

S2Ex-ZH Intrinsically safe barrier POWER SUPPLY – SEPARATOR for 2-wire transducers



ATEX

transparent for transmission protocols including HART.

2-wire transducer is installed in hazardous area.

- associated apparatus “group I”, “category (M1)” and “group II and III”, “category(1)”,

- device of “group II” “category 3”,

- intrinsically safe input circuit with safety level of ia – consistent with ATEX,

EC-Type Examination Certificate: KDB 04ATEX120

FEATURE: II (1) G [Ex ia] IIC, II (1) D [Ex ia] IIIC, I (M1) [Ex ia] I, II 3G Ex nA IIC T4

Protection level IP20

Range of working temperature -30..+70°C

- Intrinsically safe input measurement-supply circuit can supply intrinsically safe circuits with ia, ib or ic (see page 2 conditions of use) protection level of devices located in hazardous zones 0, 1, 2, 20, 21, 22 and any explosive atmospheres of explosive groups IIA, IIB, IIC and in zones M1, M2 of mine undergrounds.
- Output and supply circuits can cooperate with non-intrinsically safe circuits of devices with voltage $U_m=253V$ e.g. supplied from 230Vac main network.
- The device as accompanying device should be installed in explosion safe zone or in explosion hazardous zone in suitable explosion-proof designed enclosure (see page 3). Atmosphere should be dry, dust free and protected against access of people not trained in maintenance and operation of the device.
- The device can be installed in explosion hazardous zone in “1, 2, 21, 22” and mine undergrounds only in flameproof enclosure Ex d (or another in accordance to the relevant standards). In zone “2” basing on designation Ex 3G nA IIC T4 (category 3 device) it can be also installed basing on other rules – see page 3.

Application:

Power supply-separator S2Ex-ZH can operate in systems using digital communication technics based on 4÷20mA two-wire line (BELL 202 modulation – e.g. HART) providing galvanic separation between input, output and supply circuits. It transfers bidirectionally different data transmission protocols of smart transducers.

Current output 4÷20mA depending on the needs of the user can be configured as an active current source or as passive one, meaning it controls the 4÷20mA current loop in the line supplied e.g. from driver. Configuration is implement by using jumpers available after spreading apart the housing (fig.1).

S2Ex-ZH provides galvanic separation of two-wire transducer circuit installed on a facility in explosion hazardous area from central part located in a safe area.

S2Ex-ZH is made in different versions of the two-wire transducer supply voltage: 20V, 22V, 24V, 26V, 27V, 28V. The selected version should be compatible with the intrinsic safety certificate cooperating with two-wire transducer.

Passive input (terminals 3-2) - 4÷20 mA

Output signal - 4÷20 mA

Output load resistance: - 0 ÷ 650 Ω

Max voltage on output terminals - 26V
for passive output

Supply voltage - 22V±28V, typically 80mA

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

Galvanic separation of circuits - all circuits separated from each other

Isolation test voltage - 2 kV, 50Hz

Class - 0.1 %

Nonlinearity - ± 0.05 %

Error due to changes in supply voltage - ± 0.02 %

Error due to changes in ambient temp - ± 0.005 % / °C

“zero” and “range” regulation - ± 1.5 % by potentiometers

Time constant - typically 0.2 sec,

after agreement - 0.05÷1 sec.

On rail housing TS35, wiring 0.5÷2.5mm²

Ordering code:

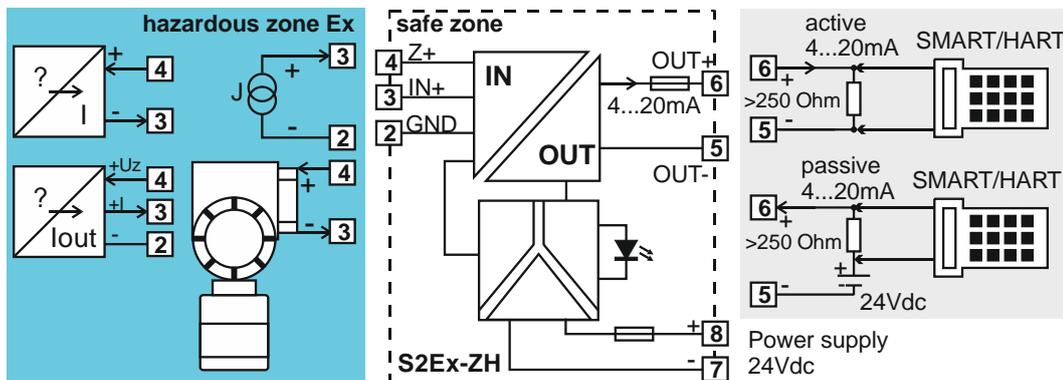
S2Ex-ZH -	Power supply-separator for 2-wire transducers
-28	U _o =29V, I _o =96.6mA
-27	U _o =28V, I _o =93.2mA
-26	U _o =27V, I _o =90mA
-24	U _o =25.2V, I _o =84mA
-22	U _o =23.1V, I _o =77mA
-20	U _o =21V, I _o =70mA

Order example:

Power supply-separator with HART, supply voltage of transducer 24V, I_o=84mA, output signal 4÷20mA: type S2Ex-ZH-24

Input – measuring-supplying leading to explosion hazardous zone (terminals 4-2) - provides supplying voltage to 4÷20mA two-wire transducer

S2Ex-ZH-28	⇒	19,4V at load 20mA
S2Ex-ZH-27	⇒	18,2V at load 20mA
S2Ex-ZH-26	⇒	17,5V at load 20mA
S2Ex-ZH-24	⇒	16,3V at load 20mA
S2Ex-ZH-22	⇒	13,8V at load 20mA
S2Ex-ZH-20	⇒	12V at load 20mA



Note: Guaranteed input impedance for HART signals: $Z > 250\Omega$ - additional 250Ω resistor is unnecessary when operating with communicator on the input. When operating with communicator on the output total $R_{load} \geq 250\Omega$.

Intrinsically safe parameters for S2Ex-ZH – input circuit with “ia” protection level:

To the input (“input” – terminals “2-3-4”) can be connected only two-wire cable – to terminals “4-3” (active input) or to “3-2” (passive input).

- a) Intrinsically safe supplying-measuring circuit: “input” - terminals “4-3” (“Z+, In+”) or “input” – terminals “4-2” (“Z+, Gnd”) with “ia” protection level

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

Realization	Uo [V]	Io [mA]	Po [W]	L/R [mH/Ω]			Lo [mH]			Co [μF]		
				I and IIA	IIB and IIB	IIC	I and IIA	IIB and IIB	IIC	I and IIA	IIB and IIB	IIC
S2Ex-ZH-28	29	96,6	0,70	0,40	0,20	0,050	22,0	12,0	0,32	1,97	0,605	0,074
S2Ex-ZH-27	28	93,2	0,66	0,43	0,21	0,054	24,0	14,0	1,0	2,15	0,65	0,083
S2Ex-ZH-26	27	90	0,61	0,46	0,23	0,058	27,0	16,0	1,8	2,33	0,705	0,090
S2Ex-ZH-24	25,2	84	0,53	0,53	0,26	0,067	33,0	20,0	3,1	2,9	0,82	0,107
S2Ex-ZH-22	23,1	77	0,44	0,64	0,32	0,079	41,0	25,0	4,6	3,76	1,02	0,14
S2Ex-ZH-20	21,0	70	0,37	0,77	0,38	0,096	52,0	33,0	6,5	4,78	1,27	0,188

Characteristic of the circuits is linear. For clustered values should be taken half of the values of Co, Lo given in this table remembering that Co cannot exceed 1μF for group I, IIA, IIB and 0,6μF for IIC.

- b) Intrinsically safe input parameters: “input” - terminals “3-2” (“In+, Gnd”):

Ui=any, Ii=93mA, Pi any, Li ≈ 0, Ci ≈ 1nF

- c) Non-intrinsically safe circuits parameters:

“output” - terminals “5-6” (“Out+, Out-”) and “supply” - terminals “7-8” (“Sup+, Sup-”): Um=253V

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

Maximal values of capacitance and inductance connected to intrinsically safe terminals “Z+, In+” and “Z+, GND” of the power supply-separator should be selected taking into account the safety parameters connected circuits of a device which will be powered by the S2Ex-ZH input. However, they cannot exceed the values given in the table above.

To the input (“input” – terminals “2-3-4”) can be connected only two-wire cable – to terminals “4-3” (active input) or to “3-2” (passive input).

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

ATEX conformity - directive 94/9/WE: PN-EN 60079-0:2013, PN-EN 60079-11:2012

EMC requirements - PN-EN 61000-6-1, PN-EN 61000-6-3

Safety requirements - PN-EN 61010-1:2002

<u>Operating conditions:</u>	Ambient temperature – storage	- -30 ÷ +70°C
	Ambient temperature - operating	- -30 ÷ +70°C
	Relative humidity	- max 90%
	Operating position	- any

Conditions of use:

If the intrinsically safe circuits has operated with intrinsically safe circuit with “ic” protection level, it may in the future operate with “ia” or “ib” protection circuits, provided that the device is sent to the manufacturer for technical verification of its “ia” protection level.

The device has a plastic, non-flammable housing and is adapted for mounting on a DIN T35 rail.

In the event of damage, the device cannot be repaired by the end-user and must be returned to the manufacturer or his authorized representative. All unauthorized modifications should be avoided.

The intrinsically safe conductors must be identifiable, separated from non-intrinsically safe ones and wired in accordance with the relevant national / international installation standards.

Make sure that the wires are well insulated from each other and do not cause any unintentional connections.

Intrinsically safe wiring (between the intrinsically safe circuit located in the hazardous area and the intrinsically safe circuit of the device) must have a minimum insulation thickness of 0.25 mm.

Typically, the device, as an accompanying device, should be mounted in a safe zone.

The device can be installed in a hazardous area "1, 2, 21, 22" and mine undergrounds only in Ex d (or other according to the applicable rules). In zone "2", based on the II 3G Ex nA IIC T4 (device category 3), it can be installed also on other rules described below in the environment of explosive mixtures with temperature class T1, T2, T3, T4 (with ignition temperature T ≥ 135°C).

In the case of explosion group I (underground mines) after switching off the power supply, the device can be removed from the flameproof enclosure without time delay, unless placed on the cover's housing "Do not open the housing within 10 min. after turning off the power." In the case of using the device in the group II gaseous or group III dust explosion group, the device cannot be removed from the flameproof enclosure without a time delay and on the outside of the enclosure the warning sign should be placed: "Do not open the casing within 10 min after turning off the power."

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

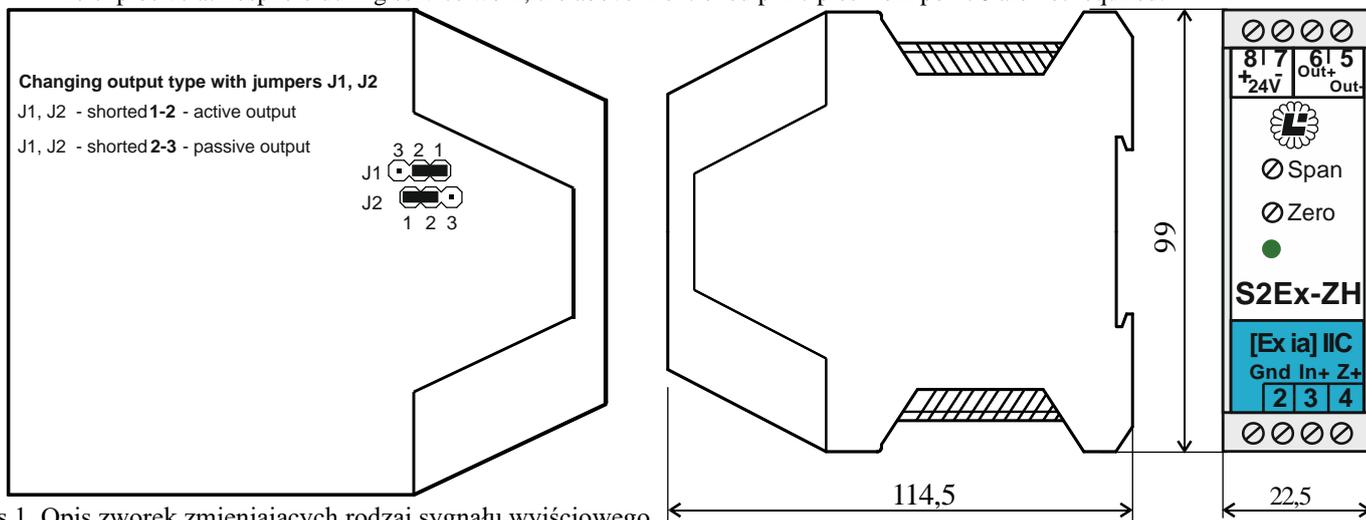
hazardous and safe zones. Put the crimping sleeves on the stripped ends of the cable cores. If in a multicore intrinsically safe cable are several intrinsically safe circuits the cables must be of A or B type with insulation test of 500V and the insulation cannot be thinner than 0.2mm. Cables and wires 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 $1 \mu F$ 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.

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 (e.g. 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, e.g. IP65, in accordance with the surrounding environment in which the installation operates. It may be an enclosure **without an explosion-proof designation**, 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 (e.g. with an "Ex nA", "Ex e" protection level) providing a minimum IP54 protection degree or higher (e.g. 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 (e.g. 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 $0.25 \div 2.5 \text{ mm}^2$;
 - 2 cables with the same cross-section of $0.5 \div 1.5 \text{ mm}^2$ 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 to live cables. When the device is powered, you can disconnect / connect disconnectable connector blocks but do not disconnect / connect non-intrinsically safe circuits. If an explosive atmosphere is present or can occur during service work, disconnect all non-intrinsically safe connector blocks or disconnect these circuits in the safe area. If there is no explosive atmosphere during service work, the above-mentioned principles from point 8 are not required.



Rys.1 Opis zworek zmieniających rodzaj sygnału wyjściowego