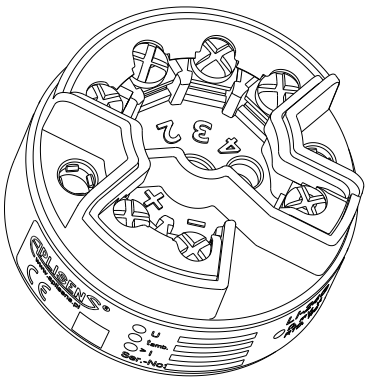
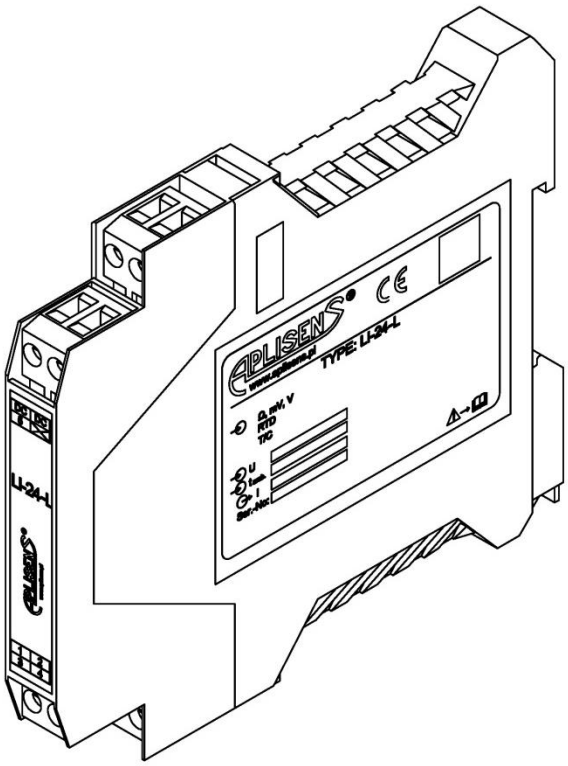
USER'S MANUAL

SMART TEMPERATURE TRANSMITTERS

LI-24L

LI-24G





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Symbols used

Symbol	Description
	Warning to proceed strictly in accordance with the information contained in the documentation in order to ensure the safety and full functionality of the device.
	Information particularly useful during installation and operation of the device
	Information particularly useful during installation and operation of Ex versions.
	Information on disposal of used equipment.

BASIC REQUIREMENTS AND SAFE USE

- The manufacturer will not be liable for damage resulting from incorrect installation, failure to maintain the device in a suitably functional condition, or use of the device other than for its intended purpose.
- Installation should be carried out by qualified personnel having the necessary authorisation to install electrical and pressure measuring devices. The installer is responsible for performing the installation in accordance with these instructions and with the electromagnetic compatibility and safety regulations and standards applicable to the type of installation.
- In the installation with control and measurement instruments exists, in case of leakage, a risk to personnel on the side where the medium is under pressure. All safety and protection requirements must be observed during installation, operation and inspections.
- If a device is not functioning correctly, disconnect it and send it for repair to the manufacturer or to a firm authorised by the manufacturer.

In order to minimise the risk of malfunction and associated risks to personnel, the device is not to be installed or used in particularly hostile conditions, where the following risks occur:

- Possibility of mechanical impacts, excessive shocks and vibration;
- Excessive temperature fluctuation;
- Condensation of water vapour, dust, icing.

When using the device in potentially explosive areas, observe technical requirements specified in this manual and applicable local (national) regulations.

Changes in the manufacture of transmitters can overtake the update's paper documentation. Current manuals can be found on the manufacturer's website at www.aplisens.pl

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1. INTRODUCTION

The subject of this manual are:

- Head-mounted smart temperature transmitter type **LI-24G** in Ex and normal version;
- Rail-mounted smart temperature transmitter type **LI-24L**.

This manual contains data, information and recommendations concerning installation and use of the transmitter, as well as troubleshooting procedures.
Information about the of intrinsically safe transmitters are marked in the text 

2. SAFETY PROCEDURES

- The installation and commissioning of the transmitter and any activities related to the operation should be performed only after careful examination of the contents of this manual.
- Installation and maintenance should be carried out by qualified personnel having necessary authorisation to install electrical equipment and measuring instruments.

- The transmitter should be used according to its intended purpose (section 6.1) with permissible parameters.
- Before assembly or disassembly of the transmitter, one must absolutely disconnect the power source.
- Under no circumstances may the electrical system of the transmitter be repaired or otherwise handled by the user. Damage assessments and repairs may only be carried out by the manufacturer or its authorised dealer.
- Do not use damaged device. If a device is not functioning correctly, disconnect it.

- When using the device in potentially explosive areas, observe technical requirements specified in this manual and applicable local (national) regulations.

3. USER INFORMATION

The user receives together with the transmitter:

a) Product Certificate, which is also a warranty card;
b) Declaration of conformity (on request);
c) Copy of the certificate (on request for transmitter in Ex version);
d) User Manual ref. No. IO.LI-24*(ENG).*

Items b), c) and d) are available on the website www.aplisens.pl

Together with transmitter **LI-24G** the user receives mounting screws together with springs.

4. TRANSPORT AND STORAGE

4.1. Transport

Transmitters should be transported in multi- or/and single-unit packaging. The packaging should be protected against displacement and direct weathering effect.

4.2. Storage

The transmitter should be stored in the original packaging, indoor rooms, free of vapours and corrosive substances, the temperature and relative humidity should not exceed the permitted conditions (see p.11.4).

5. WARRANTY

Manufacturer warrants to the conditions specified in the Product Certificate which is also a guarantee card.

Warranty is in full force under the condition of using the devices properly along with the purpose determined in the manual.

6. CONSTRUCTION

6.1. Intended use and functions

Temperature transmitters' type **LI-24L** and **LI-24G** are designed for temperature measuring in various industrial applications related to measurements, control and regulation.
LI-24G transmitters in Ex version can be used in hazardous areas explosive gas and dust.

Temperature transmitter converts the measurement signal from RTD temperature sensors or thermocouples to signal 4 ... 20 [mA] with HART communication.

Transmitters **LI-24L** and **LI-24G** are characterized by:

a) Two wires power supply (in 4…20 [mA] current loop);
b) Digital signal processing (filtration, linearization, compensation);
c) Possibility of remote configuration to the transmitter using the HART protocol;
d) Auto diagnostic system of correctness of sensor connection and functions of transmitter components;
e) Ability to operate with resistive and thermoelectric (table: 1 and 2);
f) Ambient temperature effects compensation;
g) Input/output galvanic isolation.

6.2. Construction and dimensions

Temperature transmitter type **LI-24L** and **LI-24G** consist of a sealed housing of plastic material and the electronic unit placed inside that converts signal from the sensor to a unified output signal.
Both types of transmitters have 5 terminals for measuring input and 2 terminals for power supply and signal output. Measuring inputs allow for single- or dual-channel measurement of difference, average, average with redundancy, minimum and maximum temperatures as specified in point 11.3.3. The transmitter has the possibility of compensating cold junctions of thermocouples using the internal or external sensor (Pt100).
Temperature transmitter **LI-24L** is designed for direct mounting on DIN 35 rail.
Temperature transmitter **LI-24G** can be installed in connection head type: B, DA, NA, DAN, DANW manufactured by Aplisens or from other manufacturers.

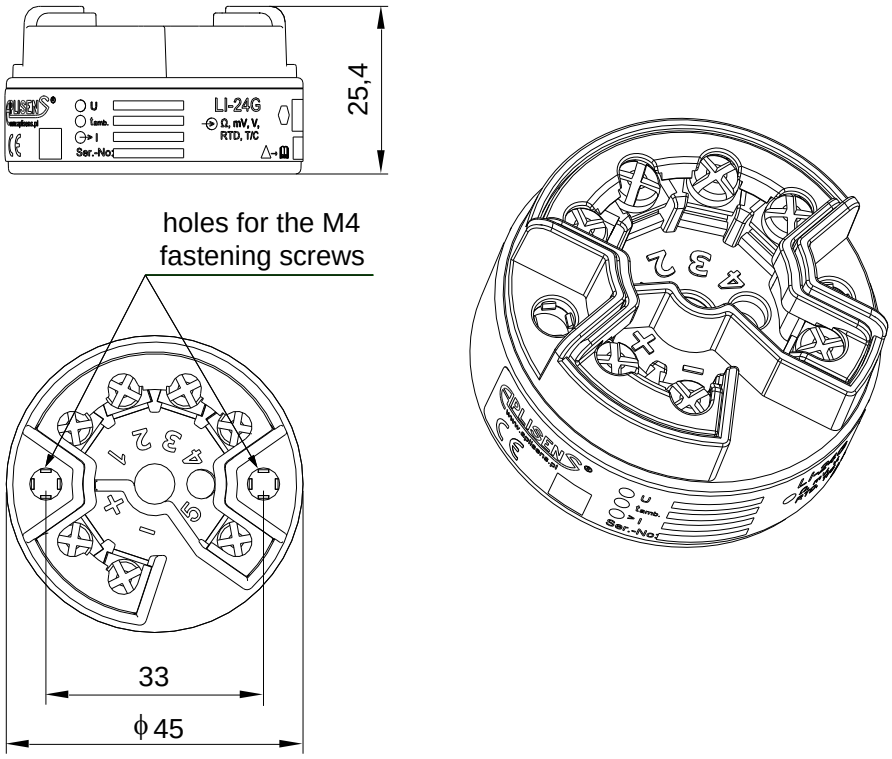


Figure 1. The LI-24G temperature transmitter. Dimensions

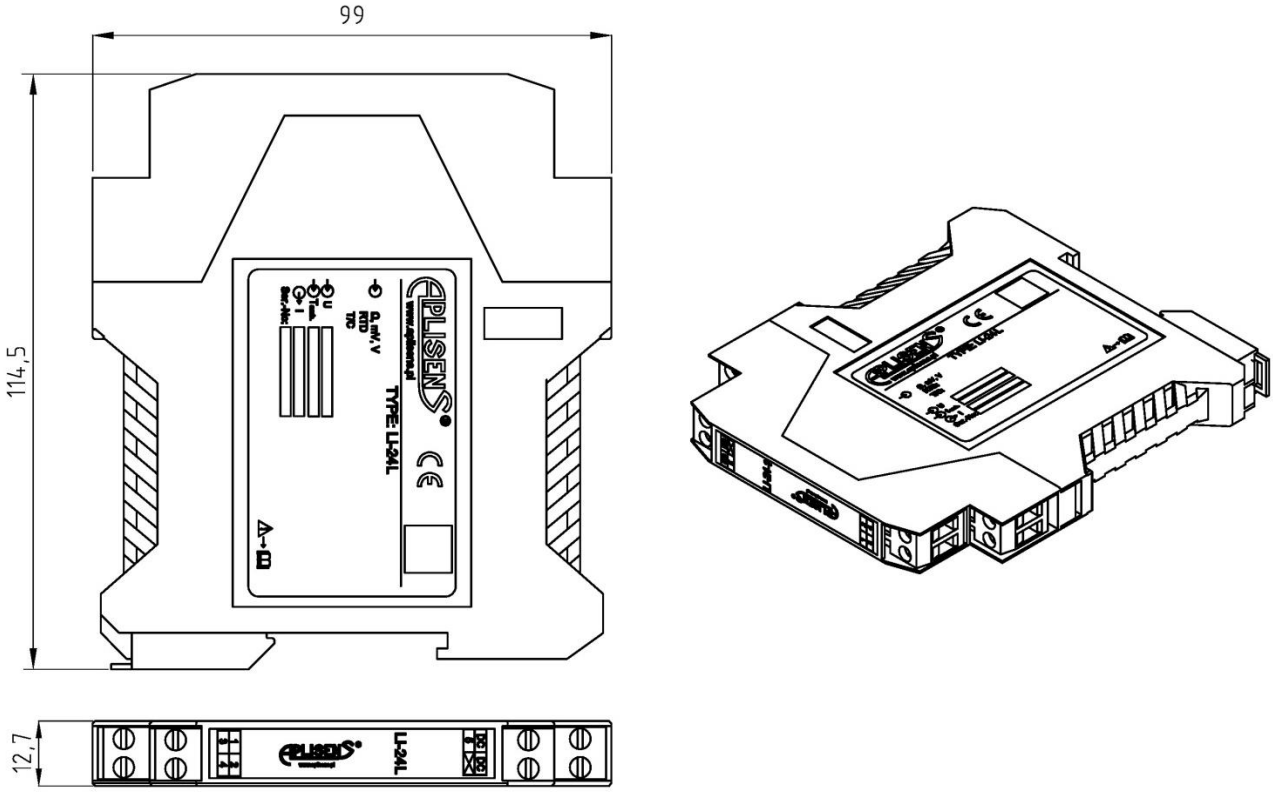


Figure 2. The LI-24L temperature transmitter. Dimensions

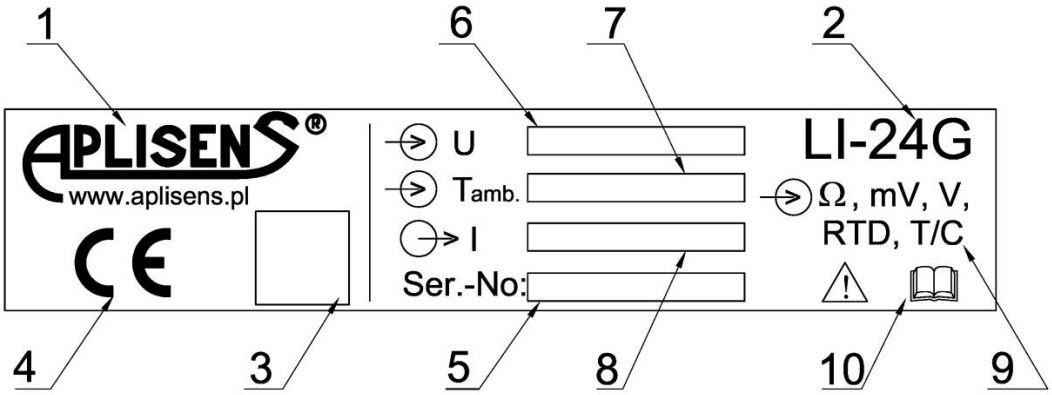
6.3. Identification

Every transmitter is provided with rating plate containing the following information:

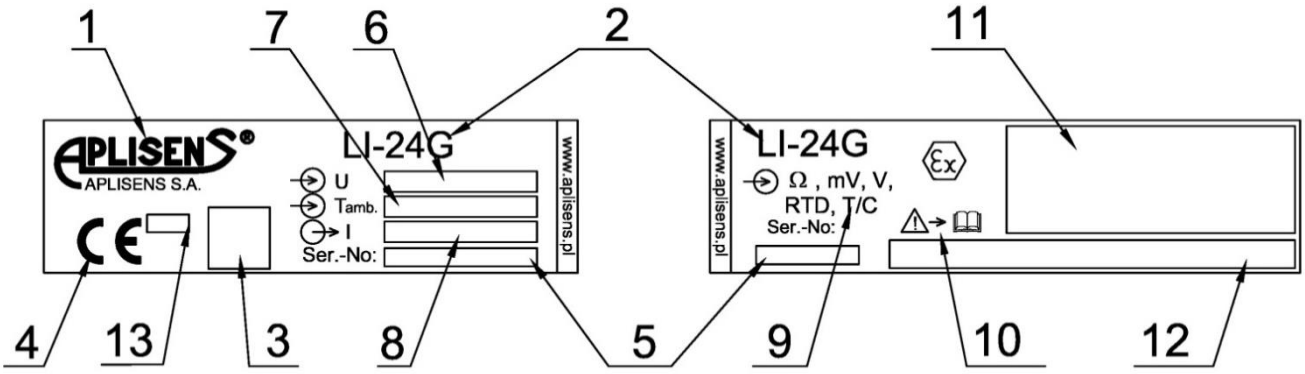
1. Logo or name of the manufacturer;
2. Transmitter type designation;
3. Product code;
4. CE marking;
5. Serial number of the transmitter;
6. Supply voltage;
7. Ambient temperature range;
8. Output signal;
9. Sensor connection type;
10. Symbol “Notice”: See relevant information contained in the manual.

Additionally Ex transmitter is equipped with the following information:

11. “Ex” mark, type of explosion protection design and certificate number; as in p. 7;
12. Values of such parameters as Ui, Ii, Pi, Li, Ci;
13. CE marking and notified body number.



Example of the rating plate of LI-24G transmitter in normal version



Example of the rating plate of LI-24G transmitter in Ex version

Figure 3. Examples of the rating plates of LI-24G transmitter

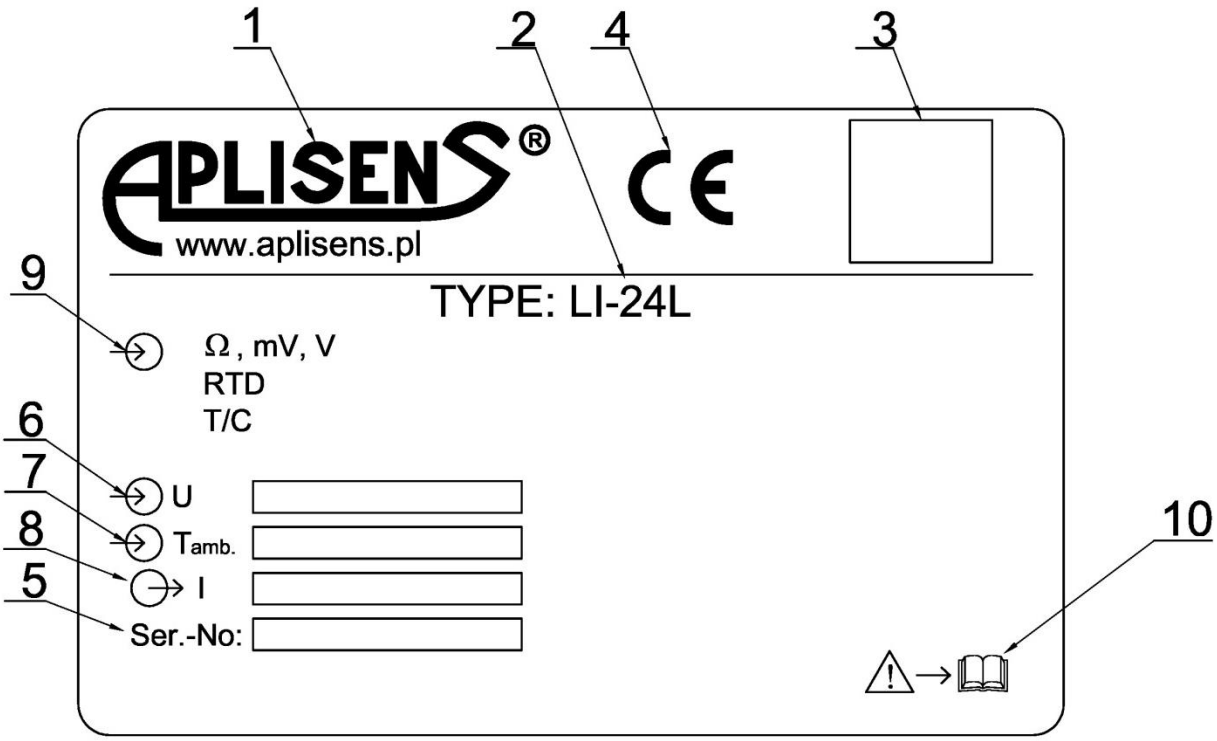


Figure 4. Example of the rating plate of LI-24L transmitter in normal version

7. CERTIFICATES FOR USE IN HAZARDOUS AREAS

7.1. Directive ATEX – intrinsic safety versions

The **LI-24G** transmitters may be used in potentially explosive atmospheres in accordance with the following explosion-proof designations:

I M1 Ex ia I Ma
II 1G Ex ia IIC T5/T6 Ga
II 1D Ex ia IIIC T105ºC Da
KDB 15 ATEX 0080X

The transmitters are designed and manufactured in accordance with requirements of the following standards: EN 60079-0:2012/A11:2013, EN 60079-11:2012, EN 50303:2000, EN 60079-26:2015.

Data on installation in hazardous areas described in p. 8.4.
Connections in hazardous areas are shown in w p. 9.3.
Permitted input parameters on the basis of a certificate KDB 15 ATEX 0080X is given in p. 11.6 Table 3.

8. INSTALLATION

8.1. General recommendation

It is recommended to install transmitters in closed enclosures to protect them against influence of the environment.

8.2. Mounting the LI-24L transmitter on DIN rail

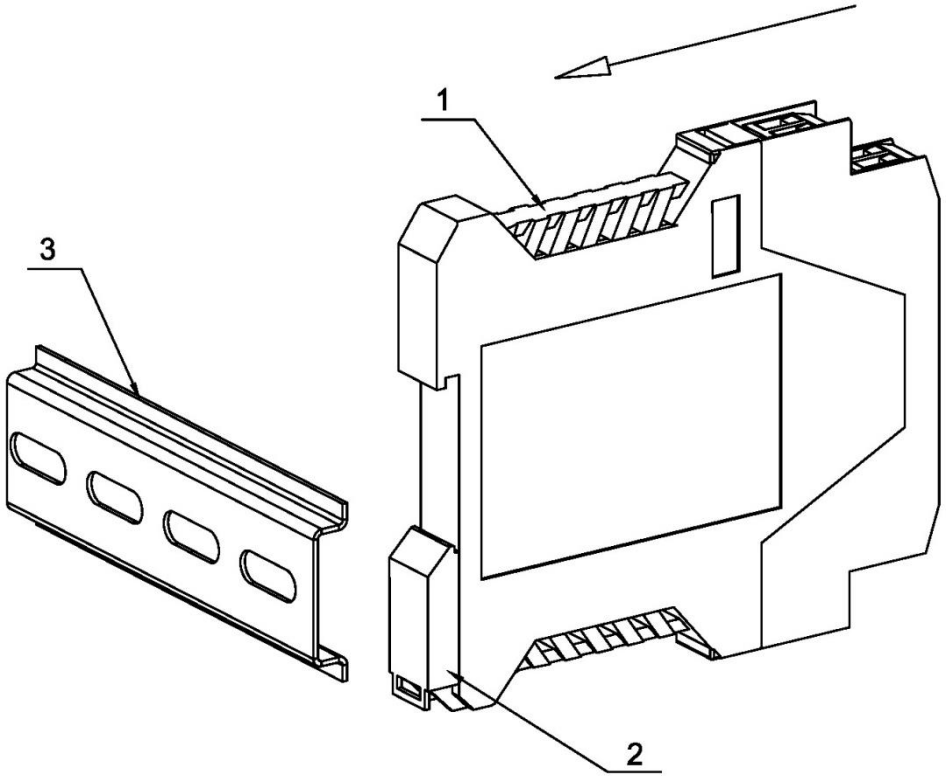


Figure 5. Mounting the LI-24L transmitter on DIN 35 rail

No element	Description
1	Rail-mounted temperature transmitter LI-24L
2	Moving catch
3	DIN 35 rail

Pass the stationary catch of the LI-24L (1) transmitter through the DIN rail (3).
Then press the transmitter (1) to the rail (3). Make sure that the moving catch (2) is tightened on the rail (3).
Dismantle the transmitter by pulling the moving catch (2) using a flat tipped screwdriver (put the screwdriver through the eye of the catch (2)) and slide the transmitter (1) of the rail (3).

8.3. Mounting the LI-24G transmitter in the connection head

No element	Description
1	Cover
2	Gasket
3	Screws with the springs
4	Head-mounted transmitter LI-24G
5	Insulating pad
6	Mounting insert
7	Connection head
8	Cover of the mounting insert

- Put the wires connecting the measuring insert (6) through the central opening of the insulating pad (5) and then through the central opening of the head transmitter (4).
- Screw the fastening screws with springs (3) into the transmitter mounting holes (4) and put them through openings in the insulating pad (5) and measuring insert (6).
- Mount the head transmitter (4) with insulating pad (5) and the measuring insert (6) to the connection head base (7) with fastening screws with the springs placed (3).
- Connect the connecting wires of the measuring insert (6) to the measuring terminals of the head transmitter (4) in accordance with point 9.
- Unscrew the cable gland; drag the supply cord through the cable gland opening into the connection head (7). Connect the power supply, in accordance with point 9, to the power terminals of the head transmitter (4). Gently pull the excess wire and tighten the cable gland.
- Screw the cover (1) with the gasket (2) to the connection head (7). Screw the cover of the measuring insert (8).

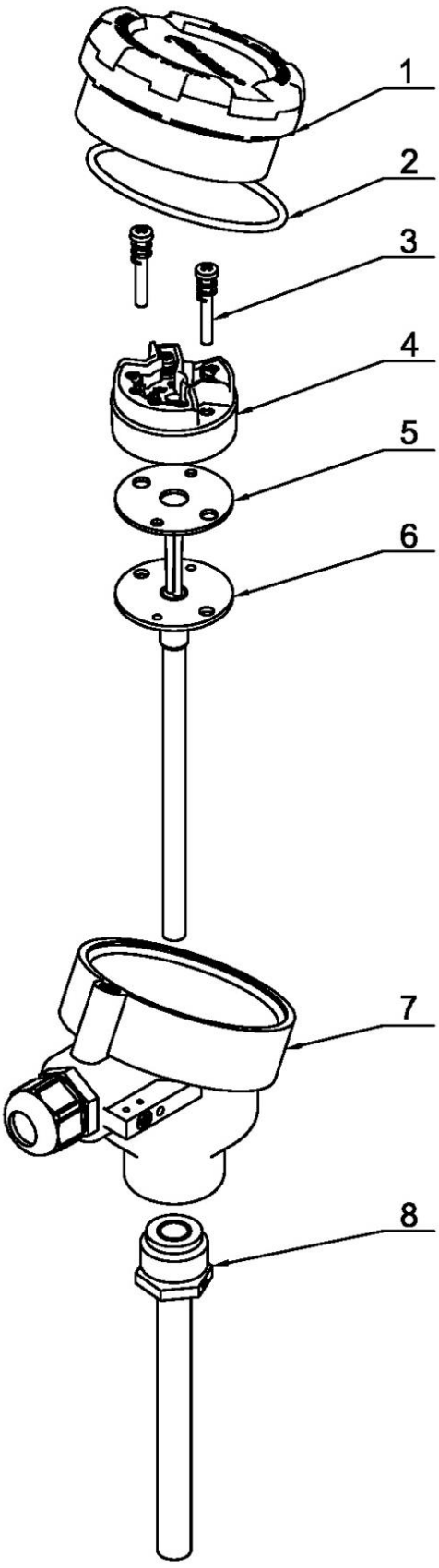


Figure 6. Mounting the LI-24G transmitter in the exemplary Aplisens connection head

The head transmitter **LI-24G** is protected against the fastening screws (figure 7) falling out form of locks in the mounting holes. The lock is adapted to cooperate with the screws' threads; therefore they have to be screwed in the transmitter housing.

Pressing the fastening screws into mounting holes, instead of screwing them can cause damage to the locks against screw falling out.

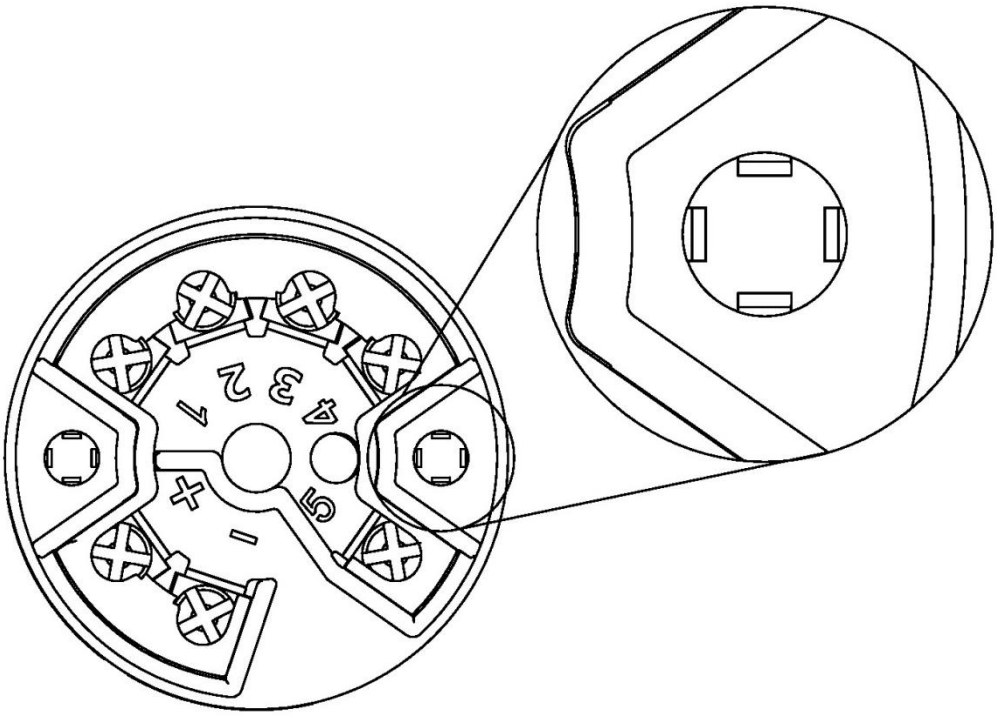


Figure 7. Protect against the fastening screws falling out

8.4. Mounting in potentially explosive areas

Due to the possibility of plastic housing becoming charged and electrostatic discharge, it is recommended to install the transmitter in a safe area and linking it with a cable to a sensor located in the potentially explosive area.

If there is a need to install the transmitter in a potentially explosive area it should be protected against the possibility of static electricity charging to the housing, e.g. by placing in metal housing (as in p.8.3).
While performing activities related to wiring or maintenance in a hazardous area one should eliminate the possibility of electrostatic discharge. Do not wipe the transmitter dry.

Temperature transmitter can be mounted directly with a separate source of heating or cooling causes (e.g. pipelines or tanks). After mounting the transmitter on the object, temperature must not exceed the temperature of temperature class and maximum surface temperature given in Table 3.

8.4.1. Mounting the LI-24G in potentially explosive areas

When mounting the **LI-24G** transmitter in a housing it must be placed approx. 3 mm between the circuit terminals and the housing.

Special conditions for safe use (according to the KDB 15 ATEX 0080X certificate).

Head temperature t transmitter LI-24G can be used:

- In **group I**, provided that the transmitter is mounted in a metal housing with a minimum degree of protection **IP54** (according to IEC 60529).
- In **group II**, provided that the transmitter is mounted in a metal housing with a minimum degree of protection **IP20**.
- In **group III**, provided that the transmitter is mounted in a metal housing with a minimum degree of protection **IP5X**.

9. ELECTRICAL CONNECTIONS

All connecting and assembly operations must be done with a disconnected power supply and disconnected input signal.

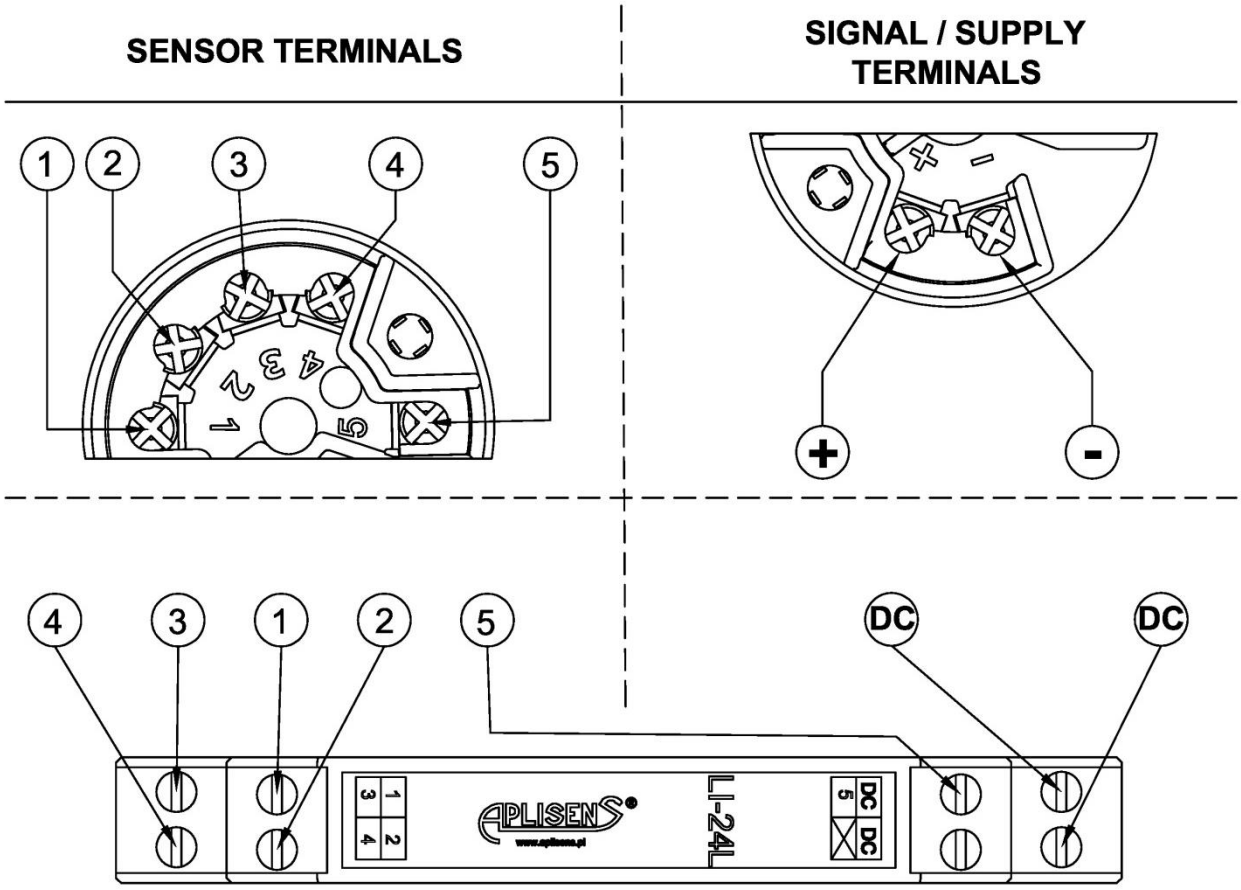


Figure 8. Designation of LI-24L and LI-24G transmitter terminals

In the **LI-24L** transmitter power supply and signal cables must be connected to the DC terminals, DC. Polarity of the connection is not important.

Cables possible to be used:

- Unshielded cable is recommended when using only the analogue signal.
- Shielded cable is recommended for HART communication.
- Shielded cable on the side of the sensor/sensors should be used for cable lengths greater than 30 m.

For connecting measuring inputs and power supply use wires specified in section 11.5.2.

9.1. Possible ways of sensors connection to the transmitter

Various configurations of sensor connection to the transmitter are shown in Figure 9.

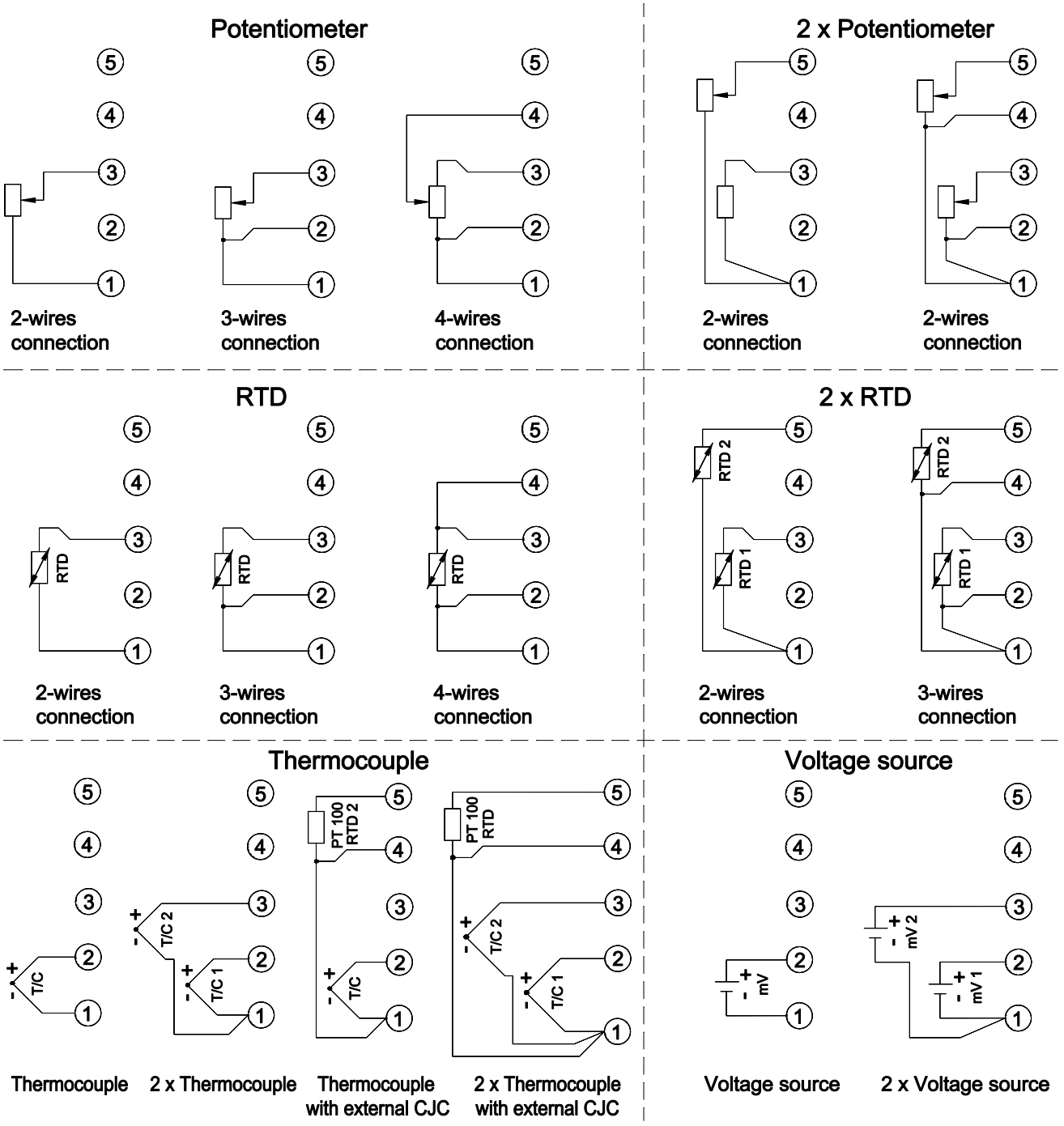


Figure 9. Possible ways of sensor connection

9.2. Electrical connection in safe areas

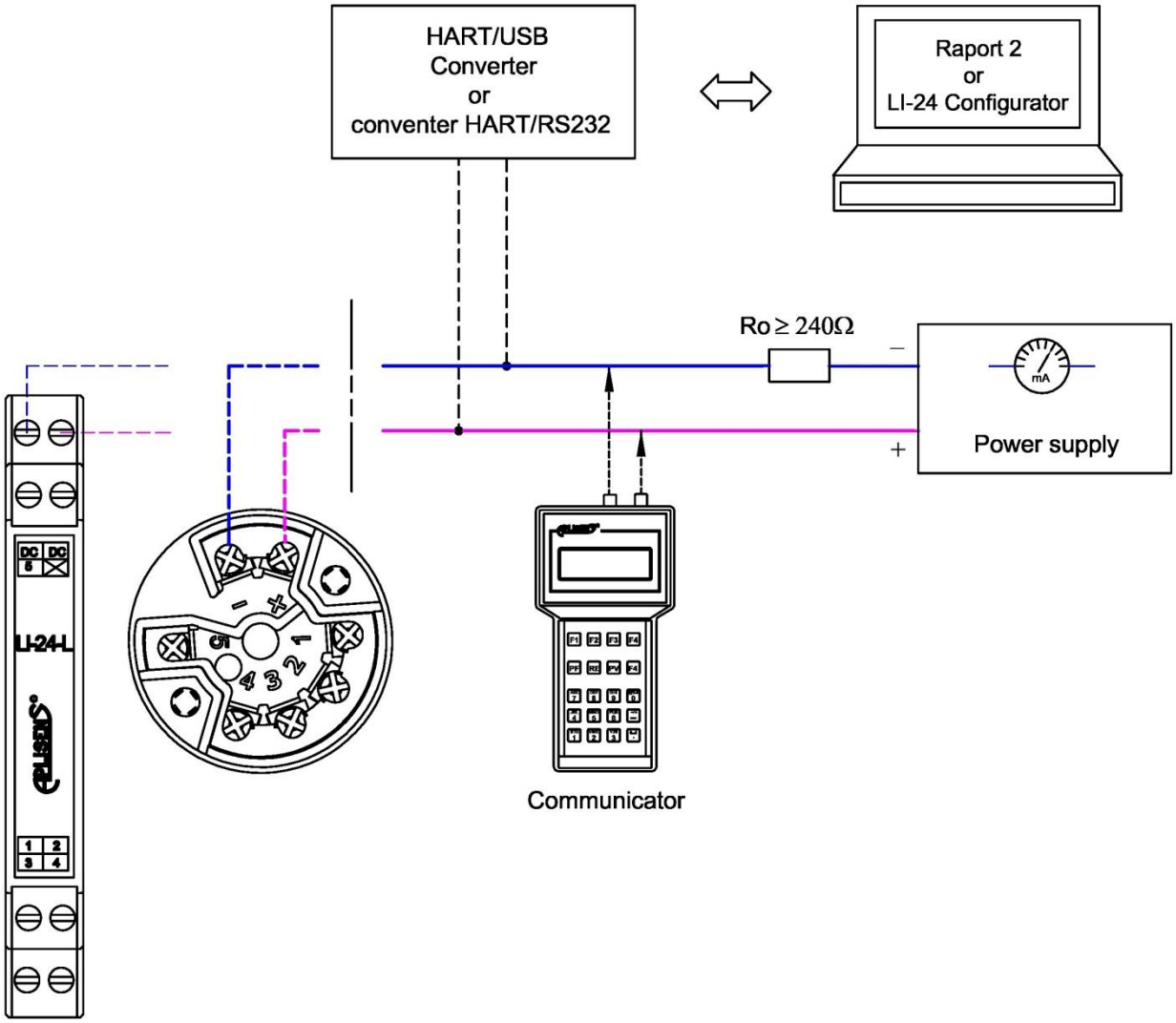


Figure 10. Electrical connection the transmitter in the safe areas

If we want to communicate with the transmitter (via the HART protocol) locally connecting a communicator or converter to the "DC" terminals "DC" for **LI-24L** or "+" "-" for **LI-24G** (as shown in figure 10) we must make sure that resistance Ro seen from terminals of the transmitter to the power source is in the range of 240 [Ω] ≤ Ro ≤ 1100 [Ω]. When Ro < 240 [Ω] communication will not take place, then increase the Ro to the minimum value of 240 [Ω].

9.3. Electrical connection in hazardous areas

In order obtain correct cooperation of the transmitter with the rest of the system and assure intrinsic safety conditions it is important to correctly connect the transmitter with particular emphasis on the requirements for the installation of intrinsically safe systems (EN 60079-25, EN 60079-14) and meeting the input/output parameters.

Transmitters can be supplied from power supply and measurement equipment with relevant intrinsic safety certificates, parameters of which for outputs to potentially explosive areas should not exceed the limits for feeding parameters of transmitters (permissible parameters of feeding the transmitters in hazardous areas see point 11.6 table 3).

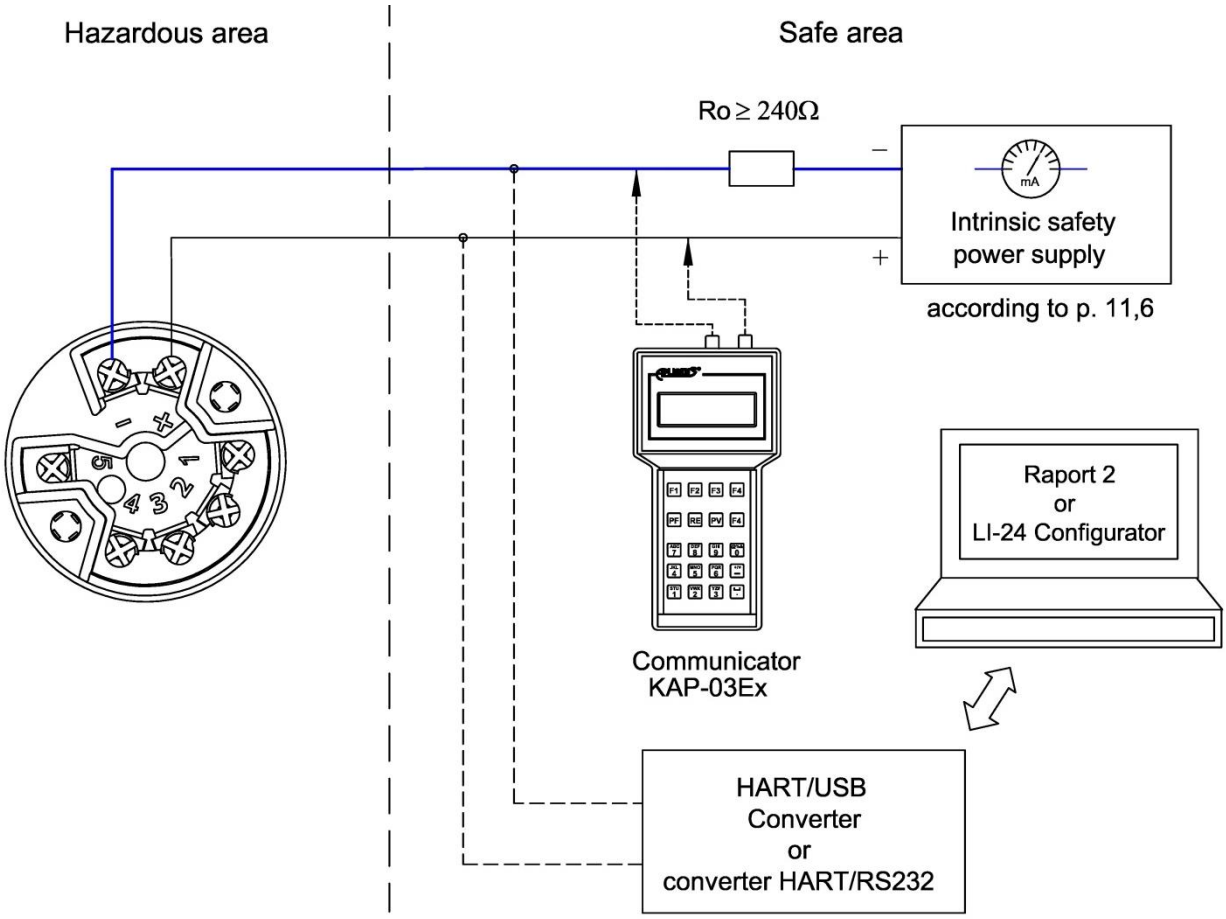


Figure 11. Electrical connection the LI-24G transmitter in the hazardous area

In order to minimize the risk of electrostatic discharge in potentially explosive areas make connections to the transmitter terminals outside of these zones.

If we want to communicate with the transmitter (via the HART protocol) locally connecting a communicator or converter (as shown in figure 11) we must make sure that resistance Ro seen from terminals of the transmitter to the power source is in the range of 240 [Ω]≤Ro≤1100 [Ω]. When Ro < 240 [Ω] communication will not take place, then increase the Ro to the minimum value of 240 [Ω].

9.4. Earthing

The transmitter must be earthed in accordance with local electrical standards.

The recommended way to connect earthing for **LI-24G** transmitter in the housing is shown in figure 12. Connect the cable screen on one side with the point earthing the installation.

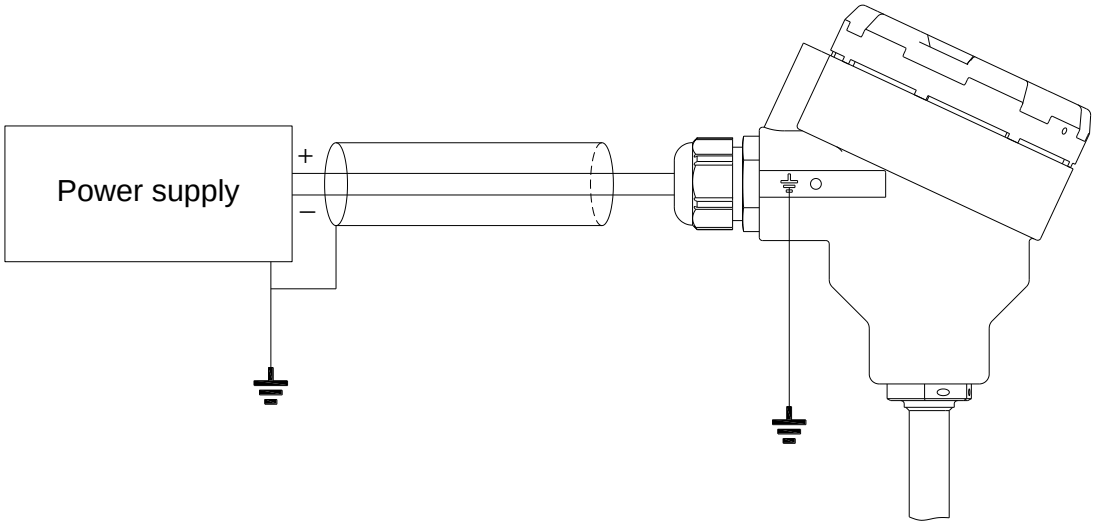


Figure 12. The recommended way to connect earthing for LI-24G transmitter in the connection head

10. CONFIGURATION

Transmitter can be configured by:

- KAP-03 communicator with software for temperature transmitters.
- Aplisens converter HART/USB Converter or HART/RS232 converter and PC with Report 2 software or LI-24 Configurator software manufactured by Aplisens (the company's website standard DDL and DTM libraries are also available).

Description KAP communicator functions is in the IO.KAP-03.02 user manual.
Information on the Hart/RS232 converter is placed in the manual for the Report 2 software: IO.RAPORT2.
Information on the Hart/USB converter is included in the DTR.HB.01 manual.
These instructions are available at www.aplisens.pl

An example of electrical connection of the LI-24L and LI-24G transmitter and communicator, or converter is shown in figure 10 and figure 11.

After configuration, protect the transmitters using the relevant HART command [247]. During work the transmitter should be protected against entries, it prevents accidental or deliberate change of configuration data. The protection function is available in the KAP-03 communicator, Report 2 and LI-24 Configurator software and in the software using the DDL or DTM libraries.

11. TECHNICAL DATA

11.1. Electrical parameters

Input signal		Thermocouple, resistance sensor, resistance or voltage	
Output signal		4…20 mA + HART rev.5.1	
Power supply voltage	LI-24L	9.5…50 V DC	
	LI-24G	8.5…36 V DC	*for standard version*
		8.5…30 V DC	*for Ex version*
Maximum load resistance		$R_0 = \frac{U_{zas}[V] - U_{zas.min}[V]}{0.023[A]}$	
Communication		Performed using the HART protocol and signal 4...20 [mA] via the KAP-03 communicator or HART/USB Converter and a PC, or other HART communicator	
Resistance to communication (HART)		240…1100 Ω	

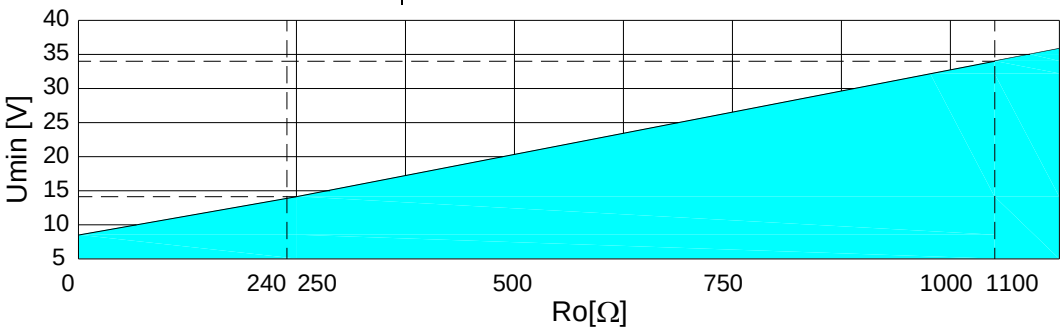


Figure 13. Correlation between supply voltage and resistance in the current loop
Area of correct operating of the transmitter (cross-hatched area) is above the shaded area.

Galvanic separation input/output	Electrical strength	2 kV in 1 min
	Resistance	500 MΩ

List of current alarms

Type of alarm	Value of the alarm current
NORMAL LOW	3.75 mA
NORMAL HIGH	21.6 mA
NAMUR LOW	3.6 mA
NAMUR HIGH	21.0 mA

Type of alarm	Value of the alarm current
CUSTOM *(alarm current level defined by the user)*	Alarm current level in the range from 3.6 mA to 23 mA
LAST VALUE *(no analogue output update)*	The alarm current level is equal to the current value preceding the alarm--generating event.

11.2. Metrological parameters

Input type, measurement range and accuracy	According to Table 1 and Table 2
User's processing characteristics	Up to 50 measuring points
Processing resolution A/C	24 bits
Input impedance, thermocouple or voltage input	>10 MΩ
Additional error due to supply voltage changes	±0.002 %/V
Additional error from the influence of temperature changes	According to Table 1 and Table 2
Output updates time (time constant)	0.5…1.5 s
Additional electronic damping	0…30 s
Sensor current	420 µA

11.3. Input data, accuracy

11.3.1. RTD sensors

Table 1. Types of sensors, measuring ranges and errors

RTD sensor connected with 2, 3 or 4 wires						
Input – RTD						
Thermal resistance sensors			2, 3 or 4 wires			
Sensor current			~420 µA			
Maximum wires resistance			25 Ω			
Sensor type	Standard	Basic range	Min. range span	Processing error Δp	Temperature processing error Δtp	Analogue output error
		°C	K	K	K/K	%
1	2	3	4	5	6	7
Pt10 (α=0,003850)	EN 60751; IEC751; DIN43760; JISC 1604-97; BS 1904	-200÷850	10	±0,80	±0,0350	Analogue output error is 0,05% FSO (Full Scale Output) over the operating temperature range
Pt50 (α=0,003850)		-200÷850	10	±0,20	±0,0070	
Pt100 (α=0,003850)		-200÷850	10	±0,07	±0,0035	
Pt200 (α=0,003850)		-200÷850	10	±0,20	±0,0020	
Pt500 (α=0,003850)		-200÷850	10	±0,05	±0,0007	
Pt1000 (α=0,003850)		-200÷266	10	±0,03	±0,0003	
Pt98 (α=0,003923)	SAMA RC-4-1966	-200÷650	10	±0,07	±0,0035	
Ni100 (W100=1,617)	PN-83/M-53952	-60÷180	10	±0,07	±0,0030	
Cu100 (W100=1,426)		-50÷180	10	±0,07	±0,0030	
Pt10 (α=0,003916)	JISC 1604-81	-200÷630	10	±0,80	±0,0350	
Pt50 (α=0,003916)		-200÷630	10	±0,20	±0,0070	
Pt100 (α=0,003916)		-200÷630	10	±0,07	±0,0035	
Pt10 (W100=1,3910)	GOST 6651-94	-200÷1100	10	±0,80	±0,0350	
Pt50 (W100=1,3910)		-200÷1100	10	±0,20	±0,0070	
Pt100 (W100=1,3910)		-200÷1100	10	±0,07	±0,0035	
Pt500 (W100=1,3910)		-200÷1100	10	±0,05	±0,0007	
Cu50 (W100=1,426)		-50÷200	10	±0,20	±0,0070	
Cu100 (W100=1,426)		-50÷200	10	±0,07	±0,0030	
Cu50 (W100=1,428)		-185÷200	10	±0,20	±0,0070	
Cu100 (W100=1,428)		-185÷200	10	±0,07	±0,0030	
Ni100 (W100=1,617)		-60÷180	10	±0,07	±0,0030	
Resistance (resistor, potentiometer)						
		Ω	Ω	mΩ	mΩ/K	%
Measuring range No.1		0…400	10	±30	≤±0,06	As above
Measuring range No.2		0…2000	10	±120	≤±0,50	
1	2	3	4	5	6	7

11.3.2. Thermocouples

Table 2. Type of sensors, measuring ranges and errors

Thermocouples						
Input – thermocouples						
Input impedance				>10 MΩ		
Maximum wires resistance				500 Ω (wires + thermocouple)		
Cold junctions compensation				Internal and external sensor Pt100, constant temperature		
Sensor type	Standard	Basic range	Min. range span	Processing error Δp	Temperature processing error Δtp	Analogue output error
		°C	K	K	K/K	%
1	2	3	4	5	6	7
B (Pt30Rh-Pt6Rh)	EN 60751; IEC584; NIST MN175; DIN43710; BS 4937; ANSI MC96.1; JIS C1602; NF C42-321	250÷1820	50	±0,55	<±0,001	Analogue output error is 0,05% FSO (Full Scale Output) over the operating temperature range
E (Ni100Cr-Cu45Ni)		-200÷1000	50	±0,15	<±0,001	
J (Fe-Cu45Ni)		-210÷1200	50	±0,20	<±0,001	
K (Ni100Cr- Ni5)		-200÷1372	50	±0,30	<±0,001	
N (Ni14CrSi-NiSi)		-200÷1300	50	±0,25	<±0,001	
R (Pt13Rh-Pt)		-50÷1768,1	50	±0,35	<±0,001	
S (Pt10Rh-Pt)		-50÷1768,1	50	±0,10	<±0,001	
T (Cu-Cu45Ni)		-200÷400	50	±0,15	<±0,001	
TC type L	GOST P 8.585-2001	-200÷800	50	±0,20	<±0,001	
Internal sensor CJC	-	-25÷75	-	±[0,35+0,007 (T-273)]	<±0,009	
		mV	mV	µV	µV/K	%
Measuring range No.1		-10…100	50	±6	<±0,001	As above
Measuring range No.2		-100…1000	50	±50	<±0,001	
1	2	3	4	5	6	7

ΔG – limiting error [K] or [%] calculated according to Tables 1 and 2.

$$\Delta G\,[K] = \Delta p\,[K] + \Delta tp\,\frac{[K]}{[K]} \cdot TO\,[K] + TN\,[K] \cdot \frac{0{,}05\,[\%]}{100\,[\%]}$$

$$\Delta G\,[\%] = \frac{\Delta P\,[K] \cdot 100\,[\%]}{TN\,[K]} + \frac{\Delta tp\,\left[{}^{K}/_{K}\right] \cdot TO\,[K] \cdot 100\,[\%]}{TN\,[K]} + 0{,}05\,[\%]$$

TN [K] – span of the measured temperature set range; algebraical difference between the upper and lower limit of the set range;
TO [K] –span of the transmitter ambient temperature range; algebraical difference between the upper and lower ambient temperature.

11.3.3. Input with two sensors

Input with two sensors	Output value / Measurement type
Difference	Ch1 – Ch2 or Ch2 – Ch1
Average	0,5 · (Ch1 + Ch2)
Average with redundancy	0,5 · (Ch1+Ch2) or Ch2 or Ch1 when one of the sensors is damaged
Minimum	min (Ch1,Ch2)
Maximum	max (Ch1, Ch2)

11.4. Permitted environmental conditions

Operating temperature range	LI-24L	-25…75 ºC	
	LI-24G	-40…85 ºC	*standard version*
		-50…70 ºC in group I: -20…60 ºC	*Ex version*
Relative humidity		max to 80 %	
The concentration of active ingredients in the atmosphere		lack of aggressive components	

11.4.1. Electromagnetic compatibility (EMC), immunity

rating according to EN 61326-1, 2 for industrial applications:

Electrostatic Discharge Immunity (ESD):
EN 61000-4-2;
S3 Level: Contact ±6kV, Air ±8kV; Criterion B

Conducted Radio Frequency:
EN 61000-4-6;
0.15…80MHz, 10V; Criterion A

Radiated Electromagnetic Field:
EN 61000-4-3;
80…2000MHz – 10V/m, …2700MHz – 1V/m; Criterion A

Electrical Fast Transient (Burst):
EN 61000-4-4;
± 2kV power supply port/earth, ± 1kV signal port/earth; Criterion B

Electrical Slow Transient (Surge):
EN 61000-4-5;
±0.5kV (±1kV) differentia mode, ±1kV (±2kV) common mode; Criterion B

11.4.2. Electromagnetic Compatibility, emission

according to CISPR16-1, CISPR 16-2, class B,
distance to antenna: 3m, quasi-peak measurements:

Radiation:
0.15 … 30MHz, 80-52dBµV/m;
30 … 2,000MHz, <54dBµV/m

Induction:
0.01 … 0.150MHz, 96-50dBµV/m;
0.150 … 0.350MHz, 60-50dBµV/m;
0.35 … 30MHz, <50dBµV/m;

11.4.3. Mechanical resistance

Shock:
EN 60068-2-27; 50g/11ms
Sinusoidal vibrations:
EN 60068-2-6, Fc test;
up to 1.6mm, 0 … 25Hz,
up to 4g for 25 … 100Hz

11.4.4. Insulation resistance

>100 MΩ @110V DC transmitters in normal versions
>100 MΩ @750V DC transmitters in Ex versions

11.4.5. High Voltage Test

75V AC, or 110V DC, 1 min., transmitters in standard versions
500V AC, or 750V DC, 1 min., transmitters in Ex versions

11.4.6. Housing ingress protection

According to EN 60529:2003

LI-24L	IP20
LI-24G	housing IP55; terminals IP10

11.5. Construction

11.5.1. Housing material

LI-24L	PA66
LI-24G	PA66

11.5.2. Cable diameter

LI-24L	≤ 2.5 mm^2
LI-24G	≤ 1.75 mm^2

11.6. Permissible input parameters of the transmitter (according to KDB 15 ATEX 0080X)

Supply the transmitters from power supply and measurement equipment with relevant intrinsic safety certificates, parameters of which for outputs to potentially explosive areas should not exceed the limits for feeding the transmitters.

Table 3. The permissible parameters of transmitters in hazardous areas

The permissible parameters of the sensor supply circuits											
Uo			Io				Po				
6 V			10 mA				15 mW				
Lo [mH]	100	50	20	10	5	2	1	0.5	0.2	0.1	0.05
Co [µF]	1.3	1.4	1.6	1.8	2	2.4	2.7	3.2	4	4.8	6

The permissible parameters of the transmitter power supply circuits					
Ui	Ii	Pi	Li	Ci	Ta
Supply from a power source with linear output characteristic					
30 V	0.1 A	0.75 W	0 µH	5 nF	≤ 50ºC and T6 ≤ 70ºC and T5 group III - 105ºC
Supply from a power source with trapezoidal output characteristic					
24 V	50 mA	0.6 W	0 µH	5 nF	≤ 50ºC and T6 ≤ 70ºC and T5 group III - 105ºC
Supply from a power source with rectangular output characteristic					
24 V	25 mA	0.6 W	0 µH	5 nF	≤ 50ºC and T6 ≤ 70ºC and T5 group III - 105ºC
24 V	50 mA	1.2 W	0 µH	5 nF	≤ 40ºC and T6 ≤ 60ºC and T5 group III - 105ºC

11.6.1. Power supply examples

Used in section 11.6.1 marking Uo, Io, Po applies to the transmitter power supply circuit. They should not be confused with the markings parameters of the sensor supply circuits, indicated in Table 3

11.6.1.1. Supply from a power source with linear output characteristic

Example of linear power supply, e.g. a typical barrier with the following parameters:
Uo = 28V; Io = 0,093A; Rw = 300Ω.

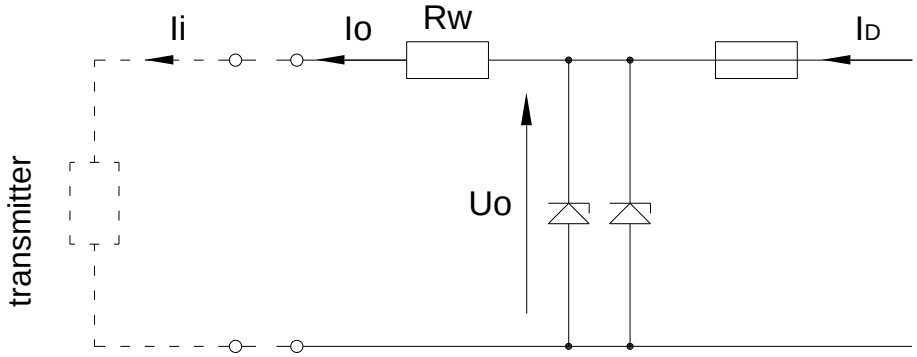


Figure 14. Linear power supply configuration

11.6.1.2. Supply from a power source with trapezoidal output characteristic

An example of trapezoidal power supply is:
Uo = 24V; Io = 0.05A; Po = 0.6 W; U_Q = 48V.

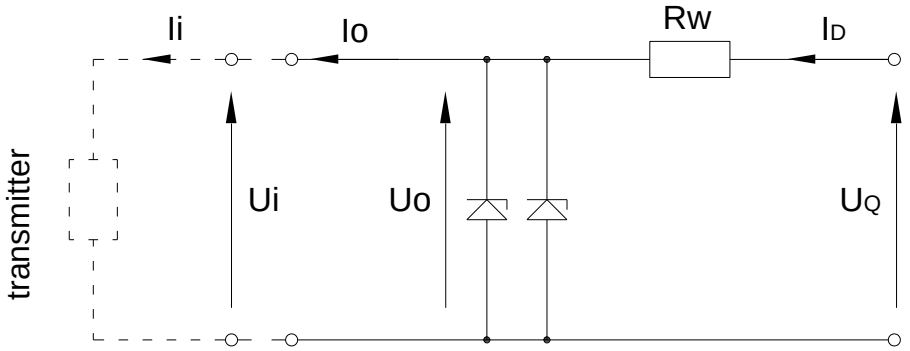


Figure 15. Trapezoidal power supply configuration

If $Uo < {}^{U_Q}/_2$ then U_Q, Io, Po parameters are related as follows:

$$U_Q = \frac{4Po}{Io}; \qquad Rw = \frac{4Po}{Io^2}; \qquad Po = \frac{Uo \cdot (U_Q - Uo)}{Rw}$$

11.6.1.3. Supply from a power source with rectangular output characteristic

Example of rectangular power supply is:
Uo = 24V; Io = 0.05A; Po = 1.2W.
The supply from a power source with rectangular output characteristic means that the voltage of an intrinsically safe power supply unit remains constant until a current limiter is activated.
The level of protection of power supply with rectangular output characteristic units is usually ‘ib’. Transmitters supplied from such supply units are also intrinsically safe devices with safety level ‘ib’.

12. INSPECTIONS. SPARE PARTS

12.1. Periodic inspections

Periodic inspections should be carried out in accordance with regulations binding the user. During the inspection, check all electrical connections at the terminals (reliability of connections) and the stability of the transmitter mounting.

12.2. Unscheduled inspections

If the transmitter is installed in a location where it could be subjected to mechanical damage, electrical surges or malfunction is found - inspect it as needed.
In case of lack of signal in the transmission line or its incorrect value, check the state of the cable, of the connection on terminals, etc. Determine whether the values of the supply voltage and load resistance are correct. If the communicator is connected to the transmitter power supply line, an indication of a fault line may be the message "No response" or "Check connection". If the line is in order, check operation of the transmitter.

12.3. Spare parts

Parts of the transmitter which may be worn or damaged and require replacement:

LI-24G			
Name	Content	Description	Ordering number
Mounting kit	2x screws M4 2x compression springs	Figure 6 position 3	

13. SCRAPPING, DISPOSAL

Waste or damaged transmitters should be dismantled and disposed of in accordance with Directive (2012/19/EU) on waste electrical and electronic equipment (WEEE) or returned to the manufacturer.

14. ADDITIONAL INFORMATION

14.1. Additional information

The manufacturer reserves the right to make constructional and technological changes which do not lower the quality of the transmitters.

14.2. Related documents

IO.KAP-03.02	User Manual KAP-03 communicator
IO.RAPORT2	Software Raport 2 and User Manual HART/RS232 converter
DTR.HB.01	User Manual HART/USB Converter