

CERTIFICATE

[1] **EC-TYPE EXAMINATION CERTIFICATE**

[2] Equipment, protective systems and components intended for use in potentially explosive atmospheres. Directive 94/9/EC
(Regulation of the MG from 22.12.2005 Official Journal (Dz.U.) No.263, Item 2203).

[3] EC – type examination certificate

KDB 10ATEX129

[4] Equipment or protective system:

**Analog signals separator type: S1-ExA, S1-ExB, S1-ExBH
S3Ex-S, S3Ex-U, S3Ex-R.**

[5] Manufacturer:

Labor-Aster

H.Gasztold, K.Kalisz, P.Ludwiczak

[6] Address:

ul. Czechowicka 19, 04-218 Warsaw, Poland

[7] This equipment and any acceptable variation thereto is specified in the annex to this certificate and the documents therein referred to.

[8] Central Mining Institute in accordance with Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex number 2 to the Directive 94/9/EC (Chapter 2 of the MG Regulation on 22.12.2005 Official Journal (Dz.U.) No 263, Item 2203).

The examination and test results are recorded in confidential KDB report number 10.176 [T-6667].

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

PN-EN 60079-0:2009, PN-EN 60079-11:2010,
PN-EN 61241-0:2007, PN-EN 61241-11:2007

[10] If the sign “X” is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the annex to this certificate.

[11] This EC-type examination certificate relates only to the design and construction of the specified equipment and protective system in accordance with Directive 94/9/EC. Further requirements of the Directive may apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

[12] The marking of the equipment or protective system shall include the following:



**I (M1) [Ex ia] I
II (1)G [Ex ia] IIC
II (1)D [Ex iaD] 20**

[13]

Annex

[14]

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[15] **Description:**

Separators type S1Ex..., S3Ex... are intermediary devices between intrinsically safe circuits and non-intrinsically safe circuits and provides galvanic separation between them for voltages up to 253V_{AC}. They are designed to be used outside explosion hazardous zone or in flameproof enclosure. Using the transmitter in a flameproof enclosure in explosive group I does not require any additional warning on the cover of flameproof enclosure with built-in separator. When in flameproof enclosure used in explosive group II (IIG or IID) opening the enclosure can occur 10 minutes after the power is turned off.

Electronic equipment of the device is in self-extinguishing polyamide which provides IP20 protection level.

Separators type S1-Ex... are design to convert DC current from the input to the output in the ratio 1:1 with providing galvanic separation.

Technical parameters of S1-Ex... separators:

Supply - from the input signal.

Input signal - current, typically 0/4÷20mA.

Output signal - current, typically 0/4÷20mA.

Protection level: IP20.

Ambient temperature: -25°C ÷ 70°C

1. S1-ExA converts intrinsically safe current signal from devices installed in explosive hazardous zones to current signal for devices in safe zone, one- or two-channel, with galvanic circuits separation between channels and intrinsically safe and non-intrinsically safe circuits for voltages up to 253V_{AC}.

Intrinsically safe input circuits with "ia" protection level:

channel 1 "in1" - terminals "1, 2", channel 2 "in2" - terminals "3, 4":

U_i=30V, I_i=100mA, P_i=1W, L_i~0, C_i~0, U_o=0, I_o=0.

Non-intrinsically safe output circuits with "ia" protection level:

channel 1 "out1" - terminals "5, 6", channel 2 "out2" - terminals "7, 8": U_m=253V_{AC}.

Wiring of intrinsically safe circuits to terminals "in1" and "in2" with one cable is possible only if it is multicore cable type A or B according to IEC 60079-14. In other case separate cables must be used.

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[15] **Description continued:**

2. S1-ExB converts current signal from devices installed in safe zone to intrinsically safe current signal for devices in explosive hazardous zone, one- or two-channel, with galvanic separation between channels and intrinsically safe and non-intrinsically safe circuits for voltages up to 253V_{AC}.

Non-intrinsically safe input circuits:

channel 1 “in1” – terminals “1, 2”, channel 2 “in2” – terminals “3, 4”: Um=253V_{AC}.

Intrinsically safe output circuits with “ia” protection level:

channel 1 “out1” - terminals “5, 6”, channel 2 “out2” – terminals “7, 8”:

see the table below.

Type	U _o [V]	I _o [mA]	P _o [W]	L/R [μH/Ω]			L _o [mH]			C _o [μF]		
				I / IIA	IIB	IIC	I / IIA	IIB	IIC	I / IIA	IIB	IIC
S1-ExB1	25.2	121	0.76	374	187	46	14	8.4	0.64	0.55	0.35	0.067
							0.5	1	0.2	0.7	0.41	0.1
							0.05	0.1	0.1	2.9	0.81	0.107
S1-ExB2	25.2	39.3	0.25	1149	574	143	100	100	21	0.46	0.26	0.067
							20	20	1	0.65	0.42	0.078
							0.02	0.1	0.2	1.8	0.82	0.107
S1-ExB3	25.2	89	0.56	510	255	63	29	17	2.6	0.45	0.38	0.047
							10	1	1	0.72	0.43	0.064
							0.2	0.1	0.2	1.8	0.82	0.107
S1-ExB4	23.1	98	0.57	506	253	63	24	15	2.5	0.54	0.45	0.062
							10	1	0.5	0.8	0.52	0.093
							0.05	0.05	0.1	1.6	1.02	0.14
S1-ExB5	17.2	91	0.39	730	365	91	32	21	4.3	0.83	0.65	0.17
							5	5	2	1.9	1.3	0.29
							0.02	0.02	0.02	3.7	2.11	0.36

Circuits characteristic is linear.

In case of clustered elements L_o, C_o values from the table should be divided by 2.

Wiring of intrinsically safe circuits to terminals “out1” and “out2” with one cable is possible only if it is multicore cable type A or B according to IEC 60079-14. In other case separate cables must be used.

3. S1-ExBH, with HART transmission, supplies and converts intrinsically safe 4÷20mA current from two-wire transmitters with HART transmission installed in explosive hazardous zone to current signal from devices in safe zone, one-channel, transparent for HART transmission, with galvanic separation between intrinsically safe and non-intrinsically safe circuit for voltages up to 253V_{AC}.

Non-intrinsically safe input circuit:

“input” – terminals “1, 2”: Um=253V_{AC}.

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[15] **Description continued:**

Intrinsically safe output circuit with “ia” protection level:

“output” – terminals “5, 6”:

see the table below.

Type	Uo [V]	Io [mA]	Po [W]	L/R [μ H/ Ω]			Lo [mH]			Co [μ F]		
				I / IIA	IIB	IIC	I / IIA	IIB	IIC	I / IIA	IIB	IIC
S1-ExBH1	25.2	121	0.76	374	187	46	14	8.4	0.64	0.55	0.35	0.067
							0.5	1	0.2	0.7	0.41	0.1
							0.05	0.1	0.1	2.9	0.81	0.107
S1-ExBH3	25.2	89	0.56	510	255	63	29	17	2.6	0.45	0.38	0.047
							10	1	1	0.72	0.43	0.064
							0.02	0.1	0.2	1.8	0.82	0.107
S1-ExBH4	23.1	98	0.57	506	253	63	24	15	2.5	0.54	0.45	0.062
							10	1	0.5	0.8	0.52	0.093
							0.05	0.05	0.1	1.6	1.02	0.14

Circuits characteristic is linear.

In case of clustered elements Lo, Co values from the table should be divided by 2.

Separators type S3Ex-... are design to convert current, voltage or resistance changes to normalized value of output current in 4÷20mA range.

Technical parameters of S3-Ex... separators:

Supply – from non-intrinsically safe output circuit, Un=9÷28V.

Output signal – 4÷20mA, two-wire transmission.

Protection level: IP20.

Ambient temperature: -25°C ÷ 70°C

4. S3Ex-S converts any intrinsically safe standard signal (e.g. 0/4÷20mA, 0÷10V etc.) to two-wire non-intrinsically safe 4÷20mA current, with galvanic separation between intrinsically safe and non-intrinsically safe circuit for voltages up to 253V_{AC}.

Intrinsically safe input circuit with “ia” protection level:

“input” – terminals “3, 4”: Ui=30V, Ii=100mA, Pi=0.99W, Li=0.1mH,

Ci=1nF, Uo=5.4V, Io=0.9mA, Po=1.1mW.

Values of Lo, Co (also for clustered elements) and L/R connection cable parameters should be adopted according to the table shown below:

Explosive group	Lo [mH]	Co [μ F]	L/R [mH/ Ω]
I and IIA	200	30	252
IIB	200	30	126
IIC	200	30	31

Characteristic of the circuit is linear.

Non-intrinsically safe output circuit:

“output” – terminals “5, 6, 7”: Um=253V_{AC}.

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[15] Description continued:

5. S3Ex-R converts any intrinsically safe signal from resistance sensors e.g. Pt100, Cu100, Ni100, PTC, NTC, potentiometers etc. to two-wire non-intrinsically safe 4÷20mA current with galvanic separation between intrinsically safe and non-intrinsically safe circuit for voltages up to 253V_{AC}.

Intrinsically safe input circuit with “ia” protection level:

“input” – terminals “1, 2, 3, 4”: U_o=5.4V, I_o=9.9mA, P_o=17mW, L_i=0.1mH, C_i=33nF. Values of L_o, C_o and L/R connection cable parameters should be adopted according to the table shown below:

Explosive group	L _o [mH]	C _o [μF]	L/R [mH/Ω]
I and IIA	100	10	17
	5	18	
	0.05	67	
IIB	100	5.6	8
	5	8.5	
	0.05	32	
IIC	100	1.1	2.2
	5	1.6	
	0.05	4.8	

Characteristic of the circuit is trapezoidal.

Non-intrinsically safe output circuit:

“output” – terminals “5, 6, 7”: U_m=253V_{AC}.

6. S3Ex-U is design to convert low-voltage intrinsically safe signals e.g. from thermocouples to two-wire non-intrinsically safe 4÷20mA current with galvanic separation between intrinsically safe and non-intrinsically safe circuit for voltages up to 253V_{AC}.

Intrinsically safe input circuit with “ia” protection level:

“input” – terminals “3, 4”: U_i=30V, I_i=0.1A, P_i=1W, L_i=0.1mH, C_i=11nF, U_o=5.4V, I_o=0.9mA, P_o=1.2mW.

Values of L_o, C_o and L/R connection cable parameters should be adopted according to the table shown below:

Explosive group	L _o [mH]	C _o [μF]	L/R [mH/Ω]
I and IIA	200	30	244
IIB	200	30	122
IIC	200	30	30

Characteristic of the circuit is linear.

Non-intrinsically safe output circuit:

“output” – terminals “5, 6, 7”: U_m=253V_{AC}.

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[16] **Reports of studies:**

Report KDB No 10.176

[17] **Special conditions of use:**

Lack

[18] **The essential requirements for safety and health.:**

Completed by fulfilling the requirements the standards:

PN-EN 60079-0 :2009 (*EN 60079-0:2006*)

PN-EN 60079-11 :2010 (*EN 60079-11:2007*)

PN-EN 61241-0 :2007 (*EN 61241-0:2006*)

PN-EN 61241-11 :2007 (*EN 61241-11:2006*)

Za zgodność z oryginałem: Henryk Gasztold