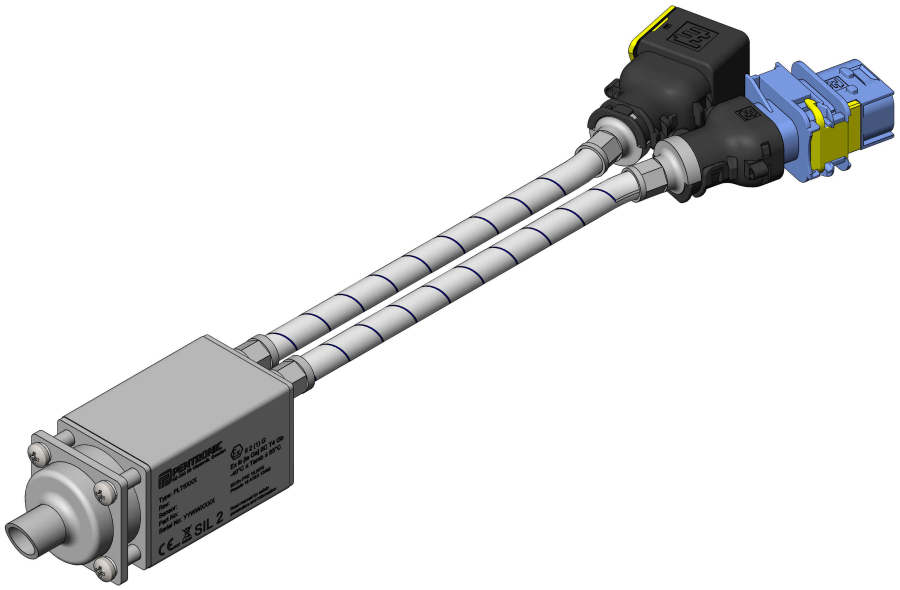
Safety instructions

PLB5000 Temperature transmitter

PLT5397, PLT5396, PLT5167



Rev 2

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1.1 Technical and commercial support

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1.2 About Pentronic AB

Pentronic is one of Europe's largest manufacturers of industrial temperature sensors. In Scandinavia Pentronic is the leading supplier of equipment for temperature measurement to industry, research and education. Pentronic manufactures temperature sensors in its own facility, primarily Pt100 and thermocouples.

Pentronic collaborates with world leading manufacturers of calibration equipment, measurement and control instrumentation, optical temperature measurement and measurement equipment for moisture, thickness and flow.

1.3 Document history

See table 1.1 for correlation between product revision of the PLT5397, PLT5396 and PLT5167 transmitter and the revision of this document. To locate the product revision of the transmitter see section 4.

Table 1.1: Document history

Document number	Document revision	Release date	Revision notes	Product revision
7-5-0-1-1/643	1 (56914)	2019-08-28	First release	1.0.X
7-5-0-1-1/643	2 (76240)	2025-06-19	Minor updates	1.0.X

2 Introduction

2.1 Scope and purpose

The Ex safety instruction manual must be read and used by qualified personnel during installation and commissioning of the PLT5397, PLT5396 and PLT5167 transmitter. These instructions are provided as an addendum to the standard product manual.

The safety instructions in this document apply to PLT5397, PLT5396 and PLT5167 transmitter with IECEx approval **IECEx PRE 18.0070** and ATEX approval **Presafe 18 ATEX 13492**.

2.2 Documentation, standards and directives

The safety instructions shall be read in conjunction with the product documentation stated in table 2.1.

Table 2.1: Product documentation

Document
PLT5397 SIL Safety manual
PLZ5291 Ex Safety instructions
PLG5465 Ex Safety instructions

The PLT5397, PLT5396 and PLT5167 transmitter adhere to the directives and standards stated in table 2.2 and table 2.3.

Table 2.2: Associated directives

Directive	Title
2014/30/EU	DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electro-magnetic compatibility
2014/34/EU	DIRECTIVE 2014/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
2011/65/EU	RoHs DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, as amended by Directive (EU) 2015/863

Table 2.3: Associated standards

Standard	Title
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements– Part 1: General requirements
IEC 61326-3-1:2008	Electrical equipment for measurement, control and laboratory use - EMC requirements- Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications
EN 55011:2009	Industrial, scientific and medical equipment - Radio frequency disturbance char-acteristics - Limits and methods of measurement with amendment EN 55011:2009/A1:2010
IEC 60079-0:2017	Explosive atmospheres – Part 0: Equipment – General requirements
EN 60079-0:2012/A11:2013	Explosive atmospheres – Part 0: Equipment – General requirements
IEC 60079-11:2011	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety ”i”

3 General information

The Pentronic PLT5397, PLT5396 and PLT5167 transmitter is an intrinsically safe temperature transmitter designed for industrial use in potentially explosive areas in Zone 1 in accordance with directive 2014/34/EU and IECEx according to classification:

II 2(1) G
EX ib [ia Ga] IIC T4 Gb
-40 °C $\leq T_{amb} \leq$ **+85 °C**

When a transmitter is installed and operated in a hazardous area or if the connected sensors are used in an hazardous area, the general Ex installation regulations IEC/EN 60079-14 as well as these safety instructions must be observed.

3.1 General safety instructions

The following instructions should be observed to ensure safety:

- Ensure that the installation area group and the temperature class comply with the application area rating.
- These operating instructions shall always be available to all persons carrying out installation and operation.
- Before installing ensure there is no visible damage to the device.
- Installation and commissioning of this device shall be performed by qualified personnel.
- Do not operate the transmitter outside the electrical, thermal and mechanical specifications.
- There are no maintenance procedures for the transmitter. The transmitter is completely maintenance free.
- In case of malfunction of the transmitter, the product shall be put out of service immediately. Pentronic AB must be informed when a transmitter is required to be replaced due to failure. Please contact Pentronic AB at quality@pentronic.se and ask for the Product return instructions or visit www.pentronic.se for return form.
- Modifications of the transmitter are not permitted.
- Bus and power shall be applied to the transmitter via the PLB5000 isolation barrier PLZ5291.

4 | Product marking

Information regarding identification, Ex-marking, connection, sensor type etc is located on the transmitter side, see figure 4.1.

Figure 4.1: Product marking of the PLT5397, PLT5396 and PLT5167 transmitter

1. Transmitter type, i.e PLT5167, PLT5396 or PLT5397
2. Product revision of transmitter (unique identification of HW and SW)
   NOTE! Verify that the revision of this document correlates with the revision on the product (see table 1.1)
3. Connected sensor type e.g thermocouple type K (TC K), PT100 4-wire etc
4. Transmitter part number
5. Transmitter serial number
6. Ex-marking

5 Ex safety parameters

All inputs and outputs of the PLT5000 direct mounted transmitter series are intrinsically safe. All Ex safety parameters are listed below.

DC/DC Supply bus 1 and 2	
U_i:	13.9V
I_i:	1.26A
P_i:	5.3W
C_i:	1nF
L_i:	0uH

Sensor circuit 1 - 3	
U_o:	5.88V
I_o:	44.5mA
P_o:	65.4mW
C_o:	18.5uF
L_o:	17.9mH
R_i:	132.26Ω

PLB Bus 1	
U_i, U_o:	4.02V
I_i, I_o:	45.1mA
P_i, P_o:	45.3mW
C_o:	509uF
L_o:	17.4mH
R_i:	89.3Ω
C_i:	25.91uF
L_i:	0uH

PLB Bus 2	
U_i, U_o:	4.02V
I_i, I_o:	45.1mA
P_i, P_o:	45.3mW
C_o:	528uF
L_o:	17.4mH
R_i:	89.3Ω
C_i:	6.65uF
L_i:	0uH

6 Installation

In addition to requirements in this document, requirements of installation instructions IEC/EN 60079-14 must be observed.

6.1 Ambient temperature

The transmitter is certified for temperature class T4 with an ambient temperature between -40 C°and +85 C°. Ensure that the transmitter complies with the expected environmental limits of the application and that ambient temperature of the application is within this limits.

6.2 Supply and databus connection via PLZ5291

The transmitter shall only be used with the PLB5000 isolation barrier PLZ5291 which provides a safe supply and data bus.

6.3 Grounding

The transmitter shall be grounded at the installation point and directly to the exterior steel sensor measurement probe. The transmitter shall be isolated from incoming bus cables and should not be bonded over the HDSCS connectors.

6.4 Sensor

The sensor input channels of the transmitter requires infallible separation between each other, hence this requirement must be taken into account for the connected sensors (measurement probe and connection cable).

Insufficient separation between sensors may lead to an increase of output voltage or capacitance, both which can invalidate compliance with IEC 60079-11 and could cause a hazardous situation.

Connected sensors must be analyzed for up to two countable faults and any number of non-countable faults. Note that no combination of these faults shall result in that the sensors will be connected in series or in parallel.

Table 6.1 lists distances required for infallible separation and minimum separation which gives rise to a countable fault. Any distance less than the listed separation for one countable fault must be considered a non-countable fault. Separation distances to earthed parts does not need to be considered. Separation can be achieved by choosing one or multiple techniques from table 6.1.

Table 6.1: Infallible separations required between connected sensors.

Type of separation	Infallible separation	Separation one countable fault
Solid insulation	$\geq$ 0.5mm	$\geq$ 0.167mm
Casting compound	$\geq$ 0.5mm	$\geq$ 0.167mm
Clearance	$\geq$ 1.5mm	$\geq$ 0.5mm
Creepage distance	$\geq$ 1.5mm	$\geq$ 0.5mm

Note that this requirement only applies between conductive parts between different sensor and not within the same sensor.

6.4.1 Sensor separation

Figure 6.1 illustrates two sensors (**S1** and **S2**) connected to two input channels. The conductive parts in **S1** requires infallible separation towards the conductive parts in **S2**. Infallible separation between the sensors may be archived if:

- The combined separation through solid insulation is $\geq$ 0.5mm (3).
- If the total separation through solid insulation (3) is less than 0.5mm, installation must guarantee a clearance of $\geq$ 1.5mm ((1) for non conductive sheathing, (2) for conductive sheathing).

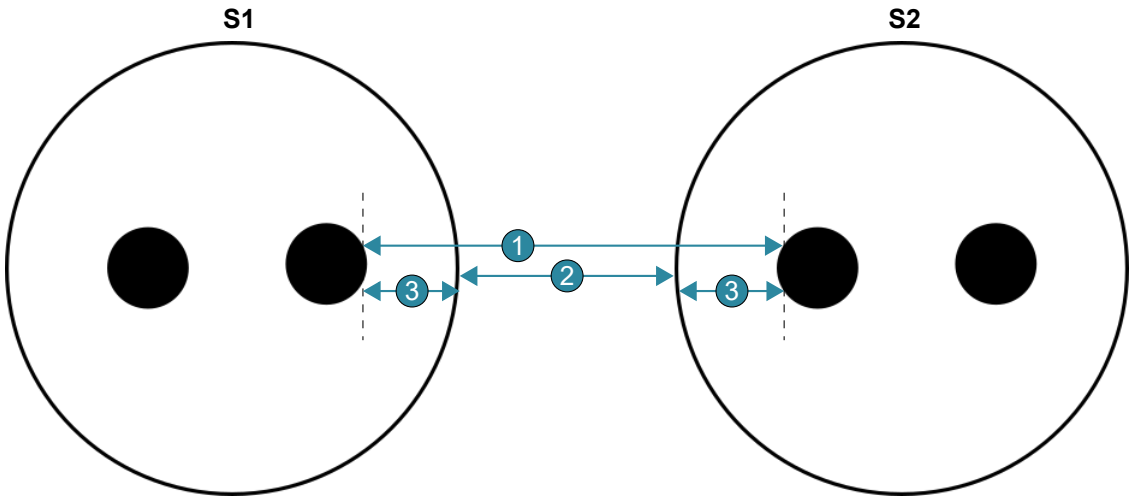

Figure 6.1: Infallible sensor separation

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