



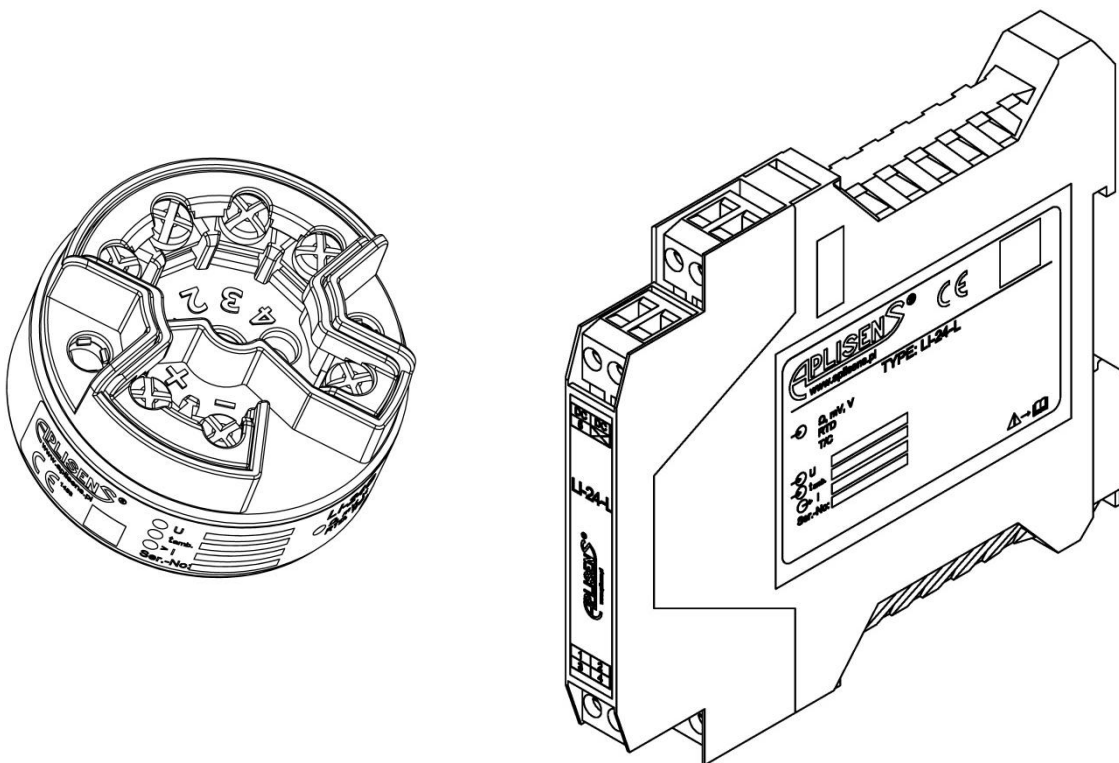
## EXPLOSION-PROOF DEVICE MANUAL

RAIL-MOUNTED SMART TEMPERATURE TRANSMITTERS





**LI-24L, LI-24L SAFETY**

HEAD-MOUNTED SMART TEMPERATURE TRANSMITTER

**LI-24G, LI-24G SAFETY**



## Symbols used

Symbol	Description
	Warning about the necessity follow strictly the information provided in the documentation in order to ensure safety and full functionality of the device.
	Information particularly useful for device installation and operation.
	Information particularly useful for Ex device installation and operation.
	Waste of electrical and electronic equipment disposal information.

## BASIC REQUIREMENTS AND OPERATION SAFETY



- The manufacturer shall not be liable for any damage resulting from incorrect installation, failure to maintain the device in proper condition, or device use other than intended.
- Installation should be carried out by qualified staff having the required authorization to install electrical and I&C equipment. The fitter is responsible for performing the installation in accordance with this manual and with the electromagnetic compatibility and safety regulations and standards applicable to the type of installation.
- If leakage in systems with I&C equipment occurs, pressurized medium poses a threat to the personnel. All safety and protection requirements must be observed during transmitter installation, operation and inspections.
- If a malfunction occurs, the device should be removed and sent for repair to the manufacturer or a facility authorized by the manufacturer.



In order to minimize the risk of malfunction and associated risks to staff, do not install or use the device in particularly adverse conditions, where the following hazards occur:

- Possible mechanical impacts, excessive shocks and vibration;
- Excessive temperature fluctuation;
- Water condensation, dust, icing.



Explosion-proof installations should be made with special care and in accordance with standards and regulations applicable to this type of installations.

Changes can be made in the manufacturing before the paper version of user documentation is updated. Up-to-date user manuals are available on the manufacturer's website:

[www.aplisens.com](http://www.aplisens.com).

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## 1. INTRODUCTION

This manual is only applicable to the LI-24L, LI-24L Safety, LI-24G i LI-24G Safety series transmitters in Exi (intrinsically safe). The transmitters are identified with model ID on nameplates and also as specified in section 3. Ex information are included in the “Product Certificate”. Model ID indicates type and version of transmitter.

The manual contains most important information on intrinsically safe transmitters compliant with ATEX directive and IECEx requirements. If intrinsically safe transmitters are installed, refer to this manual and also:

- EN.IO.LI.24.L.G.SFT manual for LI-24L Safety, LI-24G Safety series transmitters,
- EN.IO.LI.24.L.G manual for LI-24L, LI-24G series transmitters.

## SAFETY

- Read this manual carefully before installing, commissioning and operating the transmitter.
- Installation and maintenance should be carried out by qualified staff having the required authorization to install electrical and measuring devices.



- The transmitter should be used as intended within permissible parameters.
- Power source must be disconnected before installing or removing the transmitter.
- No repairs or alterations to the transducer electronic system are permitted. Only the manufacturer or a facility authorized by the manufacturer may assess damages and repair the device (if possible).
- Do not use damaged instruments. In case of failure, the device must be disconnected.



- If the equipment is used in Ex zones, the technical requirements specified in this manual and applicable local (national) regulations must be followed.

## 2. COMPLETE DELIVERY CHECKLIST

The user receives the following with the transmitter:

- a) Product Certificate, which also constitutes a warranty card.
- b) Declaration of Conformity.
- c) Certificate copy (on request).
- d) EN.IX.LI.24.L.G explosion-proof device manual.
- e) EN.IO.LI.24.L.G.SFT user manual or EN.IO.LI.24.L.G user manual.

Items b), c), d), e) are available at [www.aplisens.com](http://www.aplisens.com).

### 3. IDENTIFICATION MARKS.

Each transmitters are equipped with a nameplate showing the following data:

1. Logo or name of the manufacturer;
2. Transmitter identification;
3. CE mark;
4. QR product code;
5. Transmitter ID number;
6. Types of measuring inputs;
7. Supply voltage value;
8. Permissible ambient temperature range;
9. Output signal;
10. "Caution" symbol. See the relevant information in the user's manual;
11. Transmitter serial number;
12. Year of production;
13. Number of the notified body supervising Ex products;
14. Identification of the explosion-proof version type, certificate identification see point 7.2 for LI-24G, LI-24G Safety and point 8.2 for LI-24L, LI-24L Safety;
15. Intrinsic safety parameters, i.e.:  $U_i$ ,  $I_i$ ,  $P_i$ ,  $L_i$ ,  $C_i$ ,  $U_o$ ,  $I_o$ ,  $P_o$ ,  $C_o$ ,  $L_o$ .

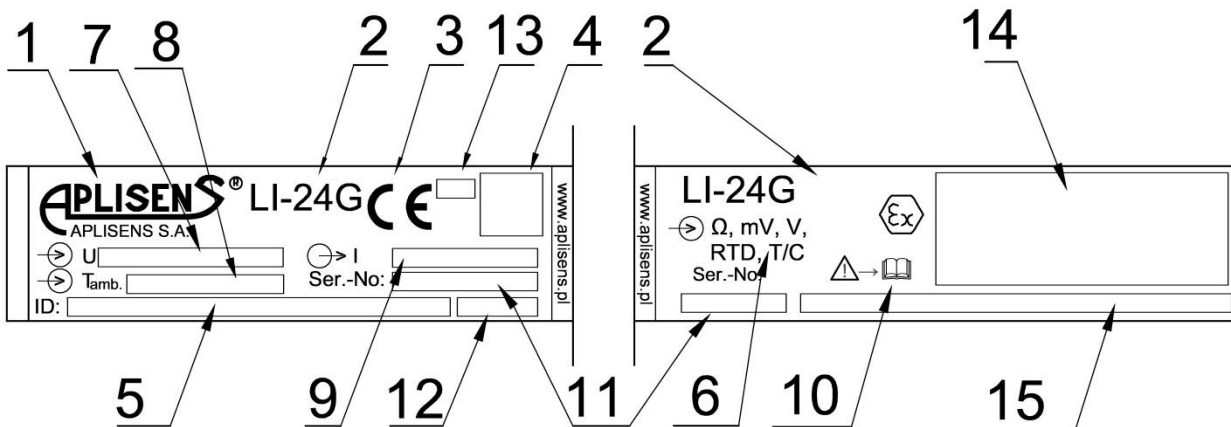
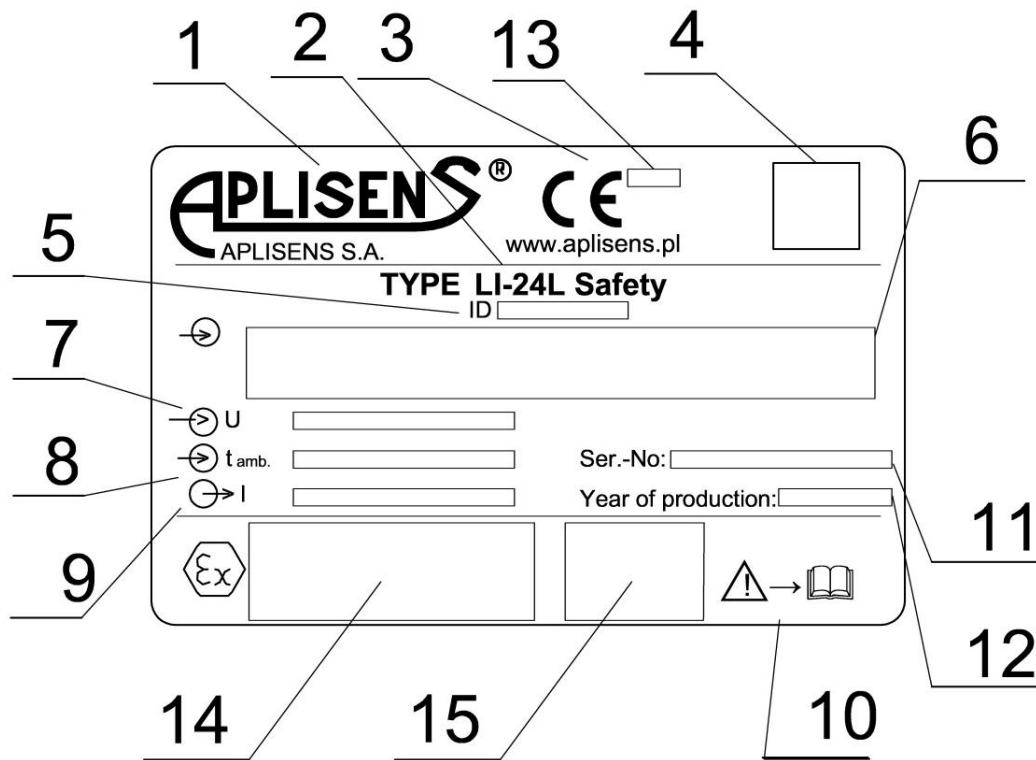


Figure 1. Sample transmitter nameplates LI-24G



**Figure 2.** Sample transmitter nameplate LI-24L Safety

#### **4. CONSTRUCTION OF THE TRANSMITTER**

The LI-24L, LI-24L Safety, LI-24G, LI-24G Safety, temperature transmitter consist of a plastic housing and an electronic unit located inside that converts the signal from the measurement sensor to a unified output signal. LI-24L, LI-24L Safety, temperature transmitters are designed for direct mounting on DIN 35 rail.

The LI-24G and LI-24G Safety temperature transducers can be installed in B, DA, NA, DAN, DANW casings from Aplisens or other casings.

#### **5. ELECTROSTATIC HAZARDS**

Transmitter housing and rating plate are made of plastic. Due to the possibility of electrifying the plastic housing and the occurrence of electrostatic discharges, it is recommended to mount the transmitter in a safe area and connect it with a cable to a sensor located in an explosion hazard zone. If there is a need to install the transmitter in a hazardous area, it should be protected against the possibility of electrifying the housing, e.g. by placing it in a metal housing or in a metal cabinet. Transmitters in hazardous areas should be installed in a place where there is no possibility of electrostatic charging.

When performing connection and maintenance activities in the hazardous area, the possibility of electrostatic discharge should be eliminated. Do not wipe the transmitter dry.

## 6. SPECIAL CONDITIONS OF USE

- a) The maximum temperature of the external heating source cannot heat the transmitter above the maximum ambient temperature declared by manufacturer.
- b) Temperature transmitters in potentially explosive areas should be installed in enclosures designed for operation in these areas and provide a minimum degree of protection: IP54 for Group I devices, IP20 for Group II devices and IP5X for Group III devices.
- c) In hazardous zones the transmitters should be installed in a way that prevents electrostatic charging, in accordance with the instructions.

## 7. INTRINSICALLY-SAFE Exi TRANSMITTERS LI24G AND LI-24G SAFETY

### 7.1. Standards used for assessment

The transmitters are manufactured in compliance with the following standards:  
 EN IEC 60079-0:2018; (IEC 60079-0:2017 ed. 7.0),  
 EN 60079-11:2012; (IEC 60079-11:2011 ed. 6.0.),  
 EN 50303:2000.

### 7.2. Transmitter intrinsic safety designations

The following ATEX and IECEx markings apply only to intrinsically safe transmitters marked with the type and model ID:

LI-24G ID 0025 0010 ...,  
 LI-24G ID 0025 0014 ...,  
 LI-24G Safety ID 0004 0006 0003 ...,

ATEX:



**I M1 Ex ia I Ma**  
**II 1G Ex ia IIC T5/T6 Ga**  
**II 1D Ex ia IIIC T105 °C Da**  
**KDB 20 ATEX 0005X**

IECEx:

**Ex ia I Ma**  
**Ex ia IIC T5/T6 Ga**  
**Ex ia IIIC T105 °C Da**  
**IECEx KDB 20.0001X**



Supply power to transmitters from supply and measurement devices with applicable intrinsic safety certificates whose parameters of outputs to a hazard zone should not exceed the permissible transmitter power supply parameters specified below.



### 7.3. Permissible input and output parameters of the intrinsic safety transmitters LI-24G and LI-24G Safety

**Table 1.** Permissible input parameters in the power supply circuit (terminals "+", "-") for LI-24G and LI-24G Safety transmitters in Exi version

Linear power supply	Rectangular power supply	Trapezoidal power supply
U <sub>i</sub> =30V	U <sub>i</sub> =24V	U <sub>i</sub> =24V, U <sub>Q</sub> =48V
I <sub>i</sub> =0,1A	I <sub>i</sub> =0,025A	I <sub>i</sub> =0,05A
P <sub>i</sub> =0,75W	P <sub>i</sub> =0,6W	P <sub>i</sub> =0,6W
C <sub>i</sub> =2,5nF	C <sub>i</sub> =2,5nF	C <sub>i</sub> =2,5nF
L <sub>i</sub> =910μH	L <sub>i</sub> =910μH	L <sub>i</sub> =910μH
-40°C ≤ T <sub>a</sub> ≤ +50°C (T6)	-40°C ≤ T <sub>a</sub> ≤ +50°C (T6)	-40°C ≤ T <sub>a</sub> ≤ +50°C (T6)
-40°C ≤ T <sub>a</sub> ≤ +70°C (T5)	-40°C ≤ T <sub>a</sub> ≤ +70°C (T5)	-40°C ≤ T <sub>a</sub> ≤ +70°C (T5)

**Table 2.** Permissible output parameters in the temperature sensor circuit (terminals "1", "2", "3", "4", "5") for the LI-24G and LI-24G Safety transmitters in Exi version

U <sub>o</sub>	I <sub>o</sub>	P <sub>o</sub>	C <sub>o</sub>	L <sub>o</sub>
6 V	3.3 mA	19.8 mW	2.5 μF	2 mH

## 8. INTRINSICALLY-SAFE Exi TRANSMITTERS LI24L AND LI-24L SAFETY

### 8.1. Standards used for assessment

The transmitters are manufactured in compliance with the following standards:  
 EN IEC 60079-0:2018; (IEC 60079-0:2017 ed. 7.0),  
 EN 60079-11:2012; (IEC 60079-11:2011 ed. 6.0.),  
 EN 50303:2000.

### 8.2. Transmitter intrinsic safety designations

The following ATEX and IECEx markings apply only to intrinsically safe transmitters marked with the type and model ID:

LI-24L ID 0024 0009 ...,  
 LI-24L ID 0024 0013 ...,  
 LI-24L Safety ID 0003 0005 0003 ...,

ATEX:



**I M1 Ex ia I Ma**  
**II 1G Ex ia IIC T4/T5 Ga**  
**KDB 20 ATEX 0005X**

IECEx:

**Ex ia I Ma**  
**Ex ia IIC T4/T5 Ga**  
**IECEx KDB 20.0001X**



Supply power to transmitters from supply and measurement devices with applicable intrinsic safety certificates whose parameters of outputs to a hazard zone should not exceed the permissible transmitter power supply parameters specified below.

### 8.3. Permissible input and output parameters of the intrinsic safety transmitters LI-24L and LI-24L Safety

**Table 3.** Permissible input parameters in the power supply circuit (terminals "+", "-") for LI-24L and LI-24L Safety transmitters in Exi version

Linear power supply	Rectangular power supply		Trapezoidal power supply
U <sub>i</sub> =30V	U <sub>i</sub> =24V	U <sub>i</sub> =24V	U <sub>i</sub> =24V, U <sub>o</sub> =48V
i <sub>i</sub> =0,1A	i <sub>i</sub> =0,025A	i <sub>i</sub> =0,05A	i <sub>i</sub> =0,05A
P <sub>i</sub> =0,75W	P <sub>i</sub> =0,6W	P <sub>i</sub> =1,2W	P <sub>i</sub> =0,6W
C <sub>i</sub> =2,5nF	C <sub>i</sub> =2,5nF	C <sub>i</sub> =2,5nF	C <sub>i</sub> =2,5nF
L <sub>i</sub> =0μH	L <sub>i</sub> =0μH	L <sub>i</sub> =0μH	L <sub>i</sub> =0μH
-40°C≤T <sub>a</sub> ≤+55°C (T5) -40°C≤T <sub>a</sub> ≤+85°C (T4)	-40°C≤T <sub>a</sub> ≤+55°C (T5) -40°C≤T <sub>a</sub> ≤+85°C (T4)	-40°C≤T <sub>a</sub> ≤+85°C (T4)	-40°C≤T <sub>a</sub> ≤+55°C (T5) -40°C≤T <sub>a</sub> ≤+85°C (T4)

**Table 4.** Permissible output parameters in the temperature sensor circuit (terminals "1", "2", "3", "4", "5") for the LI-24L and LI-24L Safety transmitters in Exi version

U <sub>o</sub>	I <sub>o</sub>	P <sub>o</sub>	C <sub>o</sub>	L <sub>o</sub>
6 V	3.3 mA	19.8 mW	2.5 μF	2 mH

## 9. TRANSMITTER POWER SUPPLY PARAMETERS

### 9.1. Minimum and maximum supply voltage

**Table 5.** Transmitter supply voltages in Exi version

Minimum supply voltage	Maximum supply voltage
10 V	According to table 1 for LI-24G, LI-24G Safety According to table 3 for LI-24L, LI-24L Safety

### 9.2. Load resistance

- a) For a linear power supply from a barrier

$$R_{o \max [\Omega]} = \frac{U_{app} - 10 V - (R_w * 0.023A^*)}{0.023A^*}$$

- b) For power supply from a trapezoidal or rectangular source.

$$R_{o \max [\Omega]} = \frac{U_{app} - 10 V}{0.023A^*}$$

*R<sub>w</sub>* – barrier resistance;

*U<sub>app</sub>* – minimum voltage of the barrier used

\*) for transmitters in Safety version, the current value should be taken 0.02082A

## 10. EXAMPLE OF POWER SUPPLY FOR TRANSMITTERS IN EXPLOSION HAZARD AREAS.

### 10.1. Linear power supply example

For example, linear power supply is provided by a typical barrier with the following parameters

$U_o = 28V$ ;  $I_o = 0.1A$ ;  $P_o = 0.7W$ ;  $R_w = 280\Omega$ .

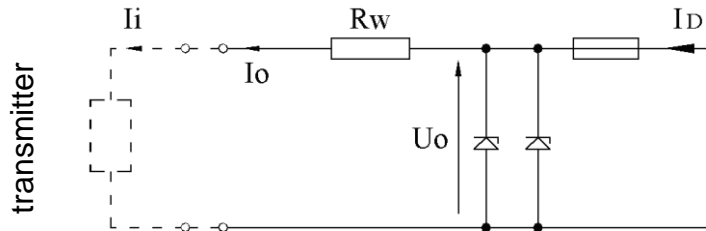


Figure 3. Principle of power supply from a linear source.

### 10.2. Trapezoidal power supply example

$U_o = 24V$ ;  $I_o = 50mA$ ;  $P_o = 0.7W$

An example of trapezoidal power supply is shown in Figure 4.

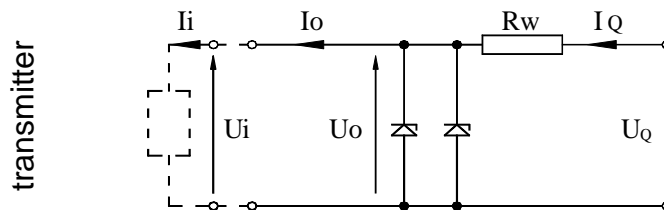


Figure 4. Principle of power supply from a trapezoidal source.

If  $U_o > \frac{U_Q}{2}$ ,  $U_Q$ ,  $I_o$ ,  $P_o$  have the following relations:

$$P_o = \frac{U_Q * I_o}{4}$$

If  $U_o \leq 1/2 U_Q$ ,  $U_Q$ ,  $I_o$ ,  $P_o$  have the following relations:

$$P_o = \frac{U_o(U_Q - U_o)}{R_w}$$

Resistance  $R_w$ :

$$R_w = \frac{U_Q}{I_o}$$

### 10.3. Rectangular power supply example

$U_o = 24 V$     $I_o = 25 mA$     $P_o = 0.6 W$

$U_o = 24 V$     $I_o = 50 mA$     $P_o = 1.2 W$

Rectangular power supply means that the voltage of an intrinsically safe power adapter does not change until the current limiter is activated.

The level of protection of rectangular power supply adapters is usually “ib”. A transmitter supplied from such power adapter is usually an “ib” intrinsically safe device.

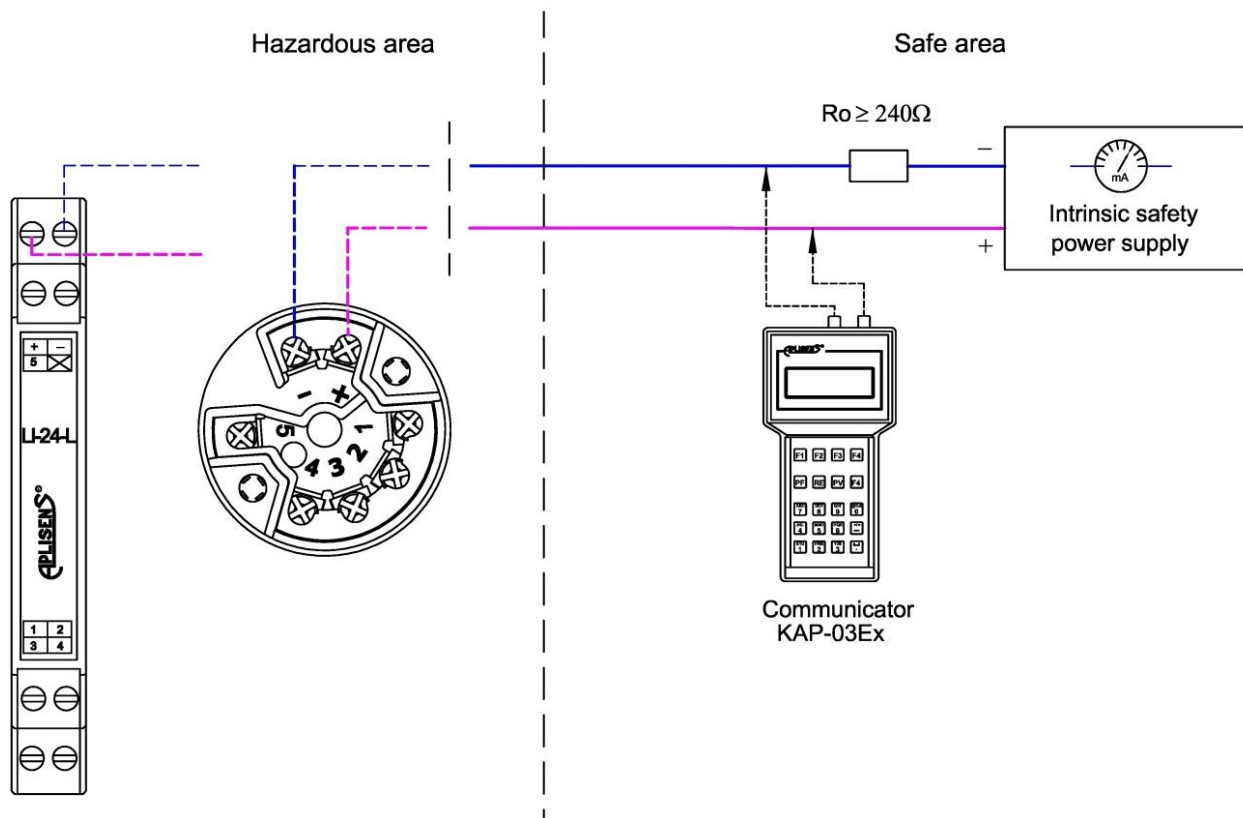
An example of power supply in practice:

A stabilized power adapter with  $U_0 = 24\text{ V}$ , “ib” protection level and current limited to  $I_0 = 25\text{ mA}$ .

## 11. CONNECTING Exi TRANSMITTERS



Transmitter and equipment in the transmitter measurement loop must be connected in compliance with intrinsic safety and explosion proofing standards and conditions for application in risk zones. If intrinsic safety rules are not followed, explosion can occur and people can be exposed to danger.



**Figure 5.** Connecting Exi transmitters



If we want to communicate with the transducer (via the HART protocol) by connecting the communicator (as in Figure 5) we must make sure that the resistance  $R_0$  seen from the transducer terminals towards the power source is in the range of  $240\text{ [}\Omega\text{]} \leq R_0 \leq 1100\text{ [}\Omega\text{]}$ . If  $R_0 < 240\text{ [}\Omega\text{]}$  does not communicate, then increase  $R_0$  to the minimum value of  $240\text{ [}\Omega\text{]}$ . The  $R_0$  resistor is only used during Hart communication. For standard 4-20mA transducer operation, the  $R_0$  resistor is not required.



The electrical system for connecting transmitters should meet installation requirements of applicable standards.



No repairs or alterations to the transmitter electrical system are permitted. Only the manufacturer or a facility authorized by the manufacturer may assess damages and repair the device (if possible).



To minimize the risk of electrostatic discharge in potentially explosive areas, make connections to the transmitter terminals outside these areas.

Due to the type of material used, the user is obliged to ensure the installation of the transmitter in accordance with the specific conditions of use.



Use a cable with or without shielding, unreinforced, compact and round cross-section, in an elastomer sheath, e.g. polyvinite, non-absorbent, e.g. YKSLY 2 \* 1, YnTKSYekw 1 \* 2 \* 1, LIYCY 2 \* 1. Cables should be protected against damage by routing them e.g. in trays, conduits, cable ladders, permanent fasteners etc.

General principles of connecting and operating the transducer in Exi version should comply with the principles and standards for devices with intrinsically safe construction:



PN-EN60079-14 - Explosive atmospheres - Part 14: Design, selection and assembly of electrical installations.

PN-EN60079-17 - Explosive atmospheres - Part 17: Inspection and maintenance of electrical installations.

## 12. ADDITIONAL INFORMATION

### 12.1. Additional information

The manufacturer reserves the right to introduce structural and technological changes to the device, which does not deteriorate its performance.

### 12.2. History of revisions

Revision No	Document revision	Description of changes
-	01.A.001/2020.05	Initial document version. Prepared by DCF.
1	01.A.002/2020.11	Change of ID numbers. Prepared by DCF.





