LABOR – ASTER

INDUSTRIAL AUTOMATION

Certyfikat nr QS/14/07

AC 083
QMS

Intrinsically safe barrier with separation
TRANSMISSION LINES CONVERTER-SEPARATOR type S2Ex-RS
RS232/RS485, RS232/RS422, RS422/RS485, RS422/RS422, RS485/RS485

ATEX

"Group I", "category (M1)" and "group II and III", "category (1)" accompanying device
- EC-Type Examination Certificate: KDB 04ATEX120
- Feature: II (1)G [Ex ia] IIC, II (1)D [Ex ia] IIIC, I (M1) [Ex ia] I
Feature basing on conformity assessment procedure according to ATEX module A:
II 3G Ex ec IIC T4, "group II", "category 3" device
Housing protection level IP20 Operating temperature range -30..+70°C

- Intrinsically safe circuit can operate with intrinsically safe transmission line with ia, ib or ic protection level (see page 3 conditions of use) led to explosion hazardous zone "0, 1, 2, 20, 21, 22" of any explosive mixtures and mine undergrounds.
- The second separated transmission side and supply circuit can work with non-intrinsically safe circuits of devices with voltage Um=253V e.g. supplied from 230Vac 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 ec IIC T4 (category 3 device) it can be also installed basing on other rules – see page 3.

- **Separation and translation of the following transmissions:**

Safe zone	Explosion hazardous zone
RS 232 **RS 485** **RS 422**	**RS 485** **RS 422**

- **The separator is designed between others for MODBUS RTU/ASCII, PROFIBUS DP and operates correctly with any half-duplex protocol.**
- **Baudrate 50 ÷ 115 200 bd.**
- **Smart control of flow direction.**
- **All circuits fully galvanically separated.**
- **Internal lines terminators.**
- **Led indication of supply, transmission and line damage.**

PURPOSE :

The separator is designed to galvanically separate and translate transmission standards RS232, RS485, RS422 in safe zone to standards RS485 or RS422 in intrinsically safe circuit leading to hazardous zone.

For RS485 and RS422 transmission the separator allows to extend the transmission line up to 1200 meters (up to 800 meters for baudrate 115200) and many devices to operate with each other. Separation eliminates interferences and the differences of potentials. It also protects connected devices from power surges.

The change in transmission type (RS422 to RS485 or vice versa) is done through appropriate connection of transmission wires to the terminals and possible connection of the terminator. Changing the input type to RS232 requires opening of the housing and switching the jumpers. Switching description is given later in this document.

Baudrate		RS485/422 connection line length
115200	-	< 800 m
57600	-	<1000m
< 57600	-	<1200m

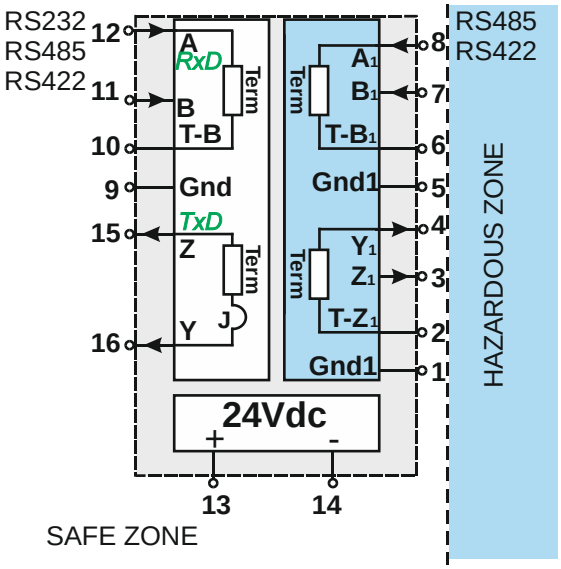
BASIC TECHNICAL PARAMETERS:

Non-intrinsically safe side RS232 according to RS232C standard

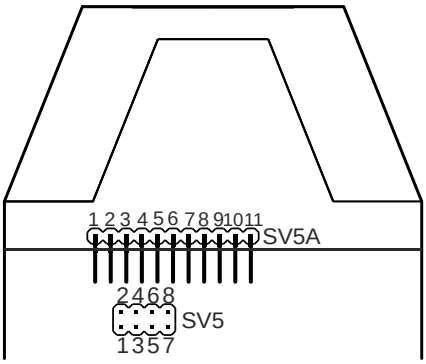
Receiver parameters:		
- low level	-	-9 V ÷ -3 V
- high level	-	+3 V ÷ +9 V
Connection line length	-	max 15m for 19200bd (capacity sum C<2500pF) max 5m for 115200bd (C<100pF)
Transmitter parameters:		
- output voltage	-	minimum ±5V on load R≥3kΩ
RS485 and RS422		
- receiver sensitivity	-	± 0.2 V
- signal from transmitter	-	min. ±2V on load R≥100Ω
Connection line length	-	max 1200m
Baudrate	-	50 to 115200 bd[1]
Minimal interval between switching	-	length of 1 character
Direction of line switching time	-	<150 ns
Distortion of the bit	-	<100 ns
Phase shift of the bit	-	<100 ns
Number of devices in the line	-	max 32
Supply indication	-	PWR LED on (blinking indicates a constant state of "0" on one of lines)
Transmission indication	-	RS LED on
Supply	-	20...28Vdc/60mA
Rail housing IP20	-	on TS35 rail cable terminals 2.5mm^2
Galvanic separation	-	circuits of both sides of transmission and supply circuit mutually separated
- isolation test voltage	-	2kV 50Hz
Rail housing IP20	-	with rail 114.5 x 99 x 22.5mm
EMC requirements 2004/108/WE	-	PN-EN 61326-1:2013
Safety requirements	-	PN-EN 61010-1:2002

[1] The device during production is tested for speed 300kB. At speeds higher than 115200 gate switching time may increase to 5 bytes.

View of the front side of the S2Ex-RS separator



Block diagram of the S2Ex-RS separator



Housing dimensions: thickness 22.5 mm; width 99 mm, height 114.5 mm.

NOTE: Terminal GND1 in intrinsically safe circuit allows connecting shield of the transmission cable which goes to explosion hazardous zone. Braid of the shielded cable cannot be grounded from both sides (in safe zone and hazardous zone). Braid does not have to but can be connected to the ground but only from one side. If GND1 terminal together with cable shield is grounded in safe zone then braid of the cable in explosion hazardous zone must be distanced minimum 5cm from terminals of the core of this cable.

View of the jumpers comb to switch.

Description of the jumpers configuration is in the table on page 3.

SAFETY PARAMETERS: ATEX compliance - directive ATEX 2014/34/UE: PN-EN 60079-0:2013, PN-EN 60079-11:2012, PN-EN 60079-7:2016

a) Intrinsically safe circuit: terminals T-B1, A1, B1, T-Z1, Z1, Y1, GND1 with "ia" protection level:

Distributed values of Co, Lo, L/R of the connection cable should be adopted according to the table shown below.

Version	Uo [V]	Io [mA]	Po [mW]	L/R [mH/Ω]			Lo [mH]			Co [µF]		
				I and IIA	IIB and III	IIC	I and IIA	IIB and III	IIC	I and IIA	IIB and III	IIC
S2Ex-RS-1	5	139	171	1,66	0,83	0,20	30	12	3,2	800	800	80
S2Ex-RS-2		141	174	1,64	0,82	0,20	30	12	2,1	800	800	80
S2Ex-RS-3		159	195	1,45	0,72	0,18	20	7	3,5	700	700	70
S2Ex-RS-4		191	236	1,20	0,60	0,15	11	5,2	1,6	600	600	60
S2Ex-RS-5		255	315	0,90	0,45	0,11	8	3,2	0,9	500	500	50
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 circuit parameters: terminals T-B1, A1, B1, T-Z1, Z1, Y1, GND1

with "ia" protection level: **Li ≅ 0, Ci ≅ 0.**

Version	Ui [V]	Ii [mA]	Pi [mW]
S2Ex-RS-1	30	299	does not require determination
S2Ex-RS-2		290	
S2Ex-RS-3		290	
S2Ex-RS-4		290	
S2Ex-RS-5		290	

c) Non-intrinsically safe circuits parameters:

terminals "A, B, T-B, Y, Z" and **"supply 24V": terminals "ZAS+, ZAS-": Um=253V**

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

In installations in which parameters Ci and Li of device cooperating with intrinsically safe circuit (connection cable excluded) exceeds 1% of the value of parameters Co and Lo given in the table above you should:

- from 50% of the value of Co, Lo subtract Ci, Li of cooperating device,
- these values remains for parameters of connection cable,
- if cable parameters are unknown you can take 200pF/m, 1µH/m for calculation.

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 ec 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 $T \geq 135°C$).

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 Uo, Io, Po, Co, Lo, Ui, Ii, Pi, Ci, Li (L, C of the cable and Li, Ci of the device installed in the hazardous area).

If the L, C clustered parameters in the connected circuit (and this is how the Li, Ci parameters of the connected device should be treated) exceed 1% of the Lo, Co value, for the calculation should be taken of the Lo, Co parameters given in the certificate for the clustered values. If such parameters are not provided, then half of the Co, Lo value from the certificate should be taken for calculations with the assumption that the Co 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 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 (eg with an "Ex ec", "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 9, 10, 11, 12, 13, 14, 15, 16, 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 $0.25 \div 2.5$ mm²,
   - 2 cables with the same cross-section of $0.5 \div 1.5$ 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 9, 10, 11, 12, 13, 14, 15, 16 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.

FUNCTIONAL DESTRIPTION

The device continuously monitors the transmission speed and adjusts its operation to the actual speed. It uses the innovate algorithm testing transmission speed developed by LABOR-ASTER company in result there is no need for constant speed or direction of the transmission. A characteristic feature of this algorithm is lack of any information loss at the start of the transmission with any speed. It is suited specifically to Modbus ASCII/RTU protocol, but works correctly in each half-duplex protocol (e.g. PROFIBUS DP). Only requirement is the continuity of transmission and minimal pauses between changing the direction of the transmission. Any errors are indicated via LEDs.

- **PWR** LED – is continuously lit after turning on power supply or blinks when it detects “low” state lasting longer than about 0,5 sec. (which proves mostly of incorrect polarity of the transmission line – to change it please disconnect the line, wait for LED is not blinking anymore and then connect again correctly).
- **RS** LED – is lit during transmission on one of the two lines.

Configuration of the device.

The separator is equipped with optional attached internal 300Ω terminators matching the wave resistance of the line.
After opening the housing can be set:

SV5A	**Description of the jumpers configuration.**
1-2	Shorting – enables transmission direction control on the side of the intrinsically safe circuit (ex hazardous zone side). Opening – disables transmission control. Transmitter is permanently switched on.
3-4	Shorting – echo block (for RS232 on safe side) Opening – echo block circuit is switched off
4-5	Shorting – enables transmission direction control on the side of the safe zone. Opening – disables transmission control. Transmitter is permanently switched on. Opening when RS232
6-7	Shorting – standard on safe zone is RS232. Opening – standard on safe zone is RS485 or RS422.
8-9	Shorting – direction switching delay by additional byte. Recommended for discontinuous transmission. Opening – usual direction switching delay (after one byte of silence).
10-11	Shorting – in RS485 transmission on safe side only terminals 15 and 16 are used. Opening – typical RS422 connection. In case of RS485 additional terminals (11-15 and 12-16) shorting is needed. Not available for previous version of the device.

SV5	**Description of the jumpers configuration.**
1-2	Shorting – connects the internal terminator to Y/Z line. Opening – disconnects the terminator of Y/Z line.
3-4 5-6 7-8	Configuration jumpers storage.

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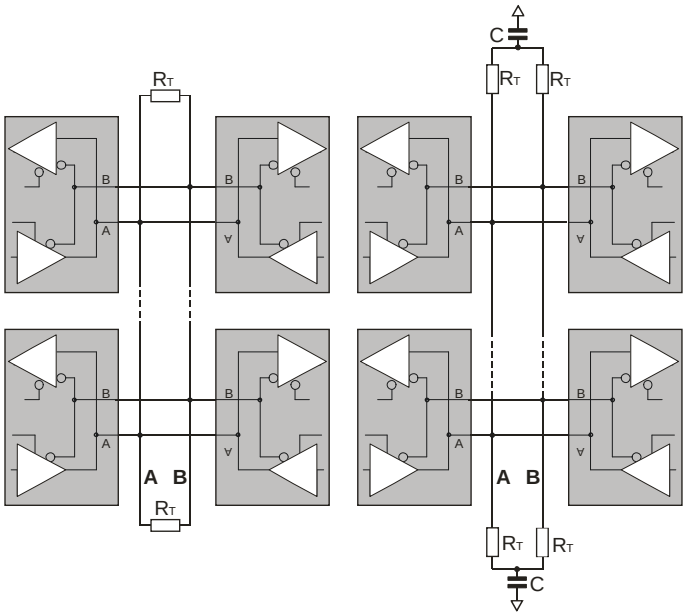
Safe side	Device connecting description	External connecting description
RS232	SW5A 6-7 short. SW5A 4-5 open. SW5A 3-4 short	DB9 – Female (example) TxD – DB9-2 RxD – DB9-3 GND – DB9-5
RS485	SW5A 6-7 open SW5A 4-5 short	A short with Y ⇒ signal A of RS485 line B short with Z ⇒ signal B of RS485 line (optionally T-B connected to B – internal terminator)
RS422	SW5A 6-7 open SW5A 4-5 short (open option) SW5 1-2 (short option for terminator)	A ⇒ signal A , B ⇒ signal B (optionally T-B connected to B – internal terminator) Y ⇒ signal Y, Z ⇒ signal Z

Hazardous side	Device connecting description	External connecting description
RS485	SW5A 1-2 short	A1 short with Y1 ⇒ signal A of RS485 line B1 short with Z1 ⇒ signal B of RS485 line (optionally T-B1 connected to B1 – internal terminator)
RS 422	SW5A 1-2 short (open option)	A1 ⇒ signal A, B1 ⇒ signal B (optionally T-B1 connected to B1 – internal terminator) Y1 ⇒ signal Y, Z1⇒ signal Z (optionally T-Z1 connected to Z1 – internal terminator)

Example of use of terminators

Connecting without noise filter



Connecting with noise filter. Only on the safe zone. Use in case of interference generators nearby e.g. high power electric engines, turbine, induction furnace. It can be ordered from LABOR-ASTER after consultancy.

$$C = \frac{1}{2 * \pi * BaudRate * R_T}$$

BaudRate – transmission speed in bods.

ORDERING CODE: Converter-separator type S2Ex-RS-Z-Y-X

where Z=(1, 2, 3, 4, 5) according to the table from page 2 (column "Version").

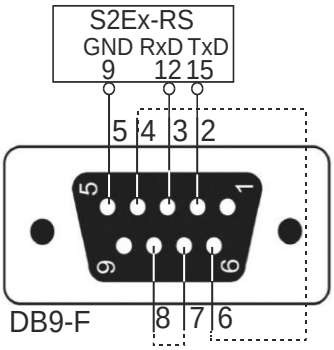
	Safe zone - Y	EX zone - X
RS232 without echo	A	-
RS232 echo	B	-
RS 485	C	C
RS 485 2-wires	CH	C
RS422 half-duplex	D	D
RS422 half-duplex with terminator	E	-
RS422 full-duplex[2]	F	F

[2] In this version (FF) the device does not control transmission direction. The same is in BF configuration.

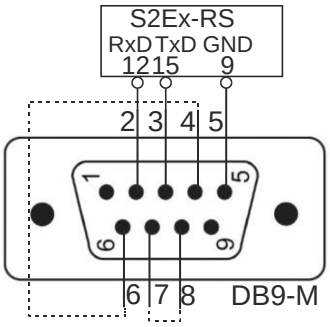
Detailed description of connection and configuration of each version.

Below description concerns ordered version and its connection. User can change his device version basing on below drawings (after demounting it and opening the housing). Most popular versions are marked on green. During inactive state of transmission lines A Y A1 Y1 have positive voltage in relation to their equivalent B Z B1 Z1 while voltmeter is between transmission terminals (couples: A B, A1 B1, Y Z, Y1 Z1). Producers have different interpretation of A and B lines. In case of troubles with transmission it is worth to try to swap these lines.

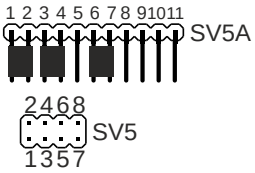
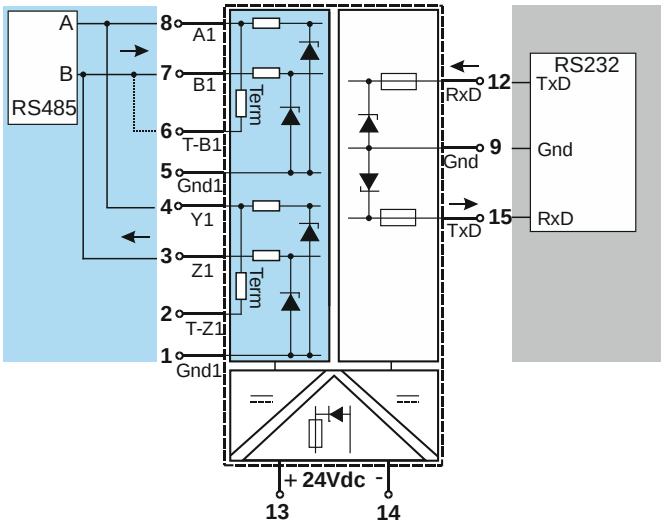
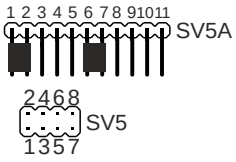
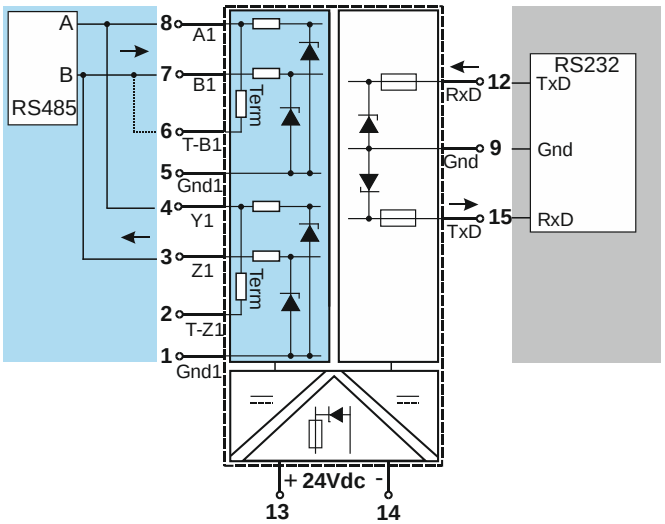
Connection between S2Ex-RS and master computer in version with RS-232 interface for two types of connectors. Other connection are shown in the end of this document.



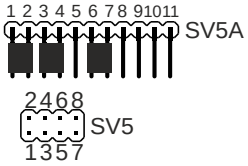
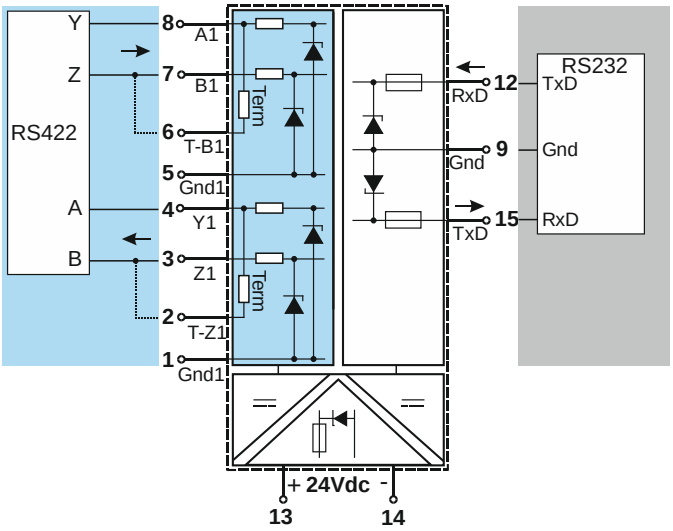
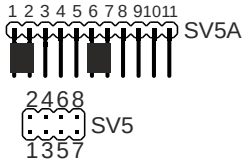
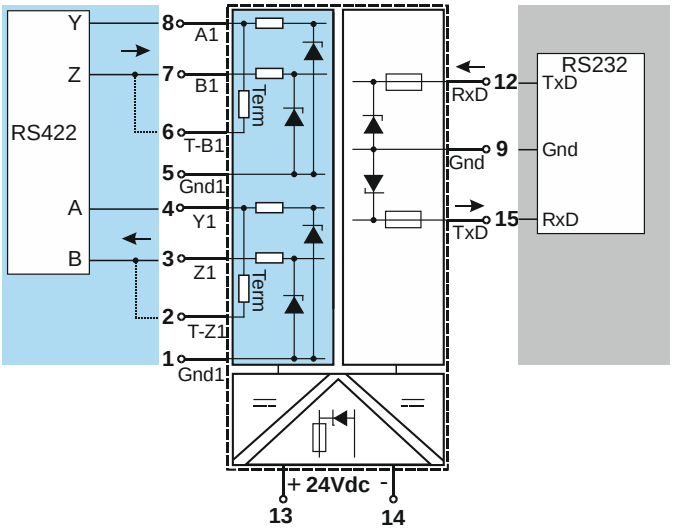
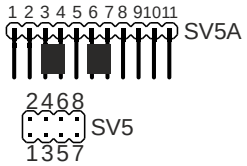
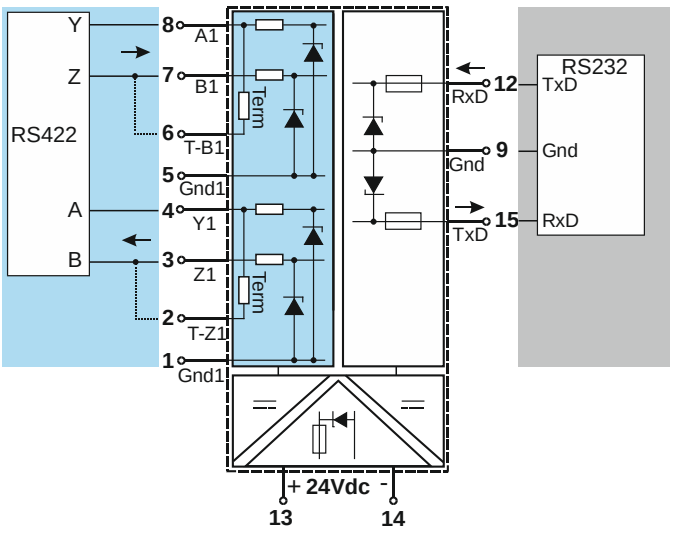
Dotted line is for optional connections for 2-wire version.

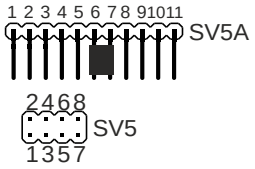
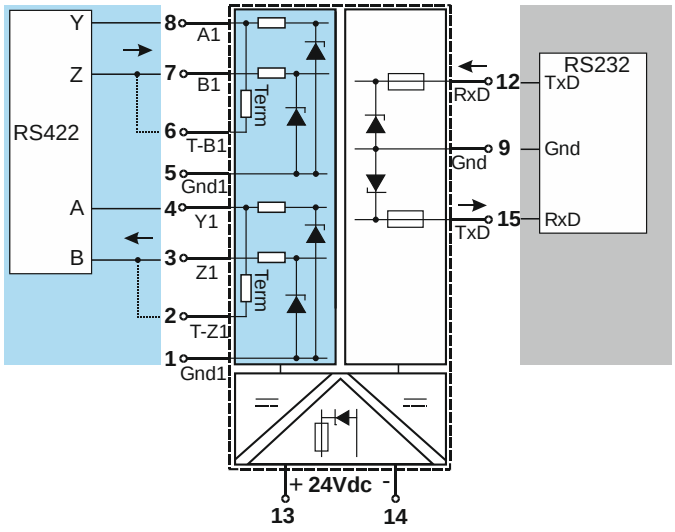
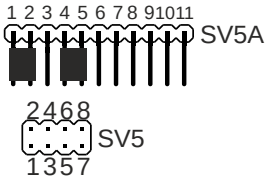
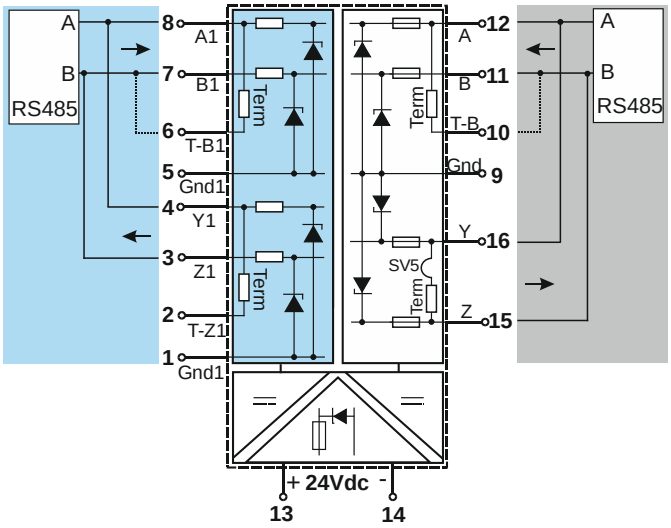
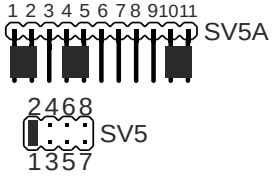
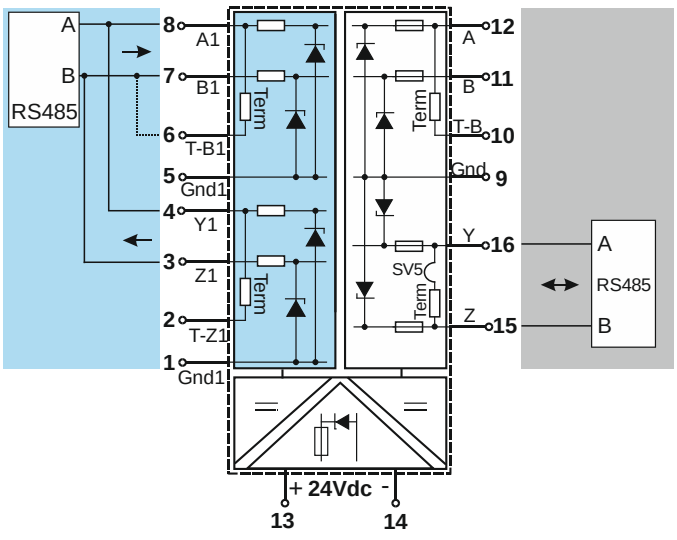


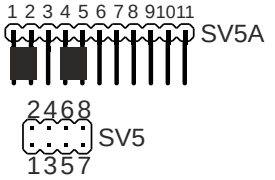
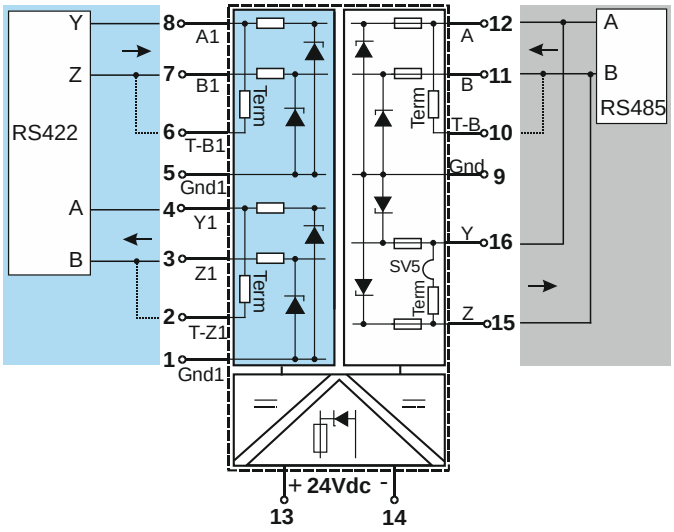
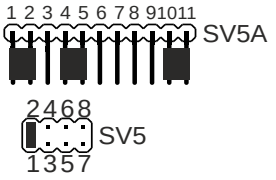
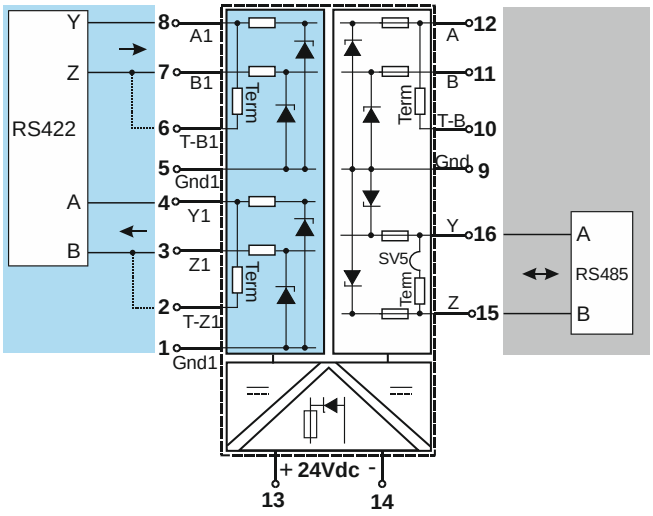
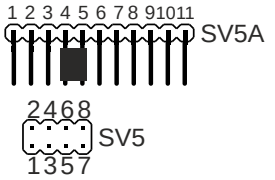
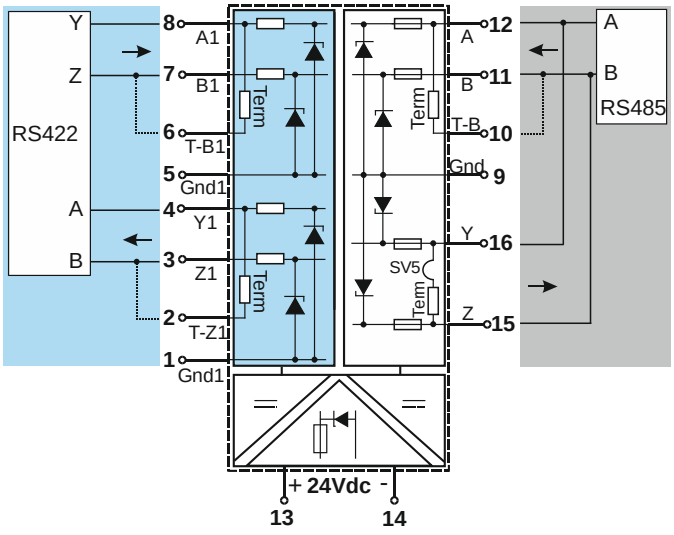
In previous version of the device signal RxD for RS232 on safe side was entering terminal number 11.

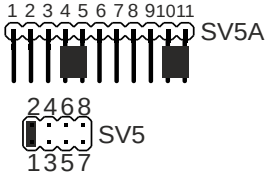
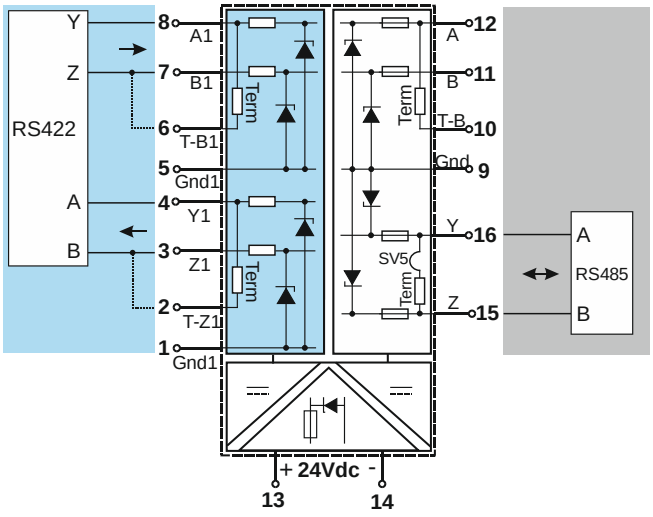
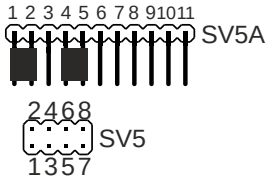
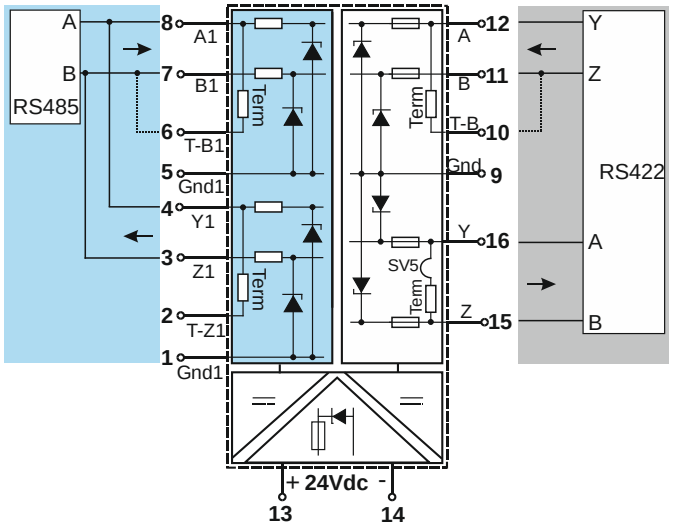
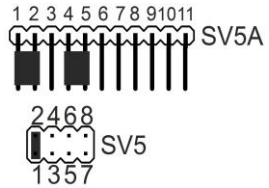
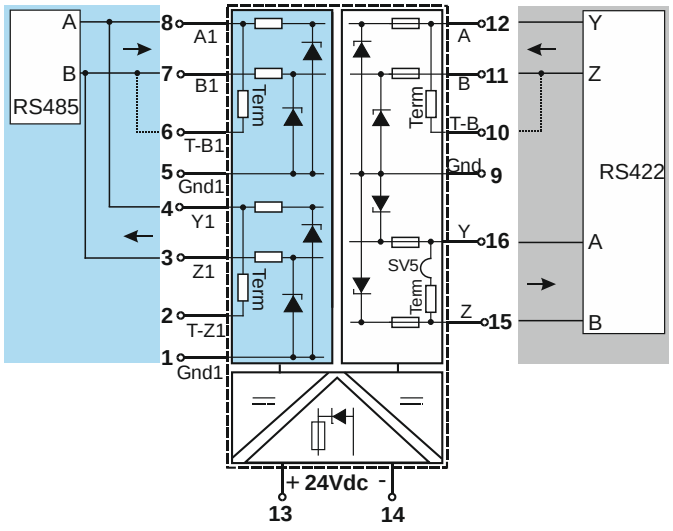
Code	*Description*	*Jumpers description*[3]	*Hazardous zone* / *Connection drawing* / *Safe zone*
S2Ex-RS-Z[4]-A-C	**RS232⇔RS485** Transmission with echo suppression. Half-duplex transmission.	SV5A 1-2 shorted SV5A 3-4 shorted SV5A 6-7 shorted 	
S2Ex-RS-Z-B-C	**RS232⇔RS485** Transmission with echo A1 B1. Half-duplex transmission. Wrong echo indicates a conflict in the RS-485 line.	SV5A 1-2 shorted SV5A 6-7 shorted 	

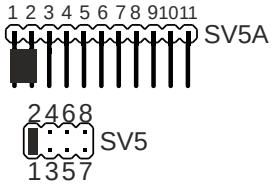
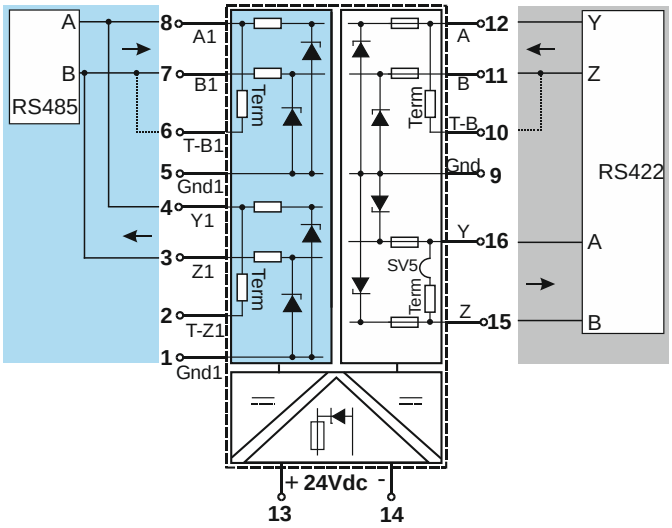
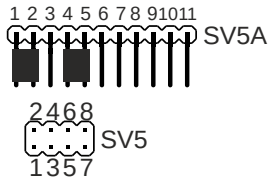
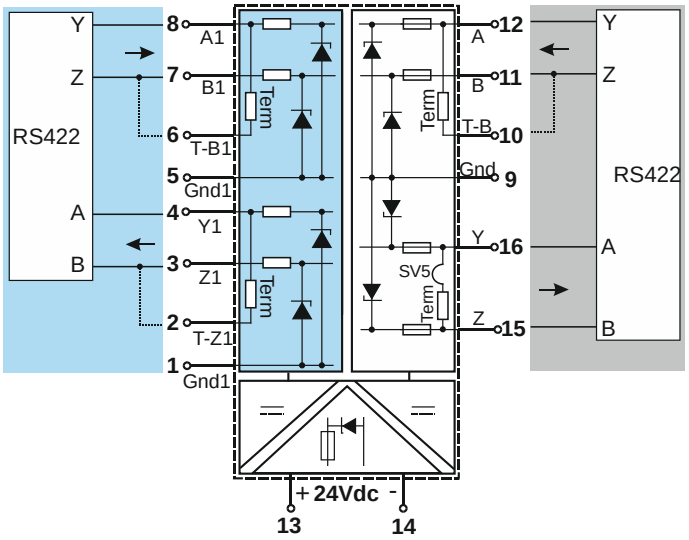
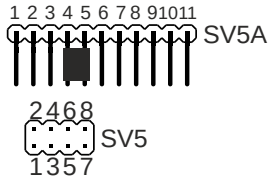
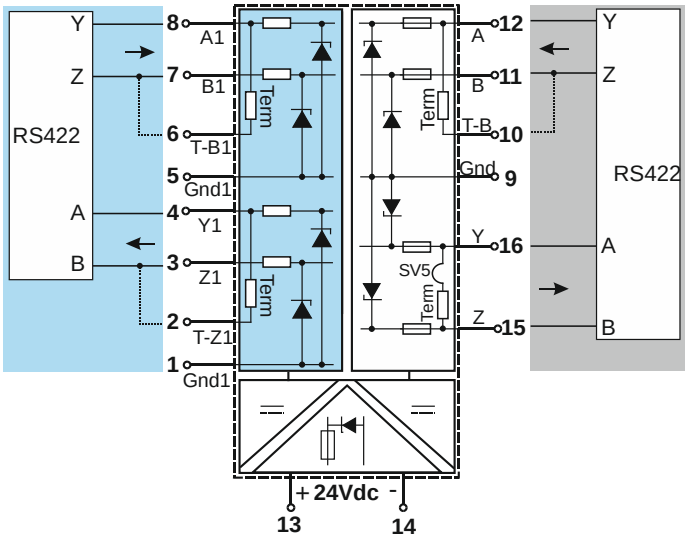
[3] Jumper SV5A 8-9 should be used in case of discontinuous transmission. This jumper does not affect function of the device described in the table.
[4] In this case parameter Z concerns intrinsically safe version Z=(1, 2, 3, 4, 5) and was described in the table on page 2 ("Version" column). This jumper does not affect function of the device described in the table.

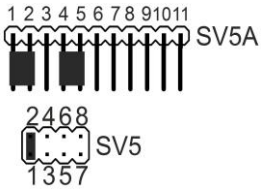
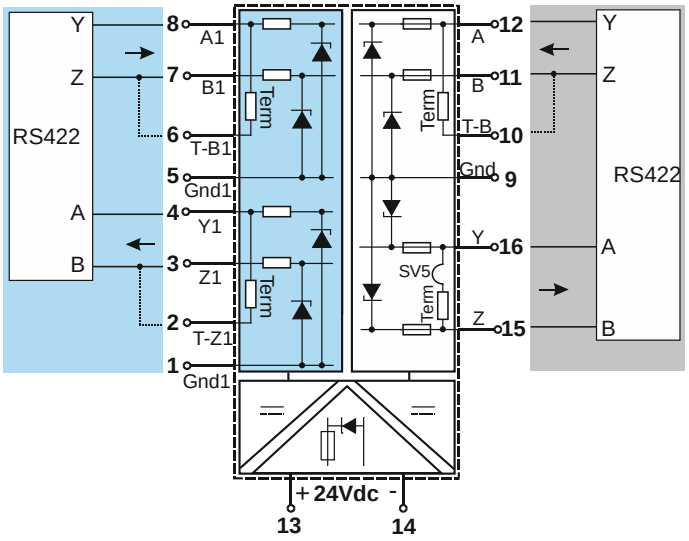
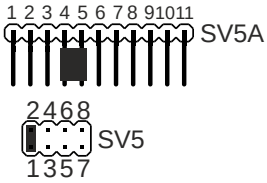
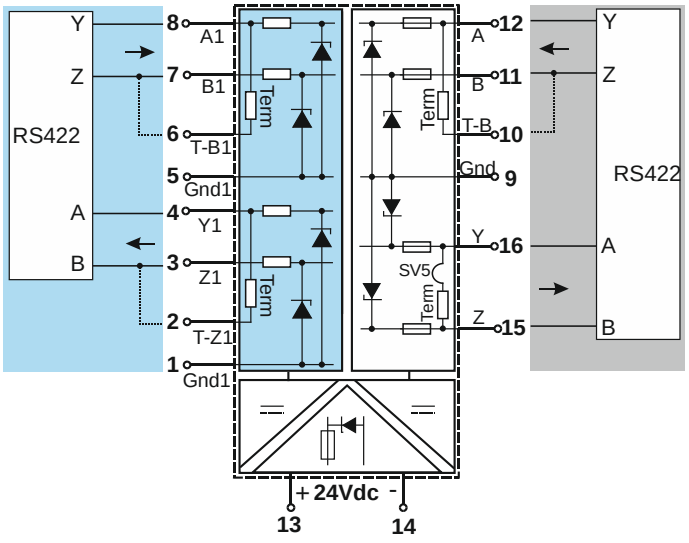
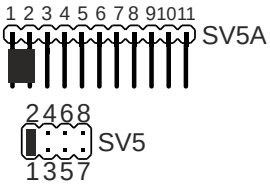
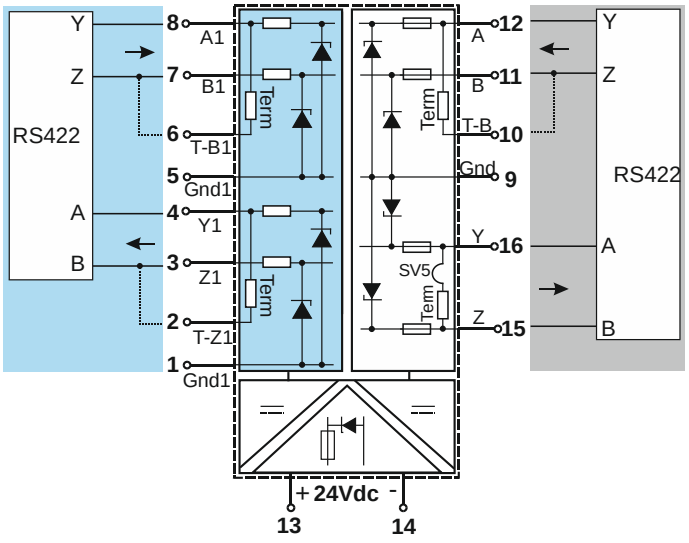
Code	Description	Jumpers description	Hazardous zone — Connection drawing — Safe zone
S2Ex-RS-Z-A-D	**RS232⇔RS422** A1 B1 receiving, Y1 Z1 transmitting. Transmission with echo suppression. RS422 transmission half-duplex with releasing lines Y1 Z1. A1 B1 always receive and is correlated with TxD, and Y1 Z1 transmits and is correlated with RxD.	SV5A 1-2 shorted SV5A 3-4 shorted SV5A 6-7 shorted 	
S2Ex-RS-Z-B-D	**RS232⇔RS422** A1 B1 receiving, Y1 Z1 transmitting. Transmission with lines A1 B1 control. RS422 transmission half-duplex with releasing lines Y1 Z1. Echo occurrence indicates wrong configuration of line RS422 (shorted) or conflict.	SV5A 1-2 shorted SV5A 6-7 shorted 	
S2Ex-RS-Z-A-F	**RS232⇔RS422** A1, B1 receiving, Y1 Z1 transmitting. Transmission with echo suppression. RS422 transmission full-duplex without direction control. Device is transparent for transmission. A1 B1 always receive and is correlated with TxD, and Y1 Z1 transmits and is correlated with RxD.	SV5A 3-4 shorted SV5A 6-7 shorted 	

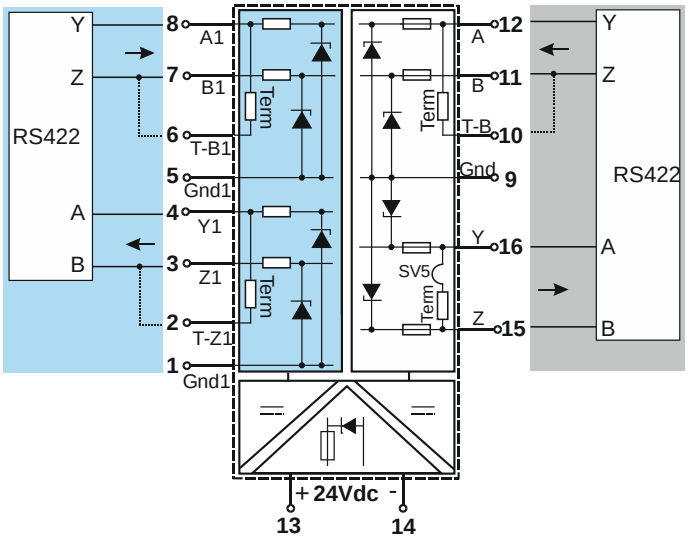
Code	Description	Jumpers description	Hazardous zone — Connection drawing — Safe zone
S2Ex-RS-Z-B-F	**RS232⇔RS422** A1, B1 receiving, Y1 Z1 transmitting. Transmitting with echo. Echo occurrence indicates shortage error of lines A1-Y1, B1-Z1. RS422 transmission full-duplex without direction control. Device is transparent for transmission. A1 B1 always receive and is correlated with TxD, and Y1 Z1 transmits and is correlated with RxD	SV5A 6-7 shorted 	
S2Ex-RS-Z-C-C	**RS485⇔RS485** Transmission half-duplex with all direction control.	SV5A 1-2 shorted SV5A 4-5 shorted 	
S2Ex-RS-Z-CH-C	**RS485⇔RS485** Transmission half-duplex with all direction control. RS485 on safe zone in 2-wire version with internal terminator.	SV5A 1-2 shorted SV5A 4-5 shorted SV5A 10-11 shorted SV5 1-2 shorted 	

Code	Description	Jumpers description	Hazardous zone — Connection drawing — Safe zone
S2Ex-RS-Z-C-D	**RS485⇔RS422** A1 B1 receiving, Y1 Z1 transmitting. RS422 transmission half-duplex with releasing lines Y1 Z1.	SV5A 1-2 shorted SV5A 4-5 shorted 	
S2Ex-RS-Z-CH-D	**RS485⇔RS422** A1 B1 receiving, Y1 Z1 transmitting. RS422 transmission half-duplex with releasing lines Y1 Z1. RS485 on safe zone in 2-wire version with internal terminator.	SV5A 1-2 shorted SV5A 4-5 shorted SV5A 10-11 shorted SV5 1-2 shorted 	
S2Ex-RS-Z-C-F	**RS485⇔RS422** A1, B1 receiving, Y1 Z1 transmitting. RS422 transmission half-duplex without direction control. A1 B1 always receive and Y1 Z1 always transmit.	SV5A 4-5 shorted 	

Code	*Description*	*Jumpers description*	*Hazardous zone* — *Connection drawing* — *Safe zone*
S2Ex-RS-Z-CH-F	**RS485⇔RS422** A1, B1 receiving, Y1 Z1 transmitting. RS422 transmission half-duplex without direction control. A1 B1 always receive and Y1 Z1 always transmit. RS485 on safe zone in 2-wire version with internal terminator	SV5A 4-5 shorted SV5A 10-11 shorted SV5 1-2 shorted 	
S2Ex-RS-Z-D-C	**RS422⇔RS485** A, B receiving, Y Z transmitting. Transmission half-duplex with all transmission direction control. No terminators from safe side.	SV5A 1-2 shorted SV5A 4-5 shorted 	
S2Ex-RS-Z-E-C	**RS422⇔RS485** A, B receiving, Y Z transmitting. Transmission half-duplex with all transmission direction control. Terminators from safe zone.	SV5A 1-2 shorted SV5A 4-5 shorted SV5 1-2 shorted 	

Code	Description	Jumpers description	Hazardous zone — Connection drawing — Safe zone
S2Ex-RS-Z-F-C	**RS422⇔RS485** A B receiving, Y Z transmitting. Transmission half-duplex with only Y1 and Z1 control from intrinsically safe side. Lines are turning off if no transmission. Lines Y and Z transmitting all the time. Terminators from safe zone.	SV5A 1-2 shorted SV5 1-2 shorted 	
S2Ex-RS-Z-D-D	**RS422⇔RS422** A B A1 B1 receiving, Y Z Y1 Z1 transmitting. Transmission half-duplex with all transmission direction control.. Lines Y Z Y1 Z1 are turning off if no transmission. No terminators from safe side.	SV5A 1-2 shorted SV5A 4-5 shorted 	
S2Ex-RS-Z-D-F	**RS422⇔RS422** A B A1 B1 receiving, Y Z Y1 Z1 transmitting. Transmission half-duplex with only Y and Z control from safe side. Lines are turning off if no transmission. Lines Y1 and Z1 transmitting all the time. No terminators from safe side.	SV5A 4-5 shorted 	

Code	Description	Jumpers description	Hazardous zone — Connection drawing — Safe zone
S2Ex-RS-Z-E-D	**RS422⇔RS422** A B A1 B1 receiving, Y Z Y1 Z1 transmitting. Transmission half-duplex with all transmission direction control. Lines Y Z Y1 Z1 are turning off in no transmission. Terminators from safe side.	SV5A 1-2 shorted SV5A 4-5 shorted SV5 1-2 shorted 	
S2Ex-RS-Z-E-F	**RS422⇔RS422** A B A1 B1 receiving, Y Z Y1 Z1 transmitting. Transmission half-duplex with only Y and Z control from safe side. Lines are turning off if no transmission. Lines Y1 and Z1 transmitting all the time. Terminators from safe side.	SV5A 4-5 shorted SV5 1-2 shorted 	
S2Ex-RS-Z-F-D	**RS422⇔RS422** A B A1 B1 receiving, Y Z Y1 Z1 transmitting. Transmission full duplex with only Y1 and Z1 control from intrinsically safe side. Lines are turning off if no transmission. Lines Y and Z transmitting all the time. Terminators from safe side.	SV5A 1-2 shorted SV5 1-2 shorted 	

Code	Description	Jumpers description	Hazardous zone — Connection drawing — Safe zone
S2Ex-RS-Z-F-F	**RS422⇔RS422** A B A1 B1 receiving, Y Z Y1 Z1 transmitting. Transmission full duplex without direction control. Lines Y Z Y1 Z1 transmitting all the time. Terminators from safe side. A B are correlated with lines Y1 Z1, and Y Z with lines A1 and B1.	SV5 1-2 shorted 1 2 3 4 5 6 7 8 9 10 11 SV5A 2 4 6 8 SV5 1 3 5 7	

Below is a detailed table of RS232C interface connections from the device to the standards of the different companies. In order to ensure correct operation of the transmission control signals should be shorted. The table is for reference only. In order to determine the final connection, the following connections should be compared to the catalog data of the connected device.

Connection type → **Company name →**								8P8C (RJ45)						10P10C (RJ50)		
Signal name	**Sym**	**Direction**	**LABOR-ASTER S2Ex-RS**	**DB-25M**	**DB-25F**	**DB-9M**	**DB-9F**	**TIA-561**	**Yost**	**MMJ**	**Cisco**	**Hirschmann**	**Cyclades**	**National Instruments**	**Cyclades**	**Digi**
Common Ground	G		GND	7	7	5	5	4	4-5	3-4	4-5	4	4	6	5	7
Transmitted Data	TxD	→	TxD	2	3	3	2	6	3	2	3	3	3	8	4	5
Received Data	RxD	←	RxD	3	2	2	3	5	6	5	6	5	6	9	7	6
Data Terminal Ready	DTR	→	Shorted	20	6	4	6	3	2	1	2	-	2	7	3	9
Data Set Ready	DSR	←		6	20	6	4	1	7	6	7	-	8	5	9	2-10
Carrier Detect	DCD	←		8	-	1	-	2	7	-	-	-	7	10	8	10-2
Request To Send or Ready to Receive	RTS RTR	→	Shorted	4	5	7	8	8	1	-	-	-	1	4	2	3
Clear To Send	CTS	←		5	4	8	7	7	8	-	-	-	5	3	6	8
Ring Indicator	RI	←		22	(NC)	9	-	1	-	-	-	-	-	2	10	1

Note. No Connect (NC) – leave unconnected. Empty fields (-) in the table mean signal is not used.

Separator is placed in a housing made of self-extinguishing plastic (polyamide PA 6.6) intended for mounting on TS35 rail. The enclosure and terminal protection degree is IP20.

Operational conditions:

Ambient temperature – storage	-30 ÷ +70°C
Ambient temperature - operation	-30 ÷ +70°C
Relative humidity	max 90% no condensation
Ambient atmosphere	no aggressive dusts and gases
Operation position	any