

Accessories

for Correctors

**ELCOR, ELCOR*plus*, ELCOR*plus indexer*,
ELCOR*lite***

and Data Loggers

DATCOM, DATCOM*plus*, DATCOM*lite*





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CONTENTS:

CONTENTS:3

TERMS AND DEFINITIONS, ABBREVIATIONS USED1

INTRODUCTION.....2

INTRINSICALLY SAFE POWER SUPPLY FOR EVC PS-E, PS-E/A4

INTRINSICALLY SAFE POWER SUPPLY FOR INTERNAL MODEM PS-M, PS-M/A18

INTRINSICALLY SAFE POWER SUPPLY FOR INTERNAL MODEM PS-M1, PS-M1/A 33

RS485/RS232 COMMUNICATION SEPARATOR B-RS, B-RS/A46

DIGITAL OUTPUT SEPARATOR B-DO, B-DO/A64

COMBINED MODULE B-PRO, B-PRO/A77

COMMUNICATION SEPARATOR FOR INTERNAL BUS B-IB.....99

CURRENT OUTPUT MODULE CLO.....112

SOLAR CONTROLLER SRM.....122

APPENDIX - EXAMPLE OF THE USE OF THE ACCESSORY MODULES.....135

LIST OF LITERATURE137

SOFTWARE.....138

LIST OF FIGURES.....139

LIST OF TABLES.....141

Terms and definitions, Abbreviations Used

Symbol		Meaning
AC, ac	...	AC voltage
associated apparatus	...	Electrical equipment that include both limited-energy and non-limited-energy circuits designed so that the circuits that do not have limited energy cannot adversely affect the limited-energy circuits
DC, dc	...	DC voltage
EDTxx	...	digital transducer of pressure EDT 96 or of temperature EDT 101
ELGAS ver. 2,	...	communication protocol developed by ELGAS, s.r.o.
EMC	...	electromagnetic compatibility and resistivity
EMI	...	electromagnetic radiation
EVC	...	Electronic Volume Corrector
firmware, FW	...	software in the device
IB	...	Coding of internal intrinsically safe RS485 communication bus for ELCOR and ELCORplus devices (DATCOM, DATCOMplus) where are connected eg. pressure or temperature transducers or module B-IB.
Intrinsic Safety (IS)	...	Type of explosion protection based on the limitation of electric energy in the equipment and the connections exposed to a potentially explosive atmosphere to a level below that which could cause ignition by sparks or by thermal effects
intrinsically safe circuit (ISC)	...	A circuit that does not produce sparks or thermal effects under the prescribed test conditions according to EN 60079-11 (these conditions include normal operating condition and failure conditions) that would be capable of igniting a given explosive gas atmosphere
LF	...	low frequency
M900	...	RMG communication protocol
Modbus	...	communication protocol developed by Modicon [15]
MPE	...	Maximum Permissible Error
MPPT	...	Maximum Power Point Tracking - a technique used in solar systems to maximize solar power gain
PLC		<i>(Programmable Logic Controller)</i> Programmable logic controller for process control or machine control
SW	...	software – PC program
trouble-free components and assembly parts	...	a component or assembly of components for which certain types of failure, as specified in EN 60079-11, are not foreseen; the probability of such failures during operation or storage is so low that it is not taken into account
hf, HF	...	high frequency
VRLA	...	<i>Valve Regulated Lead Acid</i> is a name for maintenance-free valve-controlled lead-acid batteries. The electrolyte compartment is closed. When a certain internal overpressure is reached, the gases are released by the built-in valve and the pressure inside the accumulator drops.

Introduction



This manual describes the features and parameters of **ELCOR**, **ELCORplus**, **ELCORplus indexer**, **ELCORlite** volume correctors and of **DATCOM**, **DATCOMplus**, **DATCOMlite** electronic data loggers.

If ELCOR corrector is mentioned further in the text, the information provided applies also to DATCOM electronic data logger, unless otherwise stated

If ELCORplus corrector is mentioned further in the text, the information provided applies also to DATCOMplus electronic data logger, unless otherwise stated.

If the ELCORlite corrector is listed below, the information provided also applies to the DATCOMlite electronic data logger, unless otherwise stated.

The main function of the external modules included in the accessories of the correctors/loggers described above is to ensure their external power supply and external power supply of their internal modems as well as to ensure correct connection of other collaborating devices, which extend the utility features of the device. As a corrector/logger is an intrinsically safe device in terms of safety, the following modules function as a safety barrier (with the exception of CLO and SRM modules) for connecting conventional devices.

The accessories described in this manual are supplied in the form of devices in IP20 plastic enclosures intended for DIN rail mounting on a distribution board.

Dual Module Design

Most of the modules are available in two versions - basic version and the version with "/A" designation (e.g. PS-E and PS-E/A). Both versions are identical as concerns the function; the difference is in the resistance to the input voltage in terms of intrinsic safety, current consumption and the possibility of galvanic separation.

Basic Version - for general use; the module is powered by DC 12V supply connected to 230V AC power supply (intrinsically safe parameter $U_m = 250V$). The intrinsically safe module terminals are galvanically isolated from the other terminals.

"/A" Version - the module has reduced internal current consumption, which is why it is suitable for installations where there is no 230V AC power supply and which are powered from the battery (intrinsically safe parameter $U_m = 60V$). In that case, the power accumulator must not be charged from a power source connected to the 230V AC power supply. In the module, the terminals are not galvanically separated.

In terms of explosion safety, the accessory devices forming the accessory can be divided into two groups.

1. Devices containing a safety barrier for IS signals (associated apparatus according to EN 60079-11)

Designation	Name	Designed for
PS-E, PS-E/A	Intrinsically safe power supply for EVC	ELCORplus, ELCORplus indexer, ELCORplus, ELCORlite, DATCOMlite

1 Device Description



PS-M, PS-M/A	Intrinsically safe power supply for modem	ELCOR <i>plus</i> , ELCOR <i>plus indexer</i> (ELCOR <i>plus</i> , ELCOR <i>lite</i> ¹), DATCOM <i>lite</i> ¹)
PS-M1, PS-M1/A	Intrinsically safe power supply for modem	ELCOR <i>lite</i> , DATCOM <i>lite</i>
B-RS, B-RS/A	RS485/RS232 communication separator	ELCOR, ELCOR <i>plus</i> , ELCOR <i>plus indexer</i> DATCOM, DATCOM <i>plus</i> ELCOR <i>lite</i> , DATCOM <i>lite</i>
B-DO, B-DO/A	Digital outputs separator	ELCOR, ELCOR <i>plus</i> , ELCOR <i>plus indexer</i> DATCOM, DATCOM <i>plus</i> ELCOR <i>lite</i> , DATCOM <i>lite</i>
B-PRO, B-PRO/A	Combined module (IS source for EVC, communication separator, digital output separator)	ELCOR ²), ELCOR <i>plus</i> , ELCOR <i>plus indexer</i> DATCOM ²), DATCOM <i>plus</i> ELCOR <i>lite</i> , DATCOM <i>lite</i>
B-IB	Communication separator for IB	ELCOR <i>plus</i> , ELCOR <i>plus indexer</i> DATCOM <i>plus</i>

2. Appliances for General Use

Designation	Name	Designed for
CLO	Current output module	ELCOR, ELCOR <i>plus</i> , ELCOR <i>plus indexer</i> DATCOM, DATCOM <i>plus</i> ELCOR <i>lite</i> , DATCOM <i>lite</i>
SRM	Solar regulator	ELCOR <i>plus</i> , ELCOR <i>plus indexer</i> DATCOM <i>plus</i> , ELCOR <i>lite</i> , DATCOM <i>lite</i>

Devices containing safety barrier for IS signals must be connected to the corrector/logger in accordance with the applicable standards, in particular:

EN 60079-25:2010 Explosive atmospheres - Part 25: Intrinsically safe electrical systems;

EN 60079-14:2014 - Explosive atmospheres- Part 14: Electrical installations design, selection and erection;

EN IEC 60079-0:2018 - Explosive gas atmospheres, Part 0: Equipment - General requirements;

EN 60079-11:2012 - Explosive atmospheres- Part 11: Equipment protection by intrinsic safety "i"

¹) Only for LTE-Cat1 modems.

²) The external IS power supply for the EVC cannot be used for these devices.

Intrinsically Safe Power Supply for EVC PS-E, PS-E/A



CONTENTS

1	DEVICE DESCRIPTION	6
1.1	Product Identification.....	6
1.2	Device Functions	6
1.3	Description of Operation and the Equipment Design.....	7
1.3.1	PS-E Design.....	7
1.3.2	PS-E/A Design	8
1.3.3	Activity Indication.....	8
2	SAFETY	9
2.1	General	9
2.2	Using the Device in Potentially Explosive Atmospheres.....	9
2.3	Specific Conditions of Use.....	10
3	INSTALLING THE DEVICE	11
3.1	Cabling.....	11
4	TECHNICAL PARAMETERS.....	12
4.1	Operation Conditions and the Environment.....	12
4.2	Explosion-proof Design.....	12
4.3	Power Supply (12V INPUT terminals)	12
4.4	Power Supply Output (5V OUTPUT)	12
5	EXPLOSION SAFETY PARAMETERS	13
6	PRODUCT DATA PLATE	14
7	DEVICE WIRING DIAGRAMS.....	15

1 Device Description

1.1 Product Identification

Business name:	PS-E, PS-E/A
Name of product:	Intrinsically Safe Power Supply for EVC
Product drawing number:	KP 111 (KP 111 Mod. A)

1.2 Device Functions

Intrinsically safe power supply PS-E (PS-E / A) is designed for external power supply of the following devices:

- ELCOR_{plus}
- ELCOR_{plus} *indexer*
- DATCOM_{plus}
- ELCOR_{lite}
- DATCOM_{lite}

An intrinsically safe power supply can **power only one device**.

Note:

The ELCOR corrector and DATCOM data logger cannot be powered from external supply.



Attention!

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

Intrinsically safe power supply PS-E (PS-E/A) is powered by 12V DC.

The intrinsically safe power supply 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 maximum cross-section 2.5 mm² are fitted for conductor connection.

The use of an external power supply of a corrector/logger is recommended:

- If the operating mode of the corrector/logger is set to have a higher battery consumption, which shortens the battery life (e.g. on-line communication).

A corrector/logger must be powered from external power supply ³⁾:

- When using the S0-EXT1 module with HF pulse input of NAMUR in the corrector/logger.
- When using a NAMUR encoder with a measurement period of less than 1 min.



To be externally powered, the corrector/logger must be equipped with the **S3-PWR1 ³⁾** plug-in internal module.

The supply voltage from the PS-E, PS-E/A IS power supply is applied to the PWR1 terminals of the corrector/logger which relates to the S3-PWR1 module.

³⁾ Not valid for devices ELCOR_{lite} and DATCOM_{lite}.



WARNING

If a corrector is powered from an external power supply, it is necessary for the device to operate correctly, that the corrector power supply battery must be inserted and connected in the device.

The IS power supply is manufactured in two versions; in PS-E basic version and PS-E/A for accumulator supply only.

1.3 Description of Operation and the Equipment Design

The intrinsically safe power supply is protected against polarity change of the input voltage. It also has voltage, current, and output voltage regulator circuits with a Zener diode pair. The power supply has a replaceable fuse T100mA.



Fig. 1 PS-E and PS-E/A Designs

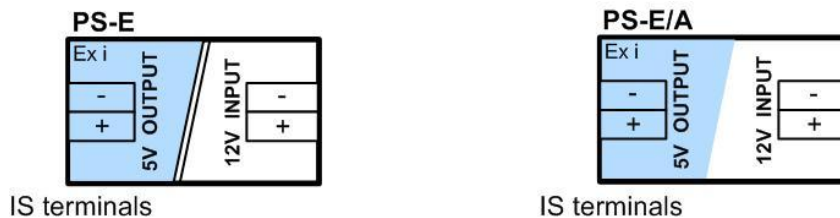


Fig. 2 Schematic symbols

1.3.1 PS-E Design


The PS-E basic variant is designed for systems whose power is derived from the mains voltage ($U_m = 250V$). The PS-E 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 PS-E has a galvanic separation between the input circuit and the intrinsically safe output circuit. Galvanic isolation is realized by insulated convertor with transformer. The power input to the transformer is limited by a fuse F1 (T100mA) and a voltage limiter with a short-circuit thyristor. The transformer is followed by a rectifier and a voltage regulator.

1.3.2 PS-E/A Design

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

This power supply design has no galvanic separation between the input and intrinsically safe output circuits (negative input and output terminals are interconnected). The power supply includes a T100mA fuse for input current limitation and a voltage regulator.



Attention!

The PS-E/A power supply 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

The device is equipped with a green LED placed under the transparent front panel. The LED is marked PWR.

LED Designation	Colour	State	Meaning
PWR	Green	Not lights	The device is not powered or is malfunctioning
		Lights	Trouble-free condition of the device

2 Safety

2.1 General

From the safety point of view, the device has been designed according to EN IEC 60079-0 [2] and EN 60079-11[3] as an associated apparatus.


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

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


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



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	- PS-E Design, Um = 250V - PS-E/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 intrinsic safety parameters of the connection terminals are specified in Section 5. The recommended types of cables are listed in Section 3.1.

2.3 Specific Conditions of Use



CAUTION!

1. The PS-E/A module has no galvanic separation between intrinsically safe and conventional circuits. This must be taken into account during installation.
2. The PS-E/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.

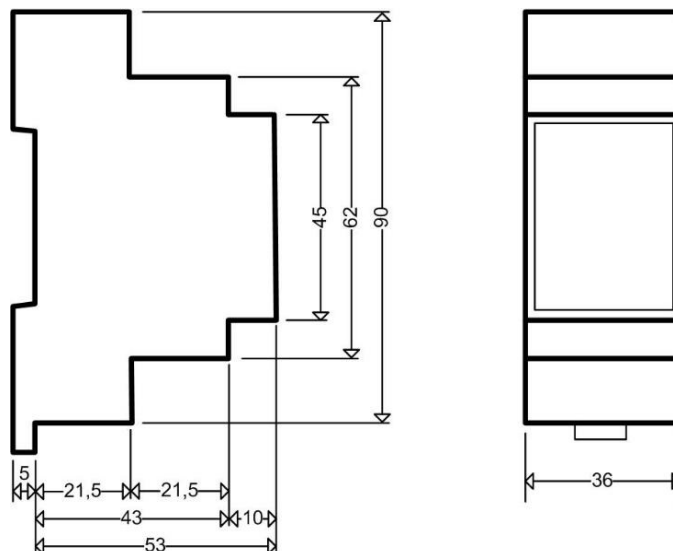


Fig. 3 IS power supply dimensions (mm)

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

Power from an external intrinsically safe PS-E (PS-E/A) power supply is fed to the terminals of the PWR1 corrector/logger.

The recommended connections are listed in paragraph. 7.

3.1 Cabling

The device has been designed and approved for connection to IS terminals using shielded cables. The shield is connected on the side of the powered device (corrector or logger), it remains unconnected on the IS side of the PS-E (PS-E/A) power supply.

For power cables longer than 5 meters, it is not recommended to use cables with a small cross-section due to the conductor resistance. Cable conductor resistance may cause undesired voltage drop over longer distances. For external power supply of a corrector from PS-E (PS-E/A) source the cable with min. conductor cross-section of 0.75 mm² is prescribed. The recommended cable types and their maximum lengths are listed in the following table.

Designation	Type	Conductor cross-section size	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 2 x 0.75 mm ²	2-wire shielded	0.75mm ²	0.65 mH/km	160 nF/km	27 Ω/km	Lappkabel Stuttgart	30m


Tab. 1 Cable recommended for EVC external power supply

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, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	protection class III (EN 61140)
Relative humidity of the environment	0% to 95% relative, non-condensing
Air pressure	86 kPa to 106 kPa
External dimensions	36 x 90 x 58 mm
Device weight	81g (PS-E) 71g (PS-E/A)
Mount	On 35mm DIN rail

4.2 Explosion-proof Design

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

4.3 Power Supply (12V INPUT terminals)

Supply voltage range	10.5 to 15 V
Current consumption (idle)	Typically 10 mA (PS-E) Typically 1.2 mA (PS-E/A)
Current consumption (short circuit at output)	max 70 mA (PS-E) max 63 mA (PS-E/A)
Max. cable length	30 m

4.4 Power Supply Output (5V OUTPUT)

Idle voltage	Typically 4.6 V
Current limitation	Typically 59.5 mA
Max. cable length	30 m
Galvanic separation	1,500 V (PS-E design only)

5 Explosion Safety Parameters


Intrinsically safe power supply PS-E (PS-E/A) is of trapezoidal characteristics.

Maximum output voltage	U _o :	6.5 V
Maximum voltage before limiting resistor	U _o :	9.638 V
Maximum output current	I _o :	168 mA
Maximum output power	P _o :	405 mW
Maximum external capacity	C _o :	50 μF (for gas group IIB)
Maximum external inductance	L _o :	1.5 mH (for gas group IIB)

The inductance and cable capacity (depending on the length and type of the cable used) must comply with the explosion-proof parameters of the power supply.

6 Product Data Plate

PS-E




1953500001

Date: 2019

$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$

T100 mA F75 mA



Ex II (1)G

[Ex ia Ga] IIB


FTZÚ 19 ATEX 0046X $U_m = 250 \text{ V}$

CE 1026

$U_o = 6.5 \text{ V}$ $U_q = 9.638 \text{ V}$


$I_o = 168 \text{ mA}$ $P_o = 405 \text{ mW}$

$C_o = 50 \mu\text{F}$ $L_o = 1,5 \text{ mH}$



ELGAS, s.r.o. Semtínská 211, 533 53 Pardubice
Czech Republic

PS-E/A




1953600001

Date: 2019

$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$

T100 mA F75 mA



Ex II (1)G

[Ex ia Ga] IIB


FTZÚ 19 ATEX 0046X $U_m = 60 \text{ V}$

CE 1026

$U_o = 6.5 \text{ V}$ $U_q = 9.638 \text{ V}$

$I_o = 168 \text{ mA}$ $P_o = 405 \text{ mW}$

$C_o = 50 \mu\text{F}$ $L_o = 1,5 \text{ mH}$



ELGAS, s.r.o. Semtínská 211, 533 53 Pardubice
Czech Republic

Fig. 4 Data Plates

7 Device Wiring Diagrams

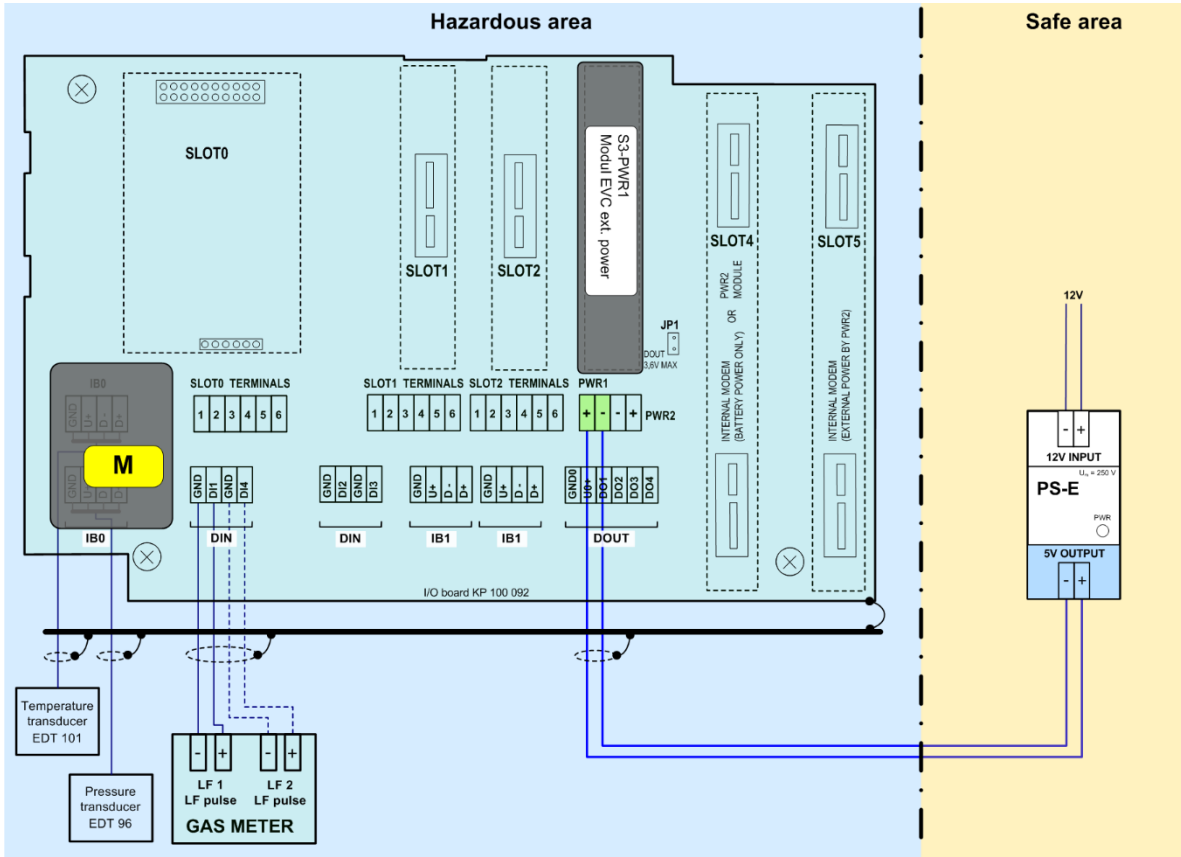


Fig. 5 Basic connection of external power supply of a corrector

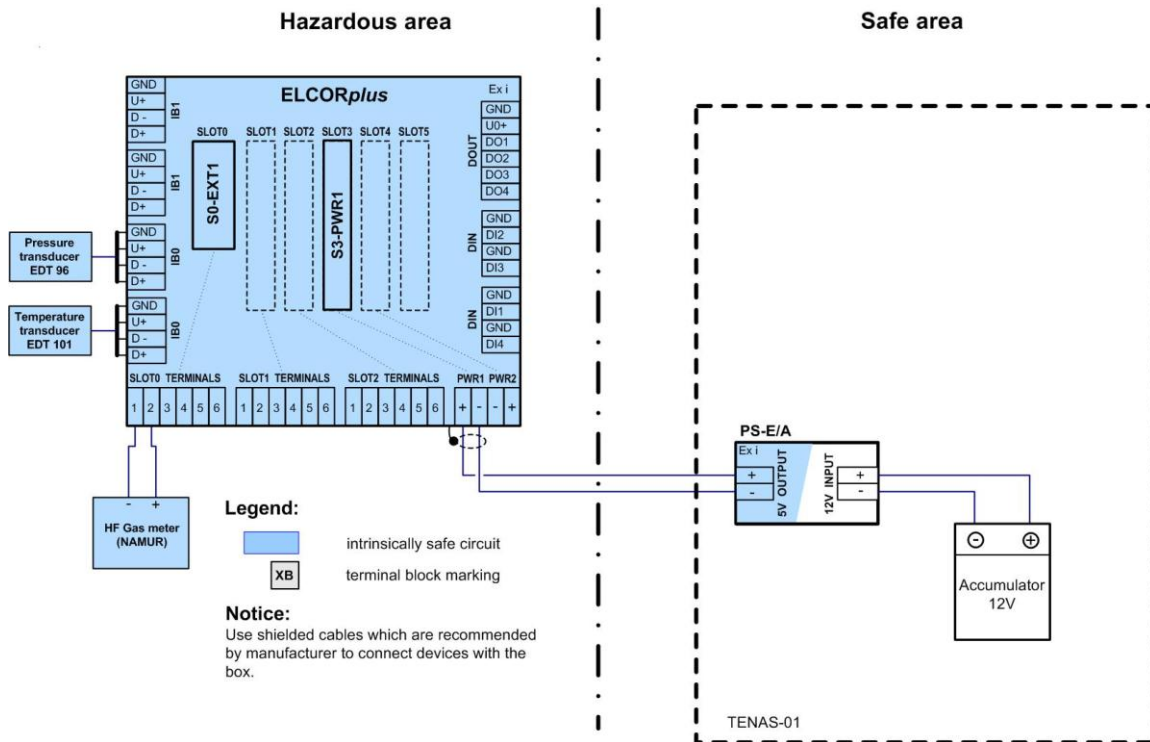


Fig. 6 Connection of EVC external power supply from the accumulator

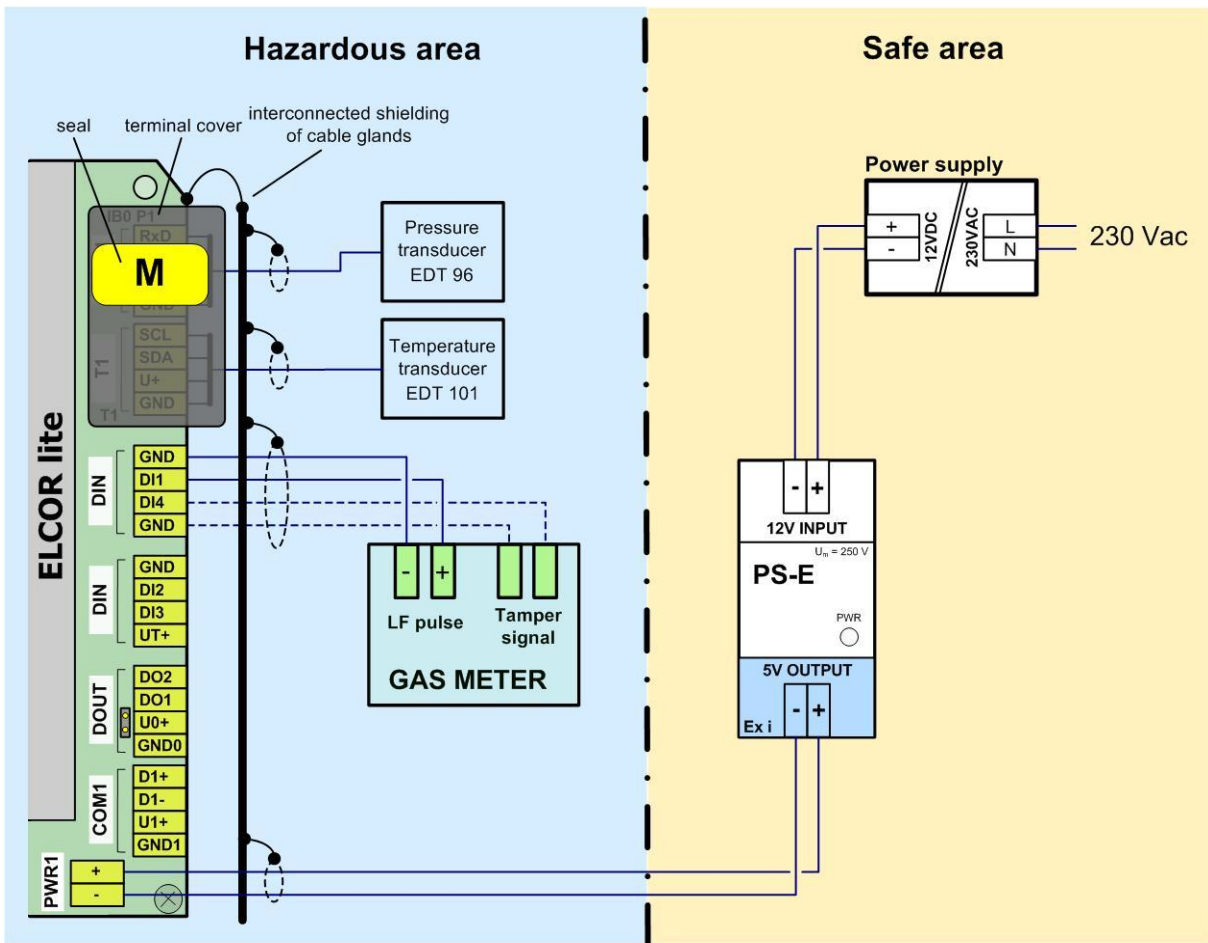


Fig. 7 Basic connection of external power supply of ELCORlite corrector

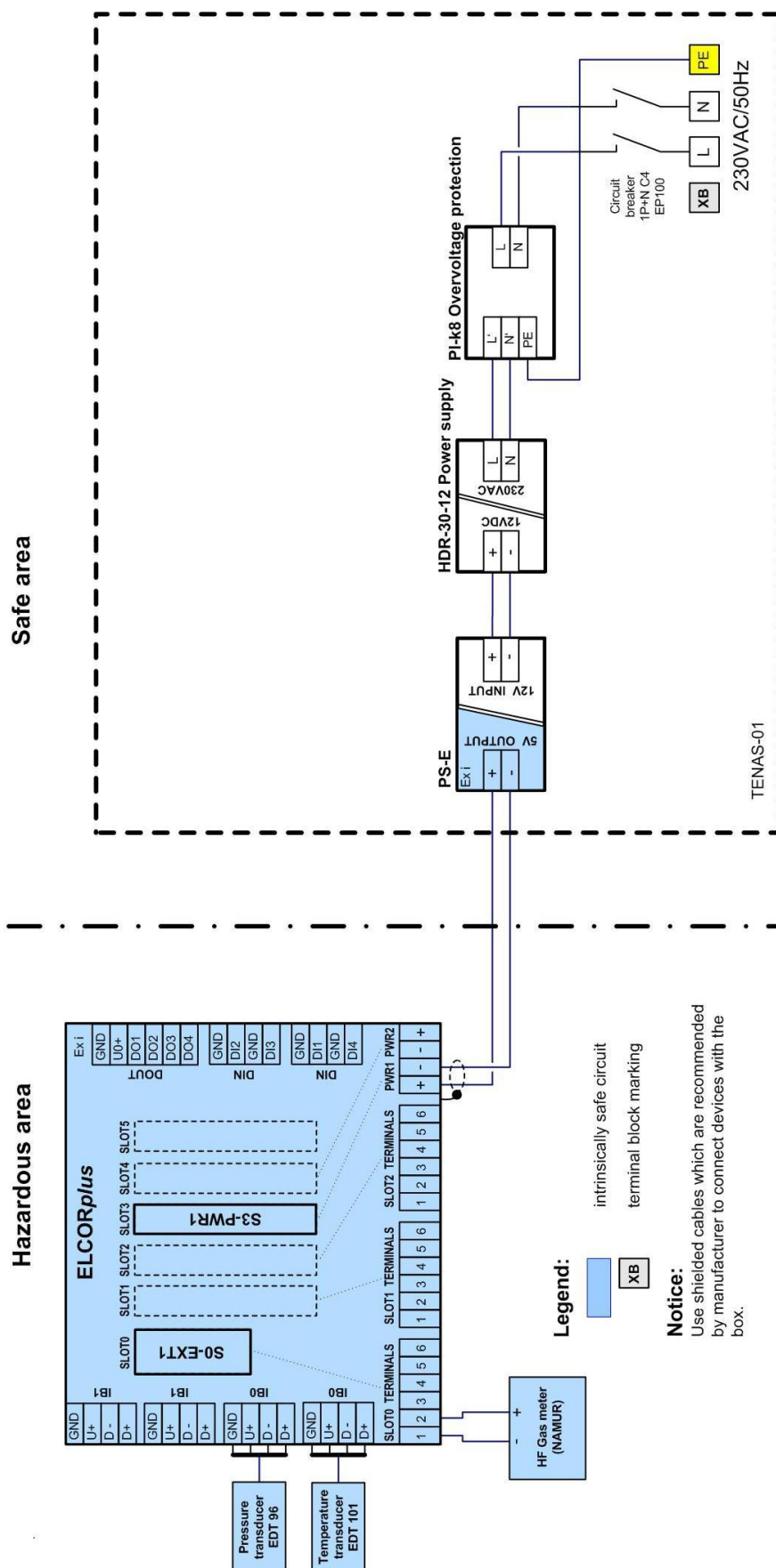


Fig. 8 Connection of the external EVC power supply

Intrinsically Safe Power Supply for Internal Modem PS-M, PS-M/A



CONTENTS

1	DEVICE DESCRIPTION	20
1.1	Product Identification.....	20
1.2	Device Functions	20
1.3	Description of Operation and the Equipment Design.....	21
1.3.1	PS-M Design	21
1.3.2	PS-M/A Design.....	22
1.3.3	Activity Indication.....	22
2	SAFETY	23
2.1	General	23
2.2	Using the Device in Potentially Explosive Atmosphere	23
2.3	Specific Conditions of Use.....	24
3	INSTALLING THE DEVICE	25
3.1	Cabling.....	25
4	TECHNICAL PARAMETERS	27
4.1	Operation Conditions and the Environment.....	27
4.2	Explosion-proof Design.....	27
4.3	Power Supply (12V INPUT terminals)	27
4.4	Power Supply Output (5V OUTPUT terminals).....	27
5	EXPLOSION SAFETY PARAMETERS	28
6	PRODUCT DATA PLATE	29
7	DEVICE WIRING DIAGRAMS.....	30

1 Device Description

1.1 Product Identification

Business name:	PS-M, PS-M/A
Name of product:	Intrinsically safe power supply for internal modem
Product drawing number:	KP 112 (KP 112 Mod. A)

1.2 Device Functions

Intrinsically safe power supply PS-M (PS-M/A) is designed for external power supply of the internal modems of the following devices:

- ELCOR $plus$
- ELCOR $plus$ *indexer*
- DATCOM $plus$
- ELCOR $lite$ - only for modem LTE-Cat1 !
- DATCOM $lite$ - only for modem LTE-Cat1 !

An intrinsically safe power supply can power **only one device**.

Note:

The ELCOR corrector and DATCOM data logger cannot be powered from external supply.



Attention!

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

Intrinsically safe power supply PS-M (PS-M/A) is powered by 12V DC.

The intrinsically safe power supply 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 use of an external power supply of an internal modem of a corrector/logger is recommended:

- If the operating mode of the communication over the internal modem of the corrector/logger is set to have a higher battery consumption, which shortens the battery life (the default settings of the modem and the modem battery life are stated in the corrector/logger manual [15]).



To be externally powered, the internal modem of the corrector/logger must be equipped with the **S4-PWR2**⁴⁾ plug-in module.

The supply voltage from the PS-M, PS-M/A IS power supply is applied to the PWR2 terminals of the corrector/logger which are connected to the S4-PWR2 module.

The internal modem must be placed in the SLOT5 of the corrector/logger.

⁴⁾ Not valid for devices ELCOR $lite$ and DATCOM $lite$.

The IS power supply is manufactured in two versions; in PS-M basic version and PS-M/A for accumulator supply only.

1.3 Description of Operation and the Equipment Design



Fig. 9 PS-M and PS-M/A designs



Fig. 10 Schematic symbols

1.3.1 PS-M Design

The PS-M basic design is designed for systems whose power is derived from the mains voltage ($U_m = 250V$). The PS-M 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 PS-M has a galvanic separation between the input circuit and the intrinsically safe output circuit. It consists of an insulated power supply with a transformer excited by a high frequency (HF) exciter in a half bridge circuit. The power input to the transformer is limited by a fuse F1A

and a voltage limiter with a short-circuit thyristor. A bridge rectifier is placed after the transformer with a voltage limiter with TVS diodes.

1.3.2 PS-M/A Design

The PS-M/A power supply 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 ($U_m = 60\text{ V}$).

This power supply design has no galvanic separation between the input and intrinsically safe output circuits (negative input and output terminals are interconnected). The power supply includes a fuse F1A and double current limiter with a short-circuit thyristor to limit the input current and voltage.



Attention!

The PS-M/A power supply 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

The device is equipped with a green LED placed under the transparent front panel. The LED is marked PWR.

LED Designation	Colour	State	Meaning
PWR	Green	Not lights	The device is not powered or is malfunctioning
		Lights	Trouble-free condition of the device

2 Safety

2.1 General

From the safety point of view, the device has been designed according to EN IEC 60079-0 [2] and EN 60079-11 [3] 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 0046X	EU type-examination certificate (ATEX) for use in potentially explosive atmospheres.
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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 atmospheres.



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 Atmosphere

Explosion Safety Level	Device
II (2)G [Ex ib Gb] IIA	- PS-M Design, Um = 250V - PS-M/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 intrinsic safety parameters of the connection terminals are specified in Section 5. The recommended types of cables are listed in Section 3.1.

2.3 Specific Conditions of Use



CAUTION!

1. The PS-M/A module has no galvanic separation between intrinsically safe and conventional circuits. This must be taken into account during installation.
2. The PS-M/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.

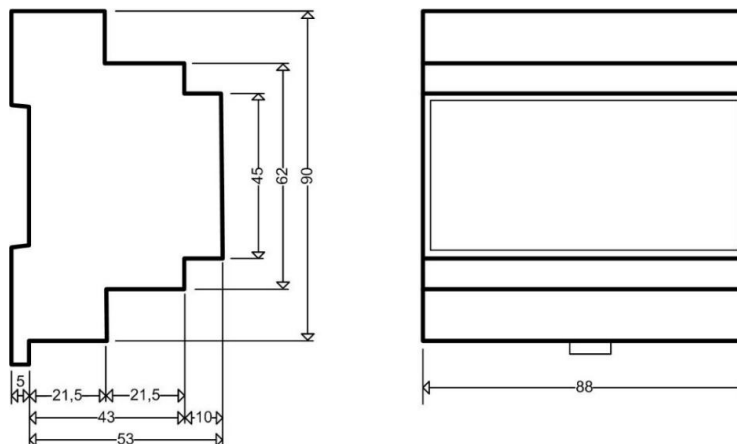


Fig. 11 IS power supply dimensions (mm)

The IS power supply must be powered from 12V DC power supply. If the DC power supply is supplied from the mains, it is necessary to supply this power supply with a 3-stage overvoltage protection with HF filter.

Power from an external intrinsically safe PS-M (PS-M/A) power supply is fed to the terminals of the PWR2 corrector/logger.

The recommended connections are listed in paragraph. 7.

3.1 Cabling

The device has been designed and approved for connection to JB terminals using shielded cables. The shield is connected on the side of the powered device (corrector or logger), it remains unconnected on the IS side of the PS-M (PS-M/A) power supply.

For power cables longer than 5 meters, it is not advisable to use cables with a small cross-section size due to the conductor resistance. Cable conductor resistance may cause undesired voltage drop over longer distances.

a) Recommended cable – devices ELCORplus, ELCORplus indexer and DATCOMplus

For external powering of an internal modem from PS-M (PS-M/A) power supply, cable with min. conductor cross-section size 1 mm² is prescribed. The recommended cable types and their maximum lengths are listed in the following table.

Designation	Type	Conductor cross-section size	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 2 x 1 mm ²	2-wire shielded	1 mm ²	0.65 mH/km	160 nF/km	19.5 Ω/km	Lappkabel Stuttgart	13 m
Unitronic LiYCY 2 x 1.5 mm ²	2-wire shielded	1.5 mm ²	0.65 mH/km	160 nF/km	13.3 Ω/km	Lappkabel Stuttgart	20 m

Tab. 2 ELCORplus - cable recommended for external power supply of the internal modem

Note:

If an external intrinsically safe PS-E (PS-E/A) external power supply is used for external powering of the device, a common 4-wires shielded cable can be used for external powering of the device and the modem:

Designation	Type	Conductor cross-section size	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 4 x 1 mm ²	4-wire shielded	1 mm ²	0.65 mH/km	160 nF/km	19.5 Ω/km	Lappkabel Stuttgart	13 m

Tab. 3 ELCORplus - cable recommended for common external power supply of EVC and the internal modem

For cable 4 x 1 mm², cable gland PG9 is intended in the corrector / logger.

An example of a connection with both PS-E and PS-M sources is shown on Fig. 14 and Fig. 17.

b) Recommended cable – device ELCORlite and DATCOMlite⁵⁾

Terminals on the ELCORlite device are used for connection, which allows a maximum cross-section of the stranded conductor with a fitted terminal (crimp sleeve) of 0.75 mm². For this reason, the maximum cable length permitted is shorter than with ELCORplus.

Designation	Type	Conductor cross-section size	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 2 x 0.75 mm ²	2-wire shielded	0.75 mm ²	0.65 mH/km	160 nF/km	19.5 Ω/km	Lappkabel Stuttgart	10 m

Tab. 4 ELCORlite – recommended external power supply cable for the internal modem

If the external power supply of the corrector and the internal modem is used at the same time, it is possible to run both external power supplies with a single common cable and thus use only one cable gland of the ELCORlite/DATCOMlite device for both signals. In this case, however, it is necessary to use a cable with a core cross-section of 0.5 mm², as the PG7 cable glands installed in the device allow the use of a cable with a maximum diameter of 6.5 mm.

Designation	Type	Conductor cross-section size	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 4 x 0.5 mm ²	4-wire shielded	0.5 mm ²	0.65 mH/km	160 nF/km	19.5 Ω/km	Lappkabel Stuttgart	10 m

Tab. 5 ELCORlite – cable recommended for common power supply of external power supply for internal modem and for EVC


⁵⁾ Modules PS-M and PS-M/A are possible to use for LTE-Cat1

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, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	Class III protection (EN 61140) equipment
Relative humidity of the environment	0% to 95% relative, non-condensing
Air pressure	86 kPa to 106 kPa
External dimensions	88 x 90 x 58 mm
Device weight	199 g (PS-M) 179 g (PS-M/A)
Mount	On 35mm DIN rail

4.2 Explosion-proof Design

Designation	 II (2) G [Ex ib Gb] IIA
Certificate no.	FTZÚ 19 ATEX 0046X
Max. voltage value Um	250 V (PS-M design) 60 V (PS-M/A design)
Environment classification	Out of potentially explosive atmospheres

4.3 Power Supply (12V INPUT terminals)

Supply voltage range	10.5 to 15 V
Current consumption (idle)	typically 13 mA (PS-M) typically 2.5 mA (PS-M/A)
Current consumption (short circuit at output)	max 820 mA (PS-M) max 570 mA (PS-M/A)
Max. cable length	30 m

4.4 Power Supply Output (5V OUTPUT terminals)

Idle voltage	typically 5.2 V
Current limitation	typically 0.95 A
Max. cable length	13 m (at 1 mm ² conductor cross-section size) 20 m (at 1.5 mm ² conductor cross-section size)
Galvanic separation	1,500 V (PS-M design only)

5 Explosion Safety Parameters


Intrinsically safe power supply PS-M (PS-M/A) is of trapezoidal characteristics.

Maximum output voltage	U _o :	6.2 V
Maximum output current	I _o :	1 A
Maximum output power	P _o :	6.2 W
Maximum external capacity	C _o :	13,700 μF (for gas group IIA)
Maximum external inductance	L _o :	90 μH (for gas group IIA)

The inductance and cable capacity (depending on the length and type of the cable used) must comply with the explosion-proof parameters of the power supply.

6 Product Data Plate

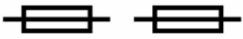
PS-M



1953700001

Date: 2019
 $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$


F1A T1A



Ex II (2)G [Ex ib Gb] IIA
 FTZÚ 19 ATEX 0046X


CE 1026

$U_m = 250\text{ V}$ $U_o = 6.2\text{ V}$
 $I_o = 1.0\text{ A}$ $P_o = 6.2\text{ W}$
 $C_o = 13700\text{ }\mu\text{F}$ $L_o = 90\text{ }\mu\text{H}$



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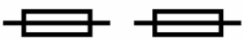
PS-M/A



1953800001

Date: 2019
 $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$


F1A T1A



Ex II (2)G [Ex ib Gb] IIA
 FTZÚ 19 ATEX 0046X

CE 1026

$U_m = 60\text{ V}$ $U_o = 6.2\text{ V}$
 $I_o = 1.0\text{ A}$ $P_o = 6.2\text{ W}$
 $C_o = 13700\text{ }\mu\text{F}$ $L_o = 90\text{ }\mu\text{H}$



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Fig. 12 Data Plates

7 Device Wiring Diagrams

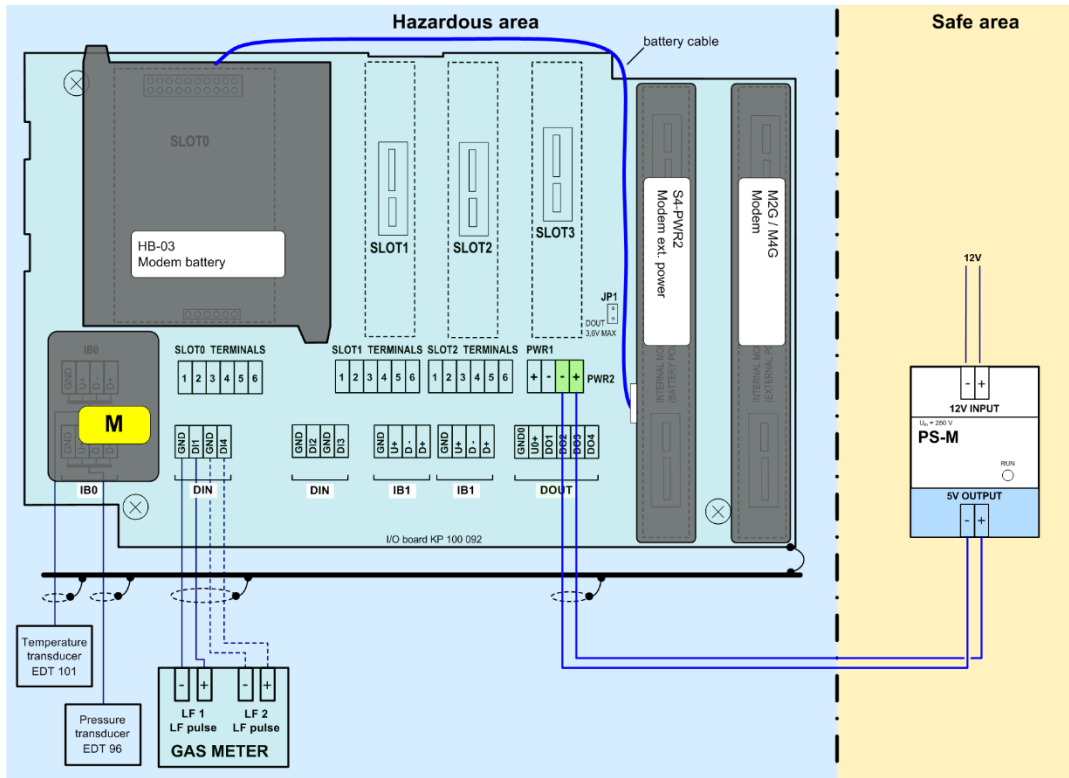


Fig. 13 Basic connection of the external powering for the internal modem from PS-M power supply

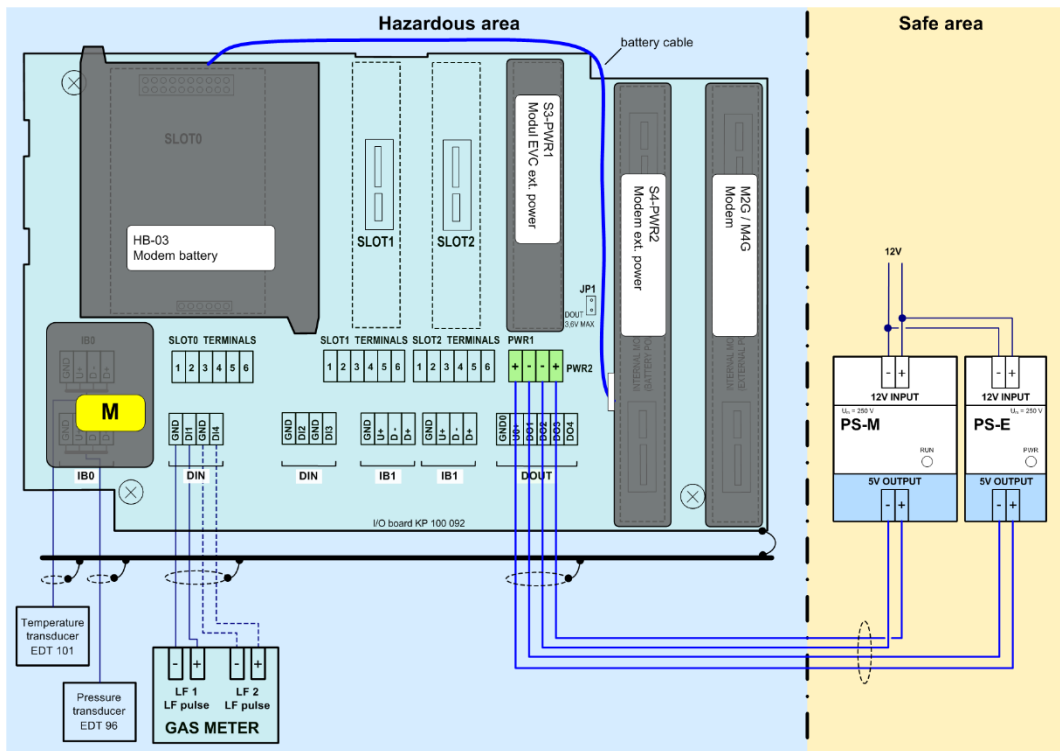


Fig. 14 Basic connection of the external power supply to the corrector and the internal modem

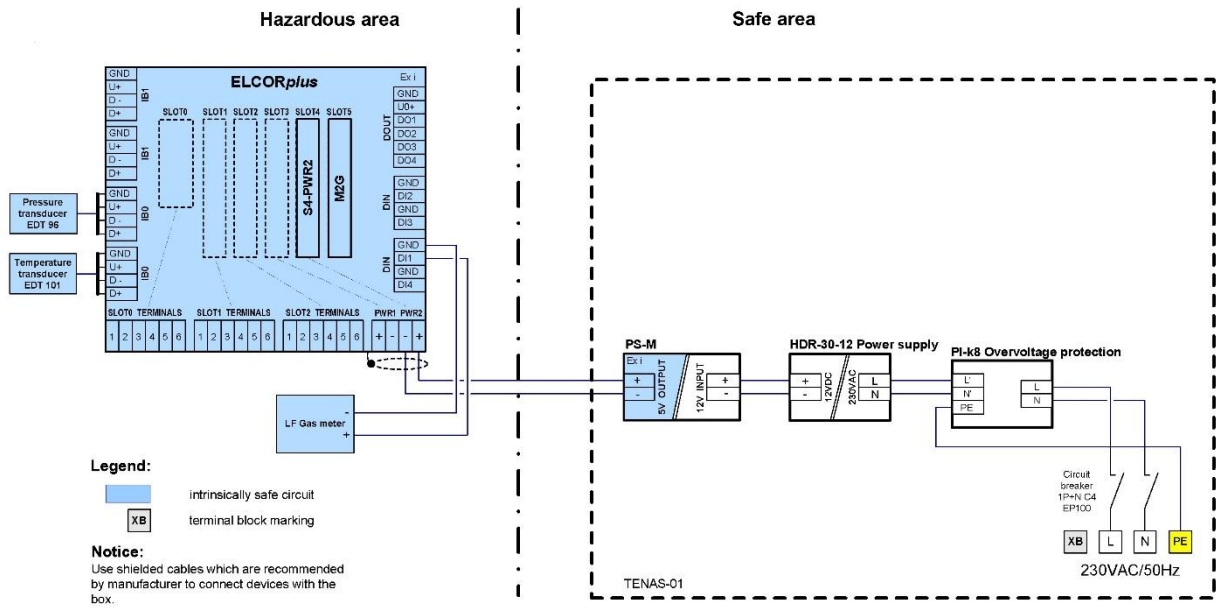


Fig. 15 Connection of the external power supply of EVC internal modem

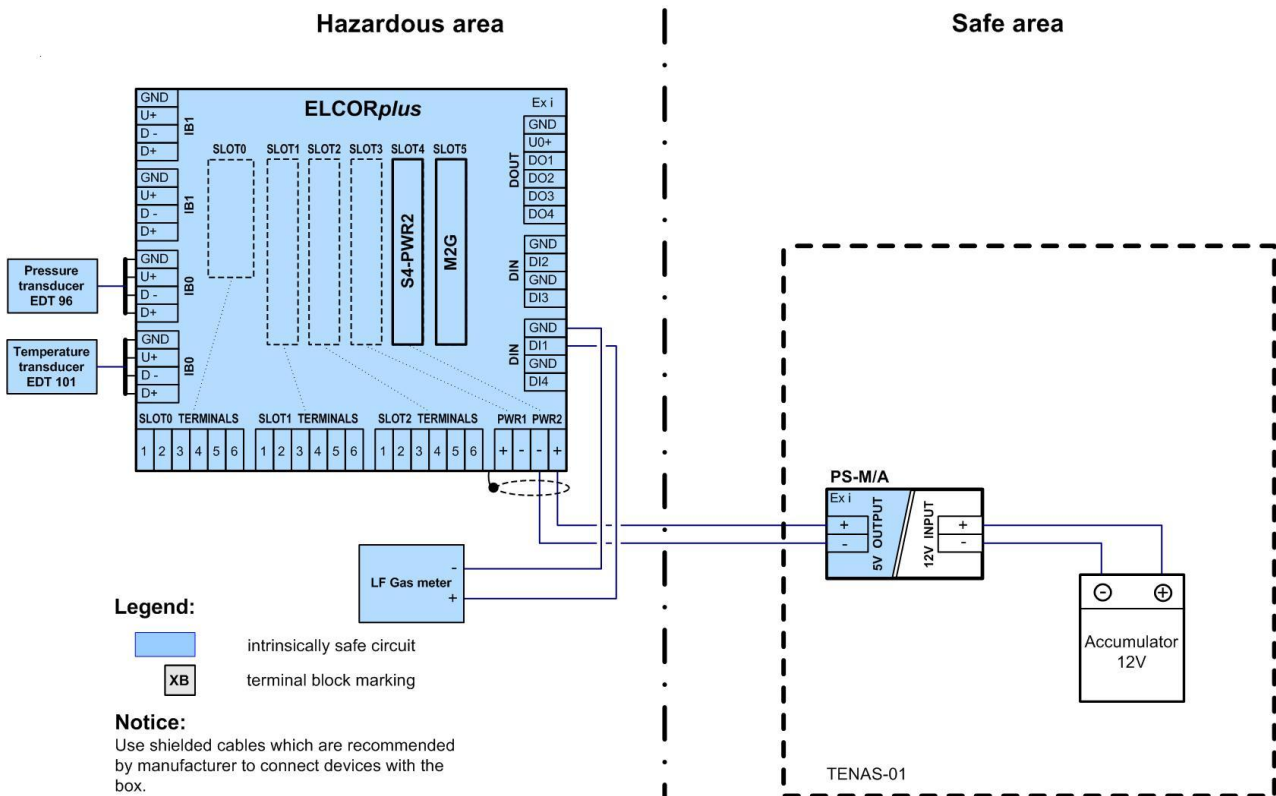


Fig. 16 Connection of external power supply of EVC internal modem from accumulator

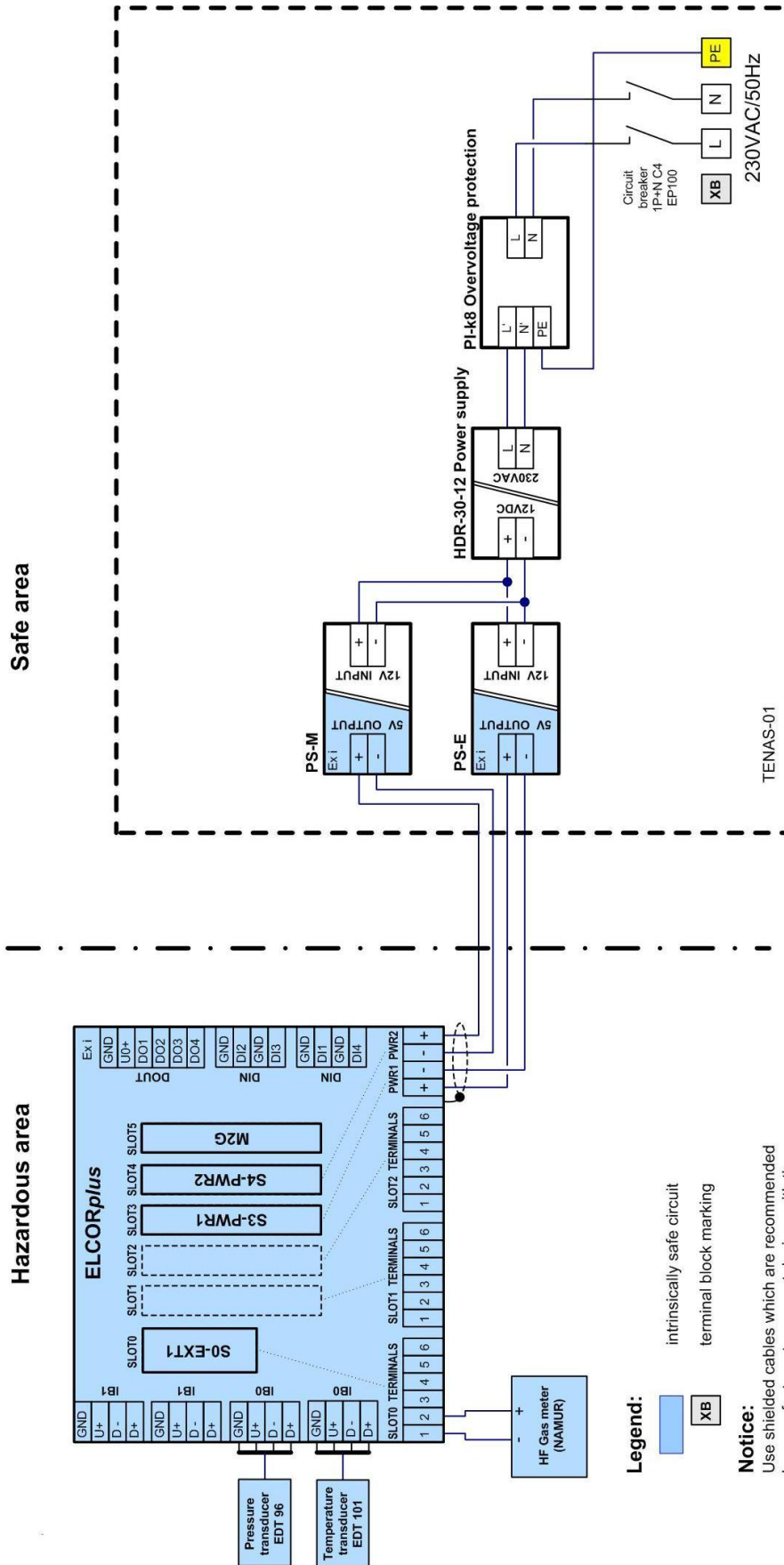


Fig. 17 Connection of external power supply of EVC and the internal modem

Intrinsically Safe Power Supply for Internal Modem PS-M1, PS-M1/A



CONTENTS

1	DEVICE DESCRIPTION	35
1.1	Product Identification.....	35
1.2	Device Functions	35
1.3	Description of Operation and the Equipment Design.....	35
1.3.1	PS-M1 Design	36
1.3.2	PS-M1/A Design.....	36
1.3.3	Activity Indication.....	37
2	SAFETY	38
2.1	General	38
2.2	Using the Device in Potentially Explosive Atmosphere	38
2.3	Specific Conditions of Use.....	39
3	INSTALLING THE DEVICE	40
3.1	Cabling.....	40
4	TECHNICAL PARAMETERS	42
4.1	Operation Conditions and the Environment.....	42
4.2	Explosion-proof Design.....	42
4.3	Power Supply (12V INPUT terminals)	42
4.4	Power Supply Output (4V OUTPUT terminals).....	42
5	EXPLOSION SAFETY PARAMETERS	43
6	PRODUCT DATA PLATE	44
7	DEVICE WIRING DIAGRAMS.....	45

1 Device Description

1.1 Product Identification

Business name:	PS-M1, PS-M1/A
Name of product:	Intrinsically safe power supply for internal modem
Product drawing number:	KP 122 (KP 122 Mod. A)

1.2 Device Functions

Intrinsically safe power supply PS-M1 (PS-M1/A) is designed for external power supply of the internal modems of the following devices:

- ELCOR*lite* ⁶⁾
- DATCOM*lite* ⁶⁾

An intrinsically safe power supply can power **only one device**.



Attention!

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

Intrinsically safe power supply PS-M1 (PS-M1/A) is powered by 12V DC.

The intrinsically safe power supply 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 use of an external power supply of an internal modem of a corrector/logger is recommended:

- If the operating mode of the communication over the internal modem of the corrector/logger is set to have a higher battery consumption, which shortens the battery life (the default settings of the modem and the modem battery life are stated in the corrector/logger manual [16]).
- The supply voltage from the intrinsically safe power supply PS-M1 and PS-M1/A is connected to the PWR2 terminals of the corrector/recorder.

The IS power supply is manufactured in two versions; in PS-M1 basic version and PS-M1/A for accumulator supply only.

1.3 Description of Operation and the Equipment Design

⁶⁾ An exception is the internal LTE-Cat1 modem, for which an intrinsically safe PS-M power supply (PS-M/A) must be used.



Fig. 18 PS-M1 and PS-M1/A designs

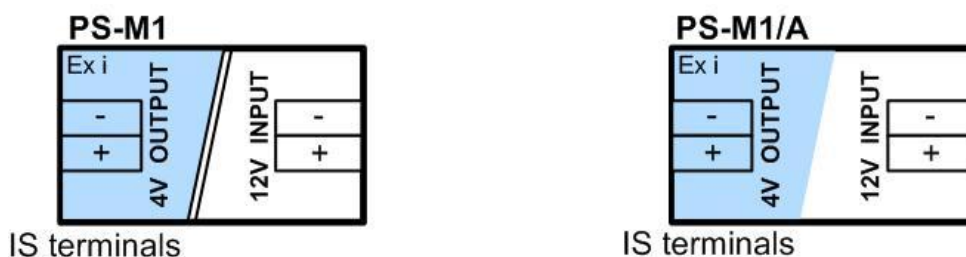


Fig. 19 Schematic symbols

1.3.1 PS-M1 Design


The PS-M1 basic design is designed for systems whose power is derived from the mains voltage ($U_m = 250V$). The PS-M1 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 PS-M1 has a galvanic separation between the input circuit and the intrinsically safe output circuit. It consists of an insulated power supply with a transformer excited by a high frequency (HF) exciter in a half bridge circuit. The power input to the transformer is limited by a fuse F1A and a voltage limiter with a short-circuit thyristor. A bridge rectifier is placed after the transformer with a voltage limiter with TVS diodes.

1.3.2 PS-M1/A Design

The PS-M1/A power supply 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 ($U_m = 60 V$).

This power supply design has no galvanic separation between the input and intrinsically safe output circuits (negative input and output terminals are interconnected). The power supply includes a fuse F1A and double current limiter with a short-circuit thyristor to limit the input current and voltage.



Attention!

The PS-M1/A power supply 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

The device is equipped with a green LED placed under the transparent front panel. The LED is marked PWR.

LED Designation	Colour	State	Meaning
PWR	Green	Not lights	The device is not powered or is malfunctioning
		Lights	Trouble-free condition of the device

2 Safety

2.1 General

From the safety point of view, the device has been designed according to EN IEC 60079-0 [2] and EN 60079-11 [3] 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 0046X	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 atmospheres.



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 Atmosphere

Explosion Safety Level	Device
II (2)G [Ex ib Gb] IIB	- PS-M1 Design, Um = 250V - PS-M1/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 intrinsic safety parameters of the connection terminals are specified in Section 5. The recommended types of cables are listed in Section 3.1.

2.3 Specific Conditions of Use



CAUTION!

- The PS-M1/A module has no galvanic separation between intrinsically safe and conventional circuits. This must be taken into account during installation.
- The PS-M1/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.

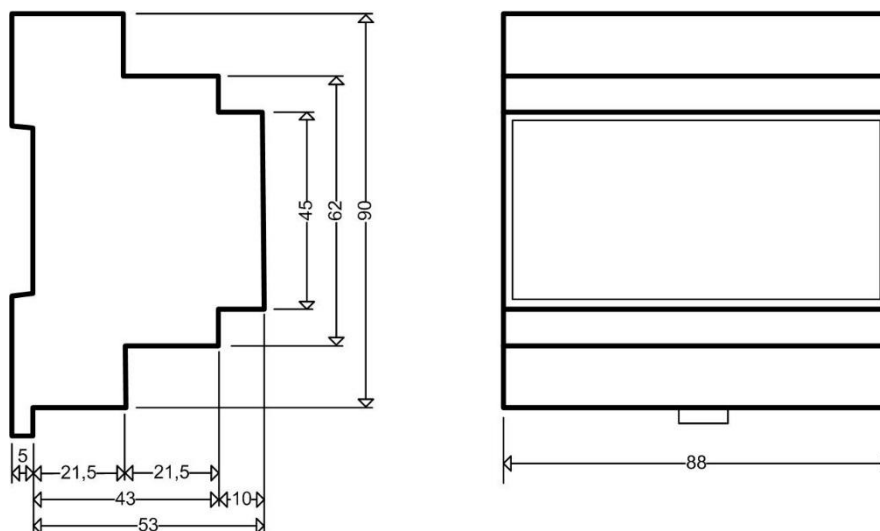


Fig. 20 IS power supply dimensions (mm)

The IS power supply must be powered from 12V DC power supply. If the DC power supply is supplied from the mains, it is necessary to supply this power supply with a 3-stage overvoltage protection with HF filter.

Power from an external intrinsically safe PS-M1 (PS-M1/A) power supply is fed to the terminals of the PWR2 corrector/logger.

The recommended connections are listed in paragraph 7.

3.1 Cabling

The device has been designed and approved for connection to JB terminals using shielded cables. The shield is connected on the side of the powered device (corrector or logger), it remains unconnected on the IS side of the PS-M1 (PS-M1/A) power supply.

For power cables longer than 5 meters, it is not advisable to use cables with a small cross-section size due to the conductor resistance. Cable conductor resistance may cause undesired voltage drop over longer distances.

For external powering of an internal modem from PS-M1 (PS-M1/A) power supply, cable with min. conductor cross-section size 0.75 mm² is prescribed. The recommended cable types and their maximum lengths are listed in the following table.

Designation	Type	Conductor cross-section size	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 2 x 0.75 mm ²	2-wire shielded	0.75 mm ²	0.65 mH/km	160 nF/km	19.5 Ω/km	Lappkabel Stuttgart	10 m

Tab. 6 ELCORlite - cable recommended for external power supply of the internal modem

If the external power supply of the corrector and the internal modem is used at the same time, it is possible to run both external power supplies with a single common cable and thus use only one cable gland of the ELCOR*lite*/DATCOM*lite* device for both signals. In this case, however, it is necessary to use a cable with a core cross-section of 0.5 mm², as the PG7 cable glands installed in the device allow the use of a cable with a maximum diameter of 6.5 mm.

<i>Designation</i>	<i>Type</i>	<i>Conductor cross-section size</i>	<i>Inductance</i>	<i>Capacity</i>	<i>Conductor resistance</i>	<i>Manufacturer</i>	<i>Max. length</i>
Unitronic LiYCY 4 x 0.5 mm ²	4-wire shielded	0.5 mm ²	0.65 mH/km	160 nF/km	19.5 Ω/km	Lappkabel Stuttgart	10 m


Tab. 7 ELCORlite – cable recommended for common power supply of external power supply for internal modem and for EVC

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, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	Class III protection (EN 61140) equipment
Relative humidity of the environment	0% to 95% relative, non-condensing
Air pressure	86 kPa to 106 kPa
External dimensions	88 x 90 x 58 mm
Device weight	199 g (PS-M1) 179 g (PS-M1/A)
Mount	On 35mm DIN rail

4.2 Explosion-proof Design

Designation	 II (2) G [Ex ib Gb] IIB
Certificate no.	FTZÚ 19 ATEX 0046X
Max. voltage value Um	250 V (PS-M1 design) 60 V (PS-M1/A design)
Environment classification	Out of potentially explosive atmospheres

4.3 Power Supply (12V INPUT terminals)

Supply voltage range	10.5 to 15 V
Current consumption (idle)	typically 13 mA (PS-M1) typically 2.5 mA (PS-M1/A)
Current consumption (short circuit at output)	max 820 mA (PS-M1) max 570 mA (PS-M1/A)
Max. cable length	30 m

4.4 Power Supply Output (4V OUTPUT terminals)

Idle voltage	typically 3.8 V
Current limitation	typically 0.95 A
Max. cable length	10 m (at 0.75 mm ² conductor cross-section size)
Galvanic separation	1,500 V (PS-M1 design only)

5 Explosion Safety Parameters


Intrinsically safe power supply PS-M1 (PS-M1/A) is of trapezoidal characteristics.

Maximum output voltage	Uo:	4.5 V
Maximum output current	Io:	1 A
Maximum output power	Po:	4.5 W
Maximum external capacity	Co:	10,000 μ F (for gas group IIB)
Maximum external inductance	Lo:	55 μ H (for gas group IIB)

The inductance and cable capacity (depending on the length and type of the cable used) must comply with the explosion-proof parameters of the power supply.

6 Product Data Plate

PS-M1




2054500001

Date: 2020

$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$

F1A T1A



Ex II (2)G **CE** 1026


[Ex ib Gb] IIB

FTZÚ 19 ATEX 0046X

$U_m = 250 \text{ V}$ $U_o = 4.5 \text{ V}$


$I_o = 1.0 \text{ A}$ $P_o = 4.5 \text{ W}$

$C_o = 10000 \mu\text{F}$ $L_o = 55 \mu\text{H}$



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PS-M1/A




2055000001

Date: 2020

$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$

F1A T1A



Ex II (2)G **CE** 1026


[Ex ib Gb] IIB

FTZÚ 19 ATEX 0046X

$U_m = 60 \text{ V}$ $U_o = 4.5 \text{ V}$

$I_o = 1.0 \text{ A}$ $P_o = 4.5 \text{ W}$

$C_o = 10000 \mu\text{F}$ $L_o = 55 \mu\text{H}$



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Fig. 21 Data plates

7 Device Wiring Diagrams

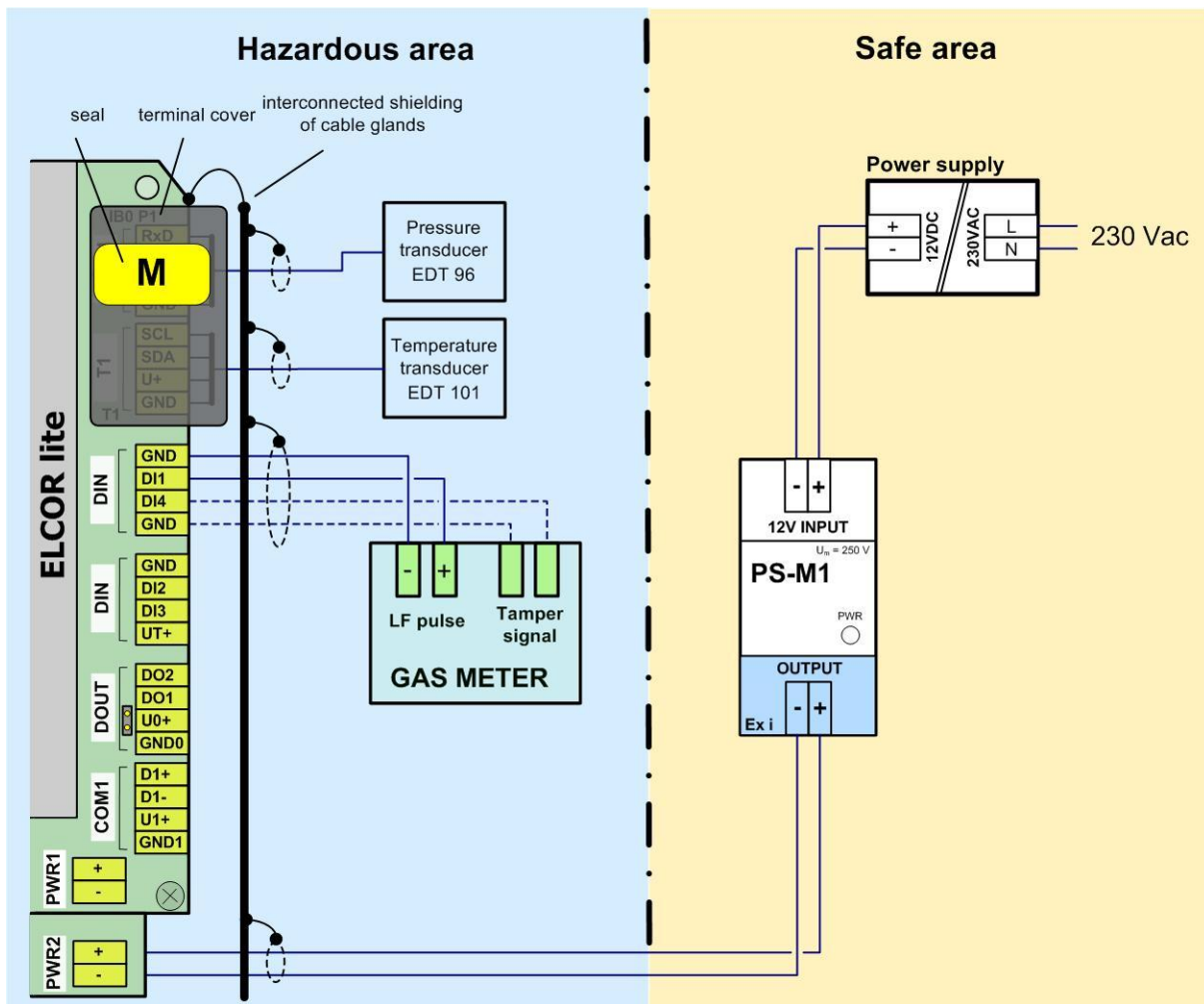


Fig. 22 Basic connection of the external power supply of the ELCORlite converter modem

RS485/RS232 Communication Separator B-RS, B-RS/A



CONTENTS

1	DEVICE DESCRIPTION	48
1.1	Product Identification.....	48
1.2	Device Functions	48
1.3	Description of Operation and the Equipment Design.....	48
1.3.1	B-RS Design.....	50
1.3.2	B-RS/A Design.....	50
1.3.3	Activity Indication.....	50
2	SAFETY	51
2.1	General	51
2.2	Using the Device in Potentially Explosive Atmospheres.....	51
2.3	Specific Conditions of Use.....	52
3	INSTALLING THE DEVICE	53
3.1	IS RS485 Communication Connection.....	53
3.2	Note on connecting communication devices via RS232 interface.....	54
3.3	Cabling.....	55
4	TECHNICAL PARAMETERS.....	56
4.1	Operation Conditions and the Environment.....	56
4.2	Explosion-proof Design.....	56
4.3	Power Supply (12V terminals).....	56
4.4	Port RS485	56
4.5	Port RS232	57
4.6	Port RS485 (Intrinsically Safe).....	57
5	EXPLOSION SAFETY PARAMETERS	58
5.1	Parameters for RS485 IS Terminals	58
6	PRODUCT DATA PLATE	59
7	DEVICE WIRING DIAGRAMS.....	60

1 Device Description

1.1 Product Identification

Business name:	B-RS, B-RS/A ⁷⁾
Name of product:	RS485/RS232 Communication Separator
Product drawing number:	KP 115 (KP 115 Mod. A)

1.2 Device Functions

B-RS (B-RS/A) communication separator is a safety separation barrier for RS485 / RS232 communication line of the following devices:

- ELCOR
- ELCOR*plus*
- ELCOR*plus indexer*
- DATCOM
- DATCOM*plus*
- ELCOR*lite* ⁸⁾
- DATCOM*lite* ⁸⁾



Attention!

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

The purpose of the communication separator is to create an interface between intrinsically safe circuits (equipment placed in a potentially explosive atmosphere) and other circuits that are placed outside the hazardous area. The device performs function of an intrinsically safe separator for the communication circuits of the corrector. Its use makes it possible to easily connect common devices for reading / writing data via RS485 or RS232 communication (PC, PCL, external modem etc.) to intrinsically safe correctors / loggers.

The B-RS (B-RS/A) communication separator is powered by 12 V DC.

The communication 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 communication separator is manufactured in two versions; in B-RS basic version and B-RS/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.

⁷⁾ Since a year 2020 is his product supplied with the designation "mod R", see nameplate Fig. 27. In addition to the JB port RS485, the originally supplied product without this designation had a JB port RS232 for connection to the corrector (recorder).

⁸⁾ The device must be equipped with a communication interface COM1 - RS485

For connection to intrinsically safe communication terminals of the corrector, the communication separator is equipped with an intrinsically safe RS485 interface. These interfaces also include terminals to which the power voltage of the internal IS power voltage is connected (terminals U+ and GND). This IS supply voltage is used to power the conversion circuits of the corrector, which are galvanically isolated from the other circuits of the corrector.

For connecting a communication device (PC, PLC, modem, etc.) to the communication separator, the separator is equipped with an RS485 / RS232 interface. Only one of them can be used, i.e. either RS485 (terminals D+, D-, GND) or RS232 (terminals GND, TXD, RXD, RTS). The separator allows the following conversation between the IS interfaces and the standard interfaces RS485 and RS232 for connecting standard devices.

Intrinsically safe communication interface	Standard communication interface	
	RS485	RS232
RS485	yes	yes

Tab. 8 The options of conversion between the communication interfaces of B-RS separator

The communication separator is a signal-transparent device, i.e. the communication signals passing through this separator do not change their properties (the communication protocol used and the communication speed used are retained). The range of available communication speeds and other parameters are provided in Section 4.

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



Fig. 23 B-RS, B-RS/A designs

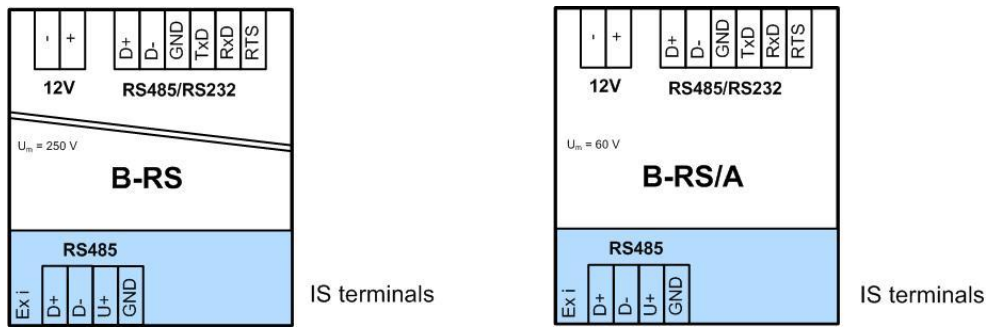


Fig. 24 Schematic symbols

1.3.1 B-RS Design


The basic version of the separator is intended for systems whose power is derived from the mains voltage ($U_m = 250V$). 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 communication separator B-RS in the basic version contains galvanic separation between the input and intrinsically safe output circuit.

1.3.2 B-RS/A Design

The B-RS/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 ($U_m = 60V$).

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-RS/A communication 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 communication separator, four indication LEDs are placed.

LED Designation	Colour	State	Meaning
PWR	Green	Lit	The module is powered
		Not lit	The module is not powered
TxD RxD RTS ↓ ↑ ↓ RxD TxD CTS	Yellow (3 pcs)	Flashes	Indicates the direction of the signal transmission TxD and the arrival of RTS signal from PC

2 Safety

2.1 General

From the safety point of view, the communication separator has been designed according to EN IEC 60079-0 [2] and EN 60079-11 [3] 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 atmospheres. Compliance with this Directive is included in the CE conformity marking.

FTZÚ 19 ATEX 0046X	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 atmospheres.



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-RS Design, Um = 250V - B-RS/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.

2.3 Specific Conditions of Use



CAUTION!

1. The B-RS/A module has no galvanic separation between intrinsically safe and conventional circuits. This must be taken into account during installation.
2. The B-RS/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.

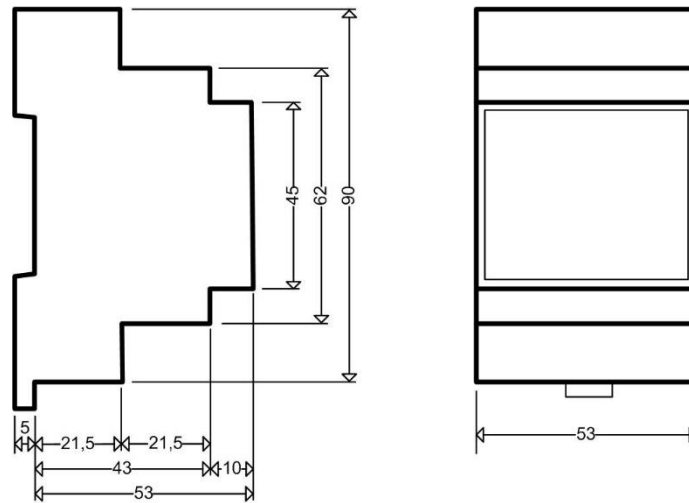


Fig. 25 Dimensions of the device (mm)

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 IS RS485 Communication Connection

This interface is intended for connecting a correcter/recorder:

ELCOR - one RS232/RS485 communication interface is built in the device. For communication, RS485 is used. The IS RS485 / RS232 interface of B-RS (B-RS/A) is connected to the RS485 / RS232 terminals on the I/O board in the ELCOR (or DATCOM) device.

ELCORplus, ELCORplus indexer - must be equipped with communication module S1-COM1. The module must be fitted in SLOT 1 and/or SLOT 2. The module offers RS232 or RS485 communication interface. The RS485 interface is used for connection to the separator, i.e. terminals 1 to 4, see Tab. 9. Two S1-COM1 communication modules can be installed in the device. In that case, communication on two completely independent communication lines is possible, and the B-RS must be used for each line separately. The cable extended from the communication separator is connected to SLOT 1 or SLOT 2 terminal.

SLOT 1, SLOT 2	RS232	RS485
Terminal	Signal	Signal
1	---	D1+
2	---	D1-
3	GND	GND
4	CTS	U1+
5	RxD	---
6	TxD	---

Tab. 9 ELCORplus - Assignment of terminal blocks SLOT 1 and SLOT 2 when fitted with S1-COM1 module

Note:

If the S4-COM0 internal module, which has an RS232 interface, is installed in the corrector / logger for communication, the B-RS and B-RS/A separators cannot be used for this interface.

ELCORlite – the B-RS separator (B-RS/A) can be used if the ELCORlite device (DATCOMlite) is equipped with an RS485 communication interface. The intrinsically safe RS485 interface of the B-RS isolation module (B-RS/A) is connected to the COM1-RS485 terminal block, terminals D1+, D1-, U1+ and GND1, on the motherboard of the ELCORlite instrument (or DATCOMlite).

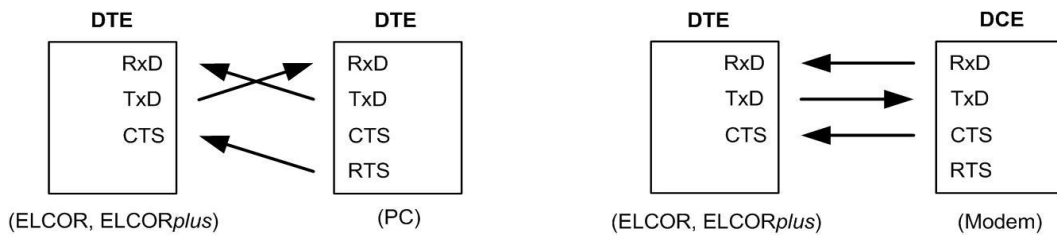
3.2 Note on connecting communication devices via RS232 interface

In terms of data transmission, two types of devices can be distinguished: DTE - Data terminal Equipment and DCE - Data Communication Equipment.

Both ELCOR and ELCORplus are DTE devices.

Depending on whether a device of the same type (i.e. DTE) or a DCE-type device is used, either a cross or a direct connection is used. For example, a PC is a DTE device, a modem is a DCE device.

Generally (RS232 interface):



In the case of Elgas devices (correctors or recorders), we connect the device via an external module B-RS (mod R) or B-RS/A (mod R). The connection with a PC (or PLC) and an external modem will look like this:

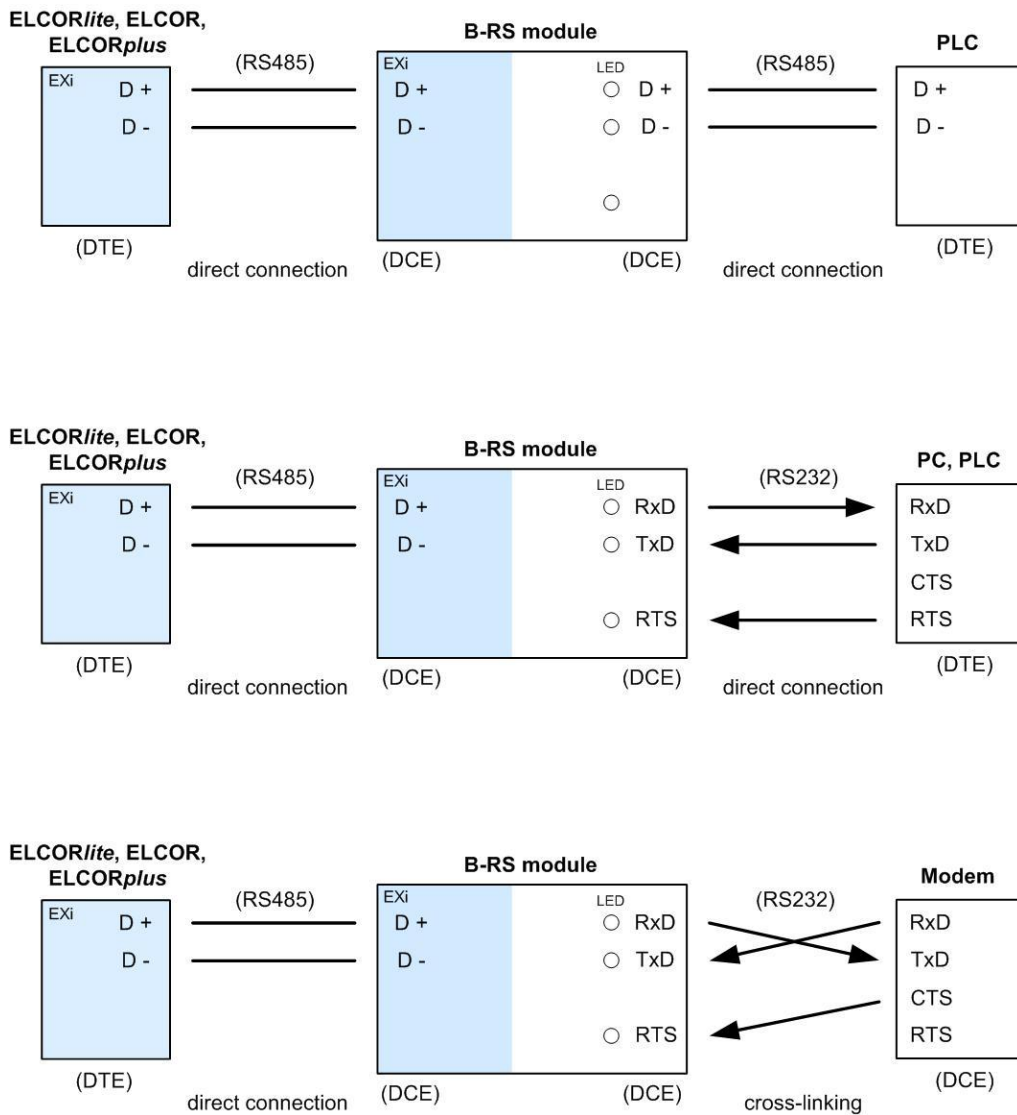


Fig. 26 Principle of connection with PC, PLC and external modem via B-RS module

3.3 Cabling

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

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

Communication interface	Cable designation	Type	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
RS485	Unitronic LiYCY 4 x 0.34 mm ²	4-wire shielded	0.65 mH/km	160 nF/km	59 Ω/km	Lappkabel Stuttgart	100 m


Tab. 10 Cable recommended for RS485 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, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	Class III protection equipment (EN 61140)
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	130 g (B-RS) 121 g (B-RS/A)
Mount	On 35mm DIN rail

4.2 Explosion-proof Design

Designation	 II (1)G [Ex ia Ga] IIB
Certificate no.	FTZÚ 19 ATEX 0046X
Max. voltage value Um	250 V (B-RS design) 60 V (B-RS/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) ⁹⁾	typically 14 mA at 14 V (B-RS) typically 8 mA at 12 V (B-RS/A)
Max. current consumption ¹⁰⁾	34 mA (B-RS) 29 mA (B-RS/A)
Max. cable length	30 m

4.4 Port RS485

Interface type	RS-485
----------------	--------

⁹⁾ Except for the power supply, no external circuits are connected to the separator terminals.

¹⁰⁾ RS232 device is connected to RS485 / RS232 terminals, RTS signal is active, terminals U + and GND of intrinsically safe RS485 port are shorted.

Baud rate	2.4 kBd to 115.2 kBd
Max. cable length	1,200 m (at 38.4 kBd) (for cable lengths over 100m, a 120 Ω resistor is required at both ends of the cable)

4.5 Port RS232

Interface type	RS-232
Baud rate	2.4 kBd to 115.2 kBd
Max. cable length	30 m

4.6 Port RS485 (Intrinsically Safe)

Interface type	RS-485
Baud rate	2.4 kBd to 115.2 kBd
U + terminal voltage against GND	typically 5.0 V
U+ terminal short circuit current	typically 19.9 mA
Max. cable length	100 m ¹¹⁾
Galvanic separation	1,500 V (B-RS design only)

¹¹⁾ 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 based on parameters of IS power supply, which is of trapezoidal characteristics.

5.1 Parameters for RS485 IS Terminals


Maximum output voltage	U _o :	7.2 V
Maximum voltage before limiting resistor	U _o :	11.12 V
Maximum output current	I _o :	109 mA
Maximum output power	P _o :	303 mW
Maximum external capacity	C _o :	18 μF (for gas group IIB)
Maximum external inductance	L _o :	1.2 mH (for gas group IIB)
Maximum internal capacity	C _i :	6 uF
Maximum internal inductance	L _i :	0 uH


6 Product Data Plate

B-RS mod.:R

 1952500001
 Date: 2020


Ex II (1)G
 [Ex ia Ga] IIB
 FTZÚ 19 ATEX 0046X
 $U_Q = 11.12 \text{ V}$ $I_O = 109 \text{ mA}$ $P_O = 303 \text{ mW}$

$-40^\circ\text{C} \leq T_{\text{amb}} \leq 70^\circ\text{C}$
 RS485:
 $U_O = 7.2 \text{ V}$
 $C_O = 18 \mu\text{F}$
 $L_O = 1.2 \text{ mH}$

F28 mA T40 mA T63 mA



CE E 1026
 $U_m = 250 \text{ V}$



ELGAS, s.r.o. Semtínská 211, 533 53 Pardubice, Czech Republic

B-RS/A mod.:R

 1952400001
 Date: 2020

Ex II (1)G
 [Ex ia Ga] IIB
 FTZÚ 19 ATEX 0046X
 $U_Q = 11.12 \text{ V}$ $I_O = 109 \text{ mA}$ $P_O = 303 \text{ mW}$

$-40^\circ\text{C} \leq T_{\text{amb}} \leq 70^\circ\text{C}$
 RS485:
 $U_O = 7.2 \text{ V}$
 $C_O = 18 \mu\text{F}$
 $L_O = 1.2 \text{ mH}$

F28 mA T40 mA T63 mA


CE E 1026
 $U_m = 60 \text{ V}$


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Fig. 27 Data Plates

7 Device Wiring Diagrams

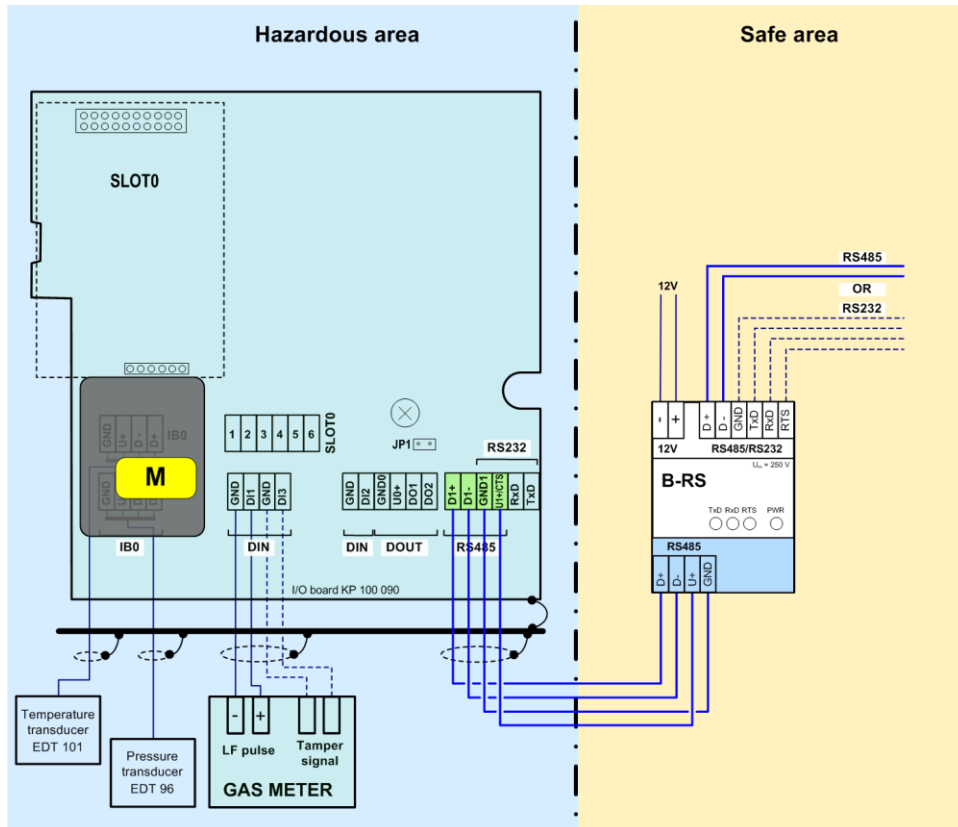


Fig. 28 Communication over RS232/RS485 via B-RS module (ELCOR)

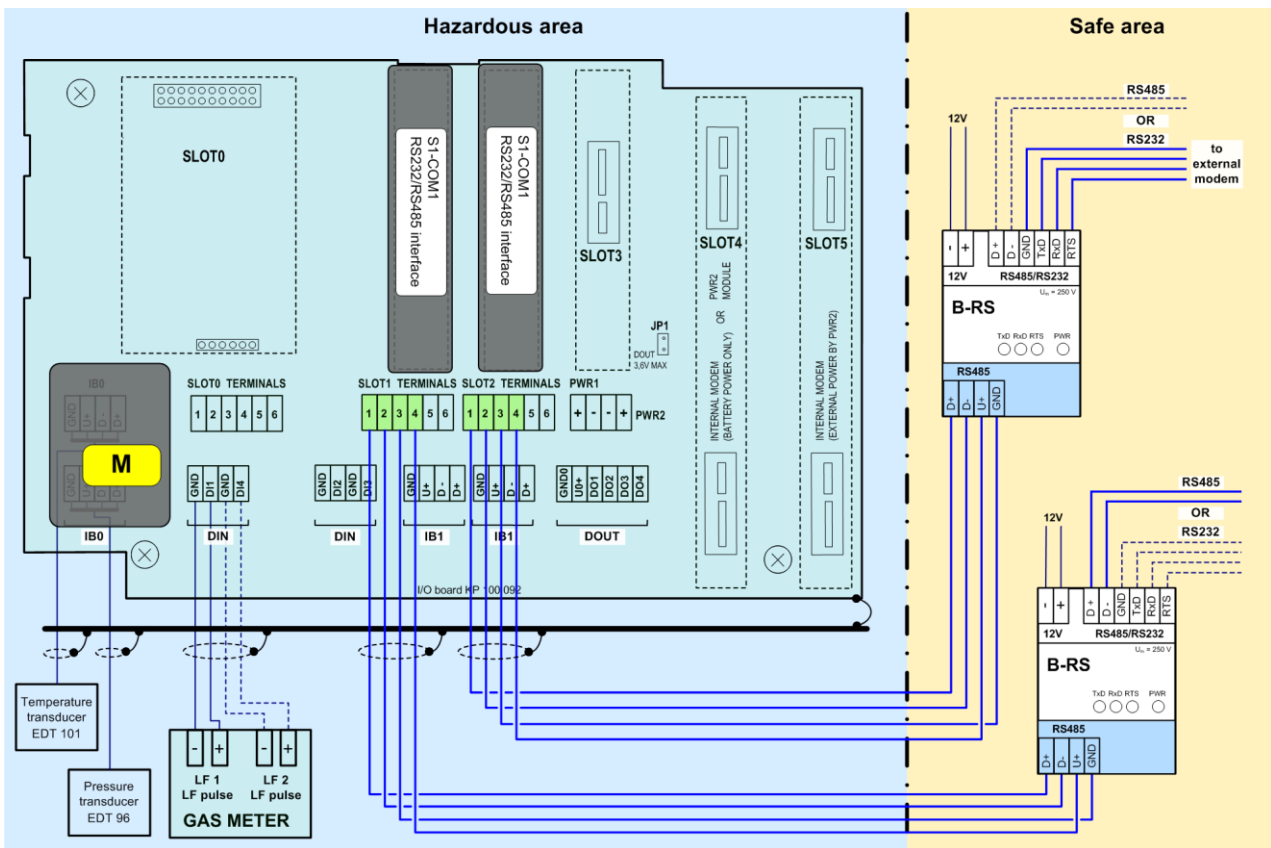


Fig. 29 ELCORplus, communication via two independent interfaces RS232/RS485

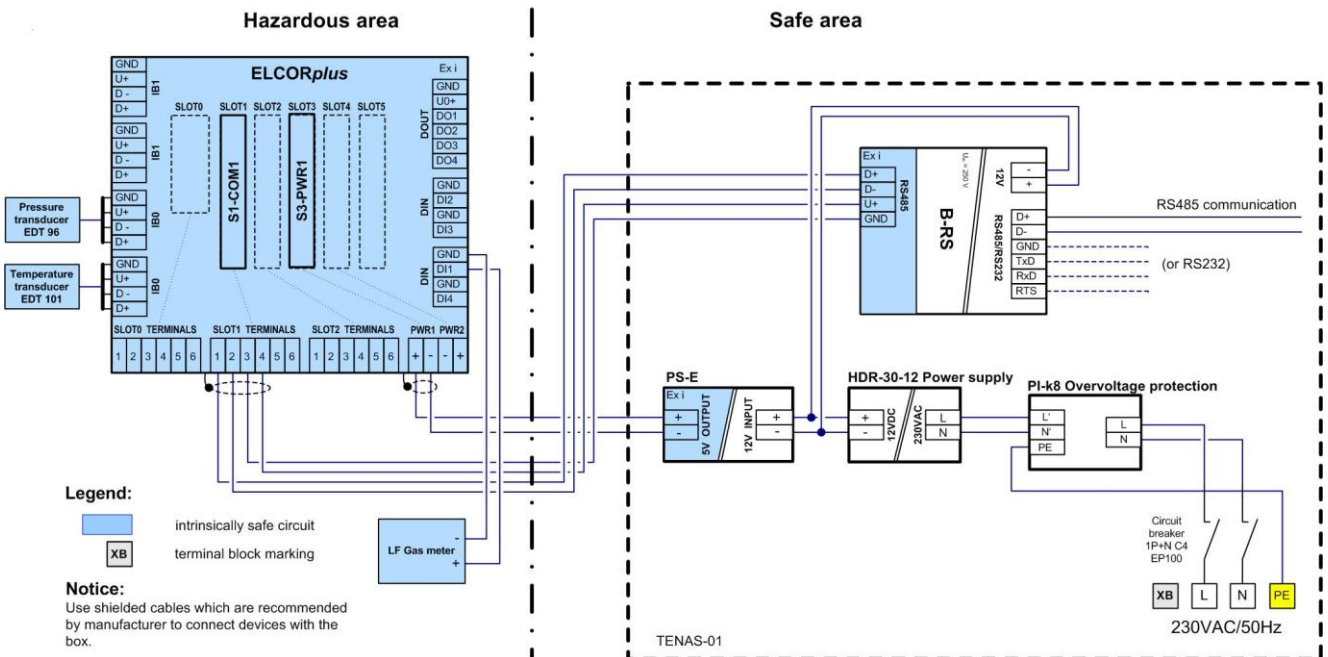


Fig. 30 Connection of ELCORplus with B-RS via RS485

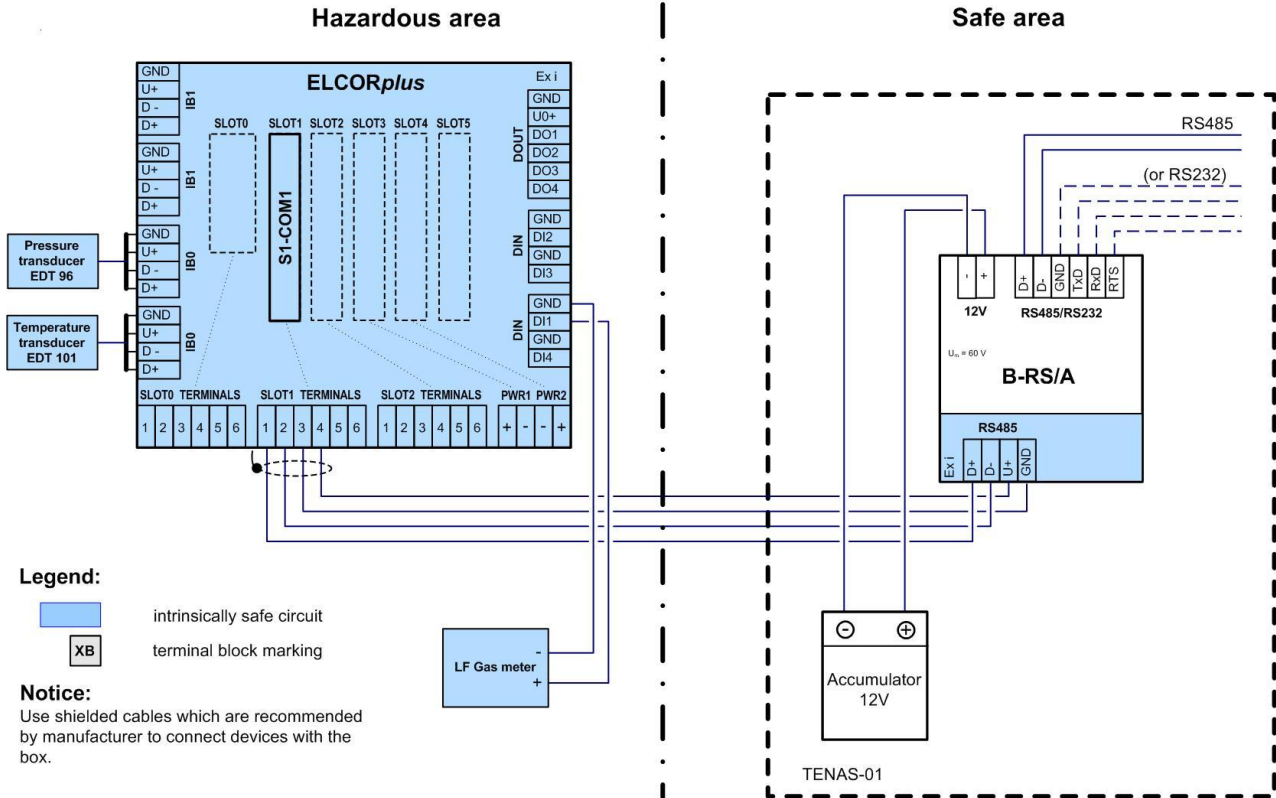


Fig. 31 Example connection with B-RS/A

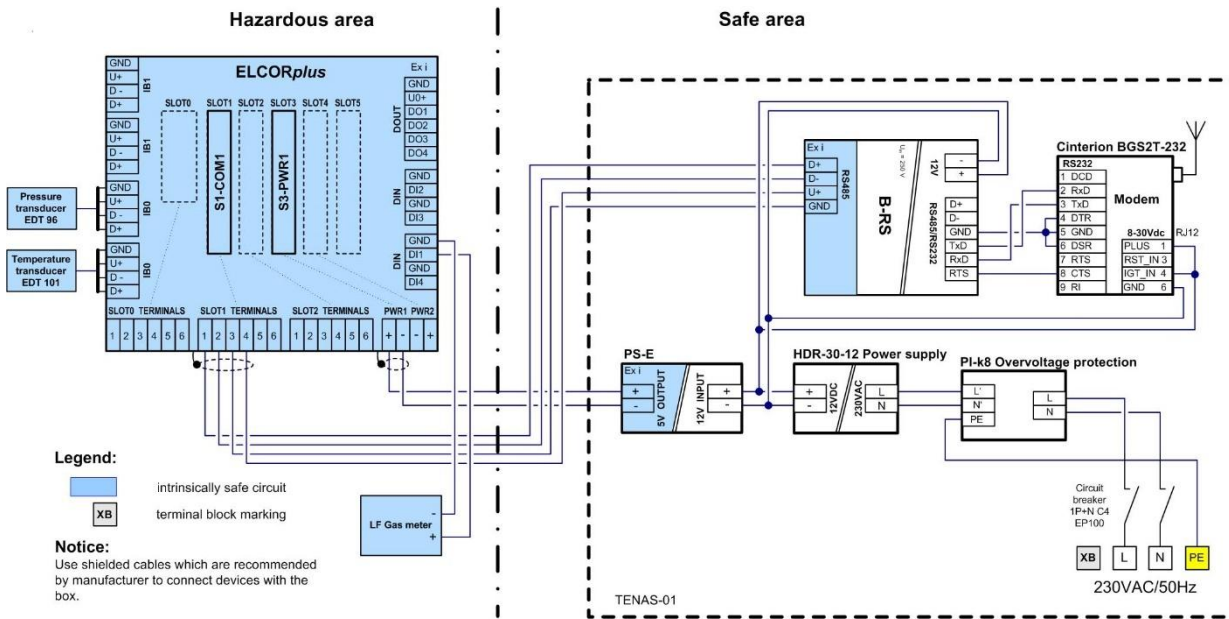


Fig. 32 Example connection of ELCORplus with external modem (RS232)

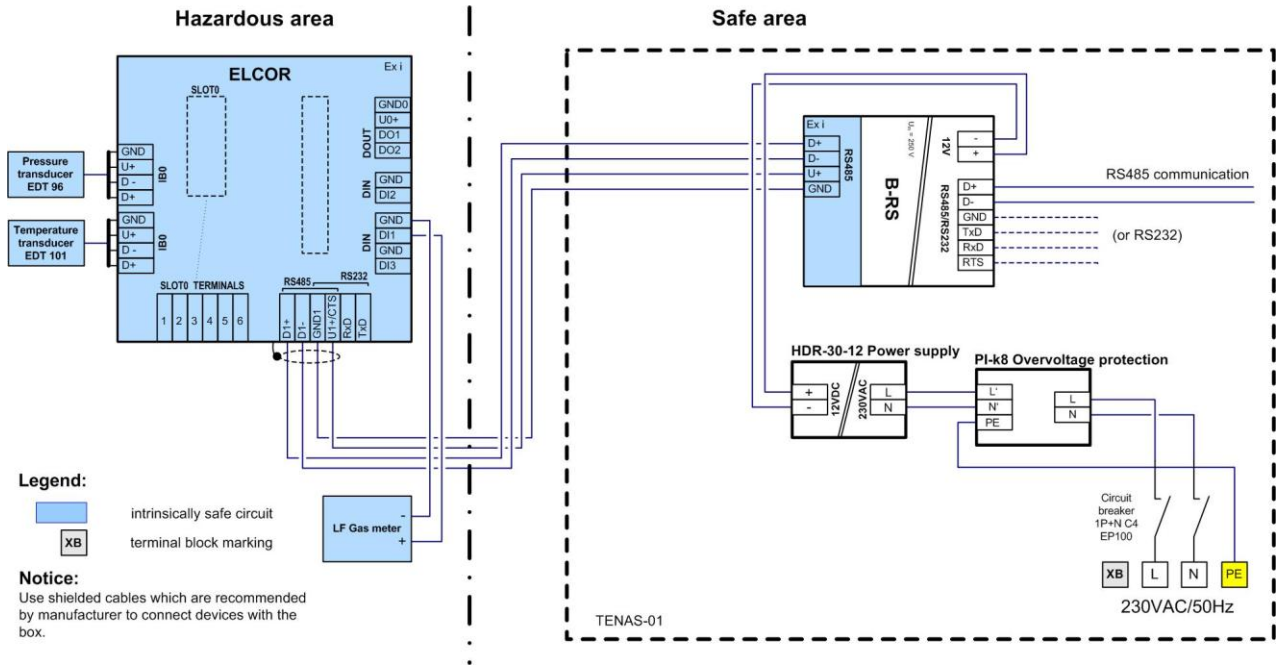


Fig. 33 Connection of ELCOR and B-RS

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



CONTENTS

1	DEVICE DESCRIPTION	66
1.1	Product Identification.....	66
1.2	Device Functions	66
1.3	Description of Operation and the Equipment Design.....	66
1.3.1	B-DO Design	68
1.3.2	B-DO/A Design.....	68
1.3.3	Activity Indication.....	68
2	SAFETY	69
2.1	General	69
2.2	Using the Device in Potentially Explosive Atmospheres.....	69
2.3	Specific Conditions of Use.....	70
3	INSTALLING THE DEVICE	71
3.1	Cabling.....	71
4	TECHNICAL PARAMETERS.....	72
4.1	Operation Conditions and the Environment.....	72
4.2	Explosion-proof Design.....	72
4.3	Power Supply (12V terminals).....	72
4.4	Digital Outputs	72
4.5	Digital Inputs.....	73
5	EXPLOSION SAFETY PARAMETERS	74
6	PRODUCT DATA PLATE	75
7	DEVICE WIRING DIAGRAMS.....	76

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:

- ELCOR
- ELCOR*plus*
- ELCOR*plus indexer*
- DATCOM
- DATCOM*plus*
- ELCOR*lite*
- DATCOM*lite*



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 / recorders.

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. The GND terminal is common to all 4 inputs DI1 to DI4. This IS voltage is necessary for powering the digital output circuits of the corrector/logger, which are galvanically isolated from the other circuits of the corrector.

The digital signals supplied from the corrector/recorder can be a binary, pulse, or data for the CLO current output module. The electrical parameters of the digital signal are unchanged after passing through the separator.

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



Fig. 34 B-DO, B-DO/A designs

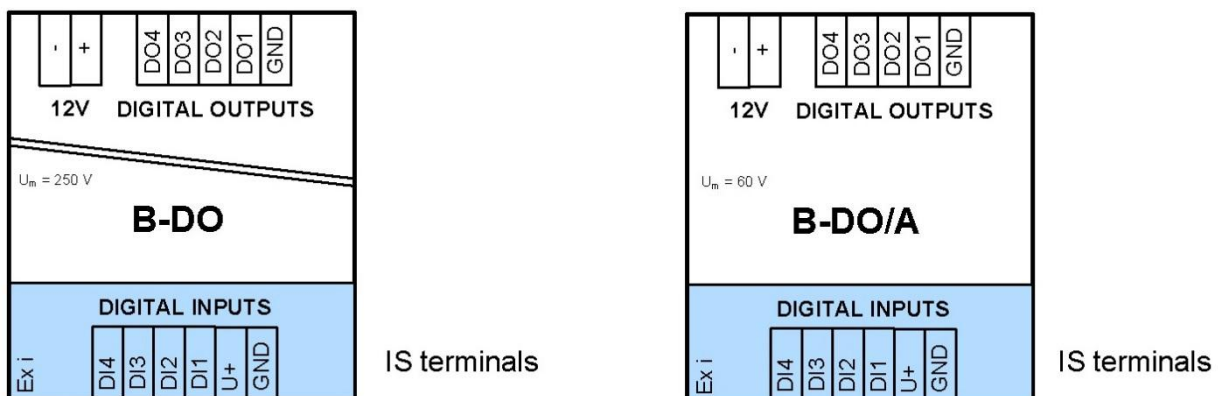


Fig. 35 Schematic symbols

1.3.1 B-DO Design

The basic version of the separator is intended for systems whose power is derived from the mains voltage ($U_m = 250V$). The B-DO 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 ($U_m = 60 V$).

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	Colour	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 EN IEC 60079-0 [2] and EN 60079-11 [3] 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 0046X	EU type-examination certificate (ATEX) for use in potentially explosive atmospheres.
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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.

2.3 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.

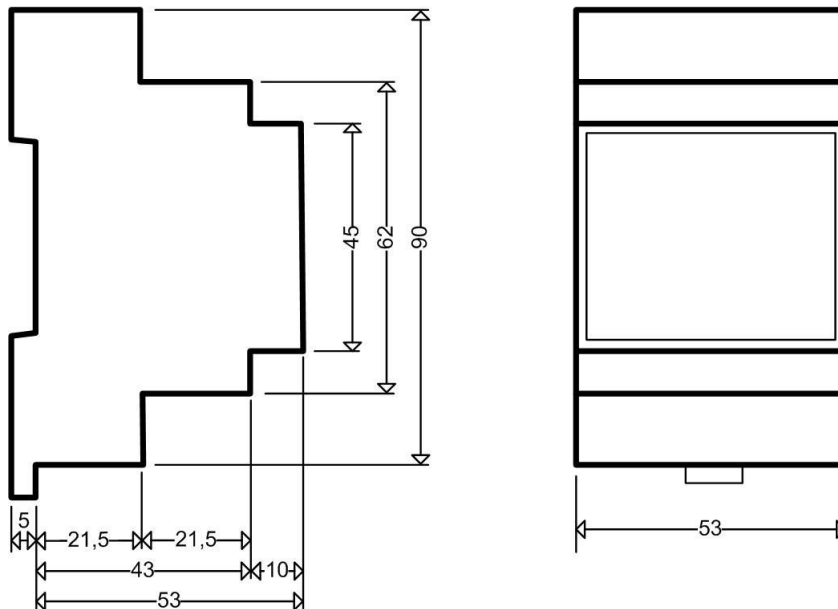


Fig. 36 Dimensions of the device (mm)

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 / logger and the digital output separator transmits the IS signal and must be shielded. The cable shield is connected on the corrector / logger 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 / logger and the digital output separator and its maximum length is shown in the following table (the mentioned 6-core cable is needed in the case of 4 outputs, in the case of 1 output a 3-core cable is sufficient).

Cable designation	Type	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 6 x 0.25 mm ²	6-wire shielded	0.65 mH/km	160 nF/km	82 Ω/km	Lappkabel Stuttgart	30 m


Tab. 11 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, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	Class III protection equipment (EN 61140)
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	 II (1)G [Ex ia Ga] IIB
Certificate no.	FTZÚ 19 ATEX 0046X
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) ¹²⁾	typically 10 mA at 14 V (B-DO) typically 0.3 mA at 12 V (B-DO/A)
Max. current consumption ¹³⁾	26 mA (B-DO) 21 mA (B-DO/A)
Max. cable length	30 m

4.4 Digital Outputs

Number of outputs	4
Type of output	Open collector

¹²⁾ Except for the power supply, no external circuits are connected to the separator terminals.

¹³⁾ The U+ and GND terminals of the intrinsically safe DIGITAL INPUTS terminal block are shorted.

Max. voltage	16 V
Max. current	100 mA
Max. resistance in closed state	10 Ω
Max. cable length	30 m

4.5 Digital Inputs

Number of inputs	4
Idle voltage	typically 5.0 V
Short-circuit current of terminals DI1 to DI4	typically 97 μ A
U+ terminal short circuit current	typically 19.9 mA
Max. cable length	30 m ¹⁴⁾
Galvanic separation	1,500 V (B-DO design only)

¹⁴⁾ 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	U _o :	7.2 V
Maximum voltage before limiting resistor	U _o :	11.12 V
Maximum output current	I _o :	109 mA
Maximum output power	P _o :	303 mW
Maximum external capacity	C _o :	19 μF (for gas group IIB)
Maximum external inductance	L _o :	1.2 mH (for gas group IIB)
Maximum internal capacity	C _i :	4.58 uF
Maximum internal inductance	L _i :	0 uH

6 Product Data Plate

B-DO




1952700001

Date: 2019



$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$

F28 mA T40 mA T63 mA




Ex II (1)G
[Ex ia Ga] IIB
FTZÚ 19 ATEX 0046X

$U_0 = 7.2 \text{ V}$ $U_Q = 11.12 \text{ V}$ $U_m = 250 \text{ V}$
 $I_0 = 109 \text{ mA}$ $P_0 = 303 \text{ mW}$
 $C_0 = 19 \mu\text{F}$ $L_0 = 1.2 \text{ mH}$

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Czech Republic

B-DO/A




1952600001

Date: 2019



$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$

F28 mA T40 mA T63 mA



Ex II (1)G
[Ex ia Ga] IIB
FTZÚ 19 ATEX 0046X

$U_0 = 7.2 \text{ V}$ $U_Q = 11.12 \text{ V}$ $U_m = 60 \text{ V}$
 $I_0 = 109 \text{ mA}$ $P_0 = 303 \text{ mW}$
 $C_0 = 19 \mu\text{F}$ $L_0 = 1.2 \text{ mH}$

ELGAS, s.r.o. Semtínská 211, 533 53 Pardubice
Czech Republic

Fig. 37 Data Plates

7 Device Wiring Diagrams

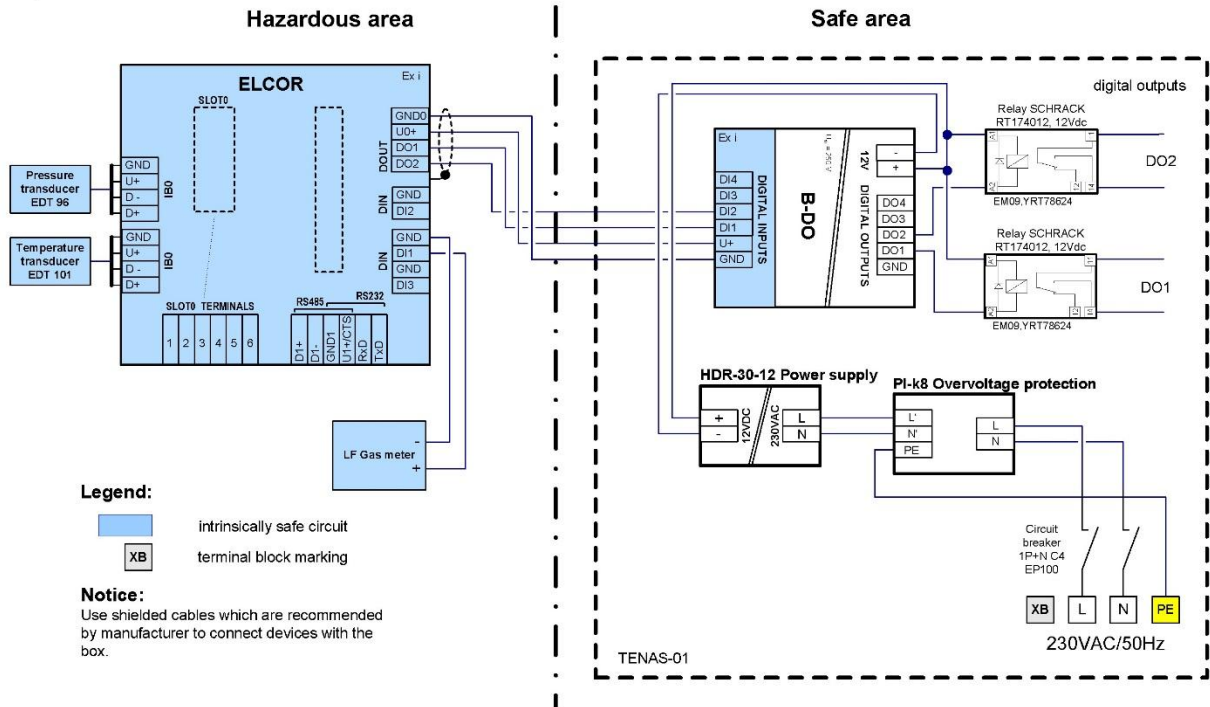


Fig. 38 Connection of ELCOR and B-DO

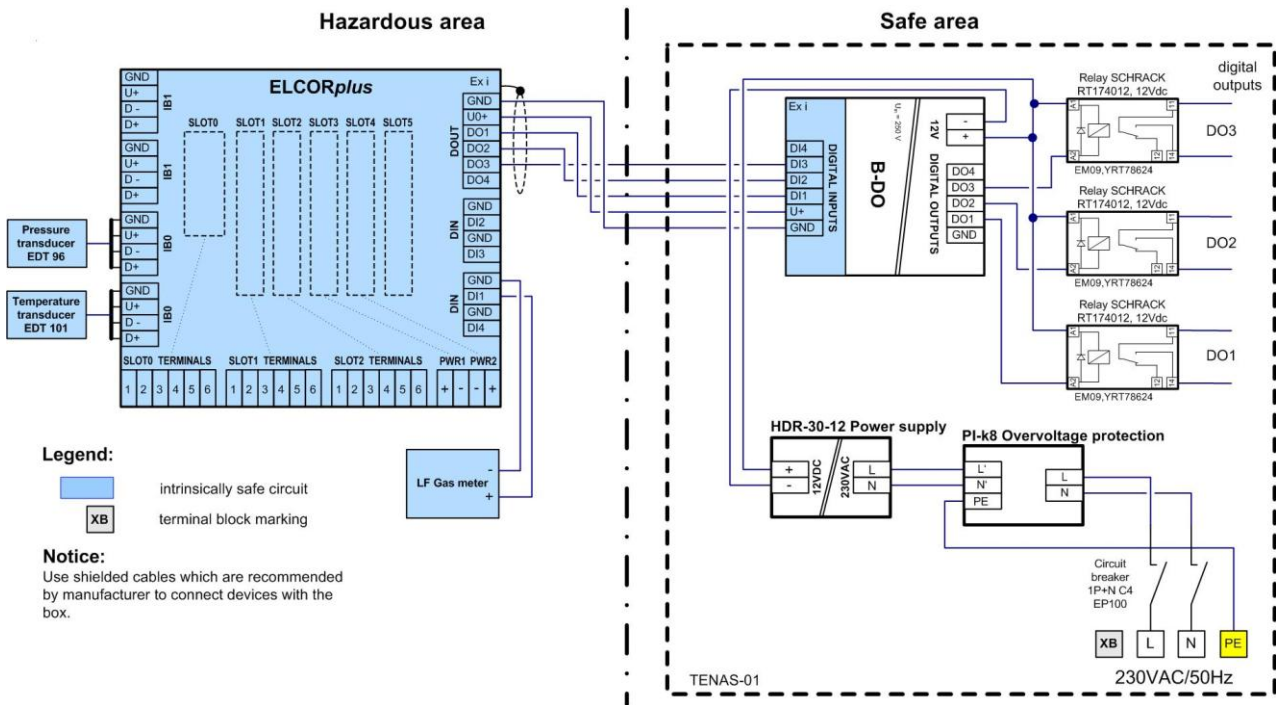


Fig. 39 Connection of ELCORplus and B-DO

Combined Module B-PRO, B-PRO/A



CONTENTS

1	DEVICE DESCRIPTION	80
1.1	Product Identification.....	80
1.2	Device Functions	80
1.3	Description of Operation and the Equipment Design.....	81
1.3.1	B-PRO Design.....	82
1.3.2	B-PRO/A Design.....	83
1.3.3	Activity Indication.....	83
2	SAFETY	84
2.1	General	84
2.2	Using the Device in Potentially Explosive Atmospheres.....	84
2.3	Specific Conditions of Use.....	85
3	INSTALLING THE DEVICE	86
3.1	Connecting to the Device.....	86
3.1.1	External IS Power Supply of the Converter	86
3.1.2	IS RS485 communication connection.....	86
3.1.2.1	Note on connecting communication devices	87
3.1.3	Separator of Digital Outputs of the Converter/Logger	88
3.2	Cabling.....	88
3.2.1	Power Cables.....	89
3.2.2	Cables for intrinsically safe communication port and digital outputs.....	89
4	TECHNICAL PARAMETERS.....	91
4.1	Operation Conditions and Environment.....	91
4.2	Explosion-proof Design.....	91
4.3	Power Supply (12V terminals).....	91
4.4	RS485 port (intrinsically safe)	91
4.5	RS485 port	92
4.6	RS232 port	92
4.7	Digital Inputs DI1,DI2 (intrinsically safe)	92
4.8	Digital Outputs DO1,DO2.....	92
4.9	IS Power Supply for EVC (5V OUTPUT terminals).....	93
5	EXPLOSION SAFETY PARAMETERS	94
5.1	Parameters for IS power supply (5V OUTPUT terminals)	94
5.2	Parameters for RS485 IS terminals.....	94
5.3	Parameters for IS terminals of DI1 and DI2 inputs.....	94

6	PRODUCT DATA PLATE	95
7	DEVICE WIRING DIAGRAMS.....	96

1 Device Description

1.1 Product Identification

Business name:	B-PRO, B-PRO/A
Product name:	Combined Module
Product drawing number:	KP 131 (KP 131 Mod. A)

1.2 Device Functions

The B-PRO (B-PRO/A) combined module is a module that combines functions from three separate modules: the P-SE, B-RS and B-DO. For the converter/logger it provides:

- safety separating barrier for RS485 communication line with possibility of conversion to RS232 line,
- two safety separating barriers for the digital outputs of the converter/logger,
- IS power supply for the converter/logger (part of the EVC). ¹⁵⁾

The B-PRO (B-PRO/A) combined module is designed for use with the following devices:

- ELCOR ¹⁵⁾
- ELCOR*plus*
- ELCOR*plus indexer*
- DATCOM ¹⁵⁾
- DATCOM*plus*
- ELCOR*lite* ¹⁶⁾
- DATCOM*lite* ¹⁶⁾



Pozor!

From the point of view of use in potentially explosive atmospheres, the combined module is designed as an associated apparatus that must be located outside the potentially explosive atmosphere during operation.

The purpose of the combined module is to provide an interface between intrinsically safe circuits (for equipment located in a hazardous area) and other circuits that are located outside the hazardous area. The device implements the intrinsically safe separator function for the converter's communication circuits, the intrinsically safe separator function for the digital outputs, and also provides external power to the converter from the built-in IS power supply. With its use, common devices for reading/writing data via RS485 or RS232 communication (PC, PLC, external modem, etc.) can be easily connected to the intrinsically safe converters/loggers.

The combined module B-PRO (B-PRO/A) is powered by 12 V DC.

Combined module is placed in a plastic box and is designed for mounting in a distribution board on a 35 mm DIN rail. For the connection of wires, there are terminals for wires with a maximum cross-section of 2.5 mm².

¹⁵⁾ ELCOR and DATCOM devices do not have the option of external power supply

¹⁶⁾ The device must be equipped with communication interface COM1 - RS485

The combined module is available in two versions; the basic B-PRO version and the B-PRO/A version for powering the module from the battery only.

1.3 Description of Operation and the Equipment Design

The separator contains anti-interference protection elements and reverse polarity protection for the voltage supplied from the power supply. It provides 3 functions for the converter/logger.

a) Communication separator

For connection to the intrinsically safe communication terminals of the converter/logger, the combined module contains a communication separator equipped with an intrinsically safe RS485 interface (RS485 terminal block). The terminal block contains data terminals D+, D-, and auxiliary terminals U+, GND. The auxiliary terminals U+ and GND carry the supply voltage of the internal IS power supply. This IS supply voltage is used to power the communication circuits of the converter, which are galvanically isolated from the other circuits of the converter.

To connect a communication device (PC, PLC, modem, etc.) to the communication separator, the separator is equipped with an RS485/RS232 interface. Only one of them can be used, i.e. either RS485 (terminals D+, D-, GND) or RS232 (terminals GND, TxD, RxD). The separator allows the following conversion between the RS485 IS communication interface and the normal RS485 and RS232 interfaces for connecting common devices:

Intrinsically safe communication interface	Normal communication interface	
	RS485	RS232
RS485	Yes	Yes

Tab. 12 Conversion options between B-PRO (B-PRO/A) communication interfaces

The communication separator is a transparent device in terms of the signal, i.e. communication signals passing through this separator do not change their properties (the used communication protocol and the used communication speed are preserved). The range of applicable communication rates and other parameters are given in paragraph 4.

b) Digital Output Separator

The isolator allows to separate up to two digital signals supplied from the converter to intrinsically safe terminals DI1 and DI2 (DIGITAL INPUTS terminals). The signals pass through the safety barrier and are output to the DIGITAL OUTPUTS terminal block, terminals DO1 and DO2 (DI1 input → DO1 output, DI2 input → DO2 output).

The DIGITAL INPUTS terminal block includes, in addition to the DI1 and DI2 signal terminals, the U+ and GND terminals to which the voltage of the internal intrinsically safe power supply is applied. The GND terminal is common for both inputs DI1 and DI2. The IS voltage at terminal U+ is required to supply the digital output circuits in the converter/logger, which, as in the case of communication, are galvanically isolated from the other circuits in the converter.

The digital signals supplied from the converter/recorder can be binary, pulse, or data for the CLO current output module. The electrical parameters of the digital signal are unchanged after passing through the separator.

c) External IS power supply for converter/logger

The intrinsically safe power supply (5V OUTPUT terminals) has reverse polarity protection, voltage and current limiter circuits and an output voltage regulator with a limiter consisting of a pair of Zener diodes. The power supply has a built-in replaceable T100mA fuse ¹⁷⁾. The output

¹⁷⁾ It is not allowed to disassemble the module. Any replacement of the fuse must be carried out at an authorised service centre.

voltage of the IS power supply (+, - terminals on the 5V OUTPUT terminal block) is connected to the PWR1 terminals of the converter/logger.

The combined module B-PRO (B-PRO/A) has no adjustment elements.

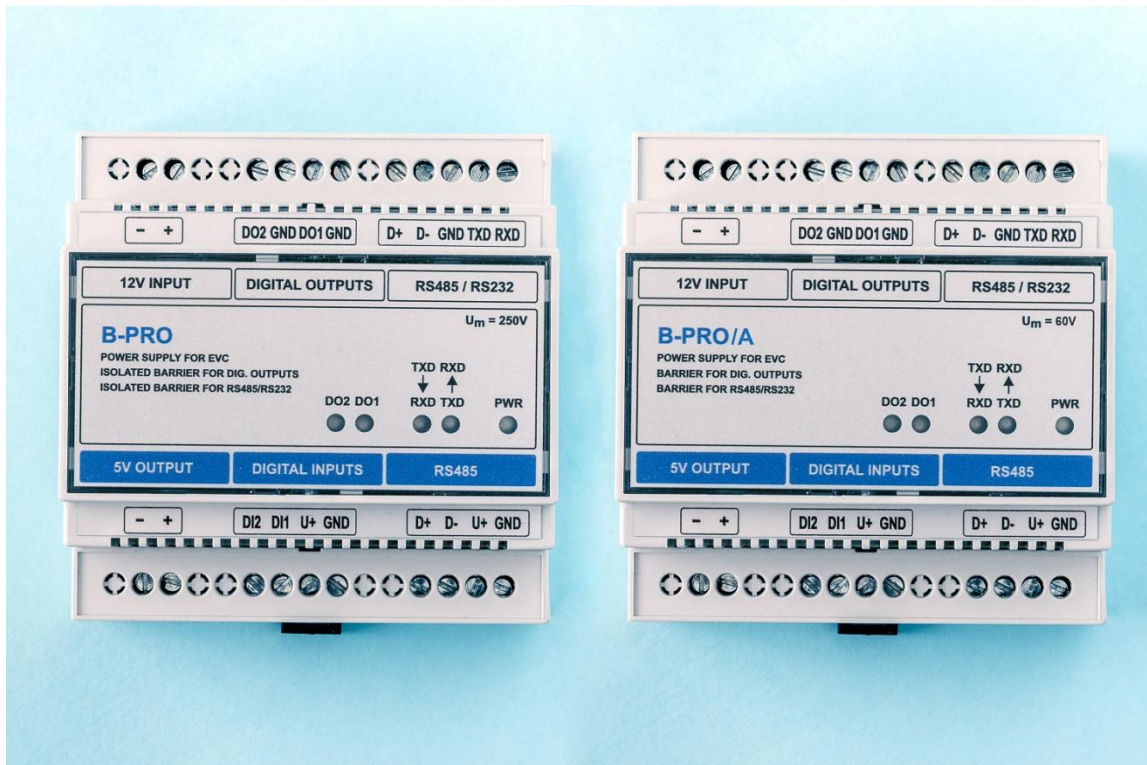
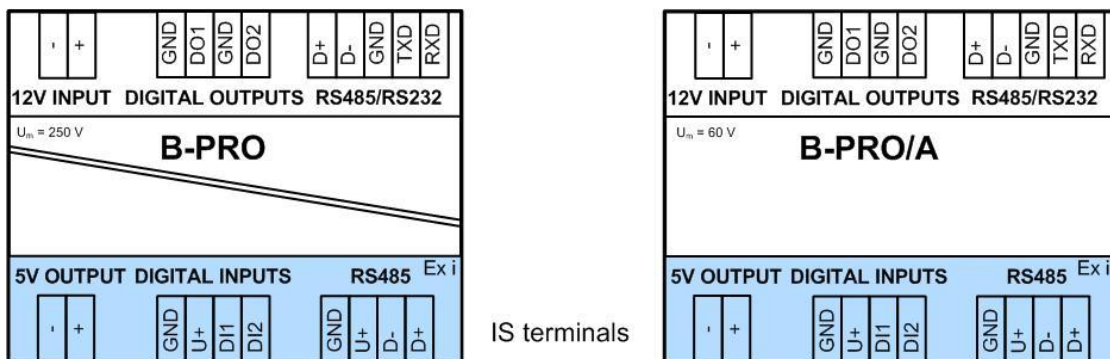


Fig. 40 Designs B-PRO and B-PRO/A



IS terminals

Fig. 41 Schematic symbols

1.3.1 B-PRO Design

The basic version of the combined module is designed for systems whose power supply is derived from the mains voltage ($U_m = 250V$). The B-PRO module can be powered e.g. from a non-backup mains supply or from a supply backed up by a battery that is recharged by a mains charger, etc.

This basic design of the B-PRO combined module has galvanic isolation between the input IS circuits and the output circuits. It is implemented by optical couplers in the communication and digital output circuits and by power supply with an isolated converter with transformer whose input power is limited by a fuse and a voltage limiter.

1.3.2 B-PRO/A Design

The B-PRO/A design of the combined module has reduced self-consumption compared to the basic design. It is suitable for systems powered only by a battery, which can be recharged by solar panels ($U_m = 60\text{ V}$).

This design of the combined module does not have galvanic isolation between the input IS and output circuits (the negative terminals of the inputs and outputs are interconnected.) The power supply is implemented by a non-isolated DC-DC converter whose input power is limited by a fuse.



Attention!

The combination module in design B-PRO/A must not be powered from sources derived from 230 V mains voltage. It must also not be powered from a battery that is charged by a mains charger.

1.3.3 Activity Indication

On the front panel of the combined module, five indication LEDs are placed.

LED designation	Colour	State	Meaning
PWR	Green	Lit	The module is powered
		Not lit	The module is not powered
TxD RxD ↓ ↑ RxD TxD	Yellow (2x)	Flashes	Indicates the direction of TxD signal transmission
DO2 DO1	Yellow (2x)	Flashes	Indicates the current presence of the signal at the corresponding DO output terminal

2 Safety

2.1 General

From the safety point of view, the combined module has been designed according to EN IEC 60079-0 [2] and EN 60079-11 [3] 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 0046X	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-PRO Design, Um = 250 V - B-PRO/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.

2.3 Specific Conditions of Use



CAUTION!

1. The B-PRO/A module has no galvanic separation between intrinsically safe and conventional circuits. This must be taken into account during installation.
2. The B-PRO/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.

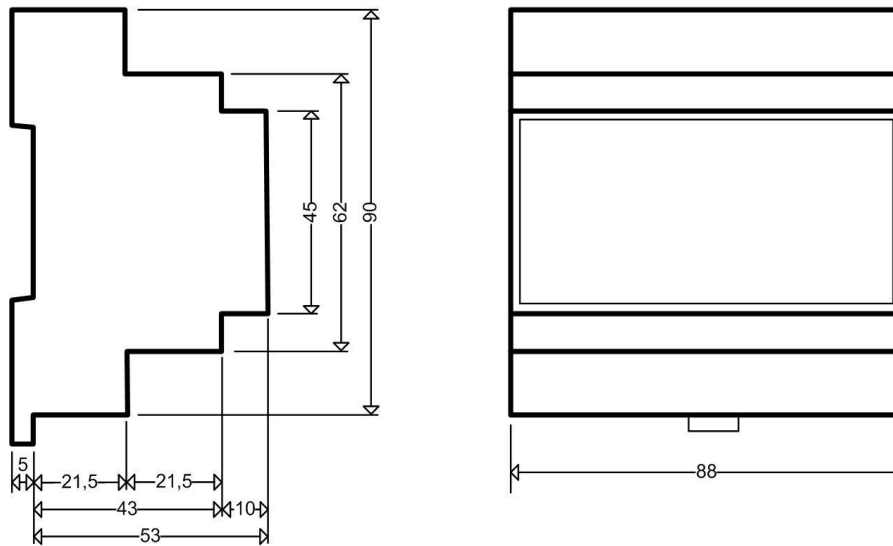


Fig. 42 Dimensions of the device (mm)

The combined module must be powered from a 12V DC power supply. If the DC power supply is supplied from the mains supply, it is necessary to assign a 3rd stage surge protector with an RF filter to this power supply.

3.1 Connecting to the Device

3.1.1 External IS Power Supply of the Converter

Power from the external intrinsically safe power supply of the B-PRO combined module (5V OUTPUT terminals) is connected to the PWR1 terminals of the converter/logger. Only one converter/logger can be powered from the 5V OUTPUT terminals of the combined module.

The recommended connections are given in paragraph. 7.

3.1.2 IS RS485 communication connection

This interface is designed to connect a converter/logger:

ELCOR - has one built-in RS232/RS485 communication interface. RS485 is used for communication. The RS485 IS interface of the B-PRO (B-PRO/A) combined module connects to the RS485/RS232 terminals on the I/O board in the ELCOR (or DATCOM).

ELCORplus, ELCORplus indexer - must be equipped with the communication module S1-COM1. The module must be installed in SLOT 1 and/or SLOT 2. The module shall offer RS232 or RS485 communication interface. The RS485 interface, i.e. terminals 1 to 4, shall be used for connection to the combined module, see Tab. 13. The cable leading from the combined module is connected to the SLOT 1 or SLOT 2 terminal block.

SLOT 1, SLOT 2	RS232	RS485
Terminal	Signal	Signal
1	---	D1+

2	---	D1-
3	GND	GND
4	CTS	U1+
5	RxD	---
6	TxD	---

Tab. 13 ELCORplus - assignment of SLOT 1 and SLOT 2 terminals when equipped with S1 COM1 module

Note:

If the internal module S4-COM0, which has an RS232 communication interface, is installed in the converter/logger for communication, the combined module B-PRO (B-PRO/A) cannot be used for this interface.

ELCORlite – The B-PRO (B-PRO/A) combined module can be used if the ELCORlite (DATCOMlite) is equipped with an RS485 communication interface. The RS485 IS interface of the B PRO (B PRO/A) combined module is connected to the COM1 RS485 terminal block, terminals D1+, D1-, U1+, GND1, on the ELCORlite (or DATCOMlite) device motherboard.

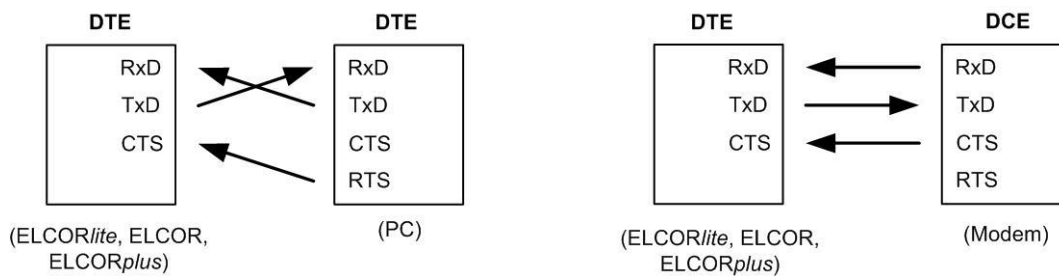
3.1.2.1 Note on connecting communication devices

In terms of data transmission, two types of devices can be distinguished: DTE - Data terminal Equipment and DCE - Data Communication Equipment.

Converters/dataloggers are DTE devices.

Depending on whether a device of the same type (i.e. DTE) or a DCE-type device is used, either a cross or a direct connection is used (generally valid for RS232, Ethernet). For example, a PC is a DTE device, a modem is a DCE device.

For the RS232 interface:



In case of Elgas devices (converters, loggers) we connect the device via external module B-RS (mod R), B-RS/A (mod R), B-PRO, B-PRO/A. The connection to the PC (or PLC automat) and to the external modem via the B-PRO (B-PRO/A) module will be as follows:

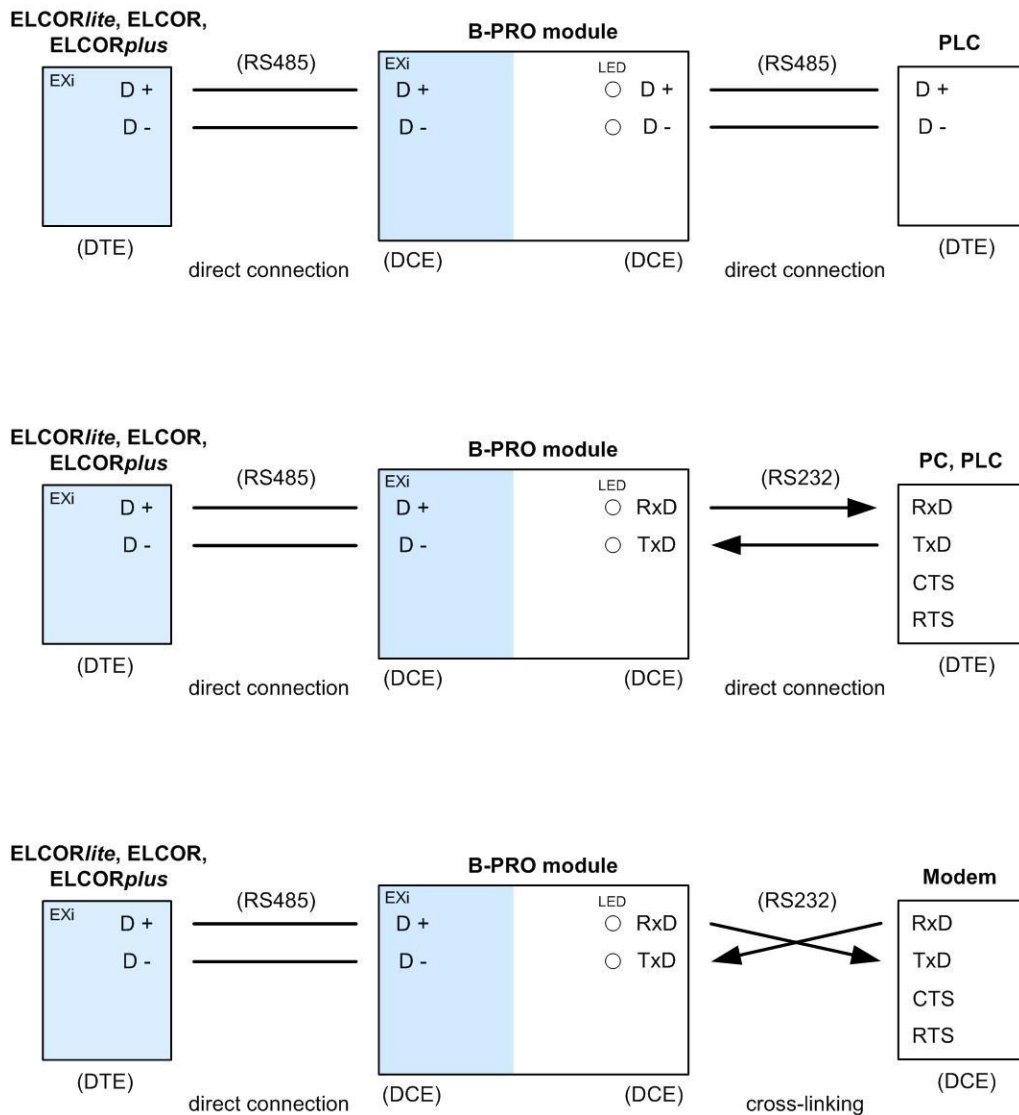


Fig. 43 Principle of connection with PC, PLC and external modem via B-PRO module

3.1.3 Separator of Digital Outputs of the Converter/Logger

Outputs from the converter/logger DOUT terminal block (terminals DO2, DO1, U0+, GND0; in the case of ELCORplus, optionally also DO3 and DO4) are connected to the DIGITAL INPUTS terminals (terminals DI2, DI1, U+, GND) of the B-PRO module (B-PRO/A).

Recommended connections are given in the paragraph 7.

3.2 Cabling

The cables between the converter/logger and the combined module carry IS signals and must be shielded. The cable shield is connected on the converter/logger side, the shield remains unconnected on the side of the combined module B-PRO (B-PRO/A).



For best EMC protection of the B-PRO module and the converter/logger, it is important that the cables between the B-PRO module and the converter are routed in a single bundle!

3.2.1 Power Cables

The power cable in this case is the cable connected to the 12V INPUT terminals and the cable for connection to the intrinsically safe output of the power supply (5V OUTPUT terminals). For power cable lengths greater than 5 m, it is not advisable to use a cable with a small cross section due to the size of the conductor resistance. The resistance of the conductor may cause undesirable voltage drop for longer distances.

When connecting the cable to an intrinsically safe circuit (5V OUTPUT), the intrinsic capacitance and inductance of the cable must be considered. These parameters depend on the length and type of cable used and must be in accordance with the explosion proof parameters of the respective system.

Designation	Type	Conductor cross-section	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 2 x 0.75 mm ²	2 wire shielded	0.75 mm ²	0.65 mH/km	160 nF/km	27 Ω/km	Lappkabel Stuttgart	30 m

Tab. 14 Recommended EVC external power cable

3.2.2 Cables for intrinsically safe communication port and digital outputs

When connecting cables to intrinsically safe circuits, the intrinsic capacitance and inductance of the cable must be considered. These parameters depend on the length and type of cable used and must be in accordance with the explosion proof parameters of the relevant system.

The recommended type of connection cable between the converter/logger and the RS485 IS terminals (D+, D-, U+, GND) of the combined module, its parameters and maximum length are listed in the following table.

Commun. interface	Designation	Type	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
RS485	Unitronic LiYCY 4 x 0.34 mm ²	4 wire shielded	0.65 mH/km	160 nF/km	59 Ω/km	Lappkabel Stuttgart	100 m

Tab. 15 Recommended cable for RS485 between converter and combined module

The recommended type of connection cable between the converter/logger and the IS terminals DIGITAL INPUTS (DI1, DI2, U+, GND) of the combined module, its parameters and maximum length are given in the following table.

<i>Designation</i>	<i>Type</i>	<i>Inductance</i>	<i>Capacity</i>	<i>Conductor resistance</i>	<i>Manufacturer</i>	<i>Max. length</i>
Unitronic LiYCY 4 x 0.25 mm ²	4 wire shielded	0.65 mH/km	160 nF/km	82 Ω/km	Lappkabel Stuttgart	100 m


Tab. 16 Recommended cable for digital outputs between converter and combined module

4 Technical Parameters

4.1 Operation Conditions and Environment

Operating ambient temperature	-40 to +70°C
Working environment	Normal environment (ČSN 33 2000-5-51 ed. 3, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	Class III protection equipment (EN 61140)
Relative humidity of the environment	0% to 95% relative, non-condensing
Air pressure	86 kPa to 106 kPa
External dimensions	88 x 90 x 58 mm
Device weight	130 g
Mounting	On 35mm DIN rail

4.2 Explosion-proof Design

Designation	 II (1)G [Ex ia Ga] IIB
Certificate no.	FTZÚ 19 ATEX 0046X
Max. voltage value U_m	250 V (B-PRO design) 60 V (B-PRO/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) ¹⁸⁾	typically 17 mA at 13 V (B-PRO) typically 10 mA at 13 V (B-PRO/A)
Max. current consumption ¹⁹⁾	100 mA at 13V (B-PRO) 90 mA at 13V (B-PRO/A)
Max. cable length	30 m

4.4 RS485 port (intrinsically safe)

Interface type	RS-485
Communication speed	2.4 kBd to 115.2 kBd

¹⁸⁾ There are no external circuits connected to the module terminals, except for the power supply.

¹⁹⁾ The RS232 device is connected to the RS485/RS232 terminals, the U+ and GND terminals are shorted and the 5V source terminals (+, -) are shorted.

Voltage of terminal U+ against GND	typically 5.0 V
Short circuit current of terminal U+	typically 20 mA
Max. cable length	100 m ²⁰⁾
Galvanic separation	1 500 V (B-PRO design only)

4.5 RS485 port

Interface type	RS-485
Communication speed	2.4 kBd to 115.2 kBd
Max. cable length	1 200 m (at 38.4 kBd) (for cable lengths of approx. over 100 m it is necessary to terminate the cable at both ends with a 120 Ω resistor)

4.6 RS232 port

Interface type	RS-232
Communication speed	2.4 kBd to 115.2 kBd
Max. cable length	30 m

4.7 Digital Inputs DI1,DI2 (intrinsically safe)

Number of inputs	2
No load voltage	typically 5.0 V
Short circuit current of terminal U+	typically 20 mA
Max. cable length	30 m ²⁰⁾
Galvanic separation	1500 V (B-RPO design only)

4.8 Digital Outputs DO1,DO2

Number of outputs	2
Output type	Open collector
Max. voltage	16 V
Max current	100 mA
Max. resistance in switched state	10 Ω

²⁰⁾ The inductance and capacitance of the cable (depending on the length and type of cable used) must be in accordance with the explosion-proof parameters of the system.

Max. cable length	30 m
-------------------	------

4.9 IS Power Supply for EVC (5V OUTPUT terminals)

No load voltage	typically 4.6 V
current limitation	typically 59.5 mA
Max. cable length	30 m ²⁰⁾
Galvanic separation	1500 V (B-PRO design only)

5 Explosion Safety Parameters

The intrinsically safe parameters are based on the parameters of the IS source, which has a trapezoidal characteristic.

5.1 Parameters for IS power supply (5V OUTPUT terminals)

Maximum output voltage	U _o :	6.5 V
Maximum voltage before limiting resistor	U _Q :	9.638 V
Maximum output current	I _o :	168 mA
Maximum output power	P _o :	405 mW
Maximum external capacity	C _o :	50 μF (for gas group IIB)
Maximum external inductance	L _o :	1.5 mH (for gas group IIB)
Maximum internal capacity	C _i :	50 uF
Maximum internal inductance	L _i :	0 uH





5.2 Parameters for RS485 IS terminals

Maximum output voltage	U _o :	7.2 V
Maximum voltage before limiting resistor	U _Q :	11.12 V
Maximum output current	I _o :	109 mA
Maximum output power	P _o :	303 mW
Maximum external capacity	C _o :	18 μF (for gas group IIB)
Maximum external inductance	L _o :	1.2 mH (for gas group IIB)
Maximum internal capacity	C _i :	5 uF
Maximum internal inductance	L _i :	0 uH

5.3 Parameters for IS terminals of DI1 and DI2 inputs

Maximum output voltage	U _o :	7.2 V
Maximum voltage before limiting resistor	U _Q :	11.12 V
Maximum output current	I _o :	109 mA
Maximum output power	P _o :	303 mW
Maximum external capacity	C _o :	18 μF (for gas group IIB)
Maximum external inductance	L _o :	1.2 mH (for gas group IIB)
Maximum internal capacity	C _i :	5 uF
Maximum internal inductance	L _i :	0 uH

6 Product Data Plate

<p>B-PRO</p>  <p>2155200001</p> <p>$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$</p> <p>ELGAS, s.r.o. Semtínská 211 533 53 Pardubice Czech Republic</p>	<p> II (1)G [Ex ia Ga] IIB FTZÚ 19 ATEX 0046X</p> <p><u>RS485/DI:</u> $U_o = 7.2 \text{ V}$ $I_o = 109 \text{ mA}$ $P_o = 303 \text{ mW}$ $C_o = 18 \mu\text{F}$ $L_o = 1.2 \text{ mH}$</p>	<p> 1026</p> <p>Date: 2021 $U_m = 250 \text{ V}$</p> <p><u>5V OUT:</u> $U_o = 6.5 \text{ V}$ $I_o = 168 \text{ mA}$ $P_o = 405 \text{ mW}$ $C_o = 50 \mu\text{F}$ $L_o = 1.5 \text{ mH}$</p> 
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<p>B-PRO/A</p>  <p>2155300001</p> <p>$-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$</p> <p>ELGAS, s.r.o. Semtínská 211 533 53 Pardubice Czech Republic</p>	<p> II (1)G [Ex ia Ga] IIB FTZÚ 19 ATEX 0046X</p> <p><u>RS485/DI:</u> $U_o = 7.2 \text{ V}$ $I_o = 109 \text{ mA}$ $P_o = 303 \text{ mW}$ $C_o = 18 \mu\text{F}$ $L_o = 1.2 \text{ mH}$</p>	<p> 1026</p> <p>Date: 2021 $U_m = 60 \text{ V}$</p> <p><u>5V OUT:</u> $U_o = 6.5 \text{ V}$ $I_o = 168 \text{ mA}$ $P_o = 405 \text{ mW}$ $C_o = 50 \mu\text{F}$ $L_o = 1.5 \text{ mH}$</p> 
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Fig. 44 Product Data Plates

7 Device Wiring Diagrams

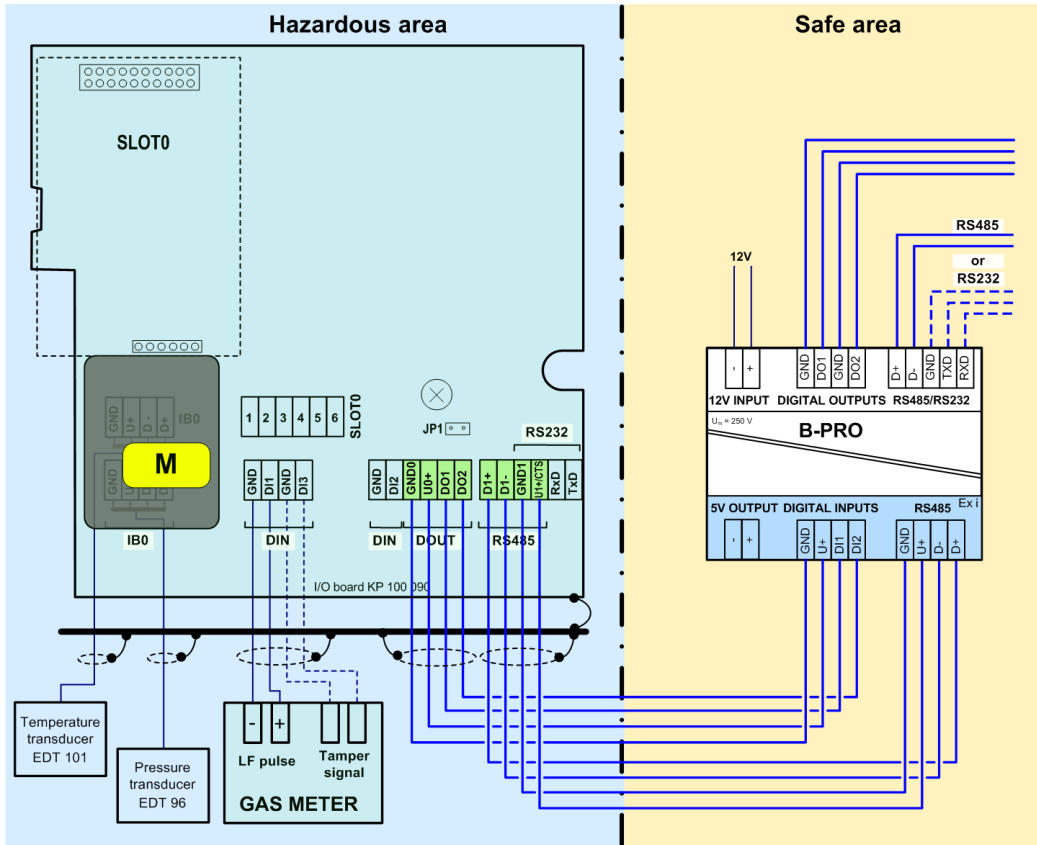


Fig. 45 Communication and digital outputs using the B-PRO module (ELCOR)

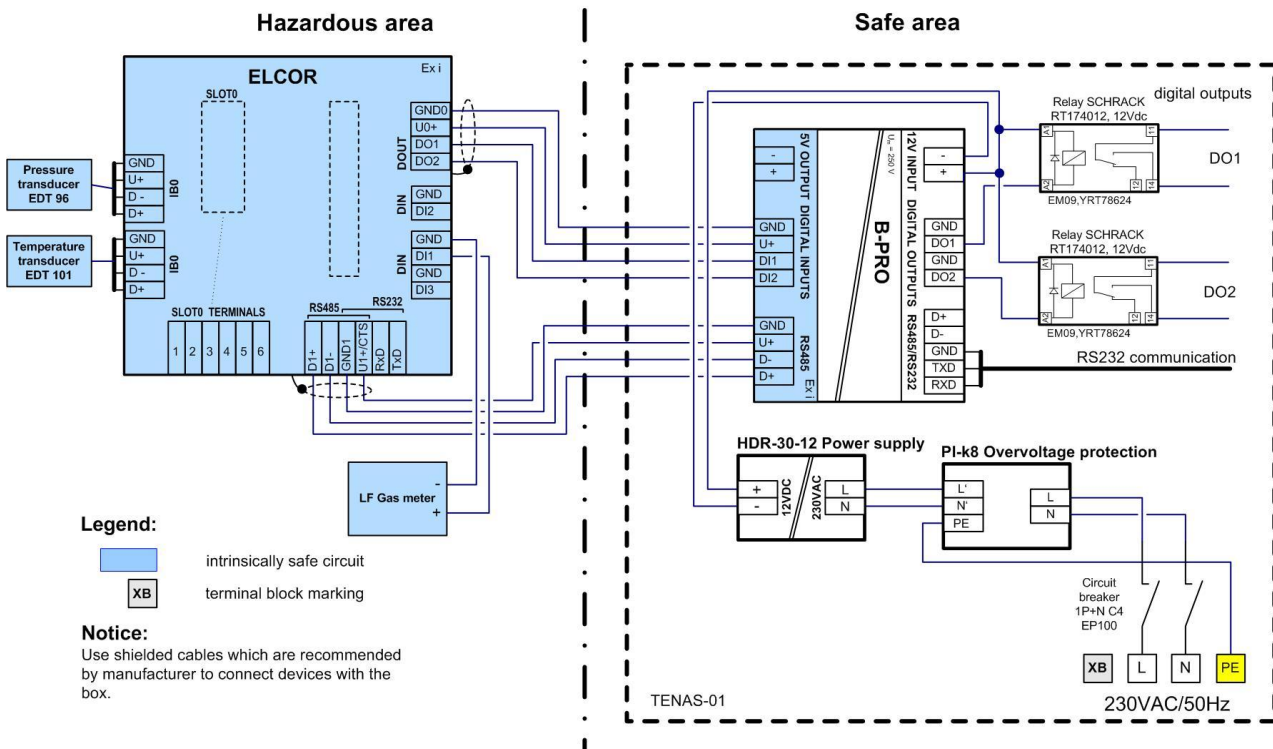


Fig. 46 Connection of ELCOR and B-PRO

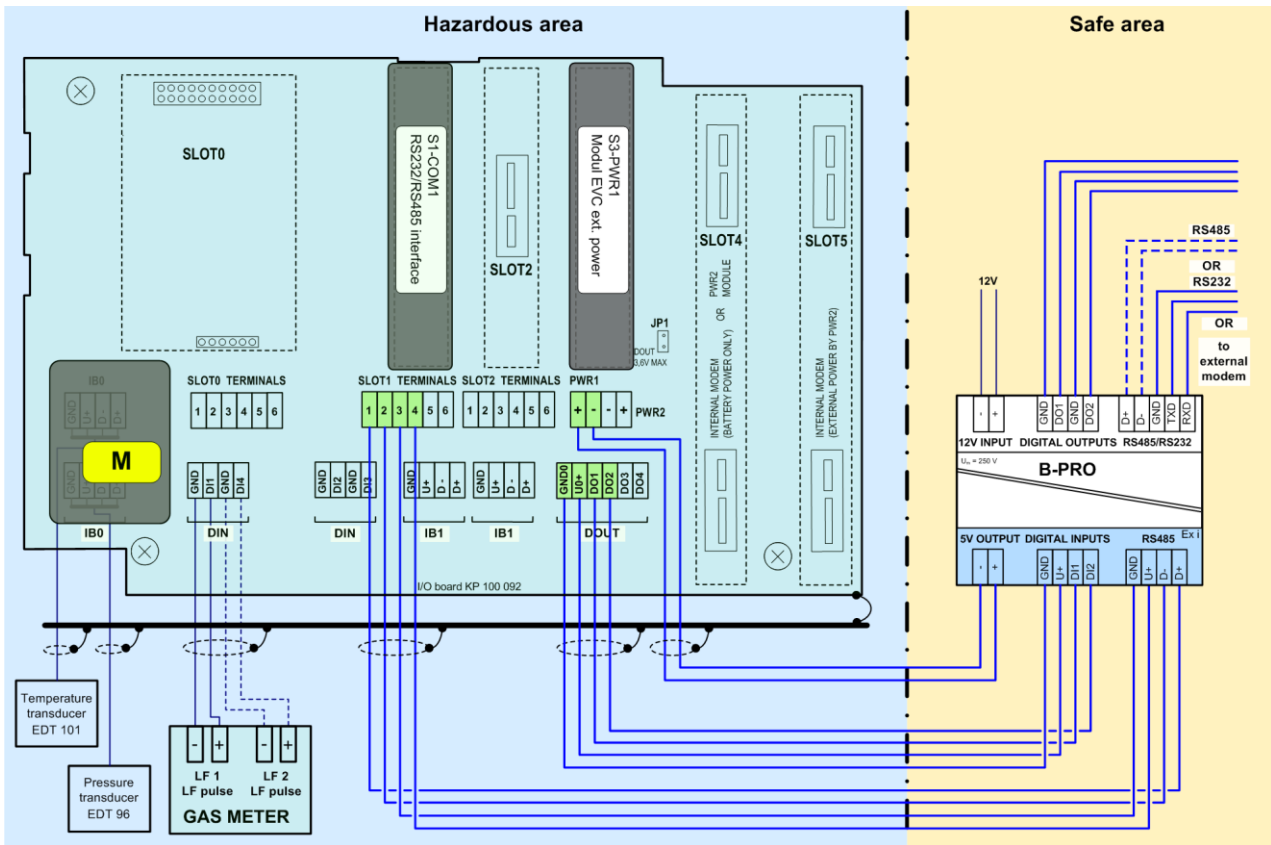


Fig. 47 Communication and digital outputs via B-PRO (ELCORplus)

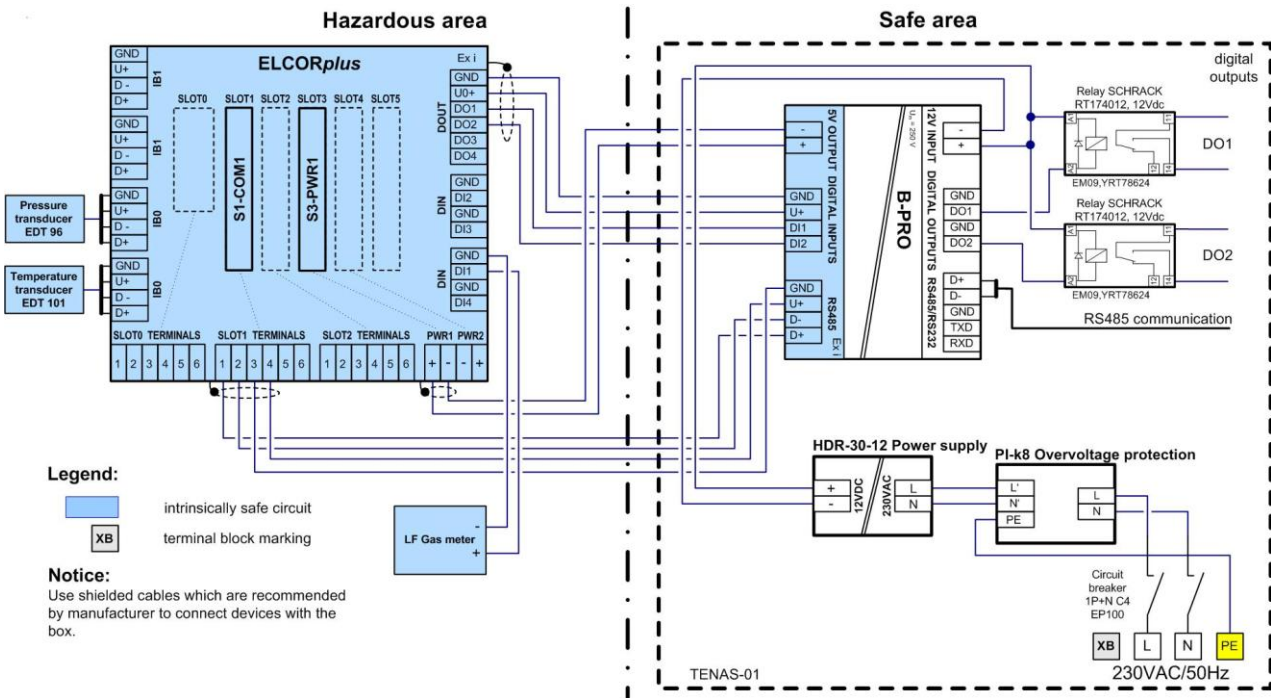


Fig. 48 Example of connecting ELCORplus to B-PRO

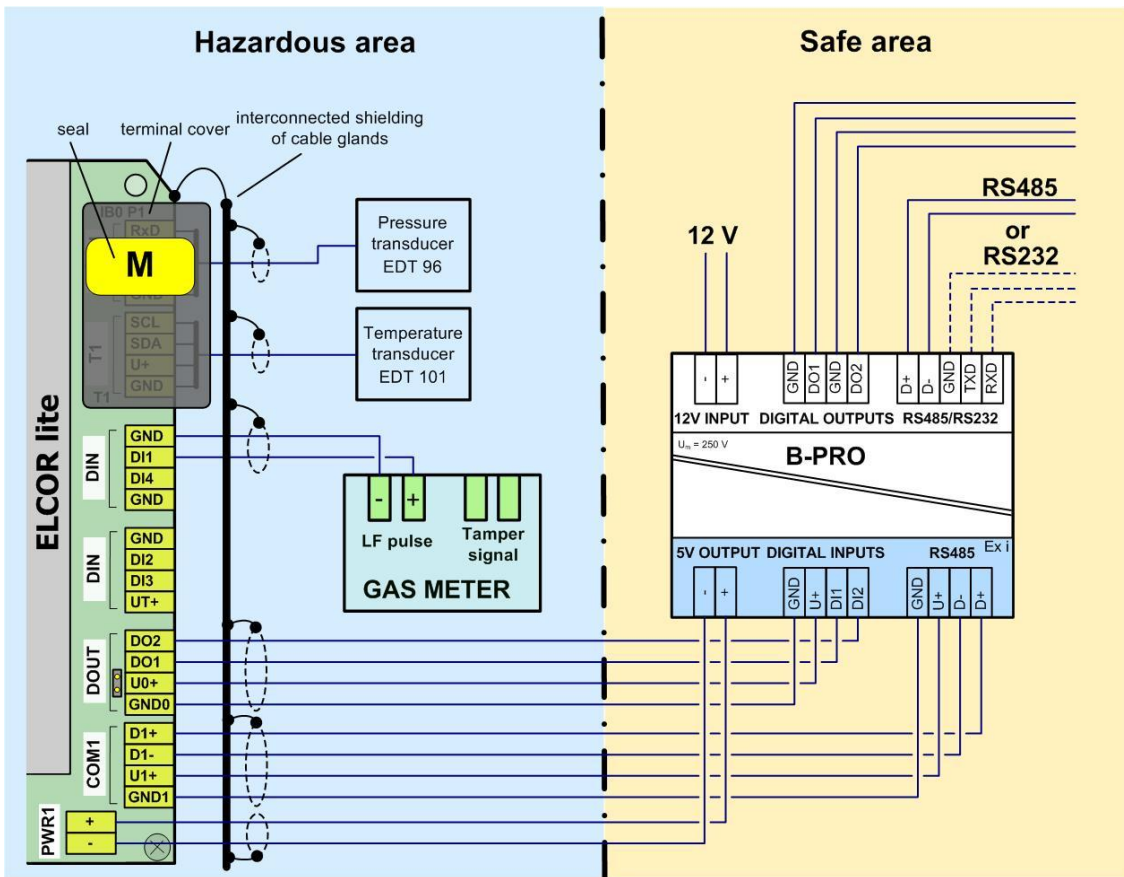


Fig. 49 Communication and digital outputs using B-PRO (ELCORlite)

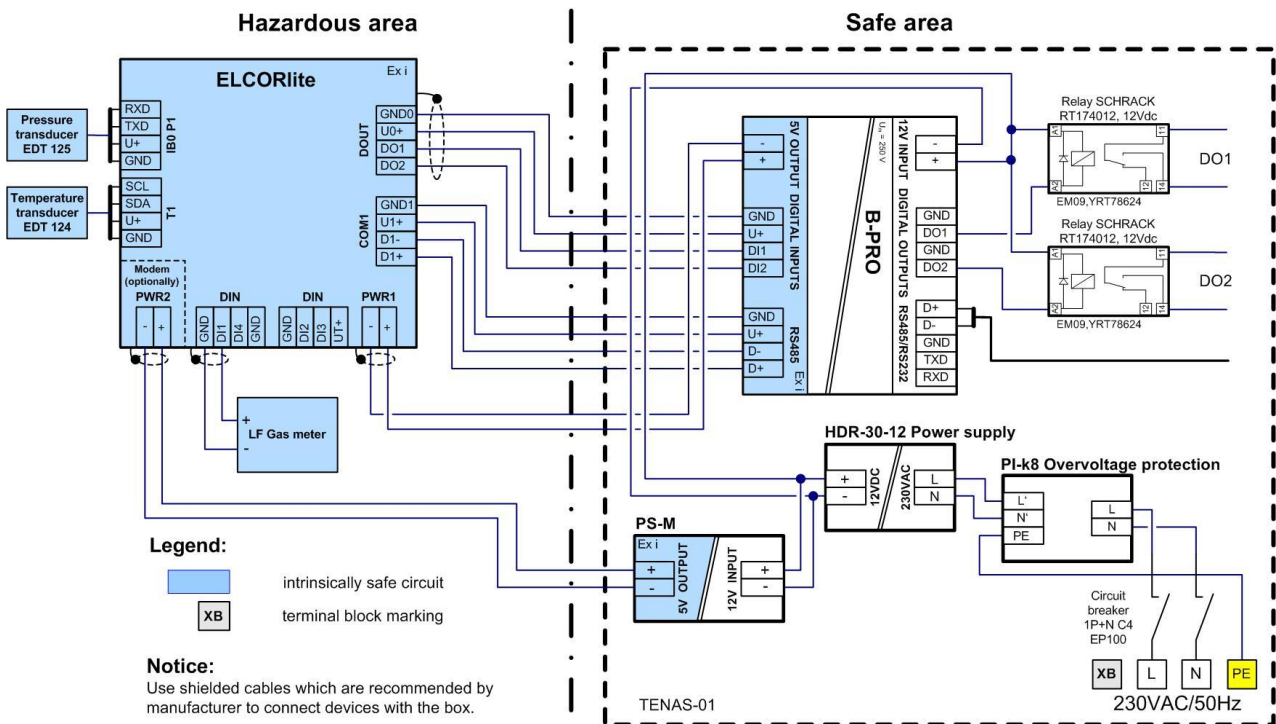


Fig. 50 Connection of ELCORlite and B-PRO

Communication Separator for Internal Bus B-IB



CONTENTS

1	DEVICE DESCRIPTION	101
1.1	Product Identification.....	101
1.2	Device Functions	101
1.3	Description of Operation and the Equipment Design.....	101
1.3.1	Activity Indication.....	103
2	SAFETY	104
2.1	General	104
2.2	Using the Device in Potentially Explosive Atmospheres.....	104
3	INSTALLING THE DEVICE	106
3.1	Cabling.....	106
4	TECHNICAL PARAMETERS	107
4.1	Operation Conditions and the Environment.....	107
4.2	Explosion-proof Design.....	107
4.3	Power Supply (12V terminals).....	107
4.4	Port RS485	107
4.5	Port RS485 (Intrinsically Safe)	107
5	EXPLOSION SAFETY PARAMETERS	109
5.1	Parameters for RS485 IS Terminals	109
6	PRODUCT DATA PLATE	110
7	DEVICE WIRING DIAGRAMS.....	111

1 Device Description

1.1 Product Identification

Business name:	B-IB
Name of product:	Communication Separator for IB
Product drawing number:	KP 116

1.2 Device Functions

The communication separator for Internal Bus named B-IB is a safety separation barrier for the internal intrinsically safe communication bus (IB) of the following devices:

- ELCOR*plus*
- ELCOR*plus indexer*
- DATCOM*plus*



Attention!

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

The purpose of the communication separator is to create an interface between intrinsically safe circuits (equipment placed in a potentially explosive atmosphere) and other circuits that are placed outside the hazardous area. The device performs function of an intrinsically safe separator for the internal intrinsically safe communication bus of the corrector. Thanks to its use, RS485 communication equipment (e.g. SRM controller module) can be easily connected to the intrinsically safe corrector / logger bus.

The B-IB communication separator is powered by 12 V DC.

The communication 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.

1.3 Description of Operation and the Equipment Design

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

For connection to intrinsically safe communication terminal (IB) of the corrector/logger, the communication separator is equipped with an intrinsically safe RS485 interface (D+, D-, U+, GND terminals). The U+ and GND terminals of this intrinsically safe interface are supplied with power from the internal intrinsically safe IB corrector bus. This IS voltage is used to supply internal circuits of the IS RS485 interface of the B-IB separator.

To connect a communication device (e.g. SRM) to the B-IB communication separator, the separator is equipped with terminals D+, D- of the standard RS485 communication interface.

The communication separator is a signal-transparent device, i.e. the communication signals passing through this separator do not change their properties (the communication protocol used

and the communication speed used are retained). The range of available communication speeds and other parameters are provided in Section. 4.

The communication separator B-IB contains galvanic separation between the intrinsically safe RS485 circuit and the standard RS485 interface.

The B-IB separation module contains no adjustable elements.

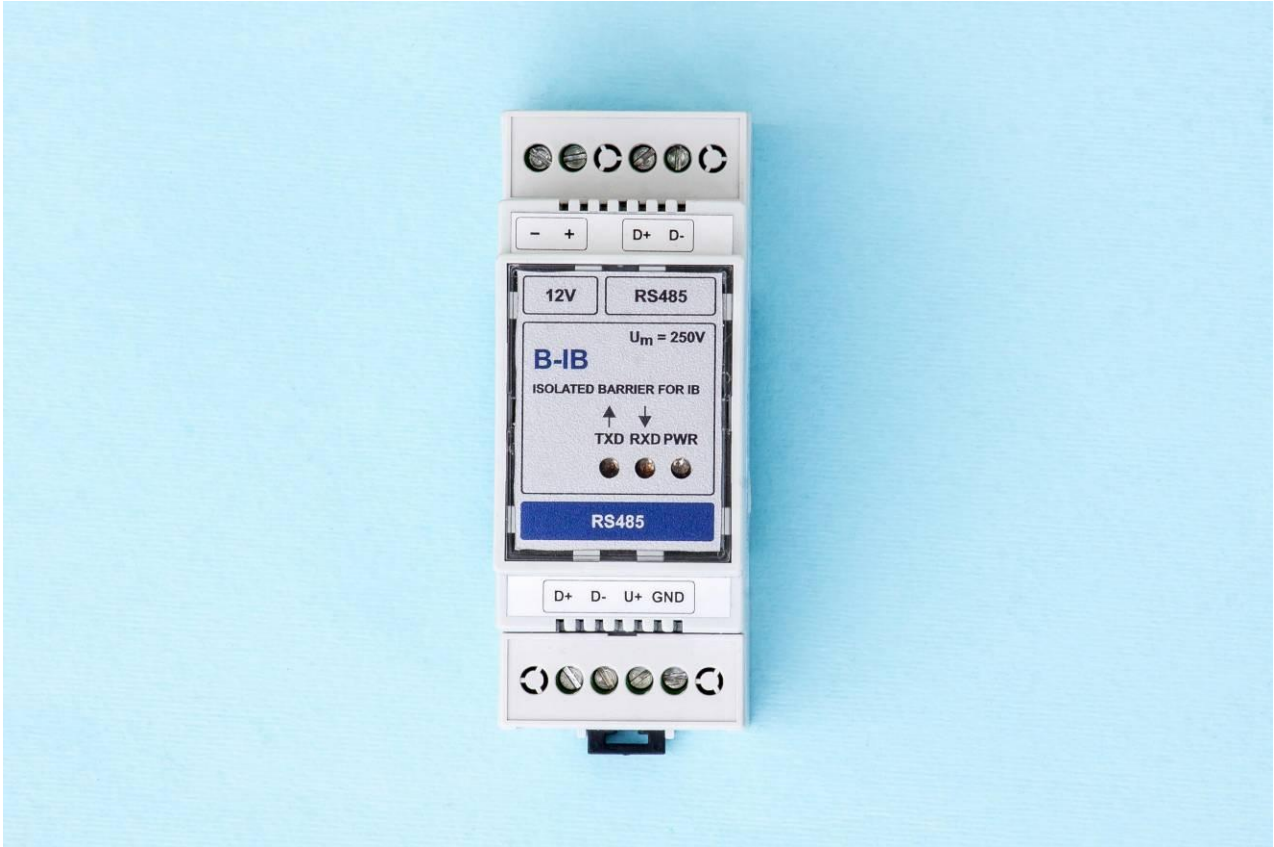


Fig. 51 B-IB designs

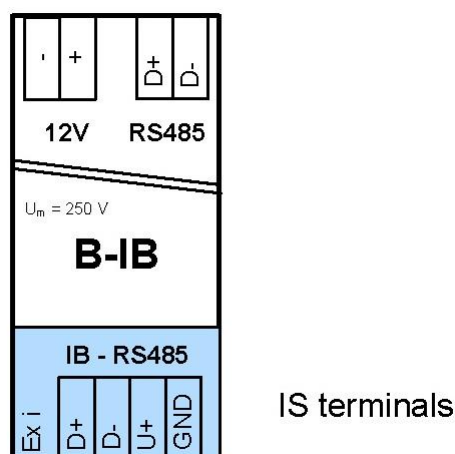


Fig. 52 Schematic symbols

1.3.1 Activity Indication

On the front panel of the communication separator, three indication LEDs are placed.

LED Designation	Colour	State	Meaning
PWR	Green	Lights	The module is powered
		Not lights	The module is not powered
↑ TxD ↓ RxD	Yellow (2 pcs)	Flashes	Indicates the direction of the signal transmission TxD and the arrival of RXD signal.

2 Safety

2.1 General

From the safety point of view, the communication separator has been designed according to EN IEC 60079-0 [2] and EN 60079-11 [3] 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 0046X	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-IB design, Um = 250V

B-IB 2 Safety

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.

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.

Dimensions of the equipment:

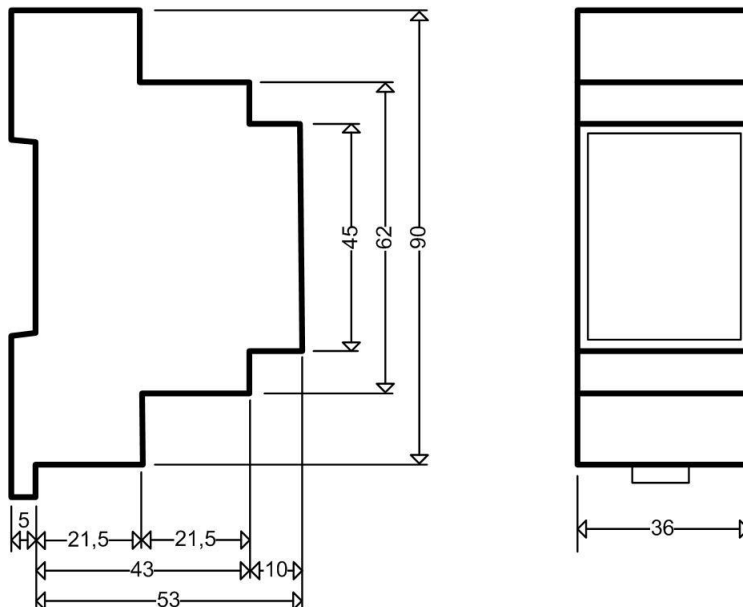


Fig. 53 Dimensions of the device (mm)

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 / logger and the communication separator transmits the IS signal and must be shielded. The cable shield is connected on the corrector / logger side, the shield remains unconnected on the B-IB communication separator side.

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

Cable designation	Type	Inductance	Capacity	Conductor resistance	Manufacturer	Max. length
Unitronic LiYCY 4 x 0.34 mm ²	4-wire shielded	0.65 mH/km	160 nF/km	59 Ω/km	Lappkabel Stuttgart	30 m


Tab. 17 Cable recommended for RS485 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, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	Class III protection equipment (EN 61140)
Relative humidity of the environment	0% to 95% relative, non-condensing
Air pressure	86 kPa to 106 kPa
External dimensions	36 x 90 x 58 mm
Device weight	78 g
Mount	On 35mm DIN rail

4.2 Explosion-proof Design

Designation	 II (1)G [Ex ia Ga] IIB
Certificate no.	FTZÚ 19 ATEX 0046X
Max. voltage value U_m	250 V
Environment classification	Out of potentially explosive atmospheres

4.3 Power Supply (12V terminals)

Supply voltage range	10.5 to 15 V
Current consumption (idle) ²¹⁾	typically 0.5 mA at 14 V
Max. cable length	30 m

4.4 Port RS485

Interface type	RS-485
Baud rate	2.4 kBd to 38.4 kBd
Max. cable length	100 m

4.5 Port RS485 (Intrinsically Safe)

Interface type	RS-485
----------------	--------

²¹⁾ Except for the power supply, no external circuits are connected to the separator terminals.

B-IB 4 Technical Parameters

Baud rate	2.4 kBd to 38.4 kBd
Max. cable length	100 m ²²⁾
Galvanic separation	1,500 V

²²⁾ 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

5.1 Parameters for RS485 IS Terminals

Maximum input voltage	Ui:	7.0 V
Maximum input current	Ii:	2.2 A
Maximum input power	Pi:	1.1 W
Maximum internal capacity	Ci:	0.8 μ F
Maximum internal inductance	Li:	0 μ H

6 Product Data Plate

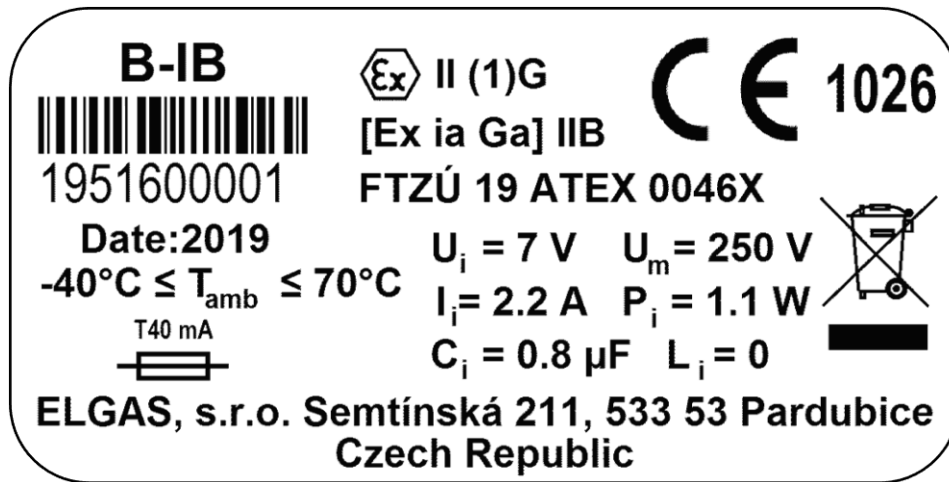


Fig. 54 Product Data Plate

7 Device Wiring Diagrams

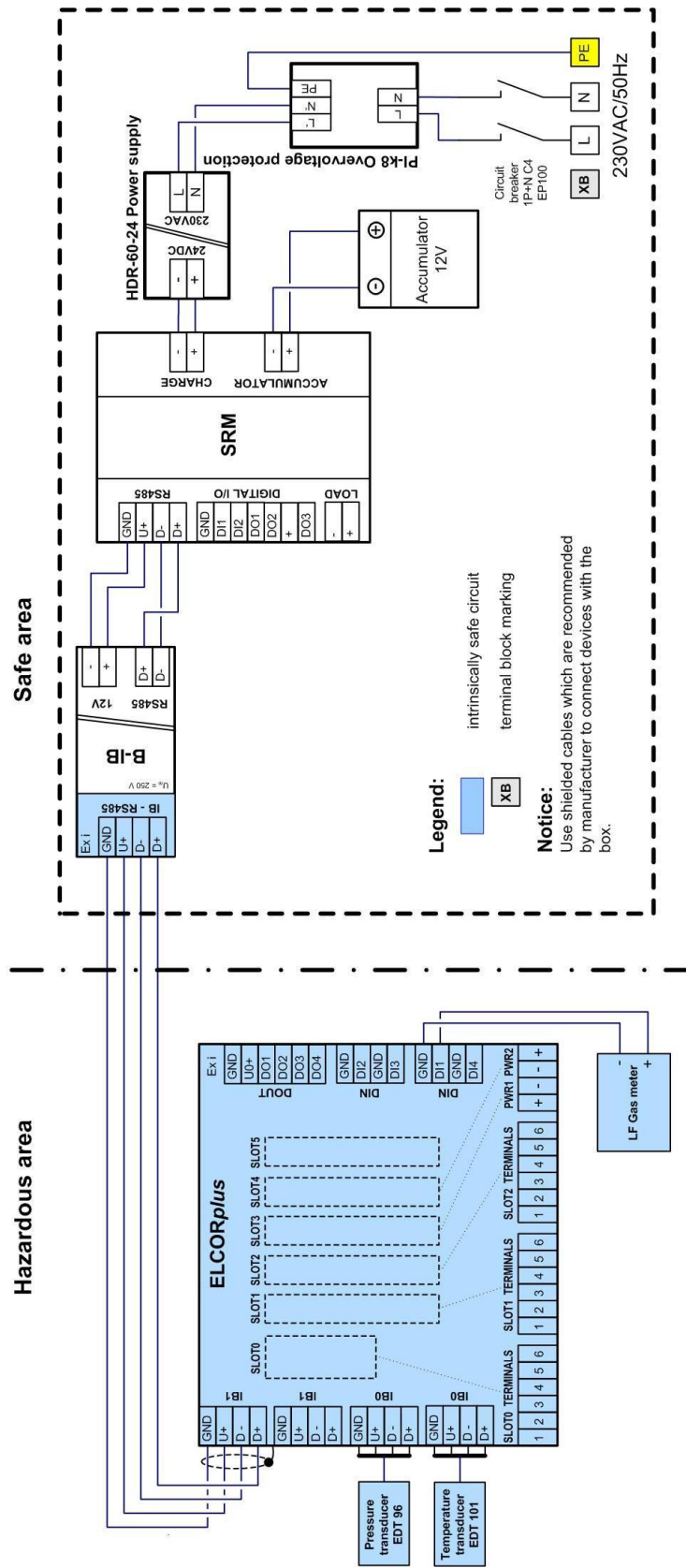


Fig. 55 The use of B-IB to connect SRM controller to ELCORplus

Current output module CLO



CONTENTS

1	DEVICE DESCRIPTION	114
1.1	Product Identification.....	114
1.2	Device Functions	114
1.3	Description of Operation and the Equipment Design.....	114
1.3.1	Activity Indication.....	116
1.4	Settings of the Current Output Module.....	116
2	INSTALLING THE DEVICE	118
3	TECHNICAL PARAMETERS	119
3.1	Operation Conditions and the Environment.....	119
3.2	Power Supply (12V terminals).....	119
3.3	Digital Input (DIN terminals).....	119
3.4	Current Input (terminals 4-20 mA).....	119
4	PRODUCT DATA PLATE	120
5	DEVICE WIRING DIAGRAMS.....	121

1 Device Description

1.1 Product Identification

Business name:	CLO
Name of product:	Current output module
Product drawing number:	KP 120

1.2 Device Functions

The current output module CLO provides a 4-20 mA current output for the following devices:

- ELCOR
- ELCOR*plus*
- ELCOR*plus indexer*
- DATCOM
- DATCOM*plus*
- ELCOR*lite*
- DATCOM*lite*

The CLO module is a digital signal corrector to a 4-20 mA current output. The module can be connected to the digital outputs of the above-mentioned correctors. Correctors / recorders can generate a continuous current output via the CLO, which is proportional to the measured analogue quantities (e.g. pressure, temperature, flow). Several CLO modules can be connected to one device (depending on the number of digital outputs of the corrector / logger).



Attention!

The CLO current output module must be connected to the above-mentioned correctors and recorders via a safety barrier, e.g. B-DO (B-DO/A).

The module must be installed out of potentially explosive atmospheres.

The CLO can also be connected to the DO1 and DO2 outputs of the SRM except for B-DO and B-DO/A.

The current output module CLO is powered by 12V DC.

The CLO module 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.

1.3 Description of Operation and the Equipment Design

The CLO module contains two galvanically isolated circuits - a digital input circuit and a current output circuit. Both of these circuits require external power supply. In terms of current line 4 - 20 mA, it is a **passive transmitter**, i.e. current loop must be powered by a separate source (see Fig. 62).

The output current is controlled within the range from 3.5 mA to 24 mA. The output current value is transmitted to the module by secured digital communication.

CLO 1 Device Description

- The idle power-on state of the output current can be set to 3.5 mA or 24 mA using the configuration switch. This output value will remain until the valid conversion data comes to the digital input.
- The period of updating the output current is determined by the setting of the parameter *Measurement Period* of the connected corrector; the value of the output current is set at the moment of receipt of valid data from the corrector. This moment is indicated on the CLO module by a flashing yellow LED "DATA".
- When no valid data is received for 3 minutes, the output will be set to idle (3.5 mA or 24 mA according to the configuration switch settings).
- If the module is unable to set the correct output current in a loop for any reason, it will always set the output to a standby of 3.5 mA regardless of the configuration switch settings.

The current output module CLO has a galvanic separation between the DIN input circuit and the output current circuit.



Fig. 56 CLO Design

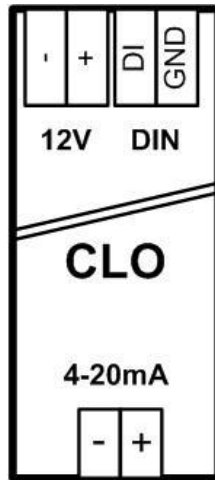


Fig. 57 Schematic symbols

1.3.1 Activity Indication

On the front panel of the communication separator, three indication LEDs are placed.

LED Designation	Colour	State	Meaning
PWR	Green	Lights	The module is powered from the side of the current line
		Not lights	The module is not powered from the side of the current line
Err	Yellow	Flashes	Error condition, no valid data has been received for min 3 minutes
DATA	Yellow	Flashes	Arrival of data from the connected corrector / logger

1.4 Settings of the Current Output Module

The current output module CLO has a built-in setting switch. This switch sets the amount of output current when the module is in an error condition.

The switch is placed under the 4-20 mA current output terminal cover. To switch the switch, remove the output terminal cover. To remove the cover, it is advisable to use a flat tool (such as a screwdriver) to separate the terminal cover from the other box covers. Make sure that the box is not mechanically damaged.

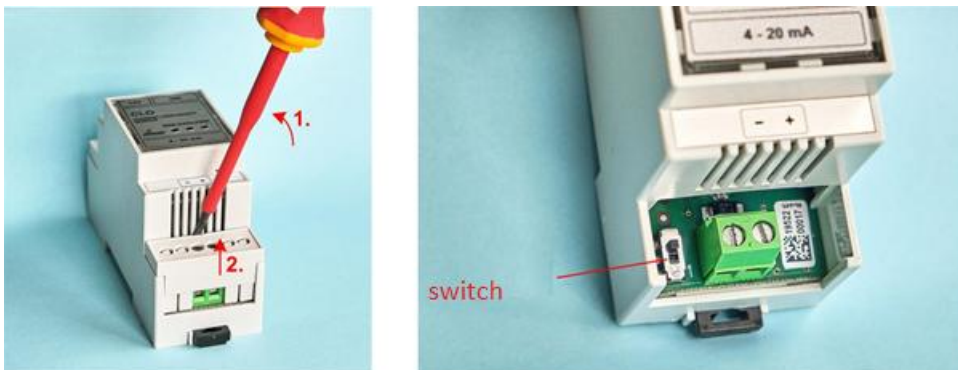




Fig. 58 CLO, switch location

Switch position	Error current value	Switch position	Error current value
	3.5 mA *)		24 mA

*) default settings

Tab. 18 CLO, setting the error current switch

2 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.

Dimensions of the equipment:

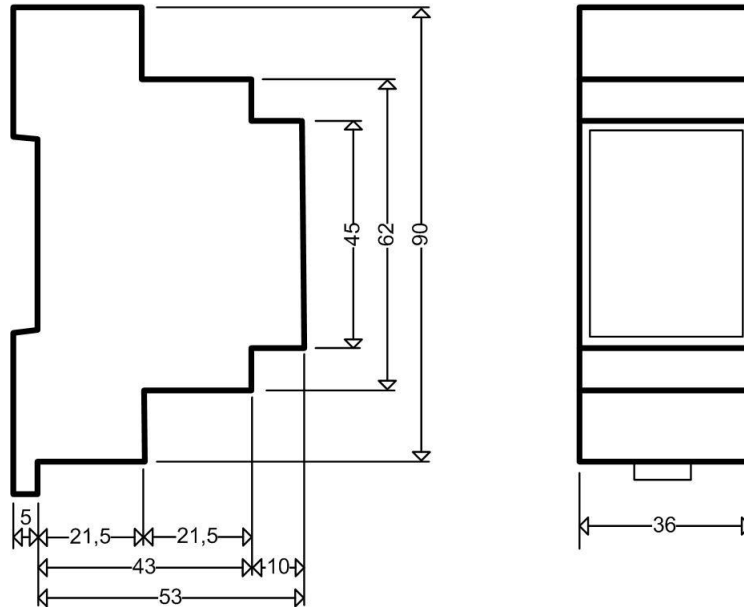


Fig. 59 Dimensions of the device (mm)

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.

The current output is of the passive transmitter type, i.e. the current loop supply must be provided either by the connected device or by an external source.

3 Technical Parameters

3.1 Operation Conditions and the Environment

Operating ambient temperature	-40 to +70°C
Working environment	Normal environment (ČSN 33 2000-5-51 ed. 3, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
External dimensions	36 x 90 x 58 mm
Device weight	80 g
Mount	On 35mm DIN rail
Storage temperature	-40 to +80°C

3.2 Power Supply (12V terminals)

Supply voltage range	3 to 15 V
Current consumption	max 3 mA
Max. cable length	30 m

3.3 Digital Input (DIN terminals)

Connection	Connection to the digital output of the corrector, or to the digital output of the intrinsically safe separator (B-DO, B-DO / A)
Max. cable length	30 m

3.4 Current Input (terminals 4-20 mA)

Supply voltage range	5 V - 40 V
Output current range	3.5 mA – 24 mA
Accuracy	0.25% of the range (at 25 °C)
Temperature error	50 ppm/°C
Galvanic separation	4 kV

4 Product Data Plate



Fig. 60 Data plate

5 Device Wiring Diagrams

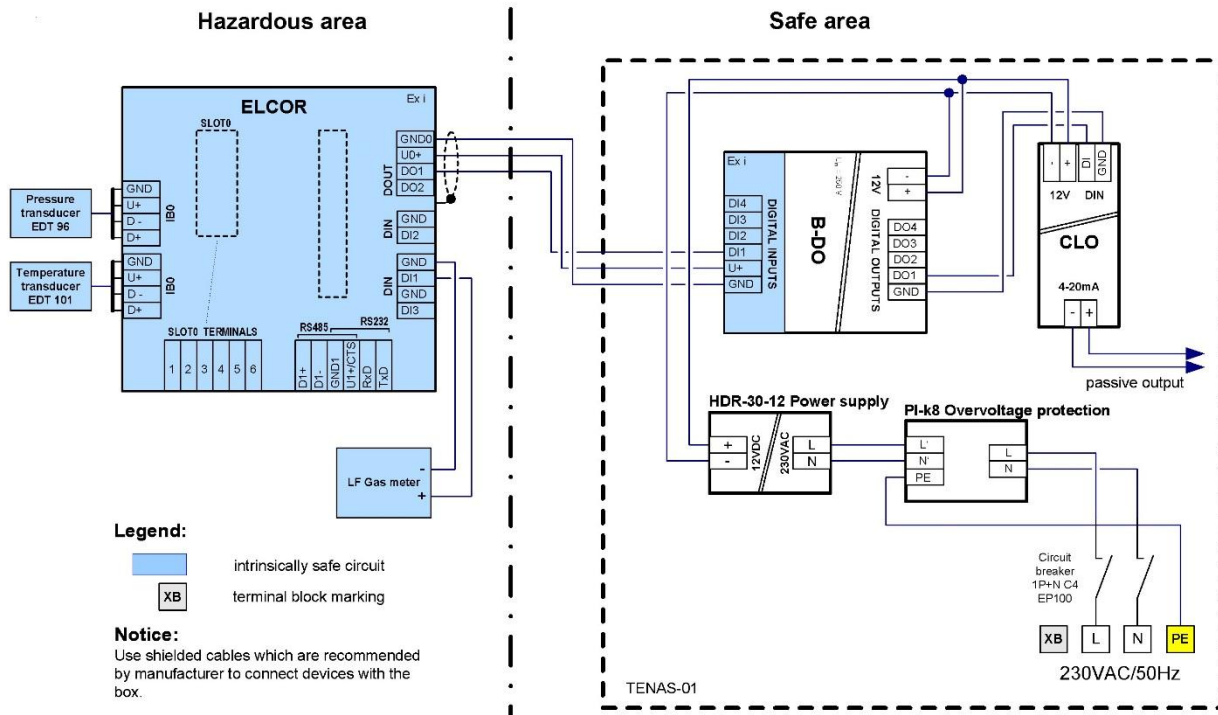


Fig. 61 Connection of CLO to ELCOR

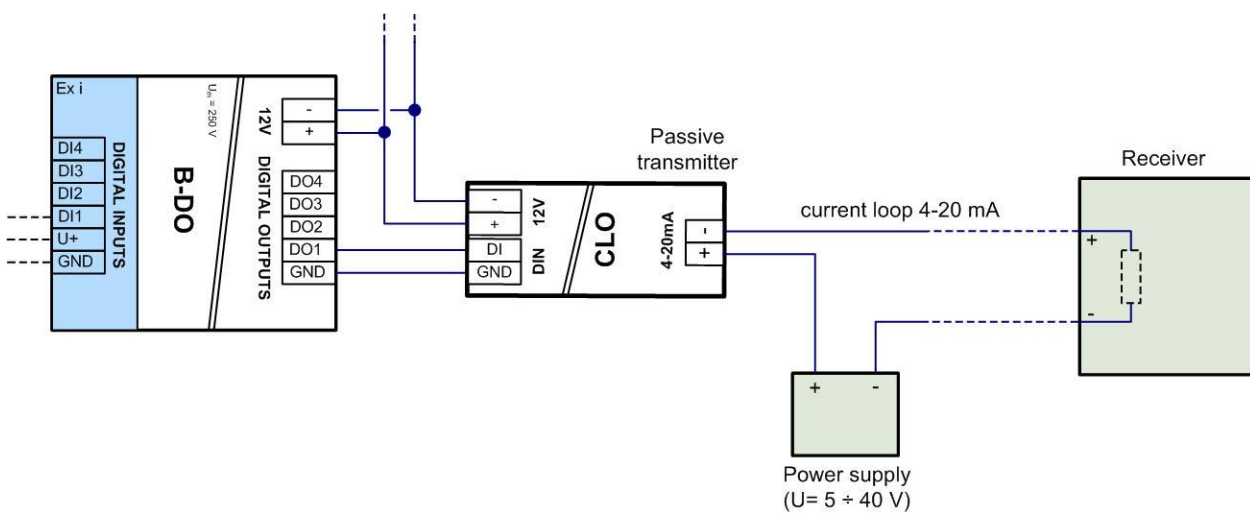


Fig. 62 CLO – current loop connection

Solar Controller SRM



CONTENTS

1	DEVICE DESCRIPTION	124
1.1	Product Identification.....	124
1.2	Device Functions	124
1.3	Description of Operation and the Equipment Design.....	124
1.3.1	Charge Controller	125
1.3.2	Digital Inputs / Outputs.....	125
1.3.3	Communications	126
1.3.4	Activity Indication.....	126
1.3.5	Fuses in the Device.....	126
1.4	Controller Configuration.....	127
2	INSTALLING THE DEVICE	129
3	TECHNICAL PARAMETERS.....	130
3.1	Operation Conditions and the Environment.....	130
3.2	Power Supply (CHARGE terminals).....	130
3.3	ACCUMULATOR (ACCUMULATOR terminals).....	130
3.4	Output (LOAD terminals).....	131
3.5	Digital Inputs DI1, DI2.....	131
3.6	Digital Outputs DO1, DO2.....	131
3.7	Digital Output DO3.....	131
3.8	Line RS485 (terminals GND, U+, D-, D+).....	132
4	PRODUCT DATA PLATE	133
5	WIRING DIAGRAM.....	134

1 Device Description

1.1 Product Identification

Business name:	SRM
Name of product:	Solar regulator
Product drawing number:	KP 119

1.2 Device Functions

The SRM solar controller is used to permanently charge a 12 V lead VRLA accumulator either from a solar panel or from a DC power source. Its main use is to provide a back-up external 12 V power supply for the corrector / logger and the attached accessory modules. The SRM controller can be connected to the ELCOR corrector using a standard RS485 interface. An exception is ELCORlite or DATCOMlite devices, for which communication with SRM via RS485 line is not possible (see 1.3.3). As an additional extension, the SRM includes 2 LF digital inputs, 2 LF digital outputs and 1 semiconductor switch.

SRM Solar Controller is intended to work with the following devices:

- ELCOR*plus*
- ELCOR*plus indexer*
- DATCOM*plus*
- ELCOR*lite*
- DATCOM*lite*

The SRM controller 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.

1.3 Description of Operation and the Equipment Design

The SRM controller includes circuits for controlling the charge of the connected VRLA lead accumulator, as well as extension of digital output circuits and the controlled semiconductor switch circuit.

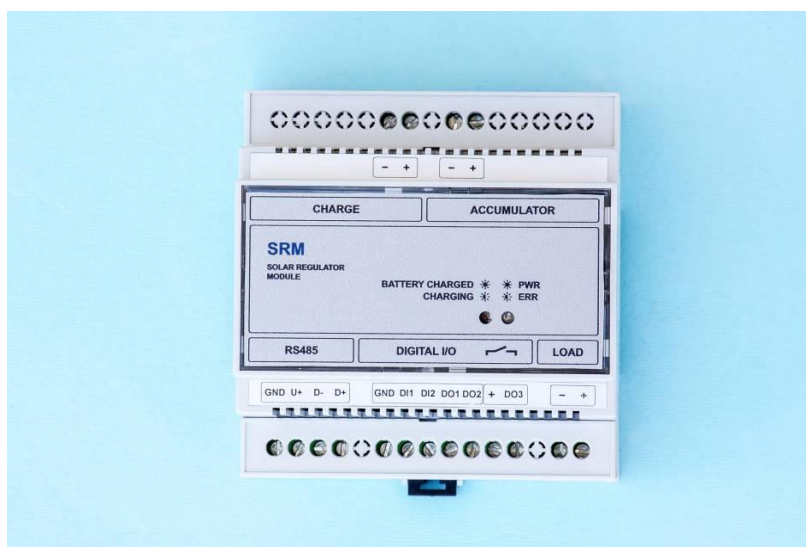


Fig. 63 SRM design

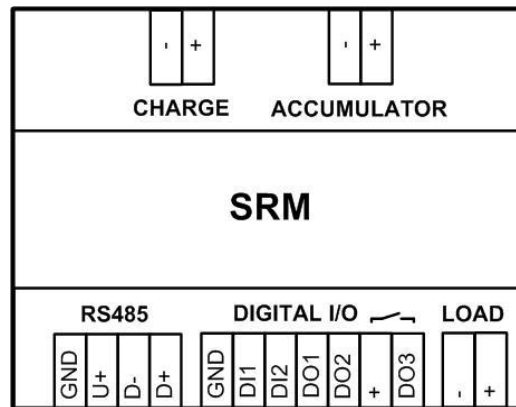


Fig. 64 Schematic symbols

1.3.1 Charge Controller

The SRM solar controller has been designed for permanent charging of lead VRLA accumulators either from a solar panel or from a DC power source. The accumulator is used as a source of external power and 12 V voltage for the connected corrector and its accessories.

The controller, accumulator and load are in the "float charge" connection, i.e. the accumulator and the load are connected in parallel to the controller, which provides constant voltage. The method of recharging corresponds to the way in which the accumulator is connected in the system. In the first phase, the controller recharges with constant current and then with constant voltage before the charging voltage is reached. When 10% of the maximum charging current is reached, the "battery charged" status is indicated, but the charging with constant voltage continues. The charging voltage value is compensated depending on the ambient temperature using the built-in PTC thermistor. During the whole charging period the presence of the accumulator in the system is tested in 1-minute intervals. If the conditions for proper operation of the system (accumulator disconnected, too low or high battery voltage...) are not met, the battery is disconnected from the load (LOAD terminals). The charging status is indicated by two LEDs visible through the front panel.

The input current to the device is limited by fuse F1 (T3A15). The battery current is limited by quick fuse F2 (F3A15) with max. interruption current of 1,500 A. The fuse F2 also serves as a protection against reversal of the accumulator polarity.

Powering from the Solar Panel:

For solar panel power supply, the MPPT control at the controller input is applied. The MPPT control limits the input current so that the voltage at the solar panel output does not fall below a fixed voltage (V_{mpp}). At this operating point, the solar panel can achieve the highest performance.

DC Power Supply:

The DC power supply must have an output voltage higher than V_{mpp} at the highest load.

1.3.2 Digital Inputs / Outputs

The SRM is equipped with two inputs (DI1, DI2) that can be configured as pulse LF inputs or binary inputs (in default settings, DI1 input controls DO3 output).

It is also equipped with three digital outputs DO1, DO2, DO3. Digital outputs DO1 and DO2 can

be configured as pulse, binary or analogue (in conjunction with the CLO module). The default setting of the outputs is binary and signaling the state of the battery charging.

DO3 is a semiconductor switch designed for switching the voltage from the SRM output (e.g. switching on power to the modem).

1.3.3 Communications

It is possible to communicate with the SRM via RS485 bus. This communication is possible with ELCOR/DATCOM, ELCOR*plus*/DATCOM*plus*, and ELCOR*plus indexer* devices. It is possible to read information on the charging status, accumulator status, temperature, etc. Also all inputs and outputs of the controller can be read and controlled.



The RS485 communication line of the SRM controller cannot be used for communication with the ELCOR*lite*/DATCOM*lite* device. Information on the charging status can be transmitted from the SRM controller to these devices only in the form of binary signals, see section 1.3.2.

1.3.4 Activity Indication

The controller activity is indicated by two indication LEDs.

LED position	Colour	State	LED Designation	Meaning
Right	Green	Lights	PWR	The device is fault-free and the accumulator is connected
		Flashes	ERR	Error state, LOAD output disconnected from accumulator
		Not lights		No power
Left	Yellow	Lights	BATTERY CHARGED	The accumulator is charged
		Flashes	CHARGING	The accumulator is being charged
		Not lights		The accumulator is not being charged (mains outage)

1.3.5 Fuses in the Device

The device contains two interchangeable fuses F1 and F2. Both fuses are placed under the cover of the CHARGE / ACCUMULATOR terminal block.

To replace the fuses, remove the terminals cover. To remove the cover, it is advisable to use a flat tool (such as a screwdriver) to separate the terminal cover from the other box covers. Make sure that the box is not mechanically damaged.

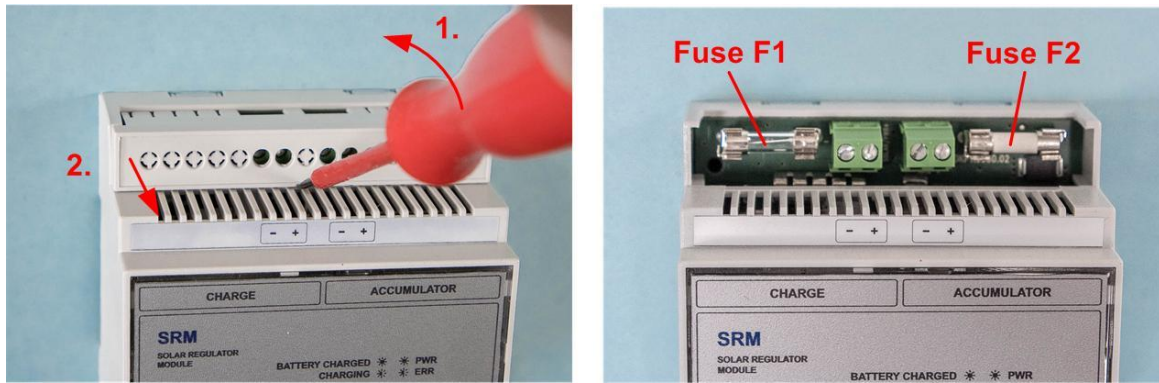


Fig. 65 The position of fuses in SRM controller

Fuse designation	Circuit	Manufacturer	Value	Order Code
F1	Input current for CHARGE terminals	-	T3A15	-
F2	Current from the accumulator	Schurter Littelfuse	F3A15 F3A15	0001.1009 02163.15MXP

Tab. 19 Table of replaceable SRM fuses

1.4 Controller Configuration

By default, the controller is shipped with the "ELGAS mode" setting.

1) The behaviour of the SRM controller in ELGAS mode:

When power is applied, the SRM signals this default state by flashing both the right and left LEDs simultaneously (number of flashes is 5 times, duration of flashing is 1 s). In this mode, the DO1 to DO3 outputs are set as follows:

Output	Setting
DO1	Corresponds to the state "Charging" of the internal bit When the accumulator is being charged, the output is closed.
DO2	Corresponds to the state "Load" of the internal bit If the controller has connected the LOAD voltage from the accumulator, this output is closed.
DO3	Corresponds to the state of input DI1

2) The SRM controller is set up by the user using the service SW for configuring correctors and loggers. This is [19], or [20] service SW. The default ELGAS mode is cancelled by writing parameters to the SRM. With the service SW, the SRM can be brought back to the default ELGAS mode.

3) **Note:**

The SRM cannot be configured directly by connecting to a PC, but must be connected via an RS485 interface to the corrector / logger. The SRM controller is therefore configured within the corrector configuration. In the case of an ELCOR*lite* (DATCOM*lite*) device that cannot be connected to the SRM controller via a communication interface, the SRM settings cannot be made in this way.

If the SRM is not in ELGAS mode, the inputs and outputs behave according to the set parameters by service software.

2 Installing the Device

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

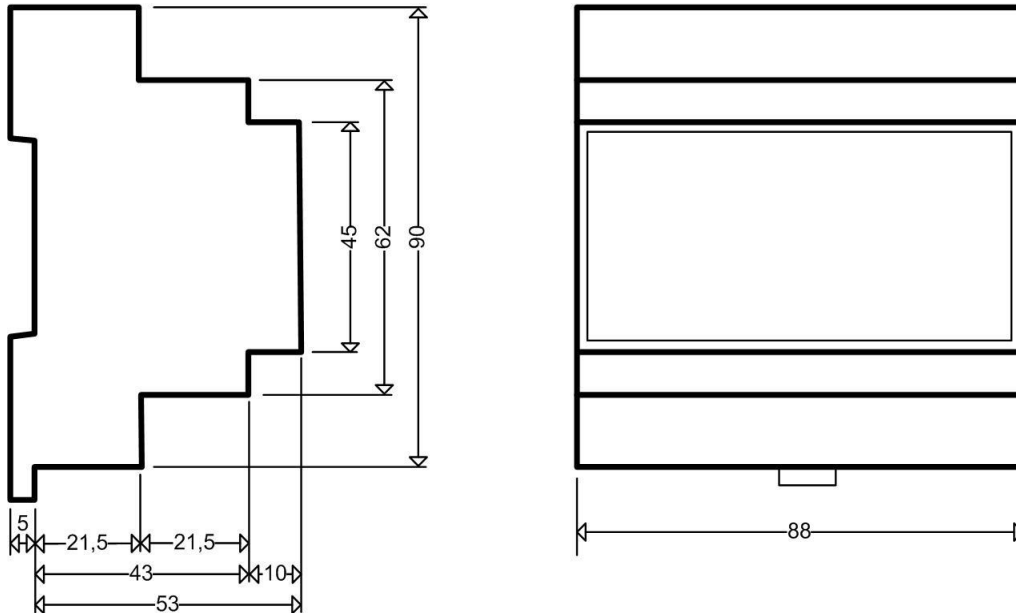


Fig. 66 Dimensions of the device (mm)

The SRM controller must be powered from a 19 V to 28 V DC power supply (solar panel or 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.

When the device is properly connected to the charging voltage source (CHARGE terminals) and to the accumulator, the green LED should light up continuously and the yellow LED will light or flash continuously (with a period of approx. 1 s).

3 Technical Parameters

3.1 Operation Conditions and the Environment

Operating ambient temperature	-40 to +70°C
Working environment	Normal environment (ČSN 33 2000-5-51 ed. 3, HD 60364-5-51)
IP rating	IP 20 (EN 60 529)
The device design in terms of protection against electric shock	Class III protection equipment (EN 61140)
Relative humidity of the environment	0% to 95% relative, non-condensing
Air pressure	86 kPa to 106 kPa
External dimensions	88 x 90 x 58 mm
Device weight	152 g
Mount	On 35mm DIN rail

3.2 Power Supply (CHARGE terminals)

Powering from the Solar Panel:	
- Max idle voltage	28 V
- Nominal voltage (Vmpp)	17.8 V
DC Power Supply:	
- Supply voltage range	19 to 28 V
Input Power	max 40 W

3.3 ACCUMULATOR (ACCUMULATOR terminals)

Input voltage	typically 13.8 V (ambient temperature 25°C) typically 13.3 to 14.9 V (ambient temperature +70 to -40 °C)
Intended for the accumulator	Lead VRLA
Charging current limitation	typically 2 A
Idle consumption (of accumulator only, $U_{\text{CHARGE}} = 0 \text{ V}$)	typically 1.9 mA
The standby consumption (Only on battery $U_{\text{CHARGE}} = 16$ to 18 V^{23})	typically 8 mA
Low battery detection	$U_{\text{AKU}} < 10.5 \text{ V}$ (error - LOAD output disconnected) $U_{\text{AKU}} < 12 \text{ V}$ (OK - LOAD output disconnected)

²³⁾ Situation e.g., when the solar panel is inadequately lightened.

3.4 Output (LOAD terminals)

Output voltage	typically 10.5 to 14.9 V
Output current	max 3.15 A

3.5 Digital Inputs DI1, DI2

Input options	LF impulse, binary
Input type	Low-power input, reed contact or potential-free output connection
Min. duration of the condition	10 ms
Idle voltage	typically 3.3 V
Short-circuit current	typically 32 μ A
"ON"	$R < 4.7 \text{ k}\Omega$ or $U < 0.2 \text{ V}$
"OFF"	$R > 500 \text{ k}\Omega$ or $U > 2.5 \text{ V}$

3.6 Digital Outputs DO1, DO2

Input options	Pulse output, binary output, analogue output (via CLO)
Type of output	Open collector
Galvanic separation	No
Voltage	max 15 V
Current	max 100 mA
Resistance in closed state	max 20 Ω

3.7 Digital Output DO3

Input options	Binary
Type of output	Semi-conductor switch
Galvanic separation	No
Voltage range	6 to 28 V
Current	max 3.15 A
Resistance drop in closed state	typically 30 mV, max. 65 mV
Consumption from DO3+ in closed state	typically 1.4 mA

3.8 Line RS485 (terminals GND, U+, D-, D+)

Interface	RS485
Communication protocol	Modbus
Baud rate	38 400 Bd
Byte format	8 bits, 1 stop, no parity
Charging terminal U+:	
The terminal is connected to the + terminal of the accumulator via a return PTC fuse. The voltage at the terminal is not dependent on the load switch (the voltage is present in the "battery low" state).	
- Voltage range	0 to 14.9 V (accumulator voltage)
- PTC resistance	typically 47 Ω (ambient temperature 25°C) max 100 Ω (ambient temperature -40°C to +70°C)
- Operating current	max 14 mA (ambient temperature -40°C to +70°C)
- Short-circuit current	typically 35 mA (ambient temperature 25°C)

4 Product Data Plate



Fig. 67 Data plate

5 Wiring Diagram

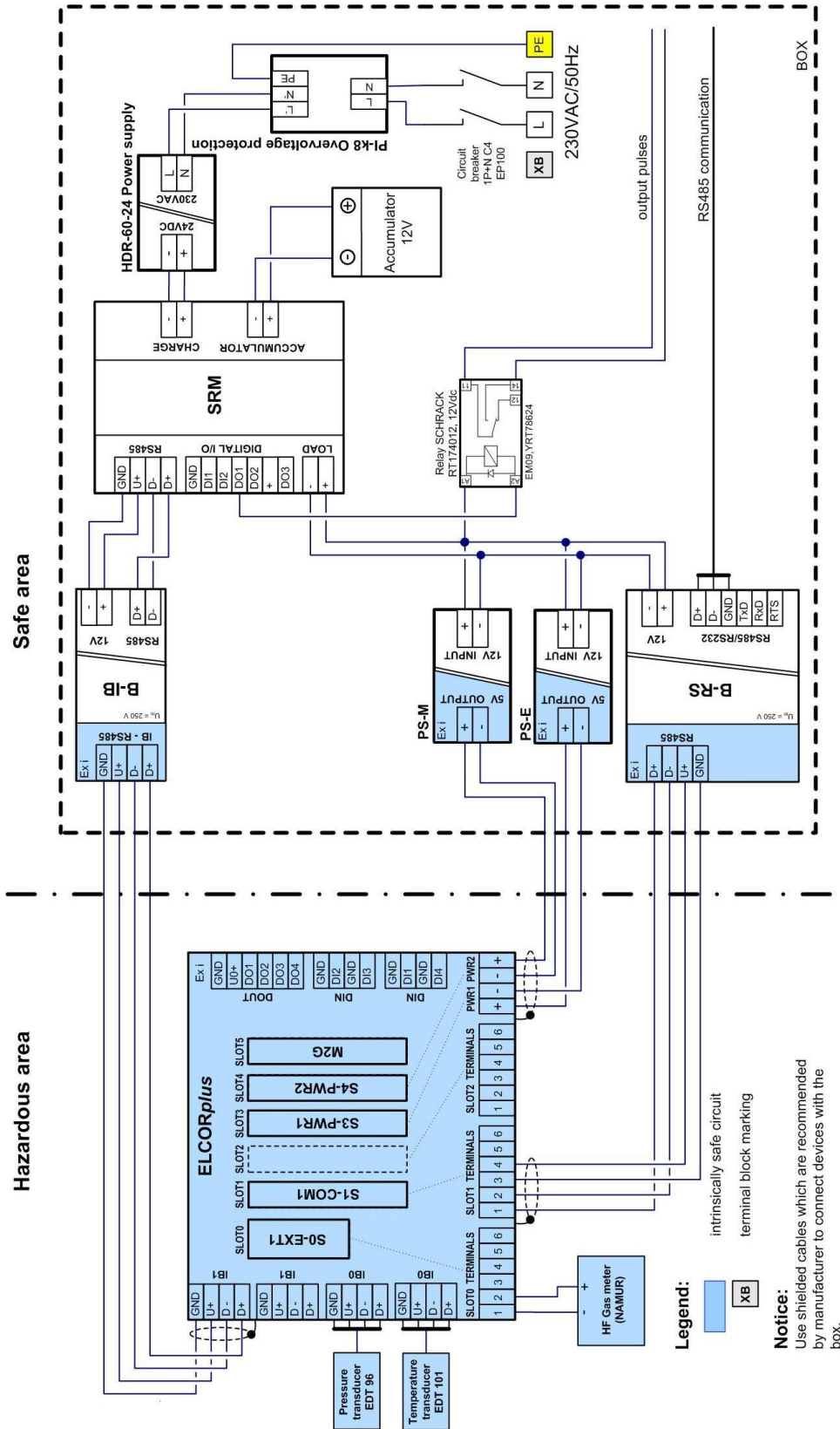


Fig. 68 Using SRM for backed-up external ELCORplus power supply and pulse output

Appendix - Example of the Use of the Accessory Modules

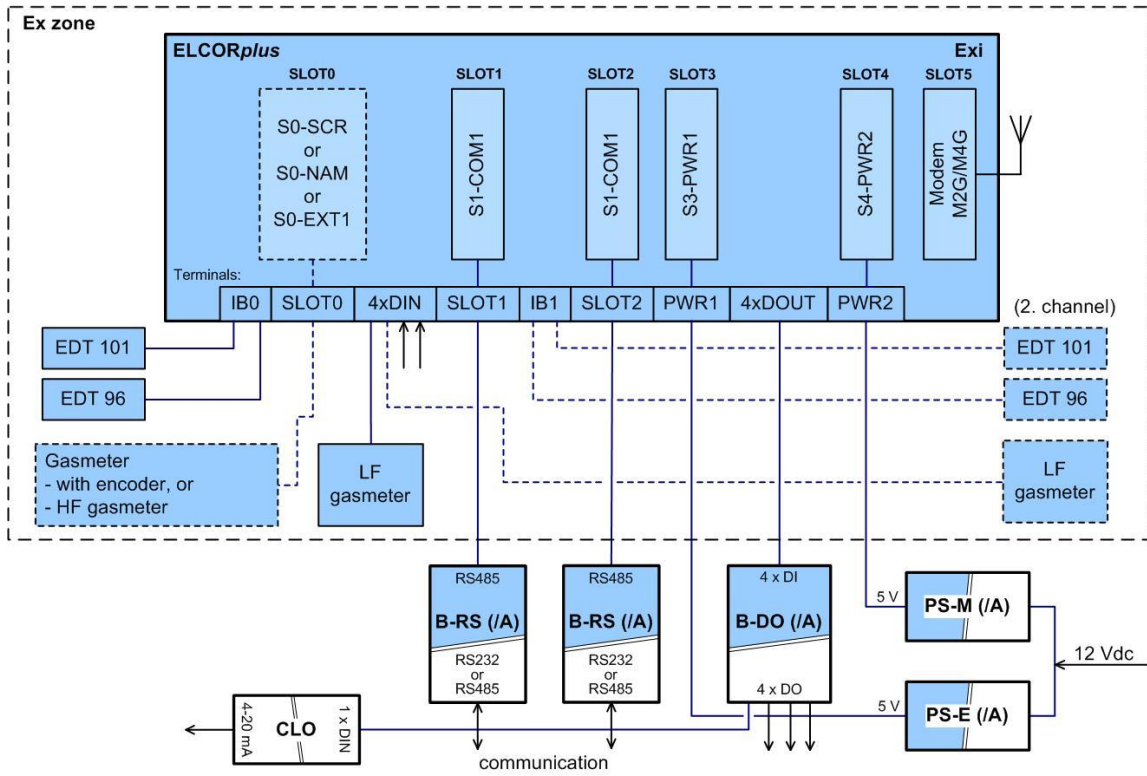


Fig. 69 ELCORplus, an example of using external modules

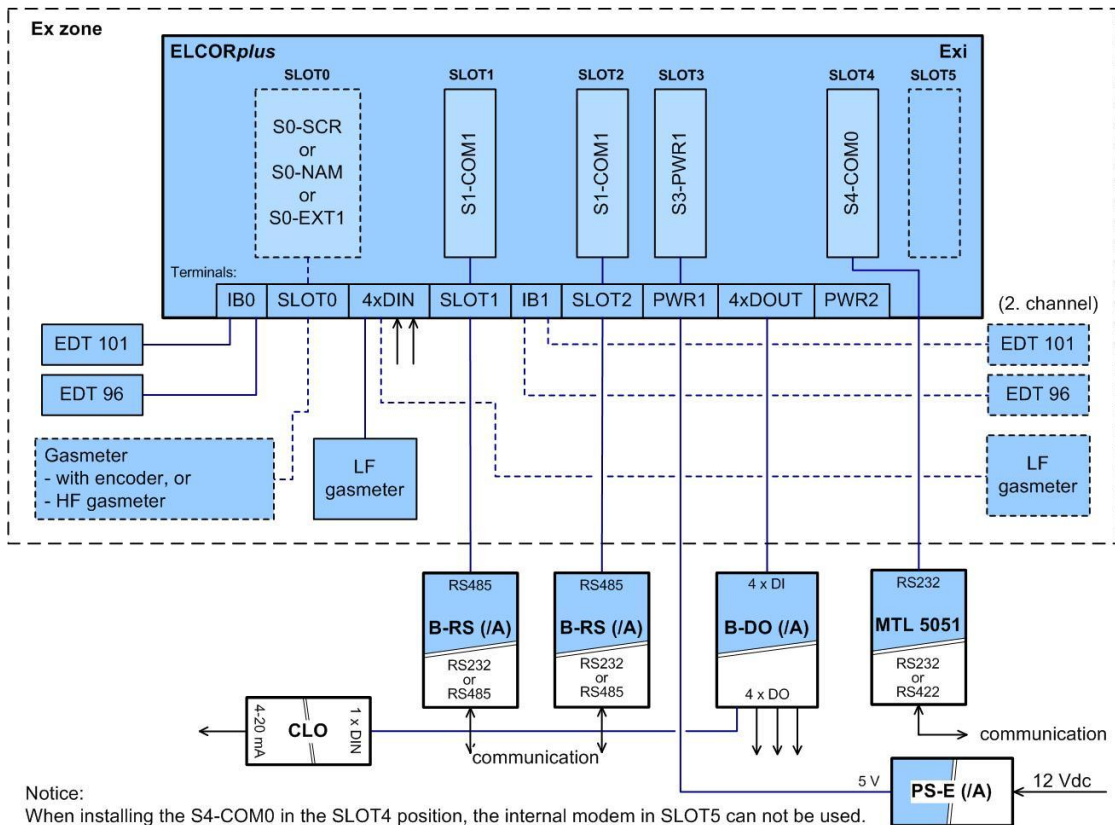


Fig. 70 ELCORplus, an example of using external modules

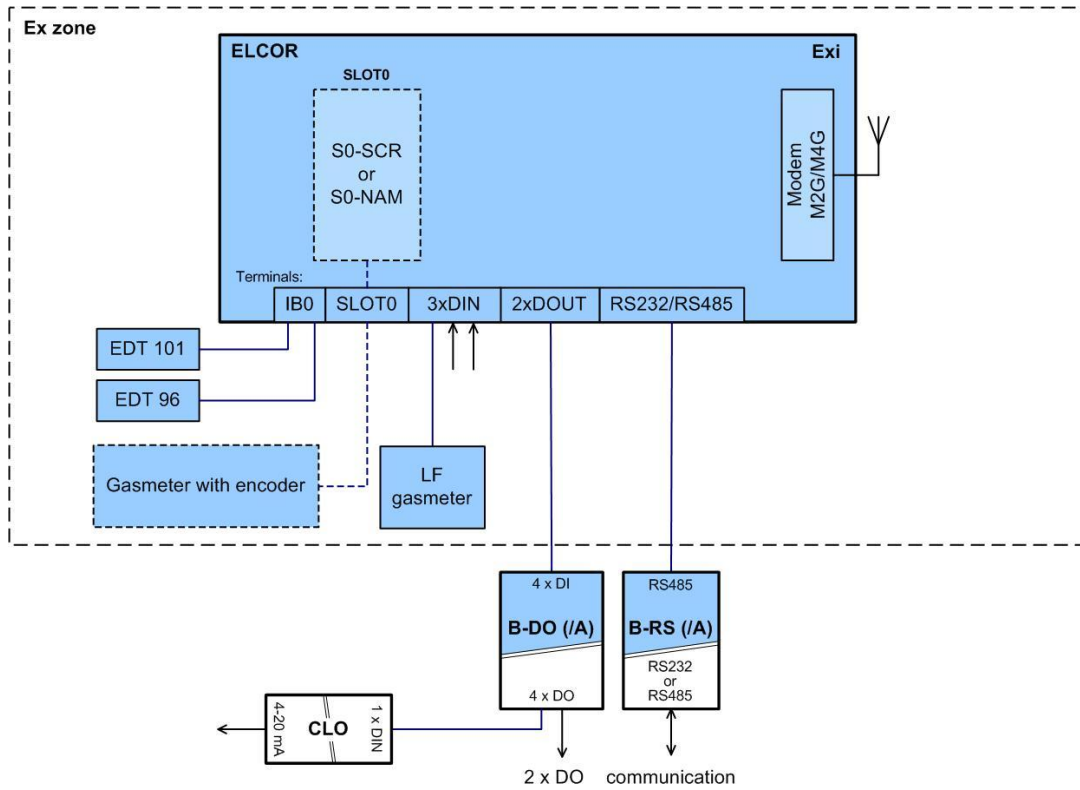


Fig. 71 ELCOR, an example of using external modules

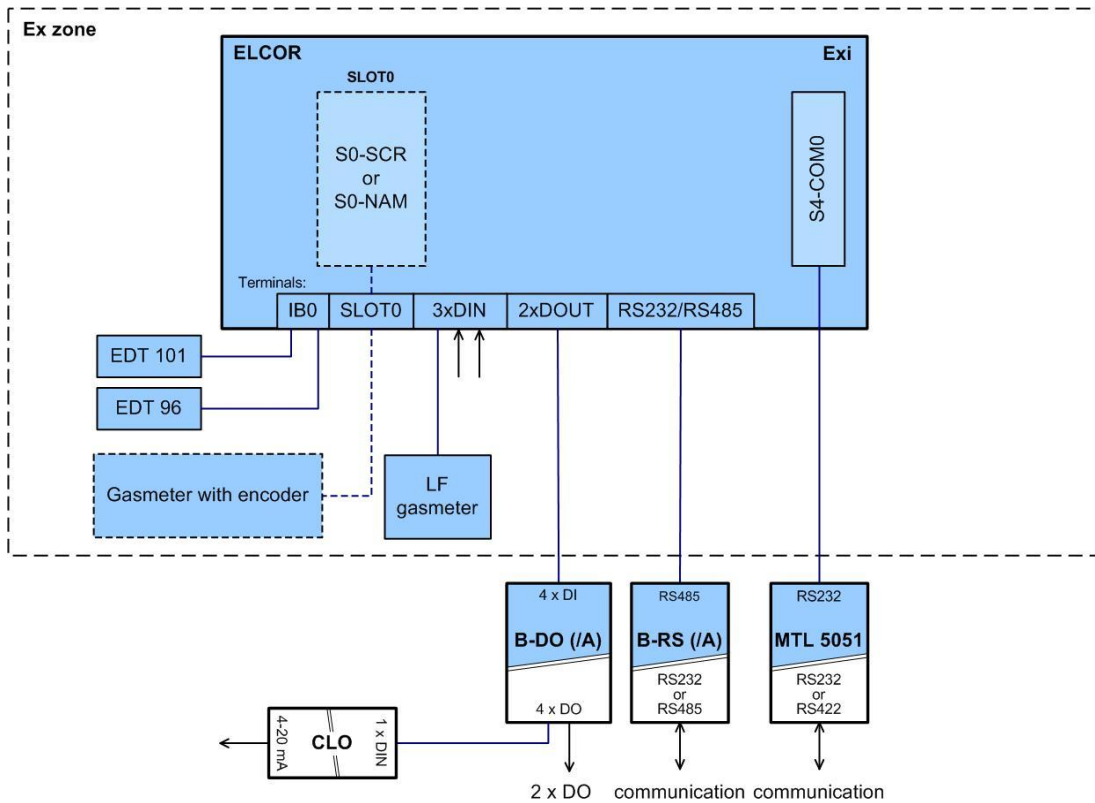


Fig. 72 ELCOR, an example of using external modules

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List of Figures

Fig. 1 PS-E and PS-E/A Designs	7
Fig. 2 Schematic symbols	7
Fig. 3 IS power supply dimensions (mm)	11
Fig. 4 Data Plates	14
Fig. 5 Basic connection of external power supply of a corrector	15
Fig. 6 Connection of EVC external power supply from the accumulator	15
Fig. 7 Basic connection of external power supply of ELCORlite corrector	16
Fig. 8 Connection of the external EVC power supply	17
Fig. 9 PS-M and PS-M/A designs	21
Fig. 10 Schematic symbols	21
Fig. 11 IS power supply dimensions (mm)	25
Fig. 12 Data Plates	29
Fig. 13 Basic connection of the external powering for the internal modem from PS-M power supply	30
Fig. 14 Basic connection of the external power supply to the corrector and the internal modem	30
Fig. 15 Connection of the external power supply of EVC internal modem	31
Fig. 16 Connection of external power supply of EVC internal modem from accumulator	31
Fig. 17 Connection of external power supply of EVC and the internal modem	32
Fig. 18 PS-M1 and PS-M1/A designs	36
Fig. 19 Schematic symbols	36
Fig. 20 IS power supply dimensions (mm)	40
Fig. 21 Data plates	44
Fig. 22 Basic connection of the external power supply of the ELCORlite converter modem	45
Fig. 23 B-RS, B-RS/A designs	49
Fig. 24 Schematic symbols	50
Fig. 25 Dimensions of the device (mm)	53
Fig. 26 Principle of connection with PC, PLC and external modem via B-RS module	55
Fig. 27 Data Plates	59
Fig. 28 Communication over RS232/RS485 via B-RS module (ELCOR)	60
Fig. 29 ELCORplus, communication via two independent interfaces RS232/RS485	61
Fig. 30 Connection of ELCORplus with B-RS via RS485	61
Fig. 31 Example connection with B-RS/A	62
Fig. 32 Example connection of ELCORplus with external modem (RS232)	62
Fig. 33 Connection of ELCOR and B-RS	63
Fig. 34 B-DO, B-DO/A designs	67
Fig. 35 Schematic symbols	67

Accessories for ELCOR, ELCORplus

Fig. 36 Dimensions of the device (mm)	71
Fig. 37 Data Plates	75
Fig. 38 Connection of ELCOR and B-DO	76
Fig. 39 Connection of ELCORplus and B-DO	76
Fig. 40 Designs B-PRO and B-PRO/A	82
Fig. 41 Schematic symbols	82
Fig. 42 Dimensions of the device (mm)	86
Fig. 43 Principle of connection with PC, PLC and external modem via B-PRO module	88
Fig. 44 Product Data Plates	95
Fig. 45 Communication and digital outputs using the B-PRO module (ELCOR)	96
Fig. 46 Connection of ELCOR and B-PRO	96
Fig. 47 Communication and digital outputs via B-PRO (ELCORplus)	97
Fig. 48 Example of connecting ELCORplus to B-PRO	97
Fig. 49 Communication and digital outputs using B-PRO (ELCORlite)	98
Fig. 50 Connection of ELCORlite and B-PRO	98
Fig. 51 B-IB designs	102
Fig. 52 Schematic symbols	102
Fig. 53 Dimensions of the device (mm)	106
Fig. 54 Product Data Plate	110
Fig. 55 The use of B-IB to connect SRM controller to ELCORplus	111
Fig. 56 CLO Design	115
Fig. 57 Schematic symbols	116
Fig. 58 CLO, switch location	117
Fig. 59 Dimensions of the device (mm)	118
Fig. 60 Data plate	120
Fig. 61 Connection of CLO to ELCOR	121
Fig. 62 CLO – current loop connection	121
Fig. 63 SRM design	125
Fig. 64 Schematic symbols	125
Fig. 65 The position of fuses in SRM controller	127
Fig. 66 Dimensions of the device (mm)	129
Fig. 67 Data plate	133
Fig. 68 Using SRM for backed-up external ELCORplus power supply and pulse output	134
Fig. 69 ELCORplus, an example of using external modules	135
Fig. 70 ELCORplus, an example of using external modules	135
Fig. 71 ELCOR, an example of using external modules	136
Fig. 72 ELCOR, an example of using external modules	136

List of Tables

Tab. 1 Cable recommended for EVC external power supply 11

Tab. 2 ELCORplus - cable recommended for external power supply of the internal modem 25

Tab. 3 ELCORplus - cable recommended for common external power supply of EVC and the internal modem 26

Tab. 4 ELCORlite – recommended external power supply cable for the internal modem 26

Tab. 5 ELCORlite – cable recommended for common power supply of external power supply for internal modem and for EVC 26

Tab. 6 ELCORlite - cable recommended for external power supply of the internal modem 40

Tab. 7 ELCORlite – cable recommended for common power supply of external power supply for internal modem and for EVC 41

Tab. 8 The options of conversion between the communication interfaces of B-RS separator 49

Tab. 9 ELCORplus - Assignment of terminal blocks SLOT 1 and SLOT 2 when fitted with S1-COM1 module 53

Tab. 10 Cable recommended for RS485 between the corrector and the separator 55

Tab. 11 Cable recommended for Digital Outputs between the corrector and the separator 71

Tab. 12 Conversion options between B-PRO (B-PRO/A) communication interfaces 81

Tab. 13 ELCORplus - assignment of SLOT 1 and SLOT 2 terminals when equipped with S1 COM1 module 87

Tab. 14 Recommended EVC external power cable 89

Tab. 15 Recommended cable for RS485 between converter and combined module 89

Tab. 16 Recommended cable for digital outputs between converter and combined module 90

Tab. 17 Cable recommended for RS485 between the corrector and the separator 106

Tab. 18 CLO, setting the error current switch 117

Tab. 19 Table of replaceable SRM fuses 127

Accessories for ELCOR, ELCOR<i>plus</i>, ELCOR<i>plus indexer</i>, ELCOR<i>lite</i> correctors and DATCOM, DATCOM<i>plus</i>, DATCOM<i>lite</i> data loggers		
Prepared by:	Team of Authors	
Issued by:	ELGAS, s.r.o. Ohrazenice 211 533 53 Pardubice Czech Republic	tel.: +420,466,414,500 511 fax: +420,466,411,190 http://www.elgas.cz e-mail: obchod@elgas.cz
Date of Issue:	July 2021	
Version:	Rev.3 (Supplemented and revised edition)	

H905EN_201905_R3_Accessories