B-DO, B-DO/A

Digital Output Separator
B-DO, B-DO/A

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CONTENTS

1 Device Description

1.1 Product Identification

Business name:	B-DO, B-DO/A
Name of product:	Digital Output Separator
Product drawing number:	KP 117 (KP 117 Mod. A)

1.2 Device Functions

B-DO (B-DO/A) digital output separator is a safety separation barrier for digital outputs of the following devices:

- Corus Evo+

Attention!

From the point of view of use in potentially explosive atmospheres, the digital output separator is designed as an associated apparatus, which must be placed outside the hazardous area during operation.

The purpose of the digital output separator is to create a safety barrier between intrinsically safe circuits (equipment placed in a potentially explosive atmosphere) and other circuits that are placed outside the hazardous area. With the use of the digital output separator, conventional devices for processing digital (i.e. pulsed, binary or digitally encoded) output signals can be easily connected to intrinsically safe correctors.

The B-DO (B-DO/A) digital output separator is powered by 12 V DC.

The digital output separator is placed in a plastic box and is designed for mounting on a distribution board on a 35 mm DIN rail. Terminals for conductors with a maximum cross-section size of 2.5 mm2 are used for connecting the conductors.

The digital output separator is manufactured in two versions: in B-DO basic version and B-DO/A for powering the separator from accumulator only.

1.3 Description of Operation and the Equipment Design

The separator contains interference protection elements and protection against polarity reversal of the power supply.

The separator allows for the separation of up to four digital signals from the corrector to the intrinsically safe terminals DI1 to DI4. The signals pass through the safety barrier and are routed to the output terminals DO1 to DO4 (input DI1 →output DO1, input DI2 → output DO2, etc.).

In addition to the signal terminals DI1 to DI4, the terminals Digital Inputs terminal box also include terminals U+ and GND to which the voltage of the internal intrinsically safe power supply is connected. This IS voltage is necessary for powering the digital output circuits of the corrector, which are galvanically isolated from the other circuits of the corrector.

The electrical parameters of the signal are unchanged after passing through the separator.

The B-DO (B-DO/A) separation module contains no adjustment elements.

Fig. 29 B-DO, B-DO/A designs

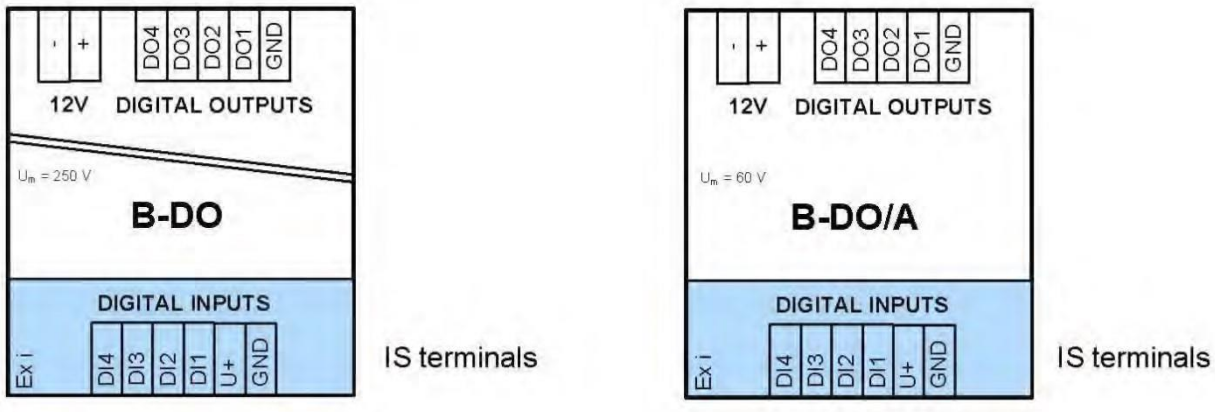

Fig. 30 Schematic symbols

1.3.1 B-DO Design

The basic version of the separator is intended for systems whose power is derived from the mains voltage (Um = 250V). The B-RS can be powered, for example, from a non-backed-up power supply or from an accumulator backed-up power supply, a rechargeable mains charger, etc.

The B-DO power supply in the basic version contains galvanic separation between the input and intrinsically safe output circuit.

1.3.2 B-DO/A Design

The B-DO/A separator design has reduced internal current consumption compared to the basic version. It is suitable for accumulator-only powered systems which can be recharged via solar panels (Um = 60 V).

This power supply design has no galvanic separation between the input and intrinsically safe output circuits (negative input and output terminals are interconnected).

Attention!

The B-DO/A digital output separator must not be powered from 230V mains voltage. Also, it must not be powered by an accumulator charged by a mains charger.

1.3.3 Activity Indication

On the front panel of the digital output separator, five indication LEDs are placed.

LED Designation	Color	State	Meaning
PWR	Green	Lit	The module is powered
		Not lit	The module is not powered
DO1 DO2 DO3 DO4	Yellow (4 pcs)	Flashes	Indicates the present of signal on the respective DO output terminal

2 Safety

2.1 General

From the safety point of view, the communication separator has been designed according to ČSN EN 60079-0 ed.4: III. 2013 and ČSN EN 60079-11 ed.2: VI. 2012 as an associated apparatus.

It is manufactured and supplied in accordance with the following European Parliament directives:

- 2014/34/EU(ATEX) Equipment and protective systems intended for use in potentially explosive atmospheres (NV 116/2016 Coll.)
- 2014/30/EU Electromagnetic Compatibility (NV 117/2016 Coll.)

The device is placed on the market and in use according to the above-mentioned directives with the CE mark affixed.

The device meets the requirements for radio interference emissions for industrial environments.

An EC Type Examination Certificate (ATEX) has been issued for use as an associated apparatus placed outside the potentially explosive atmosphere. Compliance with this Directive is included in the CE conformity marking.

FTZÚ 19 ATEX 0046	EU type-examination certificate (ATEX) for use in potentially explosive atmospheres.

ATTENTION!

The device has been designed and approved as an associated apparatus. This means that only approved intrinsically safe equipment complying with intrinsic safety parameters specified in the EC-Type Examination Certificate may be connected to the instrument's intrinsically safe terminals.

During operation, the associated apparatus must be placed outside the potentially explosive atmosphere.

DANGER!

The device must be installed and used in accordance with this documentation and the conditions stated in the ATEX certificate.

When connecting the device, the relevant safety standards must be observed.

2.2 Using the Device in Potentially Explosive Atmospheres

Explosion Safety Level	Device
II (1)G [Ex ia Ga] IIB	- B-DO Design, Um = 250V - B-DO/A Design, Um = 60 V

When connecting the device, the electrical characteristics of the connecting cables must be considered, and the requirements of the relevant safety standards met. Additionally, the Special conditions for Use must be observed, if listed in these Certificates. The explosion safety parameters of the device are specified in Section 5.

2.2 Specific Conditions of Use

CAUTION!

1. **The B-DO/A module has no galvanic separation between intrinsically safe and conventional circuits. This must be taken into account during installation.**
2. **The B-DO/A module must not be powered from sources whose voltage is derived from 230 V mains voltage. It must also not be powered by an accumulator that is also charged by the mains charger.**

3 Installing the Device

The device must be installed out of potentially explosive atmospheres. The device is intended for installation on a distribution board on a 35 mm DIN rail.

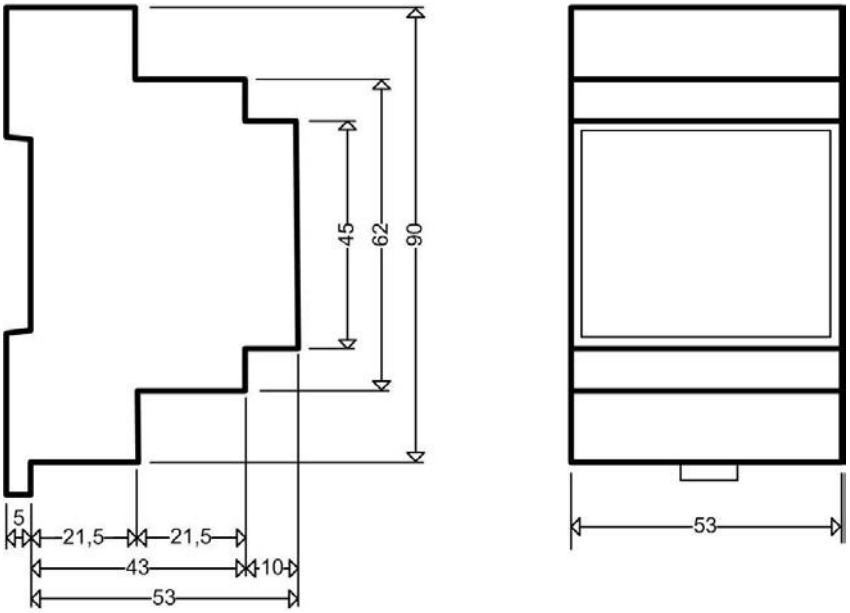

Fig. 31 Dimensions of the device (mm)

The communication separator must be powered from 12V DC power supply. If the DC power supply is supplied from the mains, it is necessary to install the 3rd stage overvoltage protection with a HF filter before the supply.

3.1 Cabling

The cable between the corrector and the digital output separator transmits the IS signal and must be shielded. The cable shield is connected on the corrector side, the shield remains unconnected on the B-DO (B-DO/A) digital output separator side.

The recommended type of jumper cable between the corrector and the digital output separator and its maximum length is shown in the following table.

Cable designation	*Type*	*Inductance*	*Capacity*	*Conductor resistance*	*Manufacturer*	*Max. length*
Unitronic LiYCY 6 x 0.25 mm2	6-wire shielded	0.65 mH/km	160 nF/km	82 Ω/km	Lappkabel Stuttgart	30m

Tab. 7 Cable recommended for Digital Outputs between the corrector and the separator.

4 Technical Parameters

4.1 Operation Conditions and the Environment

Operating ambient temperature	-40 to +70°C
Working environment	Normal environment (ČSN 33 2000-5-51 ed. 3)
IP rating	IP 20 (ČSN EN 60 529)
The device design in terms of protection against electric shock	Class III protection equipment (ČSN EN 61140 ed. 3)
Relative humidity of the environment	0% to 95% relative, non-condensing
Air pressure	86 kPa to 106 kPa
External dimensions	53 x 90 x 58 mm
Device weight	125 g (B-DO) 116 g (B-DO/A)
Mount	On 35mm DIN rail

4.2 Explosion-proof Design

Designation	Ex II (1)G [Ex ia Ga] IIB
Certificate no.	FTZÚ 19 ATEX 0046
Max. voltage value Um	250 V (B-DO design) 60 V (B-DO/A design)
Environment classification	Out of potentially explosive atmospheres

4.3 Power Supply (12V terminals)

Supply voltage range	10.5 to 15 V
Current consumption (idle) [4]	Type 8.3 mA at 14 V (B-DO) Type 0.3 mA at 12 V (B-DO/A)
Max. current consumption [5]	26 mA (B-DO) 21 mA (B-DO/A)
Max. cable length	30m

4.4 Digital Outputs

Number of outputs	4
Type of output	Open collector
Max. voltage	16 V

[4] Except for the power supply, no external circuits are connected to the separator terminals.

[5] The U + and GND terminals of the intrinsically safe DIGITAL INPUTS terminal block are shorted.

Max. current	100 mA
Max. resistance in closed state	10 Ω
Max. cable length	30m

4.5 Digital Inputs

Number of inputs	4
Idle voltage	Type 5.0 V
Short-circuit current of terminals DI1 to DI4	Type 97 µS
U+ terminal short circuit current	Type 19.9 mA
Max. cable length	30m [6]
Galvanic separation	1,500 V (B-DO design only)

[6] The inductance and cable capacity (depending on the length and type of the cable used) must comply with the explosion-proof parameters of the system.

5 Explosion Safety Parameters

Intrinsically safe parameters are common for all the terminals of the IS part of the separator and are based on the parameters of the IS power supply, which is of trapezoidal characteristics.

Maximum output voltage	Uo:	7.2 V
Maximum voltage before limiting resistor	U_Q:	11.12 V
Maximum output current	Io:	109 mA
Maximum output power	Po:	303 mW
Maximum external capacity	Co:	19 µF (for gas group IIB)
Maximum external inductance	Lo:	1.2 mH (for gas group IIB)
Maximum internal capacity	Ci:	4.58 µF
Maximum internal inductance	Li:	0 µH

6 Product Data Plate

Fig. 32 Data Plates

7 Device Wiring Diagrams

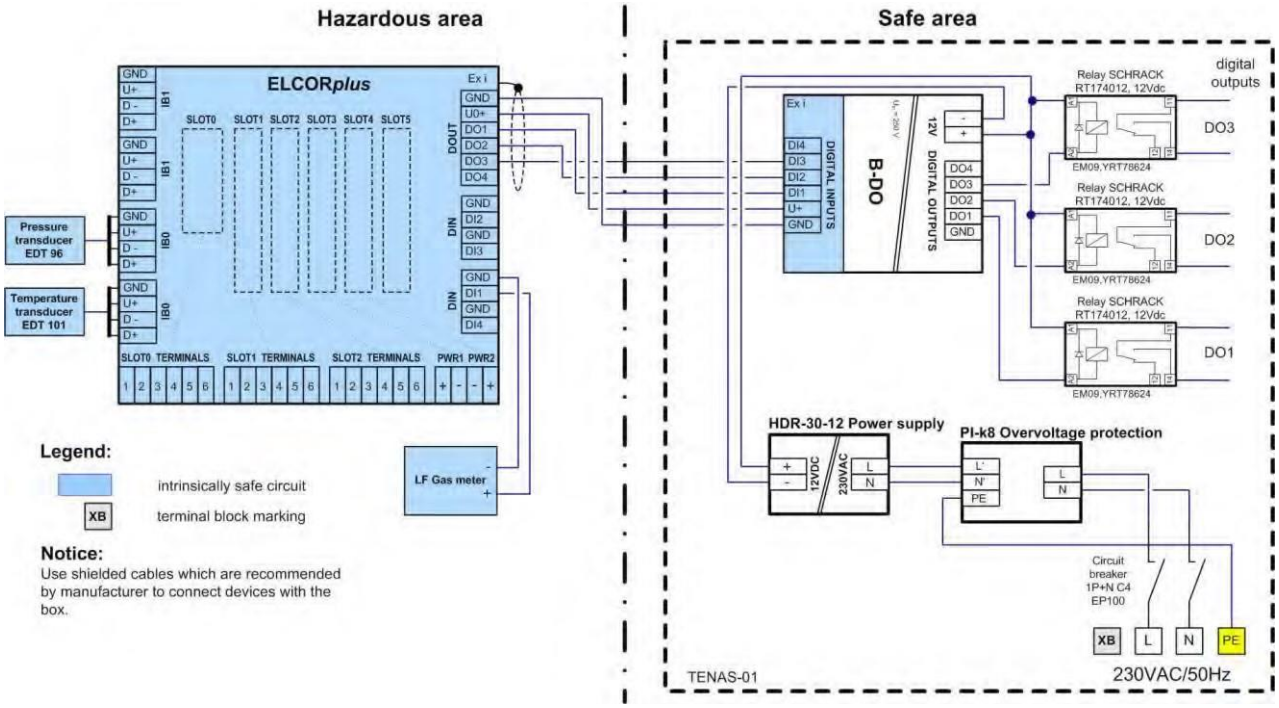

Fig. 34 Connection of Corus Evo+ and B-DO