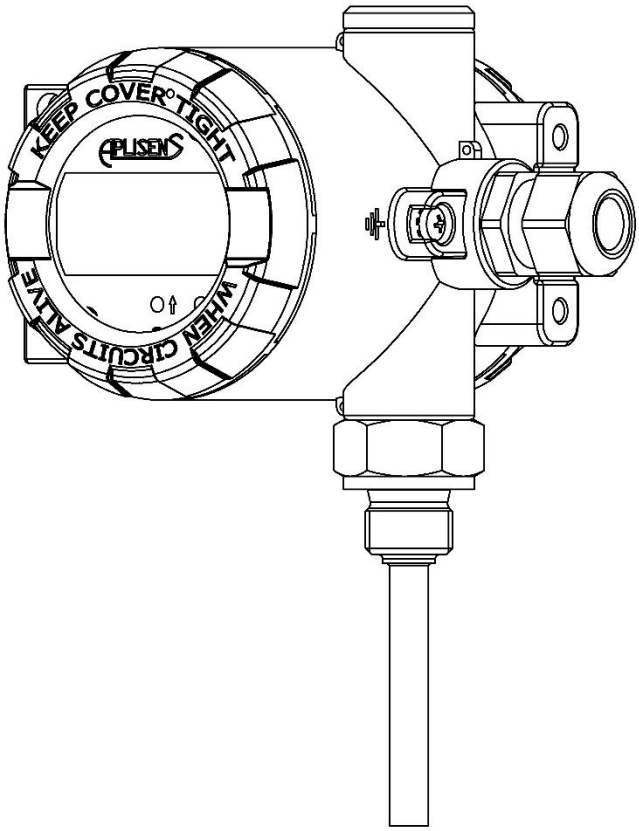
EXPLOSION-PROOF DEVICE MANUAL

SMART TEMPERATURE TRANSMITTERS
LI-24ALW, LI-24ALW Safety



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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 an Ex device.
	Waste of electrical and electronic equipment disposal information.

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 systems with pressure transmitters there 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.

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

Changes in the production of transmitters may precede a paper updating for the user. The current user manuals are available at http www.aplisens.pl

This explosion-proof construction manual EN.IX.LI.24.ALW consists of two chapters:
CHAPTER 1. INTRINSICALLY SAFE CONSTRUCTION Exi, applies only to transmitters in explosion-proof version: intrinsically safe and contains information related to the intrinsically safe version of the transmitter.
CHAPTER 2. FLAMEPROOF CONSTRUCTION Exd, applies only to explosion-proof transmitters: flameproof Exd and contains the most important information related to the flameproof of transmitters.

TABLE OF CONTENTS

LIST OF DRAWINGS

LIST OF TABLES

CHAPTER 1. INTRINSICALLY SAFE CONSTRUCTION Ex i

1. INTRODUCTION

This chapter 1 of the manual applies only to the transmitters of the series: LI-24ALW, LI-24ALW Safety in explosion-proof version: intrinsically safe Exi.
The manual contains the most important information related to the intrinsically safe version of the transmitters in accordance with the ATEX Directive and IECEx requirements. When installing and using the explosion-proof transmitters, refer to this explosion-proof device instruction EN.IX.LI.24.ALW and, additionally, the EN.IO.LI.24.ALW instruction manual.

2. SAFETY

- The installation and commissioning of the transmitter and any operation should only be carried out after careful reading of this user manual.
- 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 transmitter 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 transmitters. If the device is malfunctioning, disconnect it.
- If the equipment is used in Ex zones, the technical requirements specified in this manual and applicable local (national) regulations must be followed.

3. COMPLETE DELIVERY CHECKLIST

The user receives the following with the transmitter:

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

Items b), c), d), e) are available at www.aplisens.pl

4. IDENTIFICATION MARKS

Ex transmitters are delivered with a nameplate containing specific data:

1. Logo or manufacturer's name;
2. CE mark;
3. Notified body number;
4. Product QR code;
5. Transmitter type;
6. Measuring range;
7. Supply voltage value;
8. Permissible range of ambient temperature;
9. Output signal;
10. Type of measuring sensor (measuring element);
11. Sensor version;
12. Type of process connector;
13. Electrical connection cable entry thread;

14. Serial number;
15. Year of manufacture;
16. Caution" symbol. See the relevant information in the user's manual;
17. IP protection rating;
18. Identification of the explosion-proof version type. (see **ch.1, no. 8.2)**;
19. Manufacturer's address;
20. Input signal (types of measuring inputs).
21. „Version SA" version with gas surge arrester.

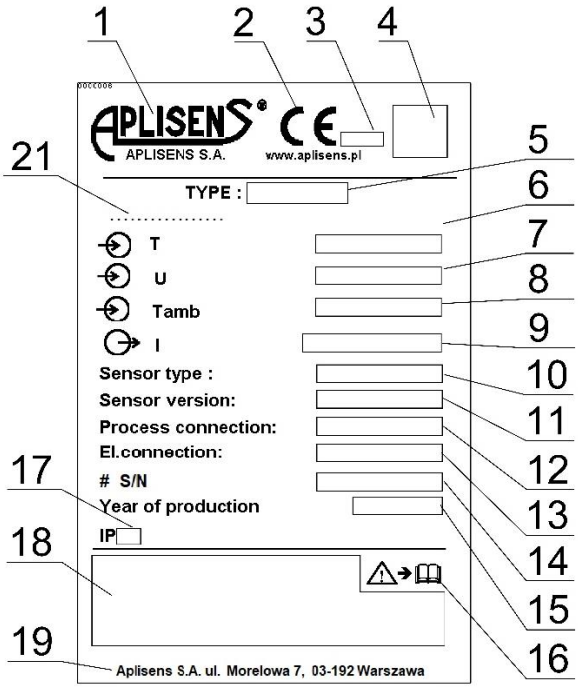


Figure 1. 1. Example of a nameplate for a transmitter with a direct sensor.

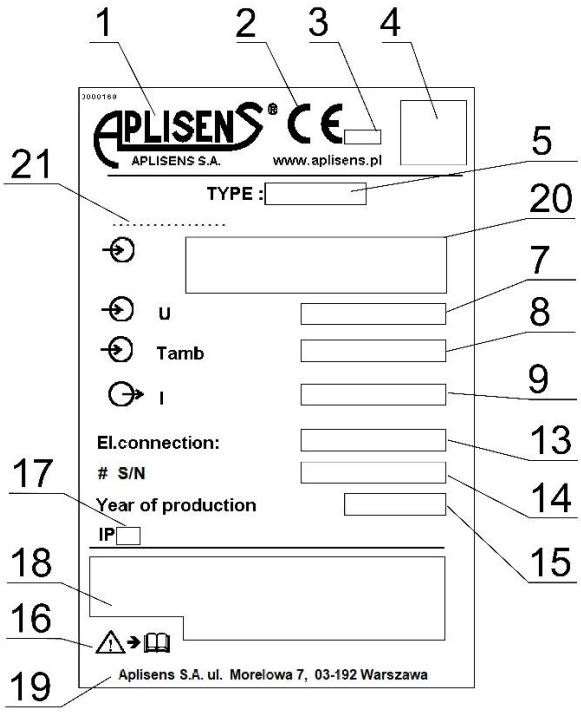


Figure 1. 2. Example of a transmitter nameplate for use with an independent remote sensor.

5. TRANSMITTER DESIGN

The transmitter housing is made of die-cast aluminum alloy or steel 1.4401 (316). It consists of a body and two screw-on covers, one of which is equipped with a glass. A transmitter enclosure has holes for installing a cable entry with M20x1.5 or ½"NPT thread. The housing is equipped with an internal and external earthing terminal. Inside the casing there is an electronic system transforming the signal from the measuring sensor into a unified output signal. Depending on the transducer type, the following ways to connect the transducer to the sensor are possible: remotely (connection with a cable), or directly (temperature sensor assembled with the transmitter).
Transmitters in aluminum enclosures are allowed for II and III group, and transmitters in steel enclosures are allowed for I, II and III group.

6. ELECTROSTATIC HAZARDS

The paint, plastic nameplate is a non-conducting layer applied on a conducting base of an enclosure. Transmitters with this design in a dust-explosion zone should be installed in a place where electrostatic charging is impossible, in particular by contact with electrically charged dust falling off or blown from neighboring devices. When performing connection and maintenance activities in the hazardous area, the possibility of electrostatic discharge should be eliminated. Do not wipe the transmitter dry.

7. SPECIAL CONDITIONS FOR SAFE USE

- This Operating Instructions must be taken into account during installation
- Version of device with surge arrester, marked as "SA", does not meet the 500V rms test required by EN 60079-11:2012. This must be taken into account when device is installing.
- For the medium temperature Tm>Ta temperature of the temperature class T** and the maximum surface temperature T* should be set according to the ch.1 p.10.3.2.
- In explosion hazardous areas, transmitters in lacquered aluminum casing, as well as transmitters fitted with plastic tags, should be installed in a manner that prevents electrostatic charging in accordance with ch.1 p.6.

8. EX MARKING

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. Explosion-proof marking of transmitters in accordance with the ATEX Directive and IECEx requirements

Transmitter type	Marking the type of explosion-proof construction, marking of the certificate	
	ATEX	IECEx
LI-24ALW with user sensor	II 2(1)G Ex ia [ia Ga] IIC T6/T5/T4 Gb II 1D Ex ia IIIC T115ºC Da I M1 Ex ia I Ma (with 1.4401 (316) enclosure only) FTZU 13 ATEX 0205X	Ex ia [ia Ga] IIC T6/T5/T4 Gb Ex ia IIIC T115ºC Da Ex ia I Ma (with 1.4401 (316) enclosure only) IECEx FTZU 13.0028X
LI-24ALW with the manufacturer's sensor	II 1/2G Ex ia IIC T6/T5/T4 Ga/Gb II 1D Ex ia IIIC T115ºC Da I M1 Ex ia I Ma (with 1.4401 (316) enclosure only) FTZU 13 ATEX 0205X	Ex ia IIC T6/T5/T4 Ga/Gb Ex ia IIIC T115ºC Da Ex ia I Ma (with 1.4401 (316) enclosure only) IECEx FTZU 13.0028X
LI-24ALW Safety without sensor (for mounting an external remote or direct senor)	II 2(1)G Ex ia [ia Ga] IIC T4 Gb II 1D Ex ia IIIC T105ºC Da I M1 Ex ia I Ma (with 1.4401 (316) enclosure only) KDB 14 ATEX 0118X	Ex ia [ia Ga] IIC T4 Gb Ex ia IIIC T105ºC Da Ex ia I Ma (with 1.4401 (316) enclosure only) IECEx KDB 15.0005X

For the temperature of the medium Tm> Ta, the temperature class T** of the transmitter for gases and the maximum surface temperature T* in the presence of combustible dust depends on the temperature of the medium.
As standard, the transmitters are manufactured for explosive gas atmospheres. A customer can also order a transmitter for explosive dust atmospheres and for mining applications.

9. TRANSMITTERS IN EXPLOSION HAZARD AREA

9.1. LI-24ALW transmitter in explosion hazard zone

EPL protection level [Ga], Gb and device category 2 (1) G means that the transmitter can be installed in hazardous zone 1 or 2, and the cable temperature sensor can be installed in zone 0. EPL protection level Da means that the transmitter it can be installed in the hazardous zone 20, 21 or 22 (fig. 1.3).
The temperature class of the transmitter for the gases and the maximum permissible surface temperature in the presence of combustible dust is defined as in chapter 1. p.10.3 and in accordance with the specifications (shown in the User Manual) of the temperature sensor.

The transmitters designed for use with a cable temperature sensor are provided with an intrinsically safe output on the sensor's side.
Sensors installed in the zone '0' should meet the following requirements:

- for a "simple apparatus" – according to section 5.7 in EN 60079-11:2012;
- the requirements relating to the operating parameters, e.g. resistance to operating pressure, temperature, resistance to chemical and mechanical stress.

A cable temperature sensor that meets the above requirements can be purchased either from Aplisens or another manufacturer. In the dust explosion hazard zone, cable temperature sensors installed by the recipient should be certified and have a marking appropriate to the zone in which they will be used.

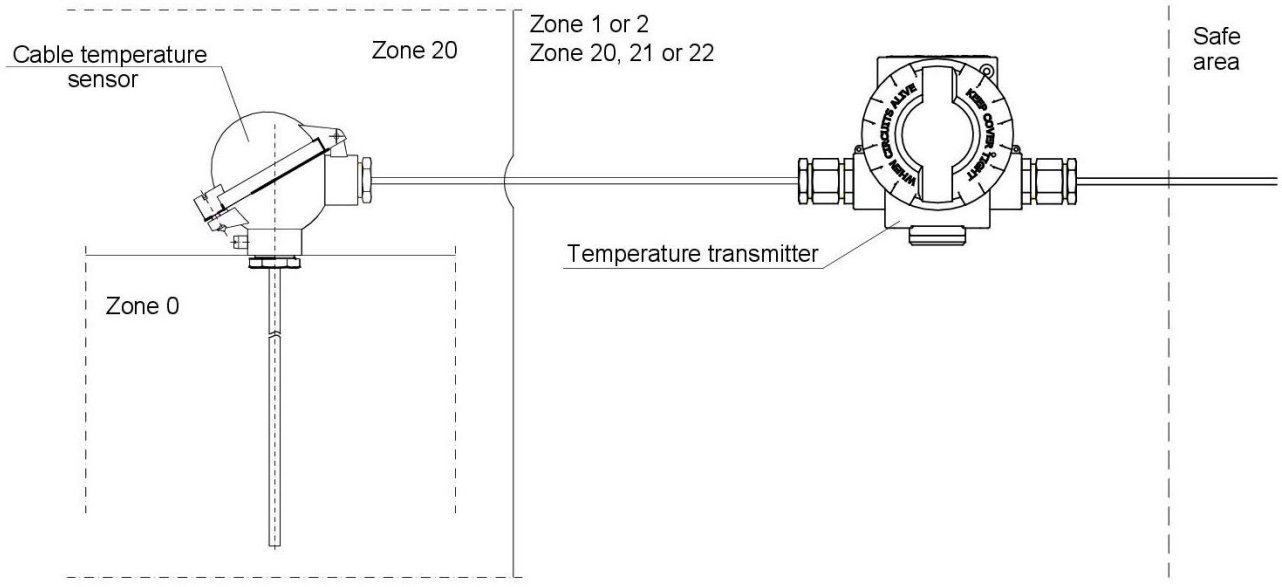


Figure 1. 3. LI-24ALW temperature transmitter with a cable temperature sensor.

If the sensor screwed into the housing is installed, the transmitter has EPL Ga / Gb protection level and category 1 / 2G, which means that the transmitter works on the border of zones 0 and 1, the process connection (sensor) can connect to zone 0, and the transmitter can be installed in the hazard zone 1 or 2. EPL protection level Da means that the transmitter with the process connection (sensor) can be installed in the hazardous area 20, 21 or 22 (Fig. 1.4).

Temperature class T ** of the transmitter with a sensor screwed into the enclosure for gases and the maximum surface temperature T * in the presence of flammable dusts depends on the temperature of the medium; see chapter 1. p. 10.3.

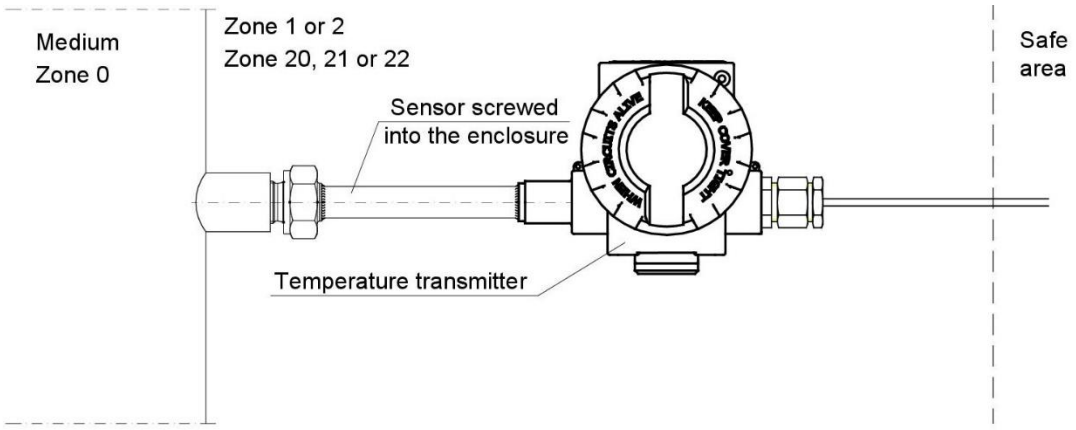


Figure 1. 4. LI-24ALW temperature transmitter with a sensor screwed into the enclosure.

Types of sensors for direct mounting with a transmitter proposed by Aplisens: WOGN, WOGB, WRGN, WRGB (according to the current catalog card). Sensors for direct mounting installed by the customer should be approved to the zone in which they will be used and provide a degree of protection of at least IP 66.

9.2. LI-24ALW Safety transmitter in explosion hazard zone

The LI-24ALW Safety transmitter is delivered without a sensor as a standard. The user should install a certified sensor suitable for the zone in which it will be installed, ensuring a protection degree of at least IP 66.

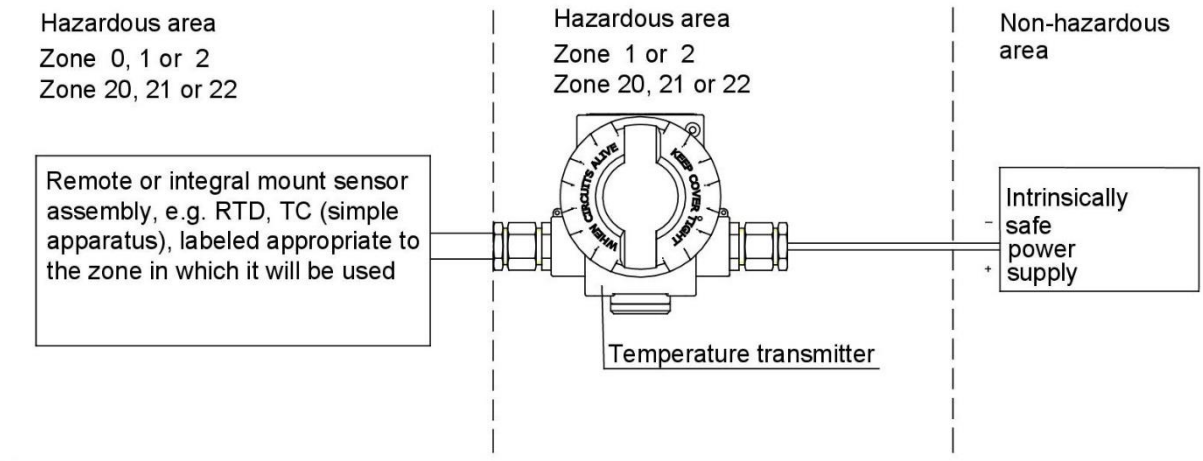


Figure 1. 5. Temperature transmitter with a cable temperature sensor or with a sensor screwed into the enclosure.

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).

A transmitter enclosure has holes for installing a cable entry with M20x1.5 or 1/2 NPT thread. In transmitters used in dust explosion zones, the cable glands and blanking plugs installed by the customer should be certified and have a designation proper to dust zones where the transmitters are used.

10. PERMISSIBLE PARAMETERS OF TRANSMITTERS

10.1. Power supply

Connections between the transmitter and other devices in the transmitter's measuring loop should be made in accordance with the applicable standards and the conditions for use in hazardous areas. Failure to follow the rules may cause an explosion and the resulting hazard to people.

Table 1. 1. Power supply voltage.

Transmitter type	Minimum supply voltage	Maximum supply voltage
LI-24ALW	13,5 V DC *	30 V DC according to the table 1.2
LI-24ALW Safety	12,5 V DC *	30 V DC according to the table 1.3
* Min. power supply voltage with the backlight off. When the display backlight is on, increase the min. supply voltage of 3V.		

The transmitters should be supplied from supply - measuring devices provided with relevant safety certificates, which output parameters to the hazardous area should not exceed the power input parameters for transmitters as specified below. It is responsibility of the user to provide power supply compliant with the requirements below.

Table 1. 2. Permissible input parameters in the power supply circuit (terminals "+", "-") for LI-24ALW transmitters.

Linear power supply		Rectangular power supply	Trapezoidal power supply	
Ui=30V	Ui=30V	Ui=24V	Ui=24V, U_Q=48V	Ui=24V, U_Q=48V
Ii=0,1A	Ii=0,1A	Ii=0,025A	Ii=0,05A	Ii=0,05A
Pi=0,75W	Pi=0,5W	Pi=0,6W	Pi=0,6W	Pi=0,5W
Ci=2,5nF	Ci=2,5nF	Ci=2,5nF	Ci=2,5nF	Ci=2,5nF
Li=18µH	Li=18µH	Li=18µH	Li=18µH	Li=18µH
-40ºC≤Ta≤+80ºC (T4) -40ºC≤Ta≤+70ºC (T5)	-40ºC≤Ta≤+40ºC (T6)	-40ºC≤Ta≤+80ºC (T5)	-40ºC≤Ta≤+80ºC (T5)	-40ºC≤Ta≤+40ºC (T6)
Tm>Ta ºC & T*, T** in accordance with ch.1. p.10.3.1 and ch.1. p.10.3.2				

Ta – ambient temperature
Tm – temperature of the measured medium
T* – maximum surface temperature in the presence of combustible dusts
T** – temperature class
The temperature of the temperature class of the transmitter T** with an installed sensor (for gases) and the maximum surface temperature in the presence of combustible dust T*, when Tm>Ta, which is determined by the so called operating temperature Tp based on way of measuring determined in ch.1. p. 10.3.1 and ch.1. p. 10.3.2.

Table 1. 3. Permissible input parameters in the power supply circuit (terminals "+", "-") for LI-24ALW Safety transmitters.

Linear power supply	Rectangular power supply	Trapezoidal power supply
Ui=30V	Ui=24V	Ui=24V, U_Q=48V
Ii=0,1A	Ii=0,025A	Ii=0,05A
Pi=0,75W	Pi=0,6W	Pi=0,6W
Ci=25nF	Ci=25nF	Ci=25nF
Li=910µH	Li=910µH	Li=910µH
-40ºC≤Ta≤+75ºC (T4)	-40ºC≤Ta≤+75ºC (T4)	-40ºC≤Ta≤+75ºC (T4)

10.1.1. Supply from a power source with linear output characteristic

Ui=30 V; Ii=0,1 A; Pi=0,75 W

For example, linear power supply is provided by a typical barrier with the following parameters Uo = 28 V; Io = 0,093 A; Rw = 300 Ω.

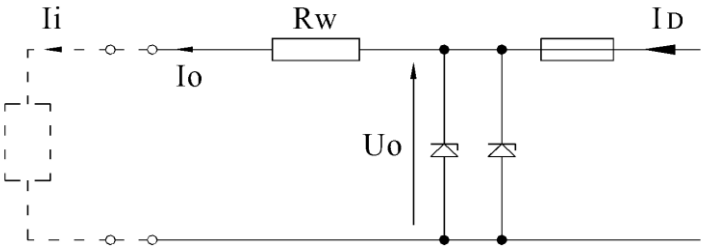


Figure 1. 6. The principle of power supply from a source with linear characteristics.

10.1.2. Supply from a power source with trapezoidal output characteristic

Uo = 24 V; Io = 50 mA; Po = 0,6 W

An example of trapezoidal power supply is shown in Figure 1. 7.

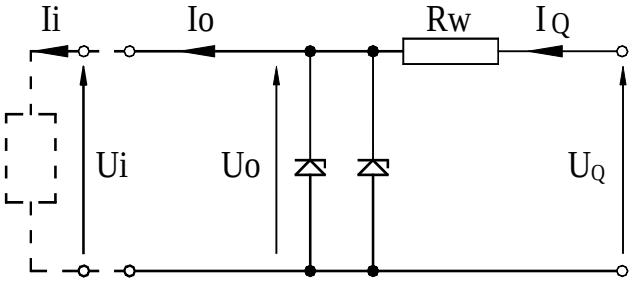


Figure 1. 7. The principle of power supply from a source with a trapezoidal characteristic.

If $U_o > \frac{U_Q}{2}$, then U_Q, I_o, P_o are related as follows:

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

If $U_o \leq \frac{U_Q}{2}$ then U_Q, I_o, P_o are related as follows:

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

Resistance R_w :

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

10.1.3. Supply from a power source with rectangular output characteristic

Uo =24 V; Io=25 mA; Po=0,6 W

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’.

Practical example of rectangular supply:

stabilised power supply unit with Uo = 24V and protection level ‘ib’, value of the current limited to Io = 25mA.

10.2. The permissible output parameters for the transmitters with a cable temperature sensor:

Intrinsically safe the permissible output parameters for the transmitters **LI-24ALW** with a cable temperature sensor:
Uo=6,6 V; Io=9,8 mA; Po=16,2 mW; Lo=400 mH; Co=3,5 µF (dla IIC), Co=480 µF (dla IIB), Co=1000 µF (dla IIA i I).
Intrinsically safe the permissible output parameters for the transmitters **LI-24ALW Safety** with a cable temperature sensor:
Uo=6 V; Io=3,3 mA; Po=19,8 mW; Lo=2 mH; Co=2,5 µF.

10.3. Ambient temperature range and temperature classes

The temperature class of transmitter depends on the input power, ambient and measured medium temperature. For transmitters used with media temperature that is no higher than permitted environmental temperature values Tm≤Ta the temperature class should be taken according to and table 1.2 for LI-24ALW transmitter or Table 1.3 for LI-24ALW Safety transmitter. In this case, the maximum surface temperature of the transmitter for combustible dusts is 115°C.

For transmitters that measure temperature greater than permitted Ta value (Tm>Ta), the effect of heat transfer from the medium temperature whose temperature is measured to the transmitter should be taken into account by measuring the increase in the transmitter's temperature due to the higher temperature of the medium. The method of determining the temperature class (T**) for gases and the maximum surface temperature (T*) for combustible dusts for the temperature of medium Tm>Ta is described in ch.1. p.10.3.1 „Measurement of transmitter operating temperature (Tp)".

10.3.1. Measurement of transmitter operating temperature (Tp).

In the case of transmitters used for the medium temperature measuring at Tm>Ta the temperature of the hottest spot on the connection surface (Tpp) which might be in contact with an explosive atmosphere and the temperature of the enclosure (Tpo) should be measured. The Tpp and Tpo temperatures should be determined for the maximum medium and ambient temperature. When calculating Tpo, ΔTe=20K should be added to account for the effect of additional heat transfer due to the input power in case of malfunction. The higher value of Tpp and Tpo+20K should be taken as the operating temperature of the transmitter (Tp) with the sensor.

10.3.2. The transmitter temperature of the temperature class (T**) for gases and the maximum surface temperature (T*) for combustible dusts.

The temperature of the transmitter temperature class T** for gases should be determined from the following equation:

T** ≥ Tp+5K for temperature classes T5, T6
T** ≥ Tp+10K for temperature classes T1...T4

Tp – operating temperature of the transmitter as determined in chap. 1. p. 10.3.1.

The maximum temperature T* of the transmitter's surface which might be in contact with dust cloud must not exceed 2/3 of the minimum ignition temperature of the dust cloud T_{CL} .

T* ≥ Tp T* = 2/3T_{CL}

T_{CL} – the minimum ignition temperature of the expected dust cloud

The maximum surface temperature T* of the transmitter, for a dust layer of 5 mm thickness:

T* ≥ Tp, where T* = T_{5mm} −75K,

T_{5mm} - minimum ignition temperature of a dust layer of 5 mm thickness.

The maximum surface temperature of the transmitter in the case of coal dust deposition must not exceed 150°C.

The temperature of the enclosure Tpo during operation must not exceed 80 ºC.

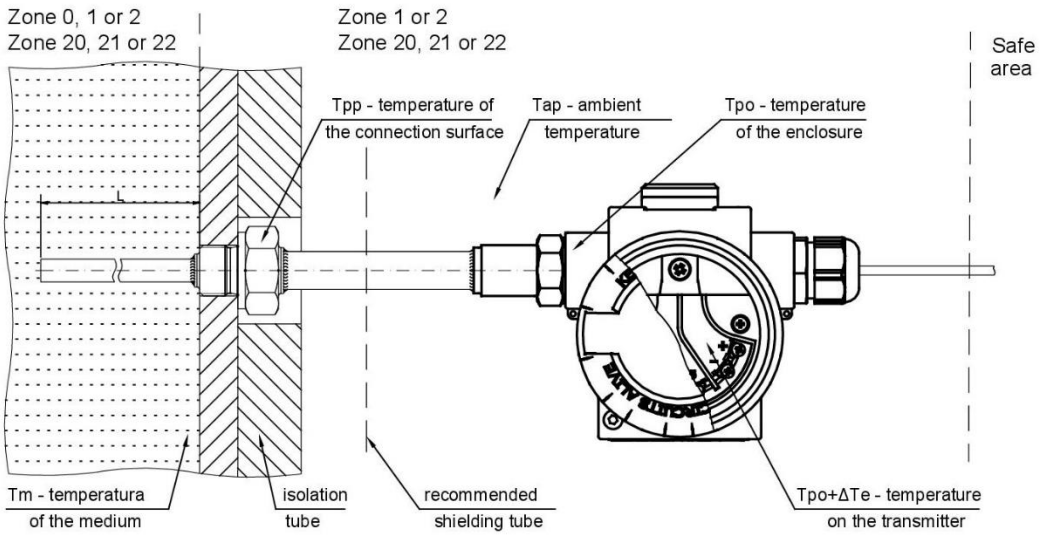


Figure 1. 8. Determining the working temperature of the transmitter.

Note 1:
If the temperature of the medium exceeds the ambient temperature Ta, the temperature class of the sensor or the maximum surface temperature can be taken as the maximum temperature of the medium (Tp) specified for the technological process. In this case it is not necessary to Tp measure.

Note 2:
In case of measurements for non-explosive media, the temperature of the medium can be greater than the temperature of the temperature class or the maximum surface temperature for a given outside explosive mixture, provided that the heat of the medium will not be transferred to any surface of the sensor installed in potentially explosive atmosphere due to the risk of explosion of gases or vapours (in contact with the explosive mixture) above the maximum permissible temperature (Tp) (see chap.1. p. 10.3.1).

System designer is responsible for selecting the sensor and the method of its installation so that the temperature of the hottest surfaces of the transmitter under extreme operating conditions is less than the temperature of the temperature class for a given substance (gas, mist, vapour).

11. CONNECTION AND OPERATION OF TRANSMITTERS

User should read and understand this User Manual before attempting to connect and use the transmitter.

The transmitter should be connected in accordance with the wiring diagram shown in Figure 1.9. In potentially explosive atmosphere the transmitter must only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area. Transmitters should be grounded via a ground terminal. If the transmitter is in contact with metal structural parts or pipes connected to a system of equalization cables, no additional earthing of the transmitter is required.

Connections between the transmitter and other devices in the transmitter's measuring loop should be made in accordance with the applicable intrinsic safety standards and the conditions of use in hazardous areas. Non-observance of the intrinsic safety rules may cause an explosion and the related hazard to people.

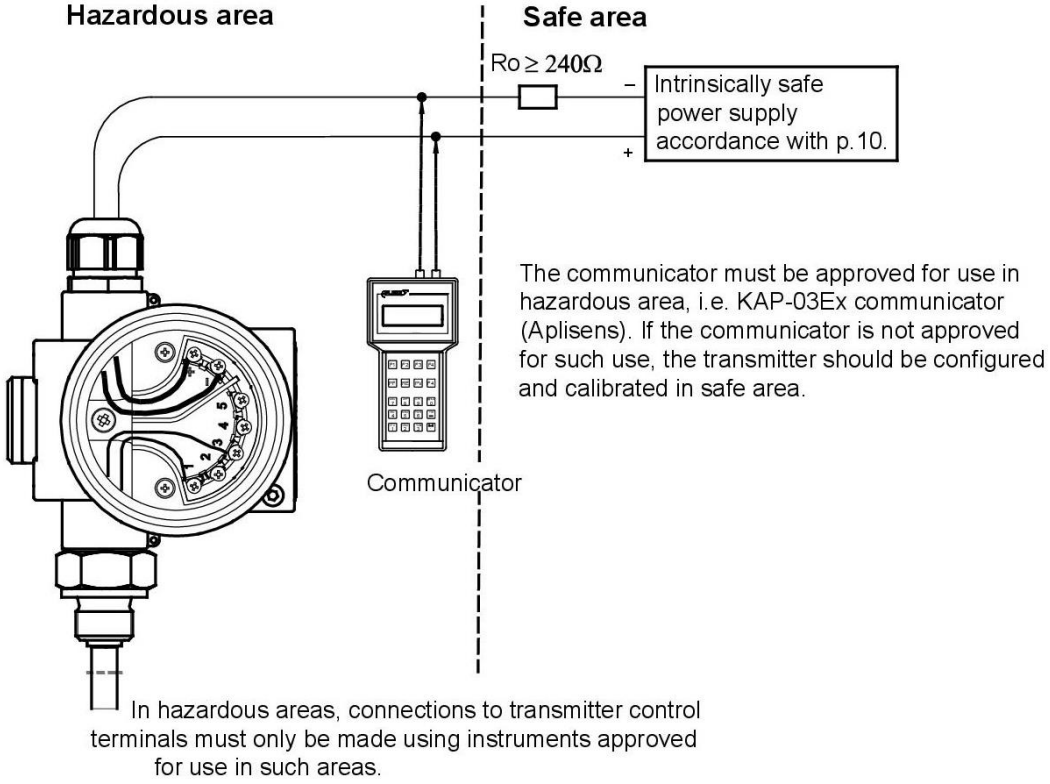


Figure 1. 9. Connection of the transmitter in Exi version.

When connecting the transmitter to the electrical system, the type and diameter of the connection cable should correspond to the cable gland installed. Compact cables of circular cross-section, shielded or non-shielded, with or without a protective layer, in tubes from non-absorbent elastomer such as soft PVC should be used, e.g. YKSLY 2*1, YnTKSYekw 1*2*1, LIYCY 2*1. Cables should be laid in e.g. cable trays, protective tubes, cable ducts, firmly attached, etc. to protect them from mechanical damage.

"Version SA" transmitters should be supplied from devices equipped with galvanically isolated power supply. If galvanically isolated power supply is not possible, the transmitter or metal parts connected to it should be properly grounded, for instance with an equipotential wiring or an equipotential bonding between the transmitter and the negative pole of power supply barrier.

In order to secure the side covers against loosening, unscrew the hex socket screws pressing the screw heads against the edges of the covers.

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

On account of the material of the enclosure (a light alloy with a high percentage of aluminum) user is required to ensure that the transmitter is not exposed to mechanical damage of the enclosure at the place of installation. If the transmitter is to be used for measurements in the presence of strong chemical agents, an enclosure made of steel 1.4401 (316) is recommended.

The transmitter's enclosure is provided with two openings for threaded (M20x1.5 or 1/2 NPT). Upon consulting with the manufacturer, customer may purchase a transmitter with or without a cable gland. Typically, transmitters supplied to customers are not provided with cable glands. A transport plug is installed in the cable gland place. In such case, the transport plug should be removed and appropriate cable gland installed (Figure 1.10) before the transmitter is installed. If such transmitter is delivered without a cable gland, the customer is obliged to install a cable gland with at least IP66 protection and operation temperature range suitable for the installation site. In transmitters used in dust explosion zones, the cable glands installed by the customer should be certified and have a designation proper to dust zones where the transmitters are used. As a blinding plug, an Aplisens plug supplied with the transmitter can be used. With cable glands ½" NPT, use LOCTITE 577 or SWAK MS-PTS-50. When connecting, make sure that the cable type and diameter is suitable for the cable gland used and temperature in the installation site.

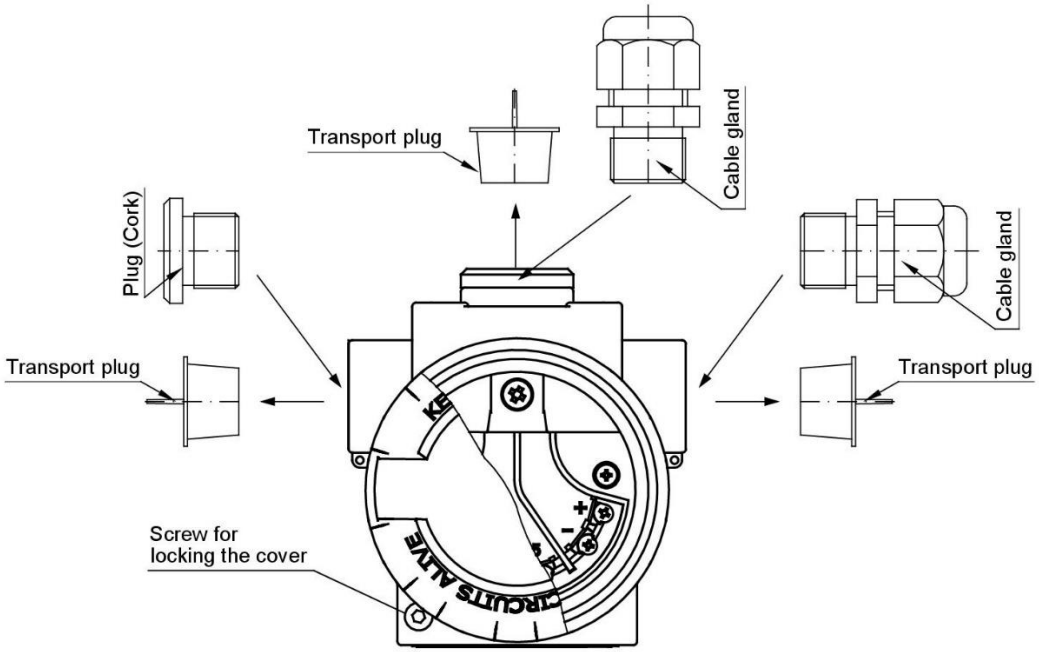


Figure 1. 10. Installation of cable entries and blinding plugs (example).

During routine inspections it should be checked that covers, cable glands and cable connectors are properly tightened. It should be checked if the enclosure and cable show no sign of mechanical damage and if the rating plate is legible. The condition of the sensor and cover should also be checked on a regular basis and it must not show any sign of damage. During maintenance the threads in covers should be lubricated using acid-free vaseline.

The general rules for connecting and using Exi transmitters should conform to the rules and standards for equipment with an intrinsically safe enclosure (as specified in chap. 1. p. 8.1), including:
EN 60079-14: Explosive atmospheres. Electrical installations design, selection and erection.
EN 60079-17: Explosive atmospheres. Electrical installations inspection and maintenance.

CHAPTER 2. FLAMEPROOF CONSTRUCTION Ex d

1. INTRODUCTION

Chapter 2 of the manual applies only to the transmitters of the series: LI-24ALW, LI-24ALW Safety in explosion-proof version: flameproof Exd.
The manual contains the most important information related to the flameproof version of the transmitters in accordance with the ATEX Directive and IECEx requirements. When installing and using the explosion-proof transmitters, refer to this explosion-proof device instruction EN.IX.LI.24.ALW and, additionally, the EN.IO.LI.24.ALW instruction manual.

2. SAFETY

- The installation and commissioning of the transducer and any operation should only be carried out after careful reading of this user manual.
- 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 transmitters. If the device is malfunctioning, disconnect it.

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

3. COMPLETE DELIVERY CHECKLIST

The user receives the following with the transmitter

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

Items b), c), d), e) are available at www.aplisens.pl

4. IDENTIFICATION MARKS

Ex transmitters are delivered with a nameplate containing specific data:

1. Logo or manufacturer's name;
2. CE mark;
3. Notified body number;
4. Product QR code;
5. Transmitter type;
6. Measuring range;
7. Supply voltage value;
8. Permissible range of ambient temperature;
9. Output signal;
10. Type of measuring sensor (measuring element);
11. Sensor version;
12. Type of process connector;
13. Electrical connection cable entry thread;
14. Serial number;

15. Year of manufacture;
16. Caution" symbol. See the relevant information in the user's manual;
17. IP protection rating;
18. Identification of the explosion-proof version type. (see **ch.2, no. 8.2)**;
19. Manufacturer's address;
20. Input signal (types of measuring inputs).

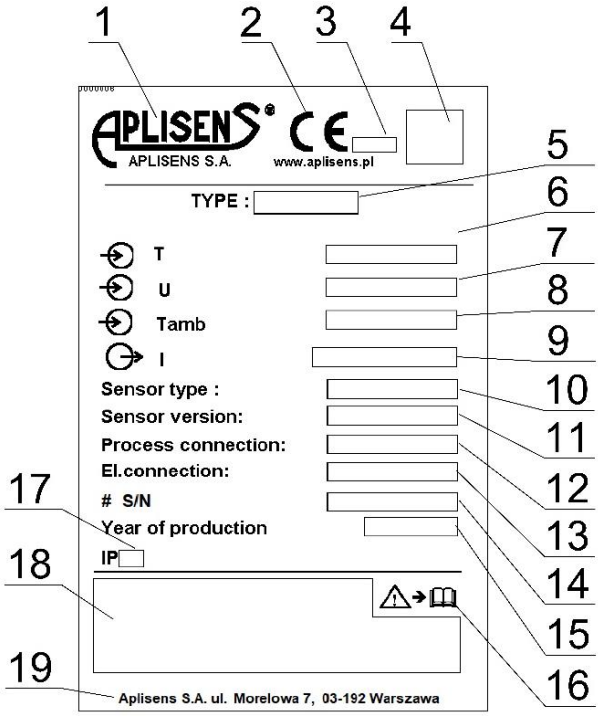


Figure 2. 1. An example of a nameplate for a transmitter with a direct sensor.

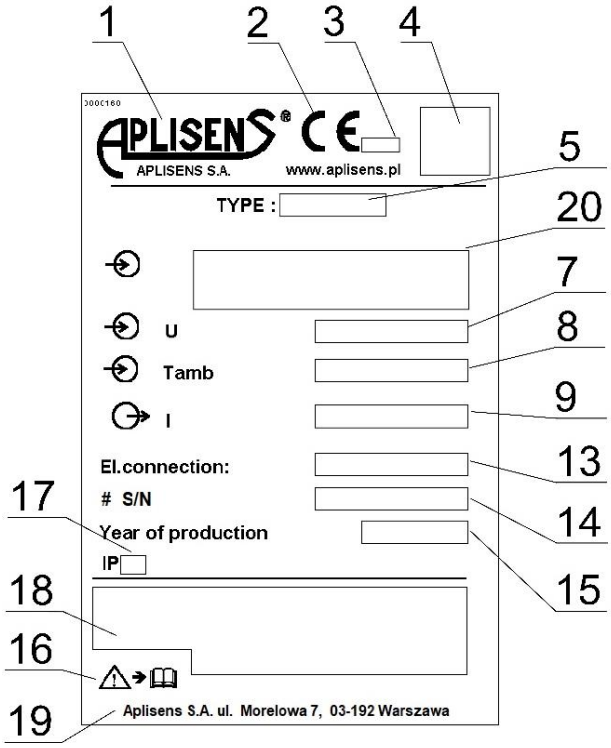


Figure 2. 2. An example of a transmitter nameplate without sensor for mounting with an external independent remote or direct sensor.

5. TRANSMITTER DESIGN

The transmitter housing is made of die-cast aluminum alloy or steel 1.4401 (316). It consists of a body and two screw-on covers, one of which is equipped with a glass. A transmitter enclosure has holes for installing a cable entry with M20x1.5 or ½"NPT thread. Exd certified cable glands should be used. The housing is equipped with an internal and external earth terminal. Inside the casing there is an electronic system transforming the signal from the measuring sensor into a unified output signal. Depending on the transducer type, the following ways to connect the transducer to the sensor are possible: remotely (connection with a cable), or directly (temperature sensor pre-assembled with the transducer).
Transmitters in aluminum enclosures are allowed for II and III group, and transmitters in steel enclosures are allowed for I, II and III group.

6. ELECTROSTATIC HAZARDS

The paint, plastic nameplate is a non-conducting layer applied on a conducting base of an enclosure. Transmitters with this design in a dust-explosion zone should be installed in a place where electrostatic charging is impossible, in particular by contact with electrically charged dust falling off or blown from neighboring devices. When performing connection and maintenance activities in the hazardous area, the possibility of electrostatic discharge should be eliminated. Do not wipe the transmitter dry.

7. SPECIAL CONDITIONS FOR SAFE USE

- Temperature class transmitter with temperature sensor installed directly (T** for gas) or the maximum surface temperature (T* for dust) depends mainly on the process temperature (temperature-controlled medium) and methods of installation on site and should be determined according to chapter 2 point 10.3 .
- In hazardous zones of dust explosion, transmitters with painted aluminum enclosures, as well as transmitters equipped with plastic marking plates should be installed in a way that prevents electrostatic charging, in accordance with ch.2 p.6.
- Some of the permitted gaps in flameproof joints are smaller and width of the flameproof joints are greater than the one specified in table 3 EN 60079-1. The relevant information for the user are included in ch.2. p.11.

8. EX MARKING

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 60079-1:2014; (IEC 60079-1:2014 ed. 7.0),
EN 60079-11:2012; (IEC 60079-11:2011 ed. 6.0),
EN 60079-31:2014; (IEC 60079-31:2013 ed. 2.0).

8.2. Explosion-proof marking of transmitters in accordance with the ATEX Directive and IECEx requirements

Transmitter type	Marking the type of explosion-proof construction, marking of the certificate	
	ATEX	IECEx
LI-24ALW without sensor (for mounting an external remote sensor)	II 2(1)G Ex db [ia Ga] IIC T5/T6 Gb II 2(1)D Ex tb [ia Da] IIIC T100ºC/T85ºC Db I M2 Ex db [ia Ma] I Mb (with 1.4401 (316) enclosure only)	Ex db [ia Ga] IIC T5/T6 Gb Ex tb [ia Da] IIIC T100ºC/T85ºC Db Ex db [ia Ma] I Mb (with 1.4401 (316) enclosure only)
(for mounting an external direct sensor)	II 2G Ex db IIC T**/T5/T6 Gb II 2D Ex tb IIIC T*/T100ºC/T85ºC Db I M2 Ex db I Mb (dla wersji z obudową ze stali 1.4401 (316)) KDB 14 ATEX 0118X	Ex db IIC T**/T5/T6 Gb Ex tb IIIC T*/T100ºC/T85ºC Db Ex db I Mb (dla wersji z obudową ze stali 1.4401 (316)) IECEx KDB 15.0005X

LI-24ALW with direct sensor by Aplisens	II 2G Ex db IIC T**/T5/T6 Gb II 2D Ex tb IIIC T*/T100ºC/T85ºC Db I M2 Ex db I Mb (with 1.4401 (316) enclosure only) KDB 14 ATEX 0118X	Ex db IIC T**/T5/T6 Gb Ex tb IIIC T*/T100ºC/T85ºC Db Ex db I Mb (with 1.4401 (316) enclosure only) IECEx KDB 15.0005X
LI-24ALW Safety without sensor (for mounting an external remote or direct sensor)	II 2G Ex db IIC T**/T5/T6 Gb II 2D Ex tb IIIC T*/T100ºC/T85ºC Db I M2 Ex db I Mb (with 1.4401 (316) enclosure only) KDB 14 ATEX 0118X	Ex db IIC T**/T5/T6 Gb Ex tb IIIC T*/T100ºC/T85ºC Db Ex db I Mb (with 1.4401 (316) enclosure only) IECEx KDB 15.0005X

For the temperature of the medium Tm> Ta, the temperature class T** of the transmitter for gases and the maximum surface temperature T* in the presence of combustible dust depends on the temperature of the medium. The LI-24ALW transmitter, which is sold without a sensor, has two markings on the rating plate: the marking for a transmitter with a connected cable temperature sensor and the marking with a direct sensor. The marking of the transmitter in this case depends on the type of the connected sensor.

9. TRANSMITTERS IN EXPLOSION HAZARD AREA

9.1. LI-24ALW transmitter in explosion hazard zone

EPL protection level [Ga], Gb and [Da], Db and device category 2 (1) G and 2 (1) D means that the transmitter can be installed in hazardous zones 1 and 21 or 2 and 22, and the cable temperature sensor can be installed in zones 0 and 20.
The transmitters designed for Mb mines must be disconnected from the power supply in the event of an explosive atmosphere.
The temperature class of the transmitter with a cable temperature sensor for the gases and the maximum permissible surface temperature in the presence of combustible dust is defined as in chapter 2. p.10.3 and in accordance with the specifications (shown in the User Manual) of the temperature sensor.

The LI-24ALW transmitters designed for use with a independent sensor are provided with an intrinsically safe output on the sensor's side.
Sensors installed in the zone '0' should meet the following requirements:

- for a "simple apparatus" – according to section 5.7 in EN 60079-11:2012;
- the requirements relating to the operating parameters, e.g. resistance to operating pressure, temperature, resistance to chemical and mechanical stress.

A cable temperature sensor that meets the above requirements can be purchased either from Aplisens or another manufacturer. In the dust explosion hazard zone, cable temperature sensors installed by the recipient should be certified and have a marking appropriate to the zone in which they will be used.

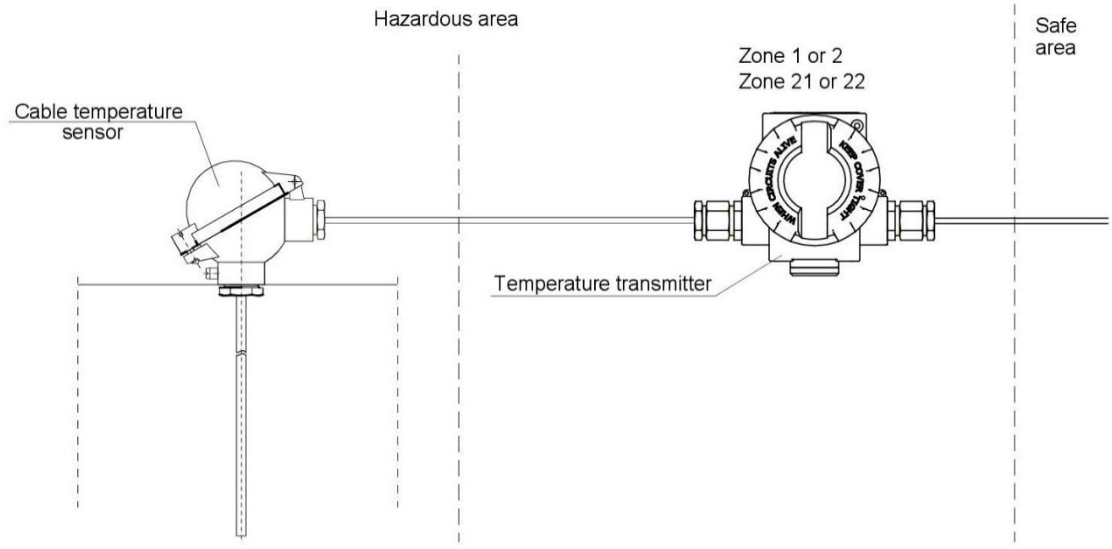


Figure 2. 3. LI-24ALW temperature transmitter with a cable temperature sensor.

It is allowed to install certified Exd direct sensors with the marking appropriate to the zone in which they will be used, ensuring a protection degree of at least IP 66.

When a sensor screwed into the housing from Aplisens is installed, the entire transmitter with the sensor has the EPL Gb and Db protection level and 2G and 2D category, which means that the transmitter with the process connection (sensor) can be installed in hazard zone 1 and 21 or 2 and 22 (Fig. 2.4). The transmitters designed for Mb mines must be disconnected from the power supply in the event of an explosive atmosphere.
Temperature class T** of the transmitter with a direct sensor for gases and the maximum surface temperature T* in the presence of combustible dusts depends on the temperature of the medium; see chapter 2. p.10.3 and chapter 2. p. 10.3.1.

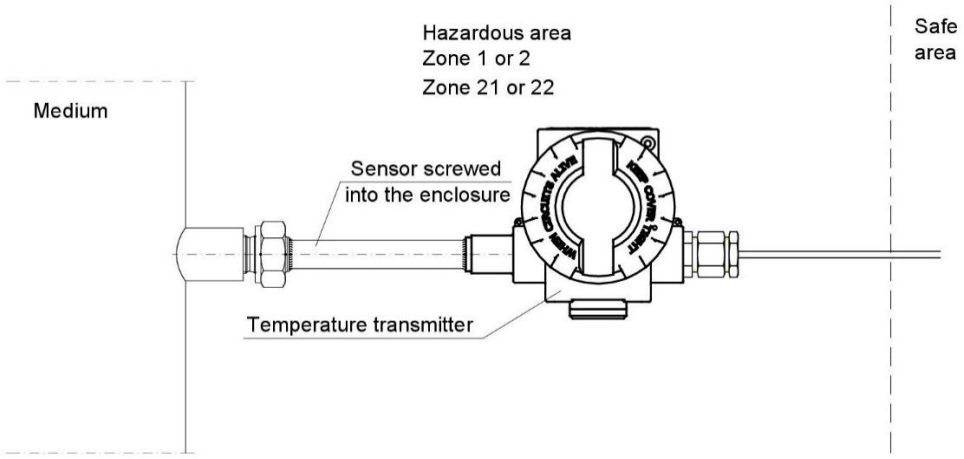


Figure 2. 4. LI-24ALW temperature transmitter with a sensor screwed into the enclosure.

Types of sensors for direct mounting with a transmitter proposed by Aplisens: WOGN, WOGB, WRGN, WRGB (according to the current catalog card).

9.2. LI-24ALW Safety transmitter in explosion hazard zone

The LI-24ALW Safety transmitter is delivered without a sensor as a standard. The user should install a certified flameproof sensor with a marking appropriate to the zone in which the sensor will be used, ensuring a degree of protection of at least IP 66 (Fig. 2.5). The transmitters designed for Mb mines must be disconnected from the power supply in the event of an explosive atmosphere.

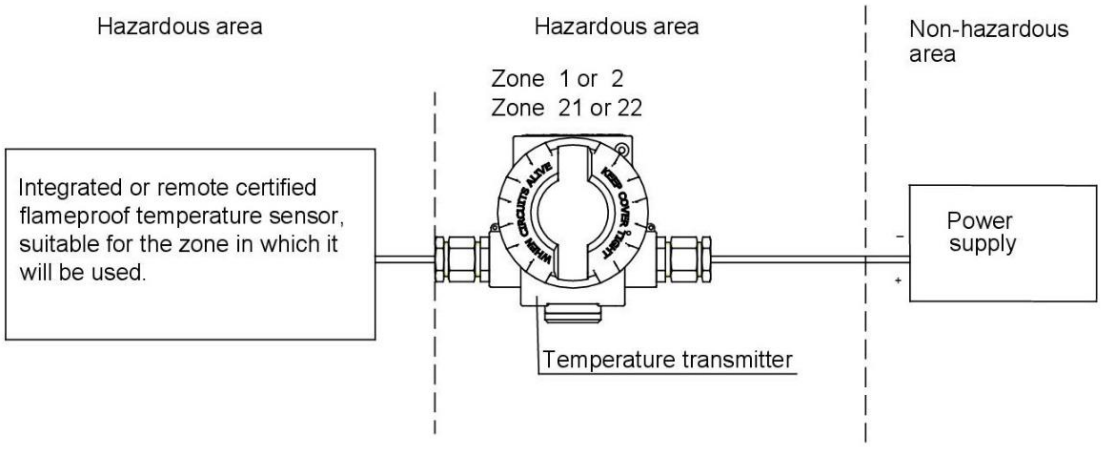


Figure 2. 5. Temperature transmitter LI-24ALW Safety with a cable temperature sensor or with a sensor screwed into the enclosure.

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).

A transmitter enclosure has holes for installing a cable entry with M20x1.5 or 1/2 NPT thread. If such a transmitter has been delivered without a cable gland, the customer is obliged to install certified cable glands and blanking plugs with the appropriate marking for the zones in which the transmitters are used, with a protection degree of at least IP66 and the operating temperature range appropriate for the place of installation.

10. PERMISSIBLE PARAMETERS OF TRANSMITTERS

10.1. Power supply

Connections between the transmitter and other devices in the transmitter's measuring loop should be made in accordance with the applicable standards and the conditions for use in hazardous areas. Failure to follow the rules may cause an explosion and the resulting hazard to people.

Transmitters should be supplied with voltage accordance with the table below (nominal voltage 24 VDC) from a transformer based PSU or other devices ensuring at least reinforced insulation between primary and secondary winding where the maximum voltage does not exceed 250 VAC. The responsibility to ensure power supply in accordance with the above requirements lies with the user.

Table 2. 1. Supply voltage for transmitters Exd.

Type transmitter	Maximum supply voltage
LI-24ALW	45 V DC
LI-24ALW Safety	36 V DC

10.2. The permissible output parameters for the transmitters with a cable temperature sensor

Intrinsically safe the permissible output parameters for the transmitters **LI-24ALW** with a cable temperature sensor:
Uo=6,6 V; Io=9,8 mA; Po=14,5 mW; Lo=400 mH; Co=3,5 µF (dla IIC), Co=480 µF (dla IIB), Co=1000 µF (dla IIA i I).
The Exd flameproof sensor should be used in the **LI-24ALW Safety** transmitters. Sensor supply voltage max. 6V.

10.3. Permissible ambient temperature range and temperature classes

Table 2. 2. Ambient temperature range and temperature classes for Exd transmitters.

Operating temperature range		Temperature class and maximum surface temperature
Ambient temperature Ta	Process temperature (medium) Tm	
-40 ºC ≤ T_a ≤ 40 ºC	-40 ºC ÷ 40 ºC	T6/T85 ºC
-40 ºC ≤ T_a ≤ 75 ºC	-40 ºC ÷ 75 ºC	T5/T100 ºC

For transmitters with a cable temperature sensor, the temperature class of the transmitter should be read from Table 2. 2.

The temperature class of transmitters with a sensor screwed into the enclosure depends on the input power, the ambient temperature and the temperature of the measured medium. For transmitters used with media temperature Tm ≤ 75°C the temperature class should be taken according to Table 2.2. . The maximum permissible temperature of the medium must not be greater than the ambient temperature Ta. In this case, the maximum surface temperature of the transmitter is 100°C.

10.3.1. Maximum surface temperature for transmitters with a sensor screwed into the enclosure

For transmitters provided with a sensor screwed into the enclosure for measuring temperatures greater than 75°C, the effects of heat transfer from the medium whose temperature is measured to the transmitter should be taken into account by measuring the increase in the transmitter's temperature due to the higher temperature of the medium. The measurement of the operating temperature Tp of the transmitters should be performed according to Chap. 2. p. 10.3.2. The method for defining the temperature class for gases and the maximum surface temperature for combustible dust for the temperature of the medium Tm>75°C is described in Chapter 2. p. 10.3.3. In transmitters with a sensor screwed into the enclosure measuring the temperature not higher than 75 ° C, the temperature class of the transmitter should be read from Table 2. 2.

10.3.2. Measurement of operating temperature Tp of transmitters with a sensor screwed into the enclosure

In the case of transmitters used for the medium temperature measuring at Tm>75°C the temperature of the hottest spot on the connection surface (Tpp) which might be in contact with an explosive atmosphere and the temperature of the enclosure (Tpo) should be measured. The Tpp and Tpo temperatures should be determined for the maximum medium and ambient temperature. When calculating Tpo, ΔTe=20K should be added to account for the effect of additional heat transfer due to the input power in case of malfunction. The higher value of Tpp and Tpo+20K should be taken as the operating temperature of the transmitter (Tp).

10.3.3. The transmitter temperature of the temperature class (T**) for gases and the maximum surface temperature (T*) for combustible dusts.

The temperature of the transmitter temperature class T** for gases should be determined from the following equation:

T** ≥ Tp+5K for temperature classes T5…T6

T** ≥ Tp+10K for temperature classes T1...T4

Tp – operating temperature of the transmitter as determined in chap. 2. p. 10.3.2.

The maximum temperature T* of the transmitter's surface which might be in contact with dust cloud must not exceed 2/3 of the minimum ignition temperature of the dust cloud T_{CL}.

$T^* \geq Tp \qquad T^* = 2/3T_{CL}$

T_{CL} – the minimum ignition temperature of the expected dust cloud

The maximum surface temperature T* of the transmitter, for a dust layer of 5 mm thickness:

$T^* \geq Tp$, where $T^* = T_{5mm} - 75K$,

T_{5mm} – minimum ignition temperature of a dust layer of 5 mm thickness

The maximum surface temperature of the transmitter in the case of coal dust deposition must not exceed 150°C.

The temperature of the enclosure Tpo during operation must not exceed 80 ºC

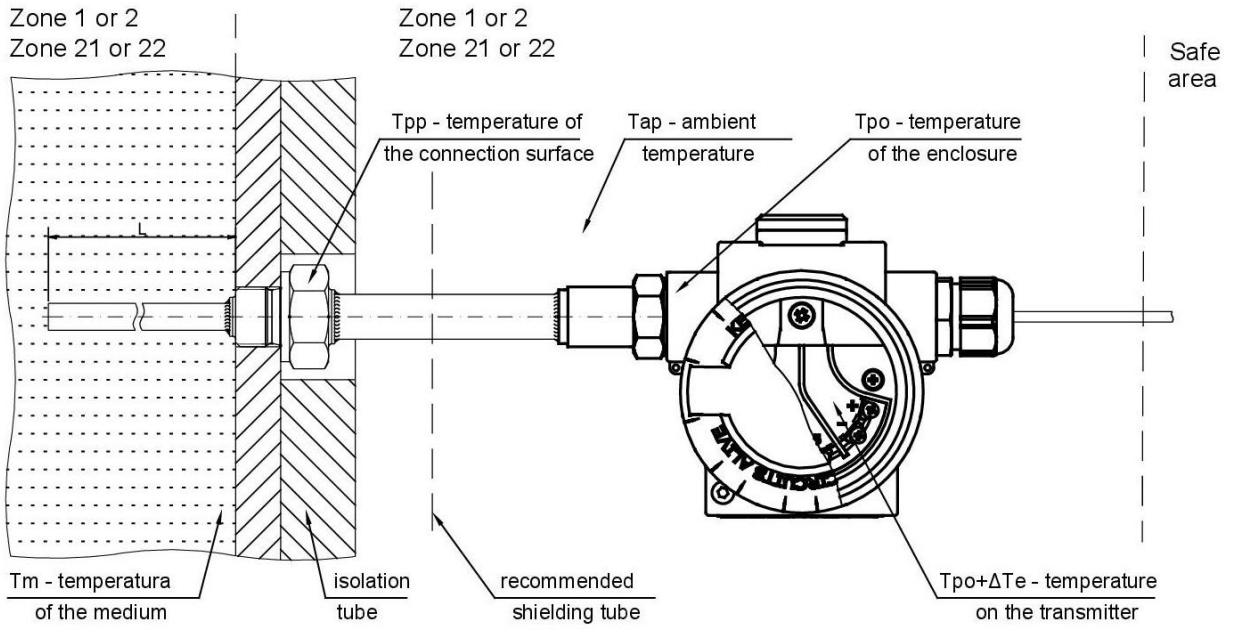


Figure 2. 6. Determination of the temperature of transmitter with sensor screwed into the enclosure.

Note 1:
If the temperature of the medium exceeds the ambient temperature, the temperature class of the sensor or the maximum surface temperature can be taken as the maximum temperature of the medium (Tp) specified for the technological process. In this case it is not necessary to Tp measure.

Note 2:
In case of measurements for non-explosive media, the temperature of the medium can be greater than the temperature of the temperature class or the maximum surface temperature for a given outside explosive mixture, provided that the heat of the medium will not be transferred to any surface of the sensor installed in potentially explosive atmosphere due to the risk of explosion of gases or vapours (in contact with the explosive mixture) above the maximum permissible temperature (Tp) (see chap.2. p. 10.3.2).

System designer is responsible for selecting the sensor and the method of its installation so that the temperature of the hottest surfaces of the transmitter under extreme operating conditions is less than the temperature of the temperature class for a given substance (gas, mist, vapour).

11. CONNECTION AND OPERATION OF TRANSMITTERS

User should read and understand this User Manual before attempting to connect and use the transmitter.

The transmitter should be connected in accordance with the wiring diagram shown in Figure 2.7. In potentially explosive atmosphere the transmitter must only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area. Transmitters should be grounded via a ground terminal. If the transmitter is in contact with metal structural parts or pipes connected to a system of equalization cables, no additional earthing of the transmitter is required.

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

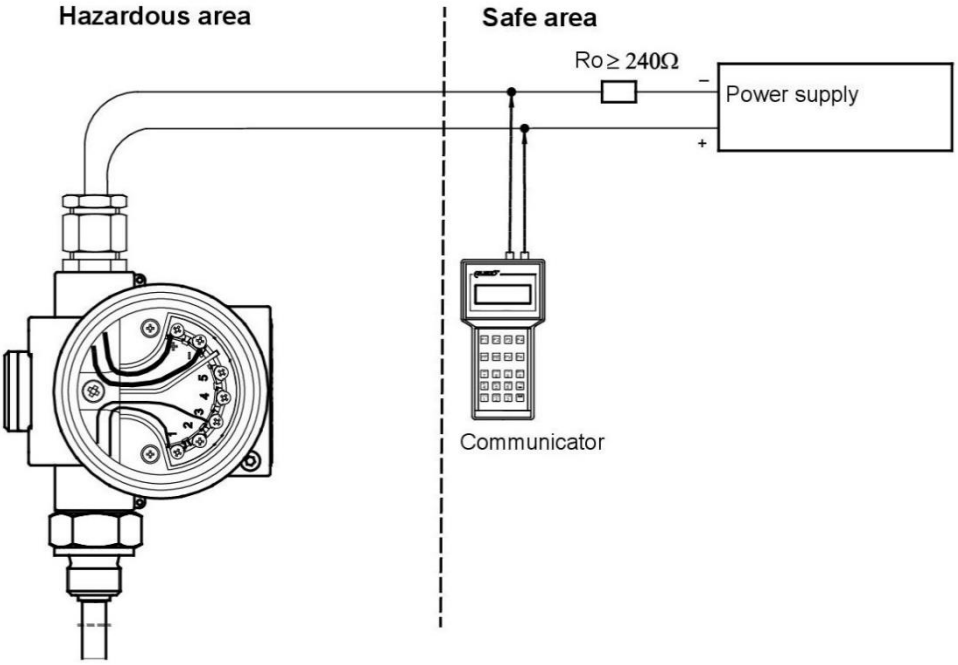


Figure 2. 7. Connection of the transmitter in Exd version.

When connecting the transmitter to the electrical system, the type and diameter of the connection cable should correspond to the cable gland installed. . Compact cables of circular cross-section, shielded or non-shielded, with or without a protective layer, in tubes from non-absorbent elastomer such as soft PVC should be used, e.g. YKSLY 2*1, YnTKSYekw 1*2*1, LIYCY 2*1. If a different cable needs to be used, it should be agreed with the transmitter's manufacturer so that an appropriate cable entry is installed or individually purchase a cable gland suited to the cable used. . The list of equivalent cable entries is given below in Table 2.3.
Cables should be laid in e.g. cable trays, protective tubes, cable ducts, firmly attached, etc. to protect them from mechanical damage.

In the hazardous area, do not unscrew the cover of the powered transmitter and do not connect to the terminals or do not change the position of the local indicator (display).

In order to secure the side covers against loosening, unscrew the hex socket screws pressing the screw heads against the edges of the covers.

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

Due to the type of enclosure material (light alloy with high aluminum content), the user is obliged to ensure that in the transmitter installation site its enclosure cannot be hit and, consequently, damaged. If the transmitter is to be used for measurements in the presence of strong chemical agents, an enclosure made of steel 1.4401 (316) is recommended.

The transmitter's enclosure is provided with openings for threaded (M20x1.5 or 1/2 NPT). Upon consulting with the manufacturer, customer may purchase a transmitter with or without a cable glands. Typically, transmitters supplied to customers are not provided with cable glands. A transport plug is installed in the cable gland place. In such case, the transport plug should be removed and appropriate cable gland installed (Figure 2.8) before the transmitter is installed. It is responsibility of the user to install a certified cable gland compliant with the list of equivalent cable glands in Table 2.3. As a blinding plug, an Aplisens plug supplied with the transmitter or a certified blinding plug compliant with the list of equivalent blinding plugs in Table 2.4 can be used. It is allowed to install other types of certified cable entries and blinding plugs about marking Exd IIC Gb, Extb IIIC Db and Exd I Mb with at least IP66 protection and -40°C...75°C temperature range. If a cable gland is installed by the user, the thread M20x1.5 in the cable gland should be lubricated with LOCTITE 243 or another with appropriate properties before installation to protect it against coming loose. With cable glands ½" NPT, use LOCTITE 577 or SWAK MS-PTS-50. When connecting, make sure that the cable type and diameter is suitable for the cable gland used and temperature in the installation site.

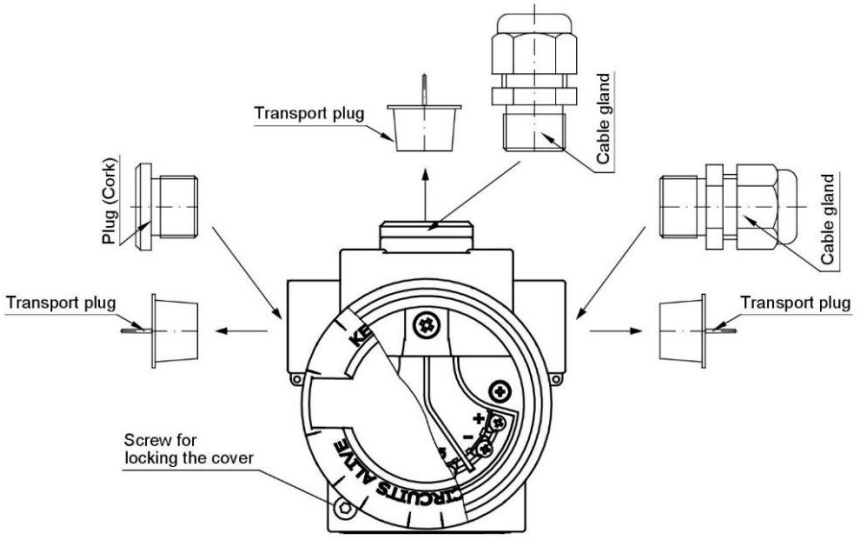


Figure 2. 8. Installation of cable entries and blinding plugs (example).

Table 2. 3. List of equivalent cable entries.

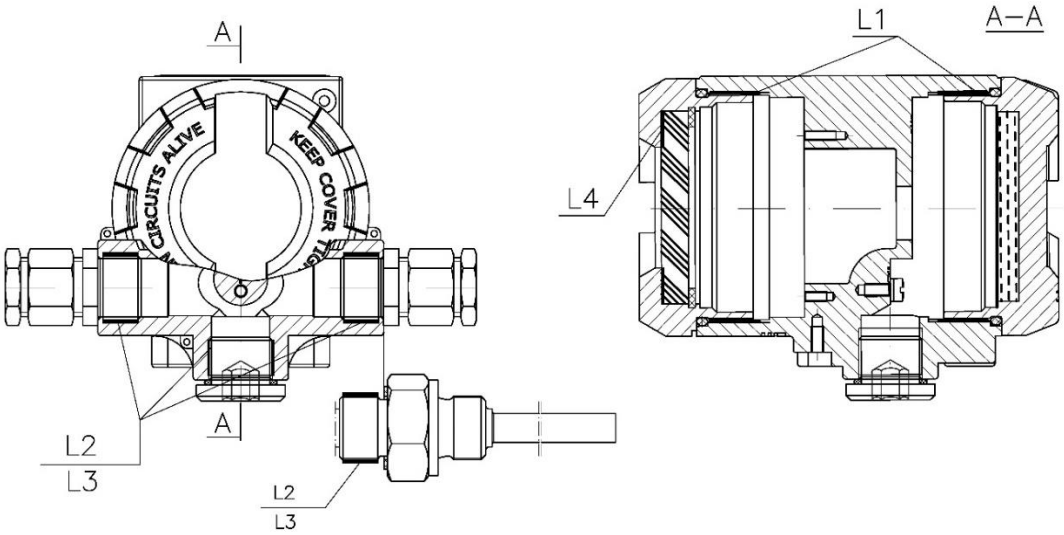
Type of packing glands	Producer	Thread	Marking	IP	Certificate No.
501/423	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 2D Ex tb IIIC Db	66÷68	CML 19ATEX1167X
501/421	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 2D Ex tb IIIC Db	66÷68	CML 19ATEX1167X
ICG 623	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex d IIC Gb II 2D Ex tb IIIC Db	67	Baseefa 06ATEX0058X
501/453/RAC	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 2D Ex tb IIIC Db	66÷68	CML 19ATEX1167X
501/453/Universal	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 2D Ex tb IIIC Db	66÷68	CML 18ATEX1268X
ICG/653/Universal	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 2D Ex tb IIIC Db	66÷68	CML 18ATEX1268X
ICG/653/Universal/L	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 2D Ex tb IIIC Db	66÷68	CML 18ATEX1268X
A2F, A2FRC	CMP-Products	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 1D Ex ta IIIC Da	66÷68	CML 18ATEX1321X
SS2K	CMP-Products	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 1D Ex ta IIIC Da	66÷68	CML 18ATEX1322X
E1FW, E2FW	CMP-Products	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 1D Ex ta IIIC Da I M2 Ex db I Mb	66÷68	CML 18ATEX1324X
PX2K, PXSS2K, PX2KX	CMP-Products	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 1D Ex ta IIIC Da I M2 Ex db I Mb	66÷68	CML18ATEX1325X

Table 2. 4. List of equivalent blinding plugs.

Type of plug	Producer	Thread	Marking	IP	Certificate No.
475	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex d IIC Gb II 2D Ex tb IIIC Db I M2 Ex d I Mb	66	Baseefa 10ATEX0262X
477	Hawke International	M20x1.5 (1/2" NPT)	II 2G Ex d IIC Gb II 2D Ex tb IIIC Db I M2 Ex d I Mb	66	Baseefa 10ATEX0262X
747, 757 i 767	CMP-Products	M20x1.5 (1/2" NPT)	II 2G Ex db IIC Gb II 1D Ex ta IIIC Da I M2 Ex db I Mb	66	CML 18ATEX1320X

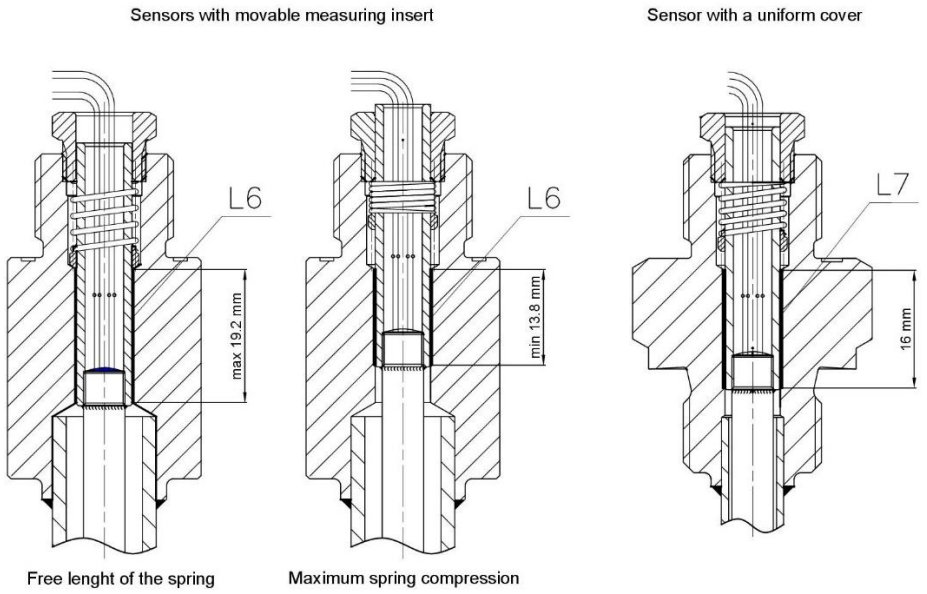
For sensors WRGB and WOGB from Aplisens, provided only with a measuring insert protection, additional process shields OG2, T1, SW1, SW2, SW1T, SW2T or an additional user shield with walls ≥1 mm thick should be installed. The need to install an additional user shield is indicated in an information label.

During routine inspections it should be checked that covers, cable glands and cable connectors are properly tightened. It should be checked if the enclosure and cable show no sign of mechanical damage and if the rating plate is legible. The condition of the sensor and cover should also be checked on a regular basis and it must not show any sign of damage. During maintenance the threads in covers should be lubricated using acid-free vaseline.
Data on the flameproof joints are given in Fig.2.9 and Fig. 2.10.



Flameproof joints for group IIC						
No	Length of joint (min. actual) L [mm]	Diameter		D-d [mm]	Quantity of joint	Comments (minimum values acc. to PN-EN 60079-1)
		D [mm]	D [mm]			
L1	12	M72x1,5	M72x1,5		2	min. 5 threads engaged (8)
L2	9	M20x1,5	M20x1,5		3	min. 5 threads engaged
L3	12,7	1/2NPT	1/2NPT		3	min. 5 threads on each surface
L4	10				1	cemented joint min. joint lenght 10mm

Figure 2. 9. Flameproof joints of transmitter.



List of the flameproof joints					
No	Length of joint (min. actual) L [mm]	Diameter		D-d [mm]	Comments (minimum values acc. to PN-EN 60079-1)
		D [mm] (hole)	d [mm] (roller)		
L6	min. 13,8 max 19,2	$ø8^{+0,058}$	$ø8\ ^{+0,040}_{-0,076}$	0,134	Length of joint min. 12,5mm max. gap 0,15 mm
L7	16,0	$ø8^{+0,058}$	$ø8\ ^{-0,076}$	0,134	Length of joint min. 12,5mm max. gap 0,15 mm

Figure 2. 10. The flameproof joints of the temperature sensors.

The general rules for connecting and using Exd transmitters should conform to the rules and standards for equipment with flameproof enclosures (as specified in chap. 2. p. 8.1), including:
EN 60079-14: Explosive atmospheres. Electrical installations design, selection and erection.
EN 60079-17: Explosive atmospheres. Electrical installations inspection and maintenance.

Due to the risk of damage, the transmitter must be protected against heating to temperatures above 80°C, also if there is no explosion risk.

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
0	01.A.001/2021.02	Initial document version. Prepared by DCF.
1	01.B.001/2021.12	Change of ATEX and IECEx (Exi) marking.