



S1-ExA CIRCUIT SEPARATOR self-powered

1 or 2 channels in rail housing with 22,5mm width

- associated apparatus "group I", "category (M1)" and "group II", "category(1), 3",
- intrinsically safe input circuit with safety level of ia – consistent with ATEX
- EC-Type Examination Certificate : KDB 10ATEX129

FEATURE I (M1) [Ex ia] I

Protection level IP20

II (1)G [Ex ia] IIC

Range of working temperature -25..+70°C

II (1)D [Ex iaD] 20, II 3G Ex nA IIC T4

- Intrinsically safe input circuit can operate with intrinsically safe circuit with ia or ib protection level of a device installed in hazardous zone "0, 1, 2, 20, 21, 22" of any explosive mixtures. Input safety parameters: $U_i=30V$, $I_i=100mA$ and $P_i=1W$.
- Output circuit can operate with non-intrinsically safe circuits of devices with voltage $U_m=253V$ e.g. supplied from 230Vac network.
- The separator can be installed in an explosion safe, dry and dust free room that is protected against access of people not trained in maintenance and operation of the separator.
- The separator is design to be used also in hazardous area in flameproof enclosure. Installation in a flameproof enclosure in explosive group "I" without restrictions. When in explosive group "IIG" and "IID" opening the flameproof enclosure can occur after 10 minutes after the power is turned off.
- In zone "2" basing on designation II 3G Ex nA IIC T4 (device of category 3) it can be also installed on different rules which are described on page 2.

Purpose:

The separator, ensuring explosion safety, provides galvanic separation of the input circuit cooperating with hazardous zone from the output circuit.

The separator does not use any auxiliary power source (no auxiliary power). It is supplied with input measurement current.

The input signal is current typically $0/4 \div 20mA$. The output current is equal to the input current.

Current output signal $0/4 \div 20mA$ can be converted to voltage signal $0/2 \div 10V$ by applying an external resistor 500Ω (fig. 1).

The separator S1-ExA transfers active current signal from hazardous zone to safe zone e.g. to logger, controller, DCS system.

Technical parameters:

Input signal	- DC current $0/4 \div 20mA$ max value $0 \div 100mA$
voltage on input	- $U_{IN} = 3,8V + R_{LOAD} \cdot 0,02A$
max input voltage	- 30V
Output signal	- DC current $I_{OUT} = I_{IN}$
load resistance	- $0 \div 800\Omega$
voltage output	- external resistor connected to output terminals:
for input $0/4 \div 20mA$	$50\Omega \Rightarrow 0/0,2 \div 1V$ $250\Omega \Rightarrow 0/1 \div 5V$ $500\Omega \Rightarrow 0/2 \div 10V$
Class	- 0,1% typically for $R_{obc} \leq 250\Omega$ $\pm 0,05\% - 0,05\% \cdot (R_{load}/100\Omega)$
Temperature drift	- $\pm 0,005\%/^{\circ}C$
Time constant	- min 5ms after agreement more e.g. 0,1s
Isolation test voltage	- 2,5 kV, 50 Hz or equivalent

Order code:

S1-ExA - - -	- intrinsically safe input circuit
- 1	- 1-channel version
- 2	- 2-channel version
- f	- frequency band increased from 20Hz to 3000Hz

Housing dimensions: width x height x depth
22,5 mm x 79 mm x 74 mm

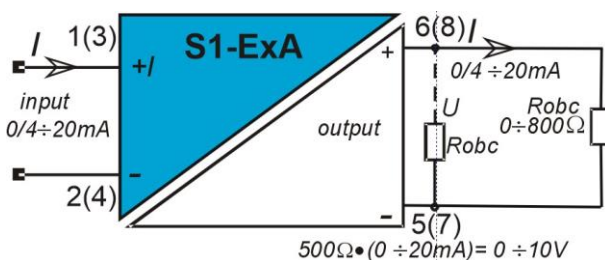


Fig. 1. Typical application – current circuits separation.

Intrinsically safe parameters for S1-ExA – input circuit with "ia" protection level:

Terminals "in1" and "in2" are individual intrinsically safe circuits galvanically separated. For simultaneous connection of two circuits, you can use one multicore cable type A or B according IEC 60079-14 or separate cables.

a) Intrinsically safe parameters of inputs with "ia" protection level:

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

$U_i=30V$, $I_i=100mA$, $P_i=1W$, $L_i \approx 0$, $C_i \approx 0$, $U_o=0$, $I_o=0$

b) Non-intrinsically safe parameters of output circuits: - channel 1 "out1"-terminals "5, 6",

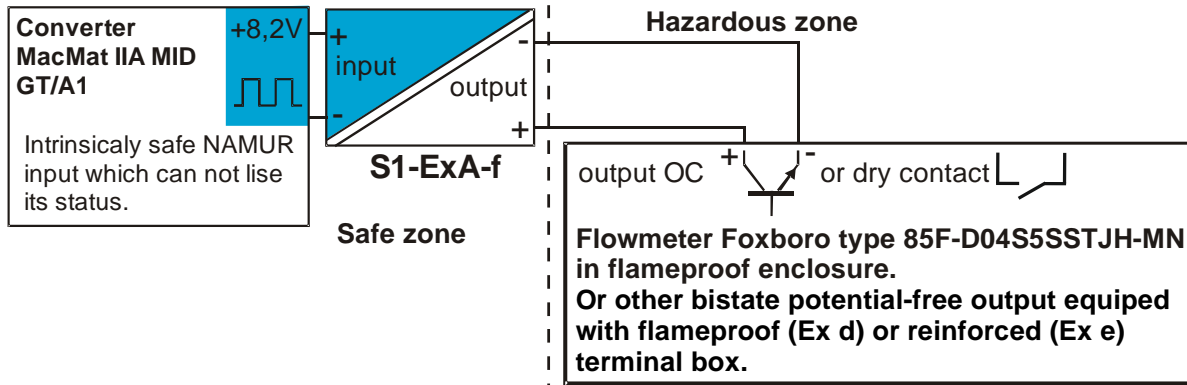
channel 2 "out2"-terminals "7, 8": $U_m=253V$

Maximal values of capacitance and inductance connected to intrinsically safe terminals 1, 2 (3,4) should be selected according to criteria of connected circuits (that is C_o , L_o given in the conditions of use of the device which the input of the separator S1-ExA will be connected to).

The drawings below presents unusual applications.

1. The separator S1-ExA is used to transmit stream of pulses with frequency from 0÷3kHz from flowmeter (output with “d” Ex protection level – flameproof housing) to intrinsically safe input circuit of the counter.

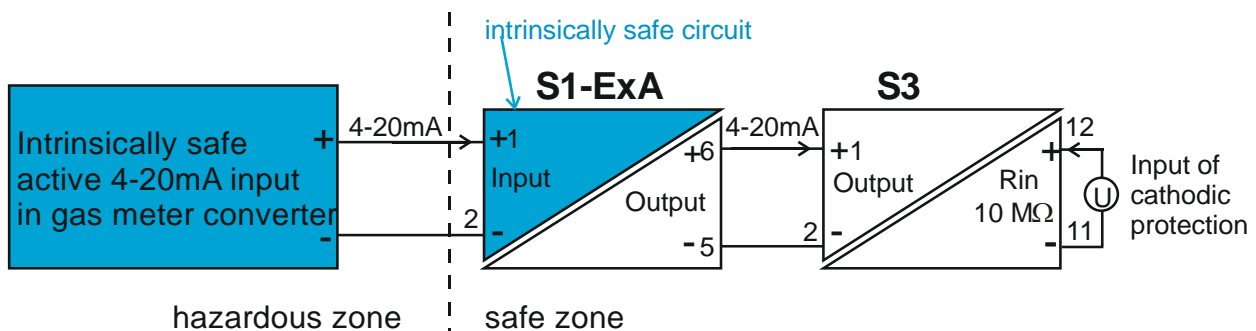
Potential-free output type OC transistor of the flowmeter (it can be also potential-free contact) due to specific construction of the S1-ExA-1-f and S1-ExA-2-f version of this separator (check ordering code) is seen by intrinsically safe input of the converter as a sensor in NAMUR standard. Correct operational up to 3000Hz.



The same application is correct for Gas Flow Computer from Integrotech company type MSP-02-FC installed in safe zone in cooperation with installed in hazardous zone in flameproof enclosure Ultrasonic Gas Meters type MPU800C from TechnipFMC company.

2. Connection of cathodic protection circuit to intrinsically safe active input 4-20mA of gas converter.

Intrinsically safe active input of gas converter (designed to operate with two-wire 4-20mA temperature or pressure transmitters) operates with intrinsically safe input of S1-ExA separator. Input of two-wire separator type S3 is controlled by a signal from cathodic protection circuit. Output of the S1-ExA separator supplies two-wire output of the S3 separator. So in this configuration voltage of cathodic protection circuit controls 4-20mA current on S1-ExA output so also in active 4-20mA circuit of gas converter.



Conditions of use:

Intrinsically safe measuring input circuit (terminals “1-2” or “3-4”) of the separator type S1-ExA with „ia” protection level can cooperate with circuits with “ia” or “ib” protection level of devices installed in zone 0, 1, 2 of explosive mixtures with air classified to explosive group IIA, IIB, IIC and in zone 20, 21 and 22 of explosive mixtures with dust.

Safety parameters U_o , I_o , P_o of connected devices should be lower than U_i , I_i , P_i of the input of the separator.

The separator is designed to be used outside of the hazardous zone or in the hazardous zone in the flameproof enclosure. Installation in a flameproof enclosure in explosive group “I” without restrictions. When in explosive group “IIG” and “IID” opening the flameproof enclosure can occur after 10 minutes after the power is turned off.

Output terminals “5-6” or “7-8” can cooperate with non-intrinsically safe circuits of devices with voltage $U_m=253V$ e.g. supplied from 230Vac main network.

The separator is placed in the housing of self-extinguishing plastic (poliamid PA 6.6) designed for mounting on T35 rail. Housing and terminals protection level is IP20.

External connections should be lead with wires of a cross section $0,5 \div 2,5 \text{ mm}^2$.

ATEX conformity - directive 94/9/WE: 2014/34/UE: PN-EN 60079-0:2013 (EN 60079-0:2012),
PN-EN 60079-11:2012 (EN 60079-11:2012), PN-EN 60079-15:2010

Compliance with the directive EMC 2004/108/WE: PN-EN 61326-1:2013

In general cables and wires of intrinsically safe circuits should be led separately regarding to non-intrinsically safe cables and wires. If intrinsically safe cable is shielded and is blue it can be in cable trays together with other non-intrinsically safe cables. Shield of the cable should be connected to the ground PE only from one side e.g. only in safe zone with a wire of 2,5mm² diameter. Maintain a distance of 50mm from the end of the shield braid to the stripped ends of the cable cores in both the hazardous and safe zones. Put the crimping sleeves on the stripped ends of the cable cores. If in a multicore intrinsically safe cable are several intrinsically safe circuits the cables must be of A or B type with insulation test of 500V and the insulation cannot be thinner than 0.2mm. Cables and wires must be permanently fixed and protected against the possibility of mechanical damage. It is recommended to use blue cables. Compare the parameters U_o, I_o, P_o, C_o, L_o, U_i, I_i, P_i, C_i, L_i (L, C of the cable and L_i, C_i of the device installed in the hazardous area).

If the L, C clustered parameters in the connected circuit (and this is how the L_i, C_i parameters of the connected device should be treated) exceed 1% of the L_o, C_o value, for the calculation should be taken of the L_o, C_o parameters given in the certificate for the clustered values. If such parameters are not provided, then half of the C_o, L_o value from the certificate should be taken for calculations with the assumption that the C_o value cannot exceed 1 µF for groups I, IIA, IIB and III and 0.6 µF for IIC.

If a "simple device" made of plastic is installed in the hazardous area, the risk of electrostatics should be assessed. In the case of cable routes with high energy (power grid) or interferences, cables with measurement signals susceptible to the impact of interferences, apart from the use of shielded twisted-pair cables, should be led at a distance, e.g. in a separate tray, and the routes crossing each other should be at right angles.

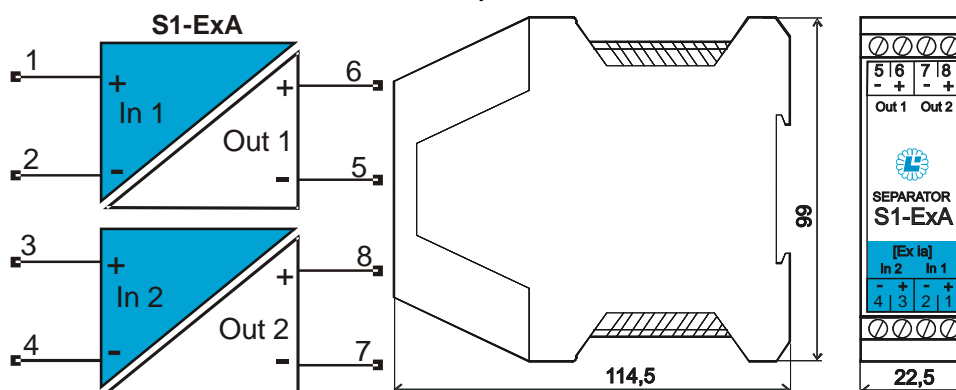
For installation in zone 2:

- 1) The housing provides a minimum degree of protection IP20. The device can be installed inside a building provided it is protected against dirt, dust, especially conductive dust, extreme mechanical exposures (eg vibrations, impacts, shocks), and thermal stress.
- 2) Installation outside the building requires an additional enclosure with a higher degree of protection minimum IP54 or higher, eg IP65, in accordance with the surrounding environment in which the installation operates. It may be an enclosure **without an explosion-proof design**, but:
 - with the warning label "Caution: risk of electrostatic discharge" (see point 6);
 - provided that it will be mounted with protection against falls and mechanical impacts.
- 3) It is safest to install the device in zone 2, both inside and outside of the building, in an explosion proof enclosure (eg with an "Ex nA", "Ex e" protection level) providing a minimum IP54 protection degree or higher (eg IP65) in accordance with the surrounding environment in which the installation operates.
- 4) Regardless of the place of installation, the devices must be protected against dirt, dust, especially conductive dusts, extreme mechanical infections (eg vibrations, impacts, shocks) and thermal stress.
- 5) In order to prevent self-loosing of cables in non-intrinsically safe screw terminals numbers 5, 6, 7, 8 one should place non-tinned cables in each of the clamp:
 - a single wire or cable with a twisted tip with a cross-section of 0.25 ÷ 2.5 mm²,
 - 2 cables with the same cross-section of 0.5 ÷ 1.5 mm² type wire with a twisted tip placed in a common tube sleeve with plastic crushed by a specialized tool.
 Tighten the terminal firmly with a torque of 0.5 Nm (typically 2 kfg force on the handle of a screwdriver with a diameter of 2.5 cm) with a flat screwdriver 3.0...3.5 mm wide. Every 6 months, check the tightening of the terminals by tightening with a torque of 0.5 Nm using a screwdriver with a width of 3...3.5 mm.
- 6) If the housing needs cleaning, use a cloth lightly moistened with a mixture of detergent and water.

Electrostatic hazard: to avoid the risk of electrostatic discharge, the casing of the device and / or the enclosure in which the device is installed should be cleaned only with a damp or antistatic cloth (soaked in antistatic liquid). Avoid any penetration of cleaning liquid into the interior to prevent damage to the device.
- 7) Non-intrinsically safe circuits (including 24Vdc power supply) must be connected to power suppliers and devices galvanically separated from the power grid (SELV or SELV-E circuits).
- 8) If an explosive atmosphere is present or can occur, non-intrinsically safe terminals numbers 5, 6, 7, 8 must not be connected/disconnected live cables of non-intrinsically safe circuits. If an explosive atmosphere is present or can occur during service work, disconnect all non-intrinsically safe circuits only in the safe area. If there is no explosive atmosphere during service work, the above-mentioned principles from point 8 are not required.

Operating conditions:

Ambient temperature – storage	-	-30 ÷ +70°C
Ambient temperature - operating	-	-25 ÷ +70°C
Relative humidity	-	max 90%
Ambient atmosphere	-	no dust and aggressive gases
Operating position	-	any



Description of connection terminals. Housing sketch.