configurat	ion			
Namur Mode				
Alarms				
Ram test error				
Code CRC error				
Flash CRC error				
Hart modem error				
Sensor failure				
Sensor not connec	ted:			
PV not valid				
PV out of limits				
SV out of limits				
ADC interface erro	or			
🗹 Oscilator fault				
Alarm current				
Custom	23,00			
 Low 				
O High				
O Last value				
			Read parameters	Write parameters

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.

Set range with assigned values	×
Upper and Lower range calibration	
The magnitude of the process applied to the Primary Variable becomes the Primary Variable Lower Range Value. A change in the PV Upper Range Value proportionately so that the Span remains constant.	
Cancel Previous Next	

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.

Set range with assigned va	alues		
Lower range calibration			
Set measured paran	neter value so it rep	presents lower range v	value of the converter.
	PV	0,00	kPa
	Percent range	0,00	%
	Current	4,000	mA
	Sel	t zero	
Cancel			Previous Next

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.

3. Setting upper range value (span).

Set range with assigned v	alues				×
Upper range calibration					
Set measured paran	neter value so it rep	presents upper ra	ange \	value of the transmitter.	
	PV	20,00		kPa	
	Percent range	100,0		%	
	Current	20,0		mA	
	56	t span			
Cancel				Previous Next	

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.

4. Final step.

Set range with assigned values					X
Calibration is done.					
	Operation completed				
Cancel		(Previous	End	

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.

Identification	Common-Practice commands					
	Unit	kPa 🔹				
Description	Transfer function	Square root function 🔫	Start point rad 0,8	%		
Process variables	Lower sensor limit	-51,000	kPa			
	Upper sensor limit	102,000	kPa			
Common parameters	Minimum span	9,000	kPa			
Basic commands	Lower range value	0,000	kPa			
	Upper range value	100,000	kPa			
	Damping value	0,3	S			
		R	lead parameters	Write parameter		

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.

Fixed current mode wizard	×
Warning	
Loop should be removed from automatic control!	
Cancel	Next

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.

Analog outpu	it calibration wizard			×
Set current				
	current value at the point o o the next step.	f calibration. The value sł	hould be equal or close to 4	mA.
	Calibration point	4 m	A	
Cancel			Previous	Next

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.

Analog output calibration wizard	×
Measure current	
The sensor is now serving 4 mA current. Please measure actual current value and set it below.	
Masured current value 4,004 mA Send	
Cancel Previous Next	

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.

4. Current calibration – upper calibration point.

Analog output	calibration wizard				×
Set current					
	urrent value at the point of the next step.	i calibration. The valu	e should be	equal or close to 20 mA.	
	Calibration point	20	mA		
Cancel				Previous Next	

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

Analog output calibration wizard	×
Measure current	
The sensor is now serving 20 mA current. Please measure actual current value and set it below.	
Masured current value 19,998 mA Send	
Cancel Previous Next	

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.

3. Final step

Analog output calibration wiz	ard		×
Done.			
	Loop can be add to automatic cont	rol!	
Cancel		Previous End	

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.

Calibration of APC2000 converter			
Enter the password protection			
WARNING: Enter a securit This wi	y password to access t I affect sensor calibratio		
Retype code	PHXEL		
Cancel		Previous	Next

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.

Calibration of APC2000) converter			×
Set sensor lower trim	point			
Current Pv value	0.005	kРа		
New Pv value	0	kPa	\checkmark	
	Set			
Cancel			Previous	Next

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..

3. Upper point calibration.

Calibration of APC200	0 converter	
Set sensor upper trim	point	
Current Pv value	7,5012	kPa
New Pv value	7,500	kPa 🗸
	Set	
Cancel		Previous

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.

4. Final step.

Calibration of A	PC2000 converter				×
Lower and uppe	er sensor point trir	n have been co	nfigured		
		0.000			
	Lower point value	0,000	kPa		
	Upper point value	7,500	kPa		
Cancel				Previous End	

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:

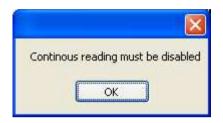
- For pressure transmitters: Cancel sensor calibration.
- For temperature transmitters: Sensor trim in a tab Factory settings.

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.

Analog output calibration wizard	
Warning	
Loop should be removed from automatic control!	
Cancel	IS Next

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

2. Current calibration – lower calibration point.

nalog output calibration wizard 🛛 🔁
Set current
Enter the current value at the point of calibration. The value should be equal or close to 4 mA. Then go to the next step.
Calibration point 4 mA
Cancel Previous Next

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.

Analog output calibration wizard	×
Measure current	
The sensor is now serving 4 mA current. Please measure actual current value and set it below.	
Masured current value 4,004 mA Send	
Cancel Previous Next	

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.

4. Current calibration – upper calibration point.

Analog outpu	ut calibration wizard	X
Set current		
	e current value at the point of calibration. The value should be equal or close to 20 mA. to the next step.	
	Calibration point 20 mA	
Cancel	Previous	d I

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.

nalog output calibration wizard
Measure current
The sensor is now serving 20 mA current. Please measure actual current value and set it below.
Masured current value 19,998 mA Send
Cancel Previous Next

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.

6. Final step

Analog output calibration wiza	rd (×
Done.		
	Loop can be add to automatic control!	
Cancel	Previous	

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

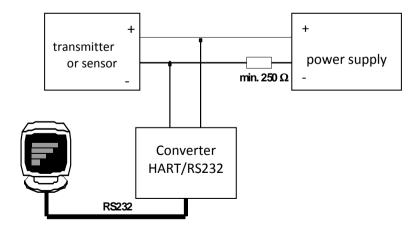


Fig. 2. Connection diagram HAR1/RS232 Converter to the supply-measuring transmitter or sensor to the computer.

