



BoX2 extreme

Installation Manual

English

Installation manual for BoX2 extreme

Foreword

All operator panels are developed to satisfy the demands of human-machine communication. Built-in functions such as displaying and controlling text, dynamic indication, time channels, alarm and recipe handling are included.

The operator panel works primarily in an object-oriented way, making it easy to understand and use. Configuration is carried out on a PC using iX Developer software. The project can then be transferred and stored in the operator panel itself.

Various types of automation equipment such as PLCs, servos or drives can be connected to the operator panels. In this manual, the term “the controller” refers to the connected equipment.

This manual explains how to install the operator panel. Please refer to the iX Developer reference manual for further information.

Order no: MAEN276

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1 Safety Precautions

Both the installer and the owner and/or operator of the operator panel must read and understand this installation manual.

1.1 General

- Read the safety precautions carefully.
- Check the delivery for transportation damage. If damage is found, notify the supplier as soon as possible.
- Do not use the operator panel in an environment with high explosive hazards.
- The supplier is not responsible for modified, altered or reconstructed equipment.
- Use only parts and accessories manufactured according to specifications of the supplier.
- Read the installation and operating instructions carefully before installing, using or repairing the operator panel.
- Never allow fluids, metal filings or wiring debris to enter any openings in the operator panel. This may cause fire or electrical shock.
- Only qualified personnel may operate the operator panel.
- The figures in this manual serve an illustrative purpose. Because of the many variables associated with any particular installation, the supplier cannot assume responsibility for actual use based on the figures.
- The supplier neither guarantees that the operator panel is suitable for your particular application, nor assumes responsibility for your product design, installation or operation.
- It is recommended to turn on and shut down the operator panel at least once before installing any components/cards or before connecting the operator panel to external devices; for example serial devices.
- For Marine panels only:
 - The operator panel must be installed and operated as described in this document to meet this certification.
 - Observe precautions for handling electrostatic discharge sensitive devices

1.2 Hazardous Materials

Part description 零件描述	Toxic and hazardous materials or elements 有毒和有害的材料或元素					
	Pb	Hg	Cd	Cr6+	PBB	PBDE
PCB and electronic components PCB 和电子元件	X	O	O	O	O	O

O: Indicates that this toxic or hazardous substance contained in all of the homogenous materials for this part is below the limit requirement in SJ/T 11363-2014.

O: 表示该有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2014 规定的限量要求以下。

X: Indicates that this toxic or hazardous substance contained in at least one of the homogenous materials for this part is above the limit requirement in SJ/T 11363-2014.

X: 表明该有害物质至少在部件的某一均质材料中的含量超出SJ/T 11363-2014规定的限量要求。

1.3 Disposal Requirements Under WEEE Regulations

For professional users in the European Union: If you wish to discard electrical and electronic equipment (EEE), please contact your dealer or supplier for further information.

For disposal in countries outside of the European Union: If you wish to discard this product please contact your local authorities or dealer and ask for the correct method of disposal.

1.4 UL and cUL Installation

- All devices have to be supplied by a Class 2 power supply.



Warning:
Do not separate when energized.

AVERTISSEMENT, NE PAS SEPARER SOUS TENSION.



Warning:
Do not open when an explosive atmosphere is present.

NE PAS OUVRIR SI UNE ATMOSPHERE EXPLOSIVE EST PRÉSENT.



Warning:
Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

This product contains a battery that is not user replaceable.

LA BATTERIE PEUT EXPLOSER EN CAS DE MAUVAISE MANIPULATION.
NE LA RECHARGEZ PAS, NE LA DÉMONTEZ PAS ET NE LA JETEZ PAS DANS LE FEU.
CE PRODUIT CONTIENT UNE PILE QUI NE PEUT PAS ÊTRE REMPLACÉE PAR L'UTILISATEUR.



Warning:
Potential electrostatic charging hazard, see instructions.
To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth when installed/used within a potentially explosive atmosphere.

POTENTIEL ÉLECTROSTATIQUE RISQUE DE CHARGEMENT,
VOIR INSTRUCTIONS.

**Warning:**

Explosion hazard! Substitution of components may impair suitability for Class I, Division 2.

RISQUE D'EXPLOSION! LA SUBSTITUTION DE COMPOSANTS PEUT NUIRE À LA CONFORMITÉ DE CLASSE I, DIVISION 2.

1.5 IECEx/ATEX Certificate and Dust Rating



II 3 G Ex nA nC IIC T4 Gc



II 3 D EX tc IIIC T85 ° C Dc

IECEx UL 17.0058X

DEMKO 17 ATEX 1900X

1.6 Conditions of Safe Use for Zone 2/22 ATEX/IECEx

- In a Zone 2 environment, this equipment shall be installed in an enclosure that provides a degree of protection not less than IP54 or greater than IP65 in accordance with IEC/EN 60079-0. The IP rating of the equipment is limited to the IP rating of the enclosure it is to be installed into.
- In a Zone 22 environment, this equipment shall be installed in an enclosure that provides a degree of protection not less than IP64 or greater than IP65 in accordance with IEC/EN 60079-0. The IP rating of the equipment is limited to the IP rating of the enclosure it is to be installed into.
- To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth when installed/used within a potentially explosive atmosphere.
- The inside of the enclosure the device is mounted in shall not be more than pollution degree 2, as defined in IEC/EN 60664-1.
- Only install in locations without UV light exposure.

1.7 During Installation

- Install the operator panel according to the accompanying installation instructions.
- Ground the operator panel according to the accompanying installation instructions.
- Only qualified personnel may install the operator panel.
- Separate the high voltage, signal, and supply cables.
- Make sure that the voltage and polarity of the power source is correct before connecting the operator panel to the power outlet.
- Peripheral equipment must be appropriate for the application and location.
- Use only UL certified and approved M12 cables according to the accompanying installation instructions.

1.8 During Use

- Keep the operator panel clean.
- Emergency stop and other safety functions may not be controlled from the operator panel.

1.9 Service and Maintenance

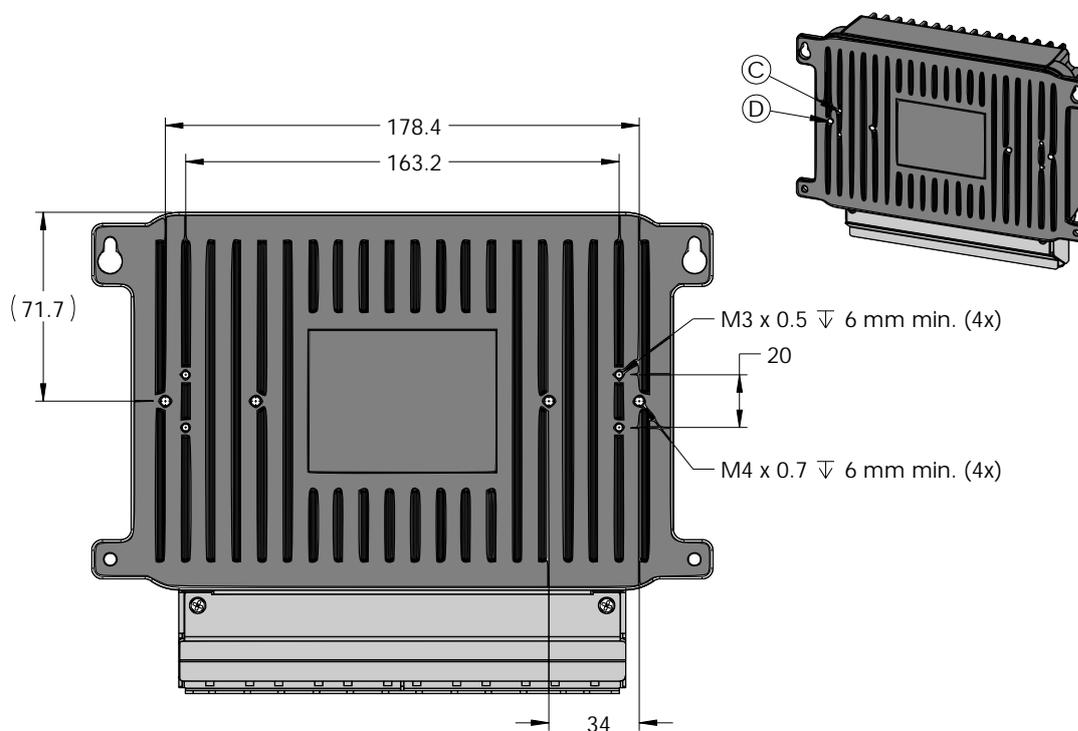
- Only qualified personnel should carry out repairs.
- The agreed warranty applies.
- Before carrying out any cleaning or maintenance operations, disconnect the equipment from the electrical supply.
- The battery must be replaced by an authorized Beijer Electronics service center.

1.10 Dismantling and Scrapping

- The operator panel or parts thereof shall be recycled according to local regulations.
- The following components contain substances that might be hazardous to health and the environment: lithium battery and electrolytic capacitor.

2 Installation

2.1 Installation Process



The following is needed:

- A Phillips screwdriver for installation of the M12 protection bracket
- Four M5 x 0.8 screws conforming to the table above
- Installation tool for mounting screws

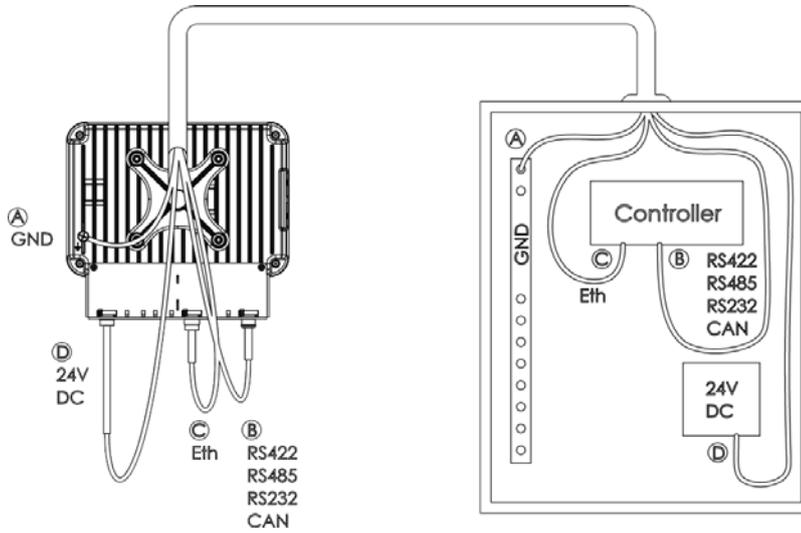
1. Unpack and check the delivery. If damage is found, notify the supplier.

Note:

Place the operator panel on a stable surface during installation.
Dropping the operator panel or letting it fall may cause damage.

2. Attach UL certified and approved cables to the operator panel. Approved cables include:
 - 900-1616-01 cable TxBR-2 M12 female 4p to blank 3 meter (pwr) [EX]
 - 900-1618-01 cable TxBR-2 M12 male 4p to blank 3 meter (lan) [EX]
 - 900-1621-01 cable TxBR-2 M12 male 8p to blank 3 meter (com) [EX]
 Other lengths may also be available; please contact Beijer Electronics for details.

3. Drill the correct hole pattern in panel outlined above or install unit on VESA compliant mounting bracket.



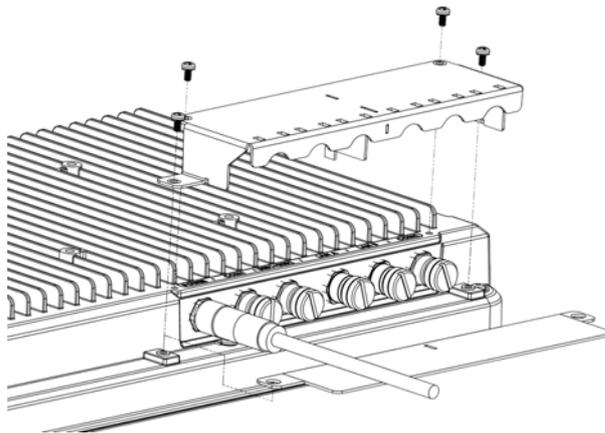
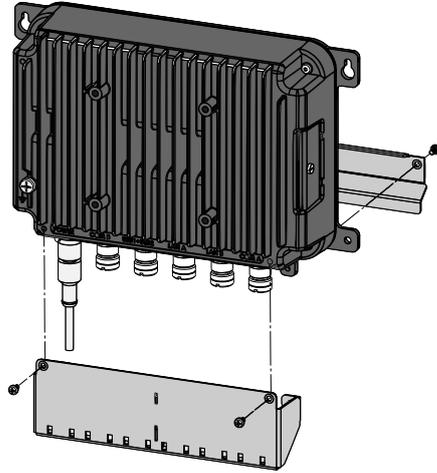
- Connect cable A to the terminal, using 14-20 AWG (2.08–0.52 mm²), 180–220 N-cm torque.

Note:

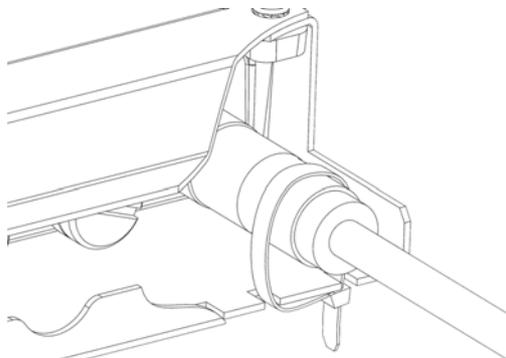
Use minimum 85°C copper conductors only.

2.1.1 Protective Connector Shield Installation Process

1. Install the protective connector shield as shown.



2. Secure the cables to the protective connector shield using the included cable ties



Note:

The protective connector shield is required to be used on all applications.

2.1.2 Connections to the Controller

For information about the cables to be used when connecting the operator panel to the controller, please refer to the help file for the driver in question.

2.1.3 Other Connections and Peripherals

Cables, peripheral equipment and accessories must be suitable for the application and its environment. For further details or recommendations, please refer to the supplier.

3 Technical Data

Parameter	BoX2 extreme
Dimensions, W × H × D	234 × 183 × 62 mm
Sealing	IP65
Frame material	Powder-coated aluminum
Weight	1.5 kg
CPU	i.MX 6Quad Quad ARM Cortex-A9 Core 1.0 GHz 1 MB L2 cache
Serial port COMA	M12 (8 pin, male) 1×RS-232 Rx/Tx with RTS (no CTS) and 1×RS-422, or 2×RS-485 or 1×CAN 2.0B
Serial port COMB	M12 (8 pin, female) 1×RS-485 with isolated +5V/5mA out for bias resistor network, or 1×CAN 2.0B with termination
Ethernet LAN A	M12 (4 Pin, female, D-coded according to EN/IEC 61076-2-101) 10/100 Mbit via RMII
Ethernet LAN B	M12 (4 Pin, female, D-coded according to EN/IEC 61076-2-101) 10/100 Mbit via RMII
USB	Supports up to USB 2.0 High Speed
External storage media	1 × SD card
Flash memory (application memory)	3.5 GB SSD (eMMC)
Memory RAM	2 GB DDR3
NVRAM	64 kB
Real time clock	Yes
Battery	BR 2477A/GAN lithium battery, non replaceable
Power consumption at rated voltage	8 W
Fuse	Internal DC fuse, 4 AT SMT
Power supply	+24 V DC CE: The power supply must conform with the requirements according to EN/IEC 60950 and EN/IEC 61558-2-4. UL and cUL: The power supply must conform with the requirements for class 2 power supplies.
Operating temperature	-30°C to +70°C
Storage temperature	-40°C to +80°C
Relative humidity in operation	5% - 95% non-condensation
Vibration	4g, according to EN/IEC 60068-2-6, Test Fc
Mechanical shock	40g, half-sine, 11ms according to EN/IEC60068-2-27

Parameter	BoX2 extreme
Approvals and certifications	CE / FCC / KC Information is available on www.bejerelectronics.com
UL approval	Information is available on www.bejerelectronics.com
Marine certificates	Information is available on www.bejerelectronics.com

4 Chemical Resistance

4.1 Metal Casing

The frame and casing material is powder-coated aluminum. This powder paint withstands exposure to the following chemicals without visible change:

Acetic acid 10%	Phosphoric acid 4%
Citric acid 10%	Phosphoric acid 10%
Diesel	Sea water
Distilled water	Sodium chloride 2%
Edible oil	Sodium chloride 20%
Fuel oil	Sulphuric acid 20%
Hydrogen peroxide 3%	Tap water

The powder paint shows limited resistance to the following chemicals at room temperature:

Butanol	Nitric acid 3%
Hydrochloric acid 5%	Nitric acid 10%
Isopropyl alcohol	Phosphoric acid 43%
Sodium hypochlorite 10%	Turpentine

Note:

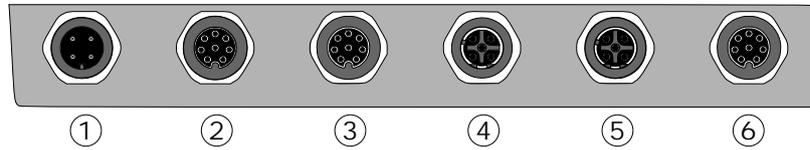
If exposure to any of the above chemicals is demanded, it is recommended to first test the chemical in a hidden spot of the metal casing.

The powder paint shows little or no resistance to the following chemicals at room temperature:

Acetic acid, conc.	Methyl-ethyl ketone	Toluene
Acetone	Nitric acid 30%	Trichlorethylene
Ammonia 5%	Phenol	Xylene
Ammonia, conc.	Sodium hydroxide 5%	97 octane unleaded petrol
Ethyl acetate	Sodium hydroxide 30%	98 octane leaded petrol

5 Operator Panel Drawings

5.1 Connectors



Pos	Connector	Description
1	Power supply	+24 VDC
2	COM B	Serial communication port
3	USB 1 + USB 2	USB Host 2.0, max output current 500 mA
4	LAN A	1 × 10/100 Base-T
5	LAN B	1 × 10/100 Base-T
6	COM A	Serial communication port

5.1.1 Power Supply

Pin	Description	M12, 4 pin male
1	V _{in+}	
2	V _{in-}	
3	V _{in-}	
4	V _{in+}	

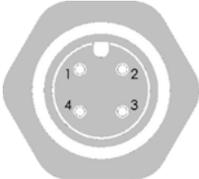
5.1.2 COM A

Pin	COM 1	COM 2	COM 3	M12, 8 pin male
1		RS422 Tx+ RS485 Tx+/Rx+	CAN-H	
2	RS232_RxD	-	-	
3	RS232_TxD	-	-	
4		RS422_Rx+	-	
5	GND	GND	-	
6		RS422 Tx- RS485 Tx-/Rx-	CAN-L	
7	RS232_RTS	-	-	
8		RS422_Rx-	-	

5.1.3 USB 1/2

Pin	USB 1/2	M12, 8 pin male
1	V _{CC}	
2	USB 2 D-	
3	USB 2 D+	
4	GND	
5	V _{CC}	
6	USB 1 D-	
7	USB 1 D+	
8	GND	

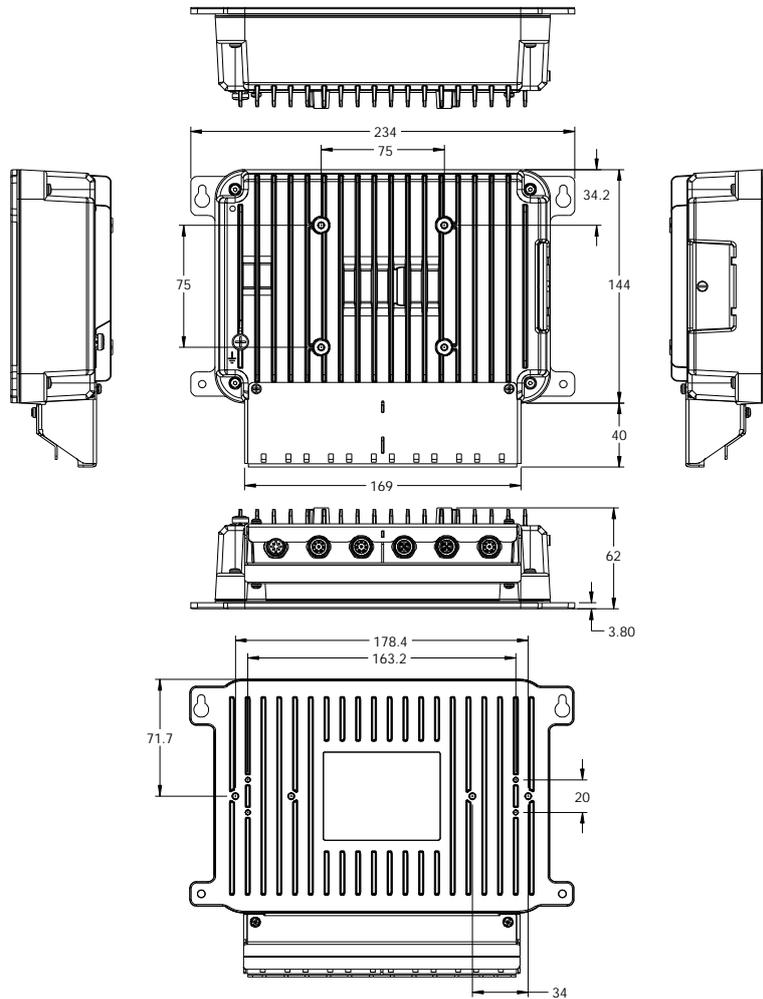
5.1.4 LAN A / LAN B

Pin	LAN A	LAN B	M12, 4 pin male
1		Tx+	
2		Rx+	
3		Tx-	
4		Rx-	

5.1.5 COMB

Pin	COM 3	CAN	M12, 8 pin male
1	RS-485 Tx+/Rx+	CAN-H	
2	TERM+	TERM+	
3	-	-	
4	-	-	
5	GND	GND	
6	RS-485 Tx-/Rx-	CAN-L	
7	TERM-	TERM-	
8	V _{CC}	V _{CC}	

5.2 BoX2 extreme Outline



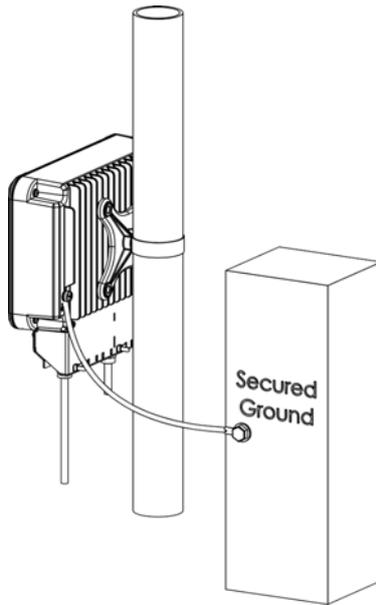
Note:

A Step CAD file is available on the web site www.beijerelectronics.com

6 Additional Installation Tips

When experiencing communication problems in noisy environments or when operating close to temperature limits, the following recommendations are to be noticed.

6.1 Grounding the operator panel



The VESA mounting of the operator panel does not provide a secure grounding connection between the panel and the device cabinet, see drawing above.

Connect a wire or grounding braid, that is sized correctly according to local electrical codes, between the chassis of the operator panel and the closest grounding point.

Note:

The grounding wires should be short and the conductor should have a large area. A long, thin grounding wire has a very high impedance (resistance) at high frequencies and does not guide disturbances to the ground.

Multi-wire conductors are better than single wire conductors with the same area. A braided conductor wire with the same area is even better. The best is a short, thick grounding braid.

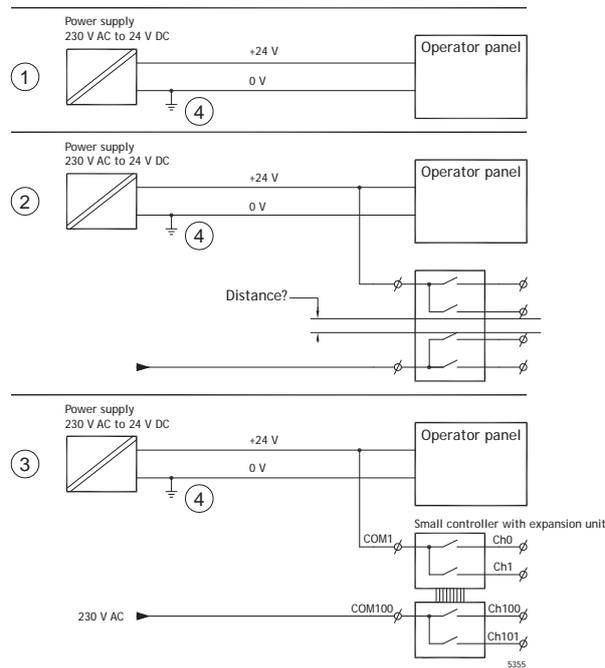
6.2 To Achieve Better EMC Protection

- Initially, use the original cabling from Beijer Electronics primarily.
- Use shielded M12 cables.

- Place the 24 V DC and communications cabling in one cable trunk/cable duct and 230/380 V AC in another. If the cables need to be crossed, cross them at 90° only. Avoid combining the cabling for stronger 24 V DC outputs with the communication cabling.

Ferrite cores that are snapped onto the shielded cabling may remove minor disturbances. Large ferrite pieces that are snapped onto unshielded cabling and where the wires go 2-4 times around the cores are approximately 5-25 times more efficient.

6.3 Safety



If a power supply that meets safety standards is used and only powers the operator panel, there is no problem. See 1 in drawing above.

However, if a 24 V unit that also powers other units is used, there is reason to be cautious, see 2 in drawing above. The operator panel does not have insulation that meets safety requirements in the event of a potential short circuit between 230 V AC and 24 V DC. It is assumed that the 24 V power supply is secure, for example, SELV according to EN 60950 (protection against electric shock) and UL 950.

Note:

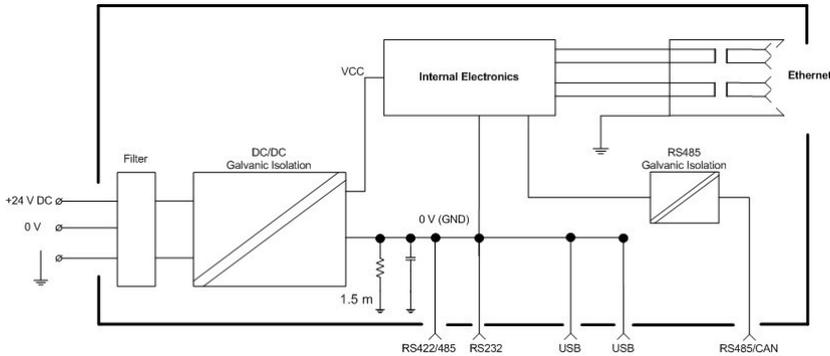
Here is an example that explains why a secure 24 V DC power supply can be ruined by mixing 24 V relay contacts with 230 V AC relay contacts in a smaller controller. Check that the clearances and creepage distances between 24 V DC and 230 V AC fulfill EN 60950 or UL 950. If not, input a separate 24 V unit into the operator panel.

If there is a substantial distance between the relay contacts for 24 V DC and 230 V AC, it is OK to use the same 24 V devices for all feeds. See 3 in drawing above.

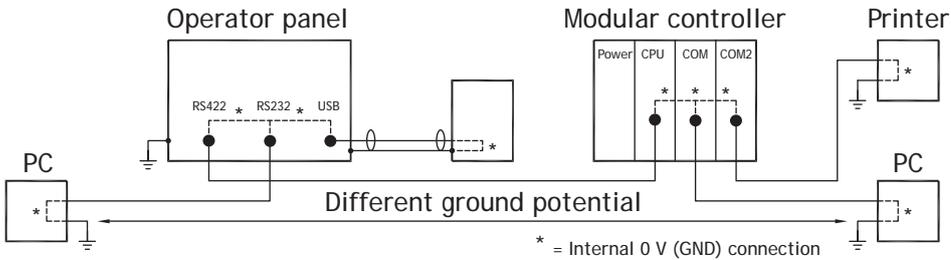
Connect 0 V on the 24 V power supply to the ground, see 4 in drawing above. This offers three advantages:

- Safety is increased. The 24 V power supply is not live in the event of a faulty connection or short circuit between 0 V (24 V) and 230 V phase.
- Transients on the 24 V feed are connected to the ground.
- No risk that the 24 V feed is at a high level in relationship to the ground. This is not unusual since there is high static electricity.

6.4 Galvanic Isolation



The operator panel has galvanic isolation against the 24 V DC power supply but no galvanic isolation between the communication ports for RS-232, RS-422/RS-485 and USB. Only the Ethernet- and RS-485 connection have galvanic isolation.



When a PC is connected to the operator panel, the internal 0 V (GND) of the panel is connected to the protective ground via the PC.

A number of USB devices can have the shield connected together with the protective ground. Here, the 0 V (GND) of the operator panel is connected to the protective ground when, for example, a USB memory stick, keyboard, or similar device is plugged in.

If a number of units are connected that have a 0 V and a ground connection, and these are connected to various grounding points, there is a substantial risk of problems. Grounding currents go through communication cables, the rear plate of the controller, internally in the operator panel, and can cause errors.

Use external units to improve communication and achieve galvanic isolation. Westermo has good industry-standard insulators that are also insulated from the 24 V DC feed.

Note:

It is very important to make sure that the 24 V feed in the external insulation unit is not connected to one of the communication outlets. If it does not have 100% insulation against the 24 V feed, disturbances and grounding currents from the 0 V on the 24 V side disrupt the communication.

Using this type of unit solves one problem but creates a larger problem! A substandard installation may work now, but problems may arise when other devices are connected.

6.5 Cable and Bus Termination RS-485

- If maximum transfer distance and maximum transfer speed is needed, shielded and twisted pair cable should be used. The mutual capacitance may not exceed 52.5 pF/m, and the cable area should be at least 0.25 mm² (AWG 24).
- 0 V, the reference voltage for communication should be included in the cabling. With two-way communication use two pairs; one pair for communication and one pair for 0 V.
- The shield must be grounded at one end. The other end is usually grounded, but with longer distances or when there is a difference in the ground potential, the shield should be connected to the ground via 0.1 μF/250 V film capacitor to prevent ground current in the braided shield. A number of manufacturers recommend that the shield be grounded at each node. Various manufacturers have different systems for bus termination.

Depending on the recipients' design, the bus wires may be on the same level or require pull-up or pull-down to ensure that no faulty signals are detected when the bus is in resting mode (all transmitters are disconnected).

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