



Urząd Dozoru Technicznego

UDT-CERT

# CERTIFICATE

No. 940/CW/001

Office of Technical Inspection  
Product Certification Body UDT-CERT

certifies that

temperature transmitter

LI-24L Safety ID: 0003 0005 0003 XXXX XXXX XXXX XXXX XX<sup>1)</sup>

temperature transmitter

LI-24G Safety ID: 0004 0006 0003 XXXX XXXX XXXX XXXX XX<sup>1)</sup>

<sup>1)</sup> X manufacturer's designation in the ID code, not related to the certificate

manufactured by

**APLISENS S.A.**

**ul. Morelowa 7**

**03-192 Warszawa**

satisfy the requirements of the standards:

**PN-EN 61508:2010 parts 1 ÷ 7**

**PN-EN 61511-1:2017-07 + PN-EN 61511-1:2017-07/A1:2018-03**

**PN-EN 62061:2008 + PN-EN 62061:2008/A1:2013-06 + PN-EN 62061:2008/A2:2016-01**

for safety integrity level

**up to and including SIL 3, with a tolerance of hardware HFT=1 according to Route 1<sub>H</sub>**

**up to and including SIL 2, with a tolerance of hardware HFT=0 according to Route 1<sub>H</sub>**

and satisfy the requirements of systematic integrity

**up to and including SC3 according to Route 1<sub>s</sub>**

**Reliability parameters of certified products are presented in the Annex  
to the Certificate.**

**The products can be used in safety-related systems that meet the requirements up to and including  
SIL 3. SIL verification of a safety-related system is the responsibility of the system integrator.**

The conditions for issue and validity of the Certificate are specified in the Annex.

Date of issue: **10.01.2020**



Director of Certification and Conformity  
Assessment Department

Jacek Niemczyk

**OFFICE OF TECHNICAL INSPECTION**  
**Product Certification Body UDT-CERT**  
**Annex, edition I dated 10.01.2020**  
**to the Certificate No. 940/CW/001**

1. Information on the certified product:

1.1. Category, type, brand or trade name:

temperature transmitter

LI-24L Safety ID: 0003 0005 0003 XXXX XXXX XXXX XXXX XX

temperature transmitter

LI-24G Safety ID: 0004 0006 0003 XXXX XXXX XXXX XXXX XX

1.2. Basic technical data:

Power supply	LI-24L Safety	10 V DC ÷ 36 V DC
	LI-24G Safety	10 V DC ÷ 36 V DC
Ambient temperature	LI-24L Safety	- 40°C ÷ 85°C
	LI-24G Safety	- 40°C ÷ 85°C
Input signal	Resistance sensor, thermocouple, resistance, voltage	
Output signal	4...20 mA + HART rev.5.1	

1.3. Reliability parameters – probability of dangerous random failures.

Reliability data of the rail-mounted temperature transmitter LI-24L Safety.

Sensor configuration	$\lambda_{total}$ FIT	$\lambda_{NE}$ FIT	$\lambda_{SD}$ FIT	$\lambda_{SU}$ FIT	$\lambda_{DD}$ FIT	$\lambda_{DU}$ FIT	SFF %	DC %
1 RTD 2p	721,502	219,665	38,550	11,643	425,222	26,422	94,735	94,150
1 RTD 3p	721,502	218,845	38,550	11,643	426,042	26,422	94,744	94,160
1 RTD 4p	721,502	218,025	38,550	11,643	426,862	26,422	94,752	94,171
2 RTD 2p	721,502	218,025	38,550	11,643	426,862	26,422	94,752	94,171
2 RTD 3p	721,502	216,385	38,550	11,643	428,502	26,422	94,769	94,192
1 TC no CJC	721,502	220,905	38,550	11,643	423,982	26,422	94,722	94,134
1 TC int CJC	721,502	218,545	38,550	11,643	426,132	26,632	94,705	94,118
1 TC ext CJC	721,502	218,025	38,550	11,643	426,862	26,422	94,752	94,171
2 TC no CJC	721,502	219,685	38,550	11,643	425,202	26,422	94,735	94,150
2 TC int CJC	721,502	217,325	38,550	11,643	427,352	26,632	94,718	94,134
2 TC ext CJC	721,502	216,805	38,550	11,643	428,082	26,422	94,765	94,187

Explanation to the table:

X RTD – X resistance sensors;

Xp – X-wire sensors;

TC- thermocouple;

CJC – cold junction compensation (int – with internal / ext – with external temperature sensor).

Reliability data of the head-mounted temperature transmitter LI-24G Safety.

Sensor configuration	$\lambda_{total}$ FIT	$\lambda_{NE}$ FIT	$\lambda_{SD}$ FIT	$\lambda_{SU}$ FIT	$\lambda_{DD}$ FIT	$\lambda_{DU}$ FIT	SFF %	DC %
1 RTD 2p	693,502	204,135	38,550	11,643	412,752	26,422	94,601	93,984
1 RTD 3p	693,502	203,315	38,550	11,643	413,572	26,422	94,610	93,995
1 RTD 4p	693,502	202,495	38,550	11,643	414,392	26,422	94,619	94,006
2 RTD 2p	693,502	202,495	38,550	11,643	414,392	26,422	94,619	94,006
2 RTD 3p	693,502	200,855	38,550	11,643	416,032	26,422	94,637	94,028
1 TC no CJC	693,502	205,375	38,550	11,643	411,512	26,422	94,587	93,967
1 TC int CJC	693,502	203,015	38,550	11,643	413,662	26,632	94,570	93,951
1 TC ext CJC	693,502	202,495	38,550	11,643	414,392	26,422	94,619	94,006
2 TC no CJC	693,502	204,155	38,550	11,643	412,732	26,422	94,601	93,983
2 TC int CJC	693,502	201,795	38,550	11,643	414,882	26,632	94,584	93,968
2 TC ext CJC	693,502	201,275	38,550	11,643	415,612	26,422	94,632	94,023

Explanation to the table:

X RTD - X resistance sensors;

Xp - X-wire sensors;

TC - thermocouple;

CJC – cold junction compensation (int – with internal / ext – with external temperature sensor).

1.4. Intended use of the product:

Temperature transmitters LI-24L Safety and LI-24G Safety are designed for temperature measurements using an external measuring element (resistance sensor or thermocouple) and converting value of temperature to standard current signal  $4 \pm 20$  mA.

2. Technical documentation according to which the tested products were produced:

No.	Name	Modification date
1	LI-24L(G) Safety_Conducted disturbance_RF_Complementary tests.zip	09.12.2019 10:48
2	001.001.001_LI-24L_Safety_LI-24G_Safety_Concept.pdf	16.11.2019 08:52
3	002.001.001_LI-24L_Safety_LI-24G_Safety_Overall scope definition.pdf	16.11.2019 08:52
4	003.001.001_LI-24L_Safety_LI-24G_Safety_Hazard and risk analysis.pdf	16.11.2019 08:52
5	004.001.001_LI-24L_Safety_LI-24G_Safety_Overall safety requirements.pdf	16.11.2019 08:53
6	005.001.001_LI-24L_Safety_LI-24G_Safety_Overall safety requirements allocation.pdf	16.11.2019 08:53
7	006.001.001_LI-24L_Safety_LI-24G_Safety_Overall operation and maintenance planning.pdf	16.11.2019 08:53
8	007.001.001_LI-24L_Safety_LI-24G_Safety_Overall safety validation planning.pdf	16.11.2019 08:54
9	008.001.001_LI-24L_Safety_LI-24G_Safety_Overall installation and commissioning planning.pdf	16.11.2019 08:54
10	009.001.001_LI-24L_Safety_LI-24G_Safety_E/E/PE system safety requirements specification.pdf	16.11.2019 08:55
11	010.001.001_LI-24L_Safety_LI-24G_Safety_E/E/PE safety related systems: realisation.pdf	05.12.2019 11:02
12	010.002.001_LI-24L_Safety_LI-24G_Safety_Description of the degree of current control regulation.pdf	17.10.2019 10:32

No.	Name	Modification date
13	010.003.001_LI-24L_Safety_LI-24G_Safety_Description of the watchdog SIL.pdf	17.10.2019 10:32
14	010.004.001_LI-24L_Safety_LI-24G_Safety_Description of the power supply.pdf	17.10.2019 10:32
15	010.005.001_LI-24L_Safety_LI-24G_Safety_Description of the microcontroller.pdf	17.10.2019 10:32
16	010.006.001_LI-24L_Safety_LI-24G_Safety_Description of the ADC24 converter degree.pdf	17.10.2019 10:32
17	010.007.001_LI-24L_Safety_LI-24G_Safety_Description of the Hart modem degree.pdf	17.10.2019 10:32
18	010.008.001_LI-24L_Safety_LI-24G_Safety_Description of the converter degree.pdf	17.10.2019 10:32
19	010.009.001_LI-24L_Safety_LI-24G_Safety_Analysis of the electrical load of resistors.xls	17.10.2019 10:32
20	010.010.001_LI-24L_Safety_LI-24G_Safety_Assumption and notes on conducting the Fault Insertion Testing.pdf	17.10.2019 10:32
21	010.011.001_LI-24L_Safety_LI-24G_Safety_Fault Insertion Testing technique based on FMEDA analysis.xls	17.10.2019 10:32
22	010.011.002_LI-24L_Safety_LI-24G_Safety_Fault Insertion Testing technique based on FMEDA analysis.xls	16.11.2019 08:50
23	010.012.001_LI-24L_Safety_LI-24G_Safety_FIT technique based on FMEDA analysis for various input configurations.xlsx	17.10.2019 10:32
24	010.013.001_LI-24L_Safety_LI-24G_Safety_Assumptions and the development of the results of the PT100 diagnostic test.pdf	17.10.2019 10:32
25	010.014.001_LI-24L_Safety_LI-24G_Safety_FMEDA analysis.pdf	17.10.2019 10:32
26	010.014.002_LI-24L_Safety_LI-24G_Safety_FMEDA analysis.pdf	16.11.2019 08:50
27	010.015.001_LI-24L_Safety_Mapped FMEDA analysis.xlsx	27.10.2019 22:20
28	010.015.002_LI-24L_Safety_Mapped FMEDA analysis.xlsx	16.11.2019 08:49
29	010.016.001_LI-24G_Safety_Mapped FMEDA analysis.xlsx	17.10.2019 10:46
30	010.016.002_LI-24G_Safety_Mapped FMEDA analysis.xlsx	16.11.2019 08:49
31	010.019.001_LI-24L_Safety_LI-24G_Safety_Tests of built-in software.pdf	22.10.2019 07:16
32	010.020.001_LI-24L_Safety_Technical documentation.pdf	16.11.2019 08:49
33	010.021.001_LI-24G_Safety_Technical documentation.pdf	16.11.2019 08:49
34	010.022.001_LI-24L_Safety_Investigation of the LED diode response to sensor disconnection.doc	16.11.2019 08:49
35	010.023.001_LI-24L_Safety_LI-24G_Safety_Black Box Testing.pdf	05.12.2019 10:55
36	010.017.001_LI-24L_Safety_LI-24G_Safety_Flowchart_Diagrams.zip	13.12.2019 13:05
37	010.017_1.001 List of functions.xlsx	16.11.2019 08:50
38	010.018_1.001_LI-24L_Safety_LI-24G_Safety_Software_Guide.docx	16.11.2019 08:51
39	MPT9_cpuSIL_01.01.04E7.hex	16.11.2019 08:51
40	MPT9_cpuSIL_01.01.04E7.hex.md5	16.11.2019 08:51
41	MPT9_cpu_01.01.04E7.zip	16.11.2019 08:51
42	010.024_1.001 LI-24L_Safety_Electrical tests_Test results.xls	10.12.2019 09:32
43	010.024_2.001 LI-24L_Safety_Electrical tests.pdf	10.12.2019 09:32
44	010.025_1.001 LI-24G_Safety_Electrical tests_Test results.xls	10.12.2019 09:32
45	010.025_2.001 LI-24G_Safety_Electrical tests.pdf	10.12.2019 09:32
46	Certificate of compliance IP 65 of enclosure of head used in temperature sensors.jpg	05.12.2019 11:15
47	Certificate of compliance IP 68 of enclosure of head used in temperature sensors.pdf	05.12.2019 11:15
48	LI-24G_Safety_Electromagnetic field immunity tests.pdf	09.12.2019 10:50
49	LI-24G_Safety_Vibration resistance tests.pdf	10.12.2019 14:15
50	LI-24G_Safety_Electromagnetic compatibility.pdf	05.12.2019 11:15
51	LI-24L_Safety_Electromagnetic field immunity tests.pdf	09.12.2019 10:49
52	LI-24L_Safety_Vibration resistance tests.pdf	10.12.2019 14:15

No.	Name	Modification date
53	LI-24L_Safety_Electromagnetic compatibility.pdf	05.12.2019 11:15
54	011.001.001_LI-24L_Safety_LI-24G_Safety_Other risk reduction measures specification and realization.pdf	16.11.2019 08:58
55	012.001.001_LI-24L_Safety_LI-24G_Safety_Overall installation and commissioning.pdf	16.11.2019 08:58
56	013.001.001_LI_24L_Safety_LI-24G_Safety_Overall safety validation.pdf	16.11.2019 08:58
57	014.001.001_LI-24L_Safety_LI-24G_Safety_Overall operation, maintenance and repair.pdf	16.11.2019 09:00
58	PL.IB.LI.24.I.G.SFT.Edycja.01.A.001.pdf	16.11.2019 09:00
59	PL.IO.LI.24.L.G.SFT.Edycja.01.A.001.pdf	16.11.2019 09:00
60	015.001.001_LI-24L_Safety_LI-24G_Safety_Overall modification and retrofit.pdf	16.11.2019 09:00
61	016.001.001_LI-24L_Safety_LI-24G_Safety-Decommissioning or disposal.pdf	16.11.2019 09:01

3. The certification process of the above mentioned products within range of conformity with the requirements of reference documents specified by the manufacturer has been performed according to the Products conformity certification scheme SIL - type of scheme 5 according to the PN-EN ISO/IEC 17067.
4. The results of the certification process have been recorded in the following documents:
  - Report of the assessment to the application No. 940/CW/2018-001 dated 07.01.2020,
  - Report of verification of the technical documentation of the product to the application No. 940/CW/2018-001 dated 07.01.2020,
  - Report on checking manufacturer's organizational and technical conditions and functional safety management system to the application No. 940/CW/2018-001 dated 28.10.2019,
  - Review of the documentation collected during the certification process and certification decision to the application No. 940/CW/2018-001 dated 10.01.2020.
5. The provisions concerning the supervision of the issued certificate are contained in the Agreement No. 67890/CW/2018 of 19.04.2018 on the certification products.
6. The certificate becomes invalid when the commitments contained in the Agreement No. 67890/CW/2018 of 19.04.2018 on the certification products are not fulfilled.
7. The manufacturer has the right to mark certified products with conformity mark "UDT-CERT SIL". The pattern of the conformity mark and the rules of using the conformity mark are attached to this certificate.
8. The manufacturer receives the Certificate and labelled documentation necessary for identification of the certified products.

Director of Certification and Conformity  
Assessment Department

Jacek Niemczyk