

# S2Ex-U



## Intrinsically safe barrier with separation VOLTAGE or CURRENT CONVERTER

- "group I" "category M1" and "group II", "group III" "category 1" accompanying device
  - Intrinsically safe input circuit of level „ia” – ATEX compliance,
  - EC-Type Examination Certificate: KDB 04ATEX120
- FEATURE II (1) G [Ex ia] IIC, II (1) D [Ex ia] IIIC**

**Protection Level: IP 20**

**I (M1) [Ex ia] I**

**Operating temperature range: -30...+70 °C**

- Intrinsically safe input circuit can work with other intrinsically safe input circuit of "ia" or "ib" protection level that is in a device that is installed in hazardous zone (zones 0, 1, 2, 20, 21, 22). Maximal input parameters:  $U_i=30V$ ,  $I_i=100mA$ ,  $P_i=1W$ .
- Output and supply circuits can work with non-intrinsically safe circuits of devices working with voltage  $U_m=253V$ , e.g. supplied from 230Vac network.
- Converter can be installed only in an explosion safe, dry and dust free room that is protected against access of persons not trained in maintenance and operation of the transducer.
- Converter can be mounted in hazardous zone in flameproof enclosure. Using in I explosive group does not require putting warning on the enclosure. After turning off the supply it can be taken out of the enclosure without delay. In case of using it in II and III explosive group, on outer part of the enclosure must be warning: "Do not open the enclosure within 10 minutes after turning off the power".

### Application:

**S2Ex-U converter is designed to convert the growth of voltages or currents to any standard signal (current or voltage). Input, output and supply circuit of the converter are mutually galvanically separated.**

Galvanic separation allows to reduce the impact of object interferences on work in the central part (drivers, regulators, indicators, recorders, collecting data system).

### Technical specification:

**Input signal:** voltage -  $\Delta U_{min}=1mV$   
 $U_i=30V$  maximum  
current -  $\Delta I_{min}=1\mu A$ ,  $I_{max}=100mA$

**Input resistance:**  
voltage version -  $\geq 100 k\Omega$  (10M $\Omega$  on request)  
current version - typically 50 $\Omega$  (0.1  $\Omega$  +1 k $\Omega$ )

**Output signal** - any standard as ordered

**Output load resistance:**  
for 0÷20, 4÷20mA signal - 0 ÷ 650  $\Omega$   
for 0÷5mA, 1÷5mA signal - 0 ÷ 3 k $\Omega$   
for voltage signals -  $\geq 10 k\Omega$

**Class** - 0.1 %

**Error due to supply voltage or load changes** -  $\pm 0.02\%$

**Error due to ambient temperature changes:**  
- $\Delta U \leq 15mV$ ,  $\Delta I \leq 10\mu A$  - 0.01 % / °C  
- $\Delta U > 15mV$ ,  $\Delta I > 10\mu A$  - 0.005 % / °C

**Nonlinearity:**  
output signal= f(U, I) -  $\pm 0.05\%$   
**Zero and span adjustment** -  $\pm 7.5\%$  by potentiometers  
**Time constant** - typically 0.2 sec.  
0.001÷1s after agreement

**Supply voltage** - 20÷28V, typically 60mA

**Note:** In case of supply voltage >28V the protection barrier fuse blowing can occur – repair by the producer.

**Galvanic circuit separation** - All circuits mutually separated

**Isolation test voltage between**  
all circuits - 2,5 kV, 50 Hz or equivalent

**Housing dimensions:** 22.5mm x 99mm x 114.5mm  
(width x height x depth)

### Ordering code:

S2Ex-U-5,4 - -----

(Umin...Umax) - --

(Imin...Imax) - ---

1 -- Output signal 0÷5mA

2 -- Output signal 0÷20mA

3 -- Output signal 4÷20mA

4 -- Output signal 0÷5V

5 -- Output signal 0÷10V

6 -- Output signal 1÷5V

7 -- Atypical output signal should be given descriptively

Voltage converter with separation  
voltage ranges  $\leq 30V$

current ranges  $\leq 100mA$

### Note:

1. For small input signals to reduce the impact of interferences cable should be shielded.
2. If time constant is to be other than 0.2s, its value should be given.

### Order example:

Voltage converter in 22.5mm rail housing, range 0...100mV,  
4÷20mA output signal:

type S2Ex-U-5,4-(0...100mV)-3

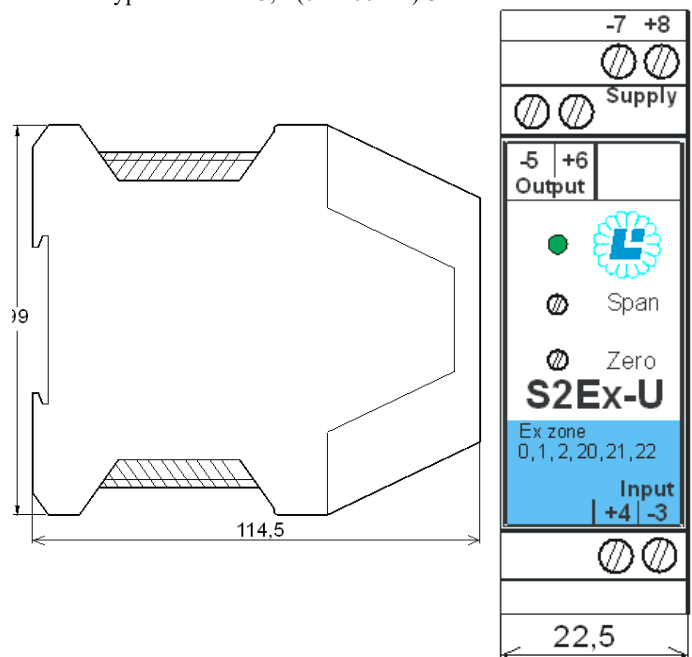


Fig.2 Housing scheme

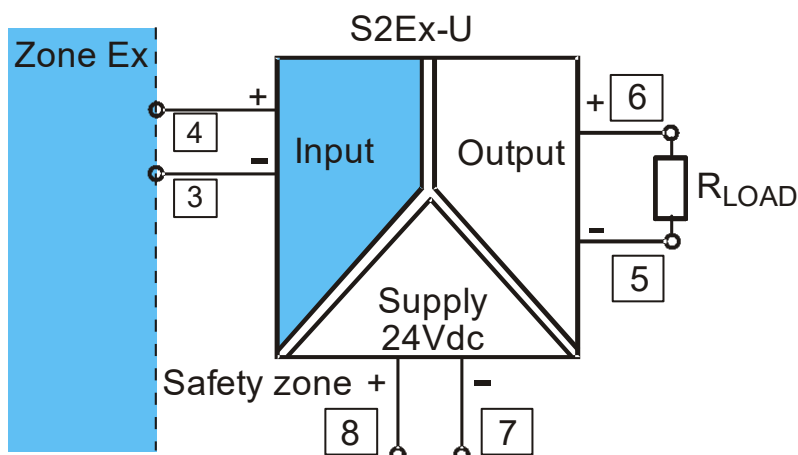


Fig.1 Block scheme

### Application conditions

Maximum capacitance and inductance values connected to the intrinsically safe terminals “3-4” of the converter have to be chosen according to connected circuits rules (that means  $C_o$ ,  $L_o$  given in the terms of use of the device to which the input of the S2Ex-U converter is to be connected). However, they must not exceed the following values:

Explosive group	$L_o$ [mH]	$C_o$ [μF]	$L/R$ [mH/Ω]
I and IIA	200	30	235
IIB and IIC	200	30	117
IIC	200	30	29

Characteristic of the circuit is linear.

Safety parameters for group III (dusts) are the same as for group IIB (gas)

### Safety parameters for S2Ex-U-5,4 – input circuit with “ia” protection level:

- Intrinsically safe input circuit: „input” - terminals „3-4”:  $U_o=5,4V$ ,  $I_o=2,4mA$ ,  $P_o=1,2mW$
- Intrinsically safe input parameters: „input” - terminals „3-4” - with “ia” protection level  
 $U_i=30V$ ,  $I_i=0,1A$  (any),  $P_i=1W$  (any),  $L_i=0,1mH$ ,  $C_i=10nF$ .
- Non-intrinsically safe circuits parameters: „input” - terminals „5-6” and „supply” - terminals „7-8” -  $U_m=253V$

### Application conditions

Intrinsically safe input measuring circuit of the converter type S2Ex-U (terminals 3-4) with “ia” protection level can work with other circuits with “ia” or “ib” protection levels of devices installed in zone 0, 1, 2 (with hazardous mixtures with air, that are in explosion groups IIA, IIB, IIC) and in zone 20, 21, 22 (dust explosion hazard, group III).

Output terminals 5, 6 and supply terminals 7, 8 can work with non-intrinsically safe circuits of devices working with voltage  $U_m=253V$ , e.g. supplied from 230Vac network.

Separator’s housing is made of self-extinguishing plastic (poliamid PA 6.6) and can be mounted on TS35 rail. The housing and terminals are IP20 made.

Outer connections should be connected using cables of  $\varnothing \leq 2.5$  mm wire diameter.

ATEX conformity - directive 2014/34/UE: PN-EN 60079-0, PN-EN 60079-11

EMC conformity - directive 2014/30/UE: PN-EN 61326-1

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  $2,5mm^2$  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  $1 \mu F$  for groups I, IIA, IIB and III and  $0.6 \mu F$  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.

### Operation condition:

Ambient temperature - for storage	-	$-30 \div +70^\circ C$
Ambient temperature - operation	-	$-30 \div +70^\circ C$
Relative humidity	-	max 90%
Ambient atmosphere	-	no dust and aggressive gases
Working place	-	any