X2 base 7

Installation Manual

English

MAEN181B, 2016-10

Installation manual for X2 base 7

Foreword

All 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 the iX Developer. 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 . 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: MAEN181B

Copyright © 2016-10 Beijer Electronics AB. All rights reserved.

The information in this document is subject to change without notice and is provided as available at the time of printing. Beijer Electronics AB, including all its group companies, reserves the right to change any information without updating this publication. Beijer Electronics AB, including all its group companies, assumes no responsibility for any errors that may appear in this document. Read the entire installation manual prior to installing and using this equipment. Only qualified personnel may install, operate or repair this equipment. Beijer Electronics AB, including all its group companies, are not responsible for modified, altered or renovated equipment. Because the equipment has a wide range of applications, users must acquire the appropriate knowledge to use the equipment properly in their specific applications. Persons responsible for the application and the equipment must themselves ensure that each application is in compliance with all relevant requirements, standards and legislation in respect to configuration and safety. Only parts and accessories manufactured according to specifications set by Beijer Electronics AB, including all its group companies, may be used.

BEIJER ELECTRONICS AB, INCLUDING ALL ITS GROUP COMPANIES, SHALL NOT BE LIABLE TO ANYONE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE INSTALLATION, USE OR REPAIR OF THIS EQUIPMENT, WHETHER ARISING IN TORT, CONTRACT, OR OTHERWISE. BUYER'S SOLE REMEDY SHALL BE THE REPAIR, REPLACEMENT, OR REFUND OF PURCHASE PRICE, AND THE CHOICE OF THE APPLICABLE REMEDY SHALL BE AT THE SOLE DISCRETION OF BEIJER ELECTRONICS AB, INCLUDING ALL ITS GROUP COMPANIES.

Contents

1 Safety Precautions 4
1.1 General 4
1.2 During Installation 4
1.3 During Use 5
1.4 Service and Maintenance 5
1.5 Dismantling and Scrapping 5
1.6 Appearance of Air in Touch Screen 5
2 Installation 6
2.1 Space Requirements 6
2.2 Installation Process 7
2.2.1 Connections to the Controller 9
2.2.2 Other Connections and Peripherals 9
3 Technical Data 10
4 Chemical Resistance 12
4.1 Plastic Casing 12
4.2 Touch Screen and Overlay Material 14
4.2.1 Autoflex EB 14
4.2.2 Touch Screen Surface 15
5 Operator Panel Drawings 16
5.1 Connectors 16
5.2 Communication Ports 16
5.3 X2 base 7 Outline 17
6 Additional Installation Tips 18
6.1 Grounding the operator panel 18
6.2 Ethernet Connection in the Operator Panel 19
6.3 To Achieve Better EMC Protection 21
6.4 Ambient Temperature 22
6.5 Safety 23
6.6 Galvanic Isolation 24
6.7 Cable and Bus Termination RS485 25

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.
- 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.
- Storing the operator panel where the temperature is lower/higher than recommended in this manual can cause the LCD display liquid to congeal/become isotopic.
- The LCD display liquid contains a powerful irritant. In case of skin contact, wash immediately with plenty of water. In case of eye contact, hold the eye open, flush with plenty of water and get medical attention.
- The figures in this manual serves 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, like for example serial devices.

1.2 During Installation

- The operator panel is designed for stationary installation on a planar surface, where the following conditions are fulfilled:
  - no high explosive risks
  - no strong magnetic fields
  - no direct sunlight
  - no large, sudden temperature changes
- 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.
- In a Zone 2 environment, this equipment shall be installed in an enclosure that provides a degree of protection not less than IP 54 or greater than IP 65 in accordance with IEC/EN 600079-0. 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 IP 64 or greater than IP 65 in accordance with IEC/EN 600079-0. The IP rating of the equipment is limited to the IP rating of the enclosure it is to be installed into.

1.3 During Use

- Keep the operator panel clean.
- Emergency stop and other safety functions may not be controlled from the operator panel.
- Do not use excessive force or sharp objects when operating the touch screen.

1.4 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.
- Clean the display and surrounding front cover with a soft cloth and mild detergent.
- Replacing the battery incorrectly may result in explosion. Only use batteries recommended by the supplier. During the warranty period, the battery needs to be replaced by an authorized Beijer Electronics service center.

1.5 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, electrolytic capacitor and display.

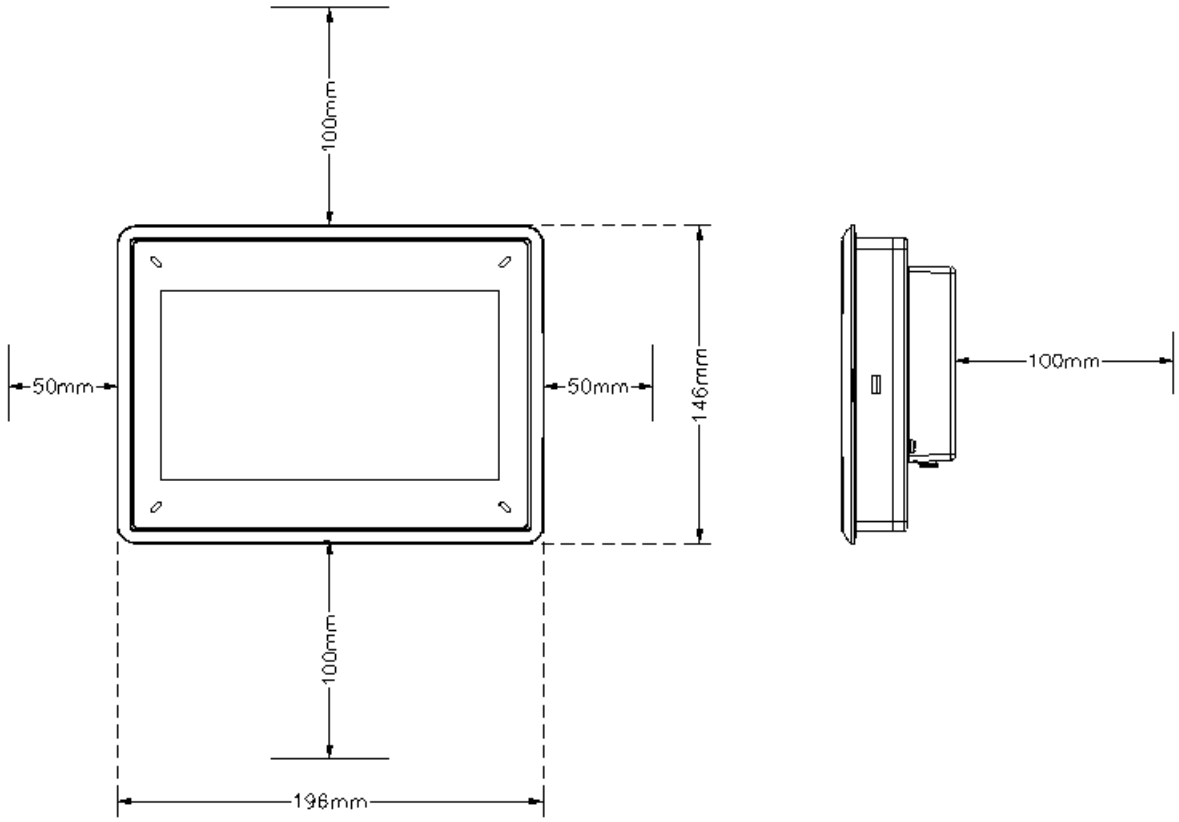
1.6 Appearance of Air in Touch Screen

The layer structure of the touch screen contains air and in rare cases appearance of bubbles can arise. This is purely cosmetic and does not affect any functionality of the operator panel. The appearance can occur under certain environmental conditions such as temperature, humidity, and atmospheric pressure.

2 Installation

2.1 Space Requirements

- Maximum installation plate thickness: 6.5 mm
- Space requirements in millimeters when installing the operator panel:

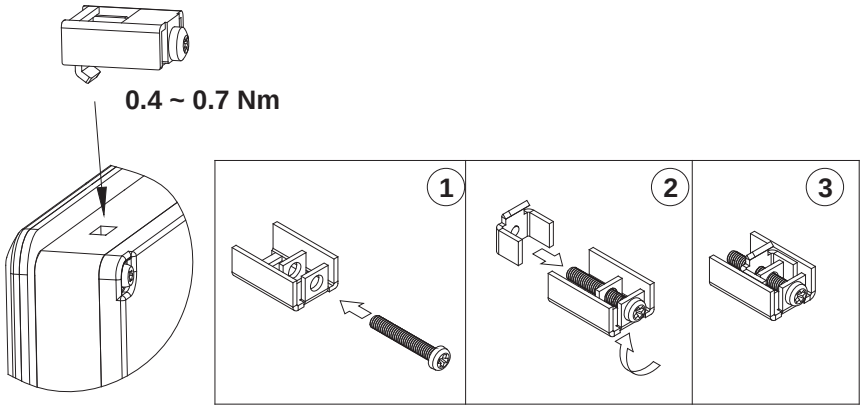


Note:
The dimensions on the drawing are not proportional.

Caution:
The openings on the enclosure are for air convection. Do not cover these openings.

2.2 Installation Process

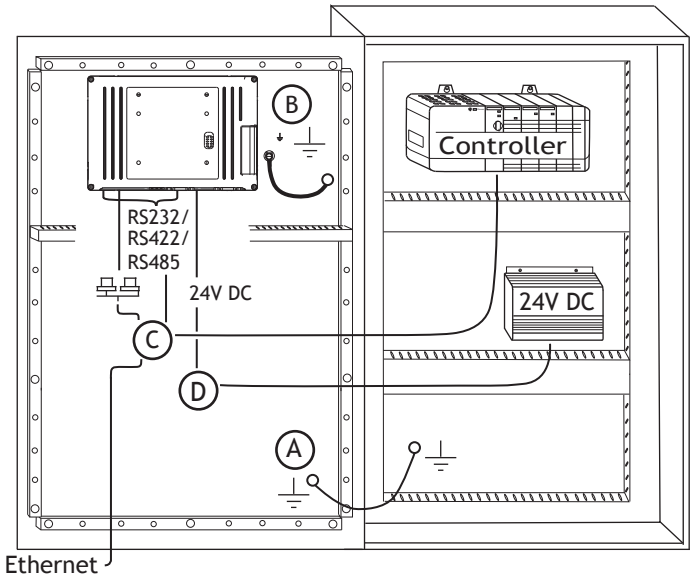
1. Unpack and check the delivery. If damage is found, notify the supplier.
2. Place the operator panel on a stable surface during installation. Dropping the operator panel or letting it fall may cause damage.
3. To cut a correct opening for the operator panel, use the cut out dimensions in the outline drawing. A separate cut out drawing is available for download from the Beijer Electronics web site. For more information, see sections *Operator Panel Drawings* and *Technical Data*.
4. Secure the operator panel in position using all the fastening holes and the provided brackets and screws:



5. Connect the cables in the specified order, according to the drawing and steps below.

Caution:

- The operator panel must be brought to ambient temperature before it is started up. If condensation forms, ensure that the operator panel is dry before connecting it to the power outlet.
- Ensure that the operator panel and the controller system have the same electrical grounding (reference voltage level), otherwise errors in communication may occur.
- Ensure that the voltage and polarity of the power source is correct.
- Separate high voltage cables from signal and supply cables.
- Shielded communication cables are recommended.



- Connect cable A.
- Connect cable B, using an M5 screw and a grounding conductor (as short as possible), that is sized correctly according to local electrical codes.
- Connect cable C.
- Connect cable D. The recommended cross-section of the cable is 1.5 mm^2..

6. Carefully remove the protective film over the operator panel display, take care to avoid static electricity that could damage the panel.

Note:
When connecting the operator panel to the power outlet for the first time, make sure not to interrupt power for a minimum of 48 hours in order to charge the battery completely. After that, the battery may be charged partly during a shorter period of time.

2.2.1 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.

2.2.2 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	X2 base 7
Front panel, W × H × D	196 × 146 × 7.5 mm
Cut out dimensions, W × H	185.8 × 135.8 mm
Mounting depth	44.7 mm (145 mm including clearance)
Front panel seal	IP 65
Rear panel seal	IP 20
Touch screen material	Polyester on glass, resistive. Overlay: Autoflex EB(1).
Touch screen operations	1 million finger touch operations
Reverse side material	Plastic (PC+ABS)
Frame material	Plastic (PC+ABS)
Weight	0.7 kg
Serial port for COM1 RS232 and COM2 RS422 / RS485	9-pin D-sub contact with RS232 RTS / CTS, chassis-mounted female with standard locking screws 4-40 UNC
Serial port for COM3 RS232 and COM4 RS485	9-pin D-sub contact, chassis-mounted female with standard locking screws 4-40 UNC
Ethernet	1 × 10 / 100 Base-T (shielded RJ45)
USB	1 × USB Host 2.0, max output current 400 mA
Processor	400 MHz ARM9
Memory RAM	128 MB (DDR2)
LED	1 × blue / red software programmable
Real time clock	Yes (on chip)
Battery	Lithium ion, 3V / 200 mAh
Power consumption at rated voltage 12 V / 24 V respectively	9.6 W
Fuse	2.0 AT
Power supply	+24 V DC (18 to 32 V DC) (galvanic isolation). CE: The power supply must conform with the requirements according to IEC 60950 and IEC 61558-2-4.
Display	TFT-LCD with LED backlight 800 × 480 pixels, 64 k colors
Active area of display, W × H	154.1 × 85.9 mm
Operating temperature	-10 °C to +50 °C
Storage temperature	-20 °C to +60 °C

Parameter	X2 base 7
Relative humidity in operation	5% – 85% non-condensed
Approvals and certifications	CE / FCC / KCC Information is available on the web site *www.beijerelectronics.com*
UL approval	According to UL lable on X2 base 7 panel.

(1) See section *Chemical Resistance* for more information.

4 Chemical Resistance

Note:
If exposure to any of the below chemicals is demanded, it is recommended to first test the chemical in a hidden spot of the equipment.

4.1 Plastic Casing

The frame and casing material is plastic (PC+ABS). This material withstands exposure to the following chemicals without visible change:

Acetic acid 10%	Nitric acid 10%
Baysilon® M 300	Phosphoric acid 30%
Citric acid 10%	Sea water
Cleaning agent, Dor®	Sodium hypochlorite
Curd soap solution 2%	Sodium thiosulphate
Hydrochloric acid 20%	Sulphuric acid 30%
Hydrogen superoxide 30%	Urea
Lactic acid 10%	-

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

Cleaner's naphtha, free from aromatic hydrocarbons	Heating oil
Ethyl alcohol 96%	Isopropanol
Glycerin	N-hexane
Glycol	Persil powder in solution

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

Acetone	Methylisobutyl ketone
Ammonia solution, diluted	Naphthalene
Aniline	Nitrobenzene
Aromatic hydrocarbons	Oleic acid
Benzene	Olive oil
Bromin	Phenol
Butter	Potassium carbonate, sat.
Chlorine	Sodium hydroxide solution 10%
Diethyl ether	Soya oil
Iodine	Toluene
Lard	Trichloroethylene

4.2 Touch Screen and Overlay Material

4.2.1 Autoflex EB

Autoflex EB covers the overlay surrounding the screen.

Solvent Resistance

Autoflex EB withstands exposure of more than 24 hours duration under DIN 42 115 Part 2 to the following chemicals without visible change:

Ajax / Vim in solution	Downy / Lenor(1)	Phosphoric acid (<30%)
Alkalicarbonate solution(1)	Ethanol	Potassium ferricyanide
Ammonia (<40%)(1)	Glycerine	Potassium hydroxide (<30%)
Acetic acid (<50%)	Glycol	Pure Turpentine
Ariel powder in solution(1)	Gumption(1)	SBP 60/95(1)
Bleach(1)	Hydrochloric acid (<36%)	Sulfuric acid (<10%)
Castor oil	Linseed oil	Tomato ketchup
Caustic soda (<40%)(1)	Methanol	Trichloroacetic acid (<50%)
Cutting oil	Nitric acid (<10%)	White Spirit
Cyclohexanol	Paraffin oil	Windex(1)
Diacetone alcohol	Persil powder in solution(1)	Wisk
Diesel	Petroleum spirit(1)	

(1) Extremely faint glossing of the texture was noted.

Autoflex EB withstands DIN 42 115 Part 2 exposure of up to 1 hour duration to glacial acetic acid without visible change.

Autoflex EB is not resistant to high pressure steam at over 100 °C or the following chemicals:

Concentrated mineral acids	Benzyl alcohol
Concentrated caustic solution	Methylene chloride

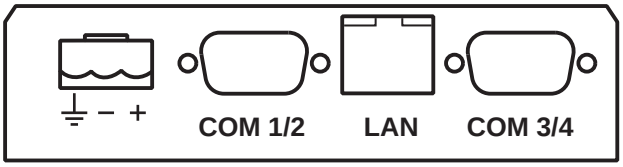
4.2.2 Touch Screen Surface

The touch screen surface on the operator panel withstands exposure to the following solvents without visible change:

Solvents	Time
Acetone	10 minutes
Isopropanol	10 minutes
Toluene	5 hours

5 Operator Panel Drawings

5.1 Connectors



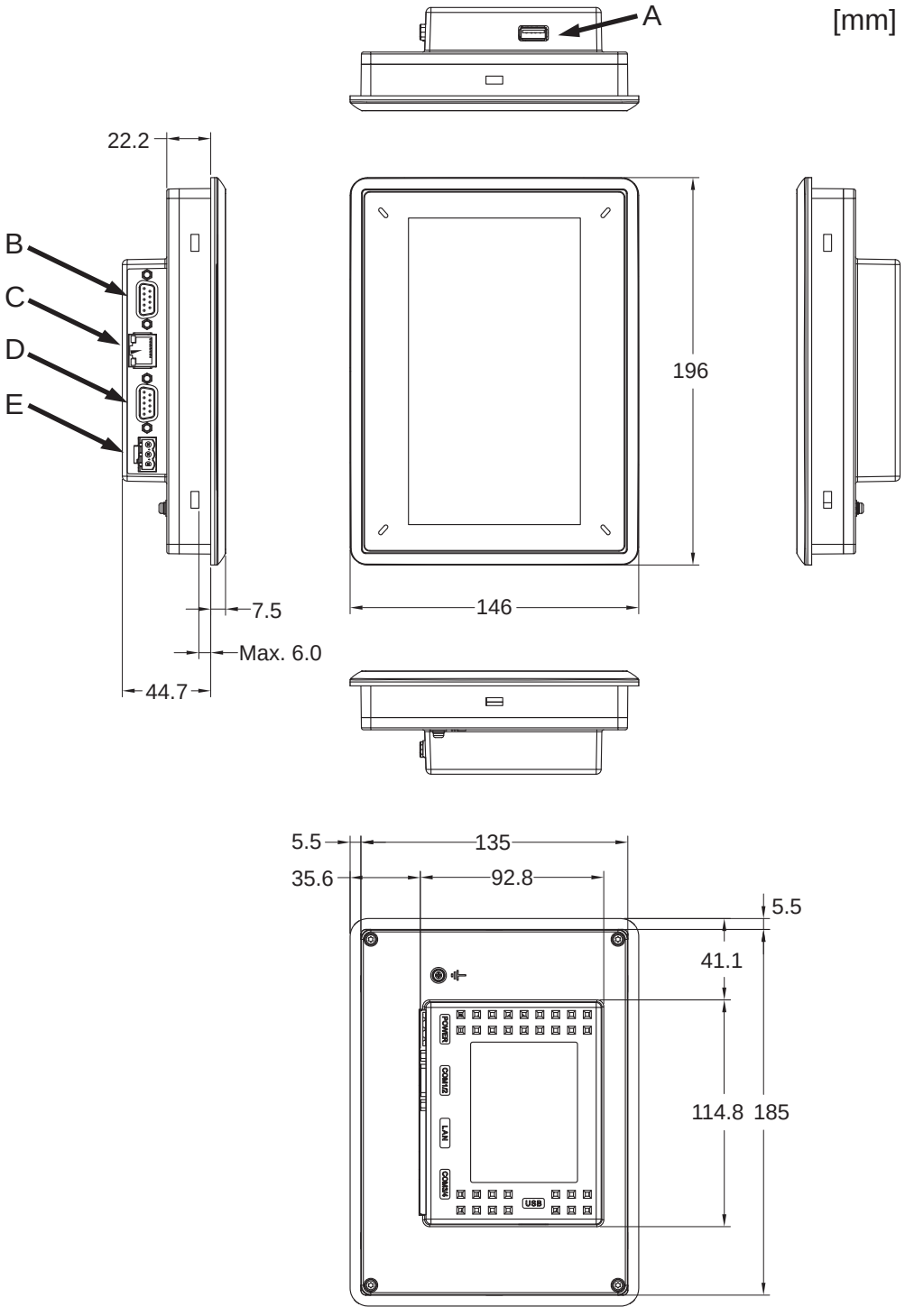
1 2 3 4

Pos.	Connector	Description
1	Power supply	+24 V DC (18-32 V DC)
2	COM 1/2	Communication Ports
3	LAN	1 × 10/100 Base-T (shielded RJ45)
4	COM 3/4	Communication Ports

5.2 Communication Ports

Pin	Serial port, 9-pin female		Serial port, 9-pin female	
	COM1	COM2	COM3	
1	-	RS422 Tx+ RS485 Tx+/Rx+	-	RS485 Tx+/Rx+
2	RS232 RxD	-	RS232 RxD	-
3	RS232 TxD	-	RS232 TxD	-
4	-	RS422 Rx+	-	-
5	GND	GND	GND	GND
6	-	RS422 Tx- RS485 Tx-/Rx-	-	RS485 Tx-/Rx-
7	RS232 RTS	-	-	-
8	RS232 CTS	-	-	-
9	-	RS422 Rx-	-	-

5.3 X2 base 7 Outline

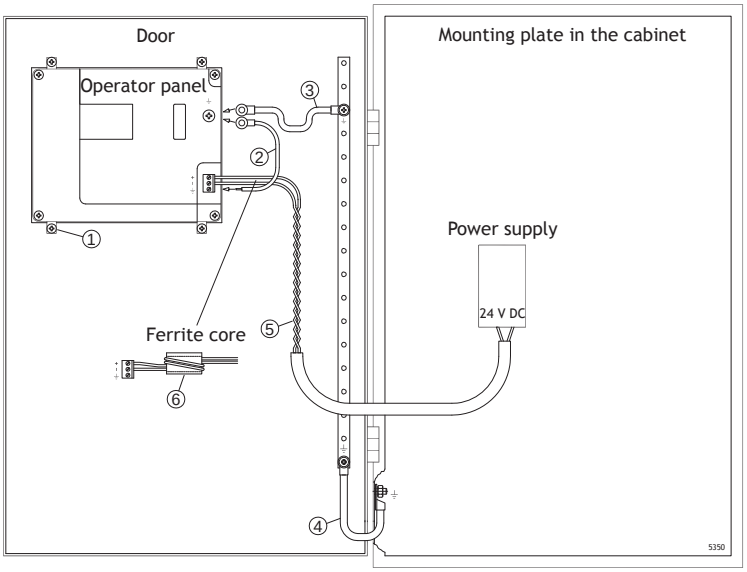


A. USB Host
B. COM3 / COM4
C. Ethernet
D. COM1 / COM2
E. 24V DC

6 Additional Installation Tips

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

6.1 Grounding the operator panel



The mounting clamps of the operator panel do not provide a secure grounding connection between the panel and the device cabinet, see 1 in drawing above.

1. Connect a wire, that is sized correctly according to local electrical codes, between the quick-connect terminal connector on the operator panel and the chassis of the panel, see 2 in drawing above.
2. 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 on the door, see 3 in drawing above.
3. Connect a strong but short grounding braid between the door and the device cabinet, see 4 in drawing above.
4. Twist the cables onto the 24 V DC feed, see 5 in drawing above.

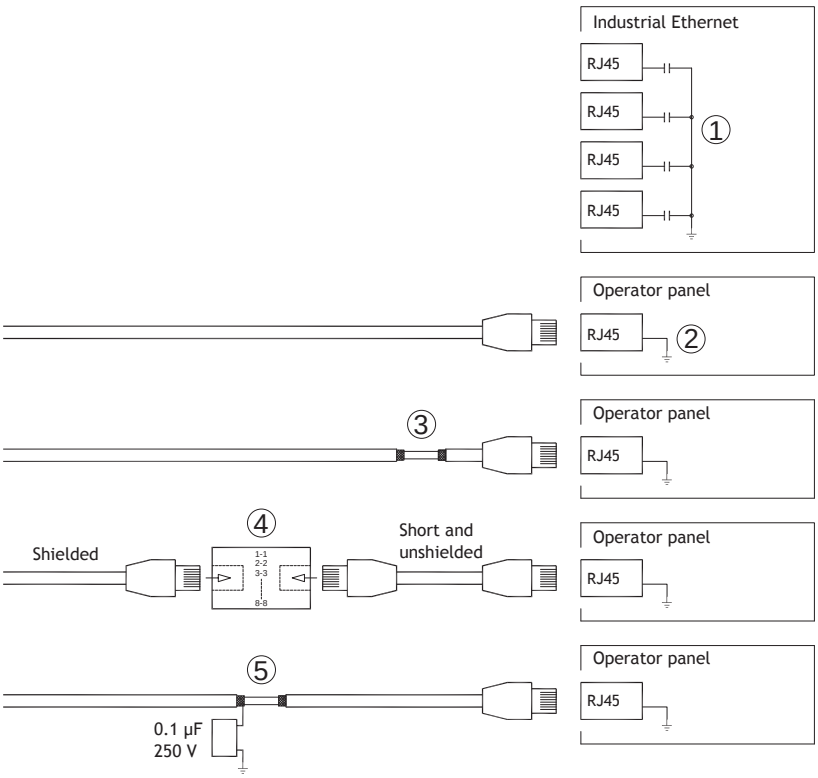
   2 turns around the ferrite core provide 4 times the suppression of 1 turn.

   3 turns around the ferrite core provide 9 times the suppression of 1 turn.

A ferrite core suppresses disturbances to the 24 V feed, see 6 in drawing above.

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 Ethernet Connection in the Operator Panel



In some industrial units for Ethernet, the RJ45 contact's shield is connected to the chassis via a capacitor, see 1 in drawing above.

The operator panel's Ethernet shield is directly connected to the chassis, see 2 in drawing above.

1. Check whether the other Ethernet unit has its shield directly grounded or grounded via a capacitor.

Note:
In many cases, connecting the shielded Ethernet cabling to the chassis at both ends is inappropriate. Hum or grounding loops can occur. Unshielded cabling may even result in fewer communication errors.

A good solution may be to use a shielded Ethernet cable, but to connect the shield at one end only.

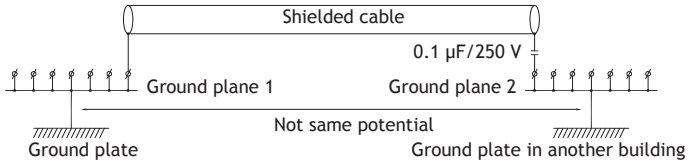
One option is to break the shield, see 3 in drawing above.

A more elegant method is to expand the shielded Ethernet cabling with a piece of unshielded Ethernet cable, see 4 in drawing above.

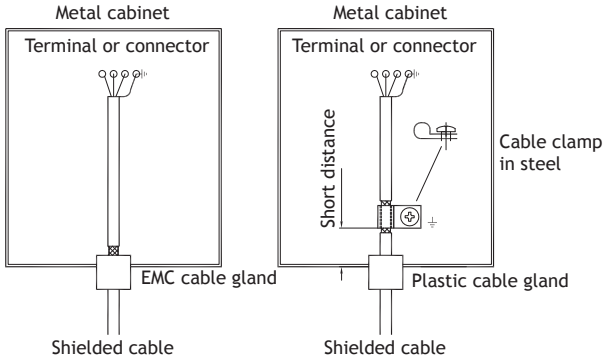
The shield can be grounded via an external 0.1 µF/250 V plastic capacitor, see 5 in drawing above. This connects the HF transients to ground.

6.3 To Achieve Better EMC Protection

- Use shielded cables for RS232 communication.
- Use twisted pair and shielded cabling for RS422 and RS485.
- Use the cabling intended for the bus type; Ethernet, Profibus, CC-Link, CAN, Device Net etc.
- Install and connect according to applicable specifications for the relevant bus standard.
- Use shielded cabling for Ethernet, preferably with foil and a braided shield.
- D-sub covers should be shielded, and the shield should be connected to the cover 360° where the cable enters.
- Connect the shield at both ends.



With longer distances, there is a risk that the ground potential may be different. In that case, the shield should only be connected at one end. A good alternative is to connect the other end of the shield to the ground via a 0.1 µF/250 V plastic capacitor. Both ends are then connected to the ground in terms of HF, but only connected to the ground at one end in terms of LF, thus avoiding the 50/60 Hz grounding loops.

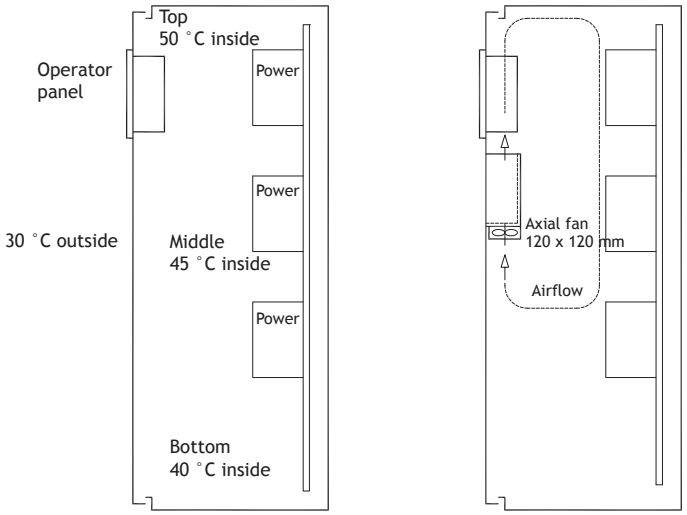


1. Use an EMC cable gland or regular plastic cable gland, remove the outer jacket and connect the shield to the installation plate with a 360° metal cable clamp.
2. Place the 24 V DC and communications cabling in one cable trunk/cable duct and 230/380 V AC in another. If the cables need to be crossed, 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.

6.4 Ambient Temperature

The maximum ambient temperature for the operator panel is provided in the specifications. The ambient temperature refers to the temperature in the device cabinet which cools the operator panel's electronics.



In most cases, the ambient temperature for the operator panel is significantly higher than the device cabinet's ambient temperature.

If the cabinet is tall and there are a number of heat-generating devices, the temperature at the top of the cabinet is considerably higher than the temperature increase that would be expected. All electronics are sensitive to heat. The lifespan of an electrolytic capacitor is cut in half with an 8-10 °C increase in temperature. A 15-20 °C temperature increase results in a quarter of the lifespan etc.

Rittal has a good program for estimating the anticipated average temperature in the cabinet as well as a large program for controlling the temperature in the device cabinet.

An enamel-coated steel cabinet has a radiant heat value of 5.5 W/m^2 and degrees C.

Installing a fan inside the cabinet evens out the temperature, while moving air provides considerably better cooling than still air. A suitable fan is a 120 x 120 mm axial fan, available in 24 V DC, 115 V AC and 230 V AC.

Install the fan so that it sits in a cooler area and blows cold air against the operator panel. If the fan is mounted at the top and sucks warm air upwards, the ambient temperature of the fan becomes higher, resulting in a shorter lifespan.

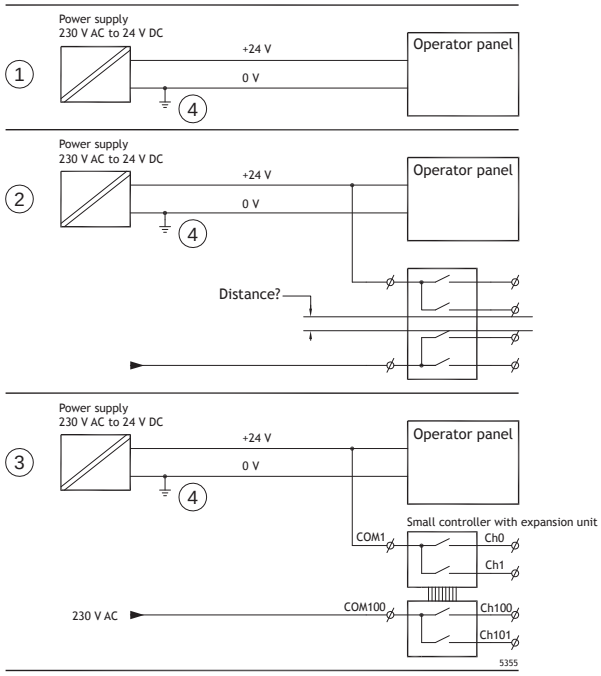
A good fan with a ball-bearing mounting has an expected lifespan of at least 40,000 hours (not a guaranteed lifespan) at 40 °C. This corresponds to at least 4 years of continuous use. If a thermostat is installed, the fan only operates when needed.

Large graphic terminals draw only one fifth of the current when the background lighting is off. The loss effect drops from e.g. 25 W to only 5 W.

An approximate value of the net power consumption for the operator panel can be calculated by multiplying the supply voltage with the current drawn by the operator panel. This is assuming that all supplied power is transformed to heat.

6.5 Safety

Most of the operator panels are fed with 24 V DC.



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

However, if a 24 V unit that also feeds 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 feed is secure, for example, SELV according to EN 60950 (protection against electric shock) and UL 950.

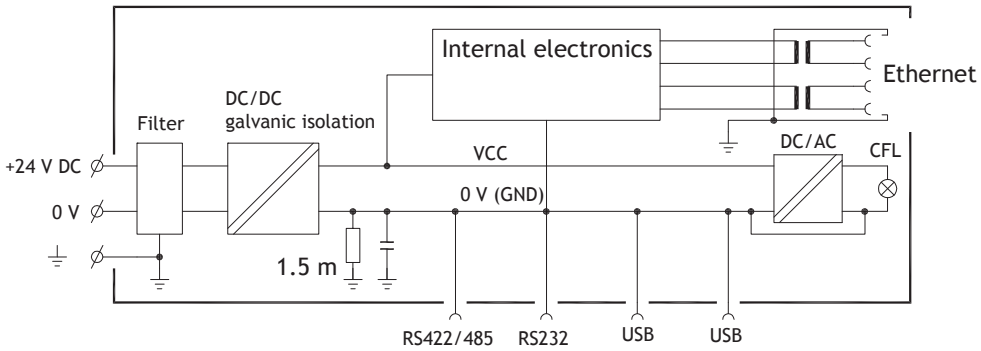
Note:
Here is an example that explains why a secure 24 V DC feed can be ruined by mixing 24 V relay contacts with 230 V AC relay contacts in a smaller controller. Check that the clearances and creepage distances between 24 V DC and 230 V AC fulfill EN 60950 or UL 950. If not, input a separate 24 V unit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

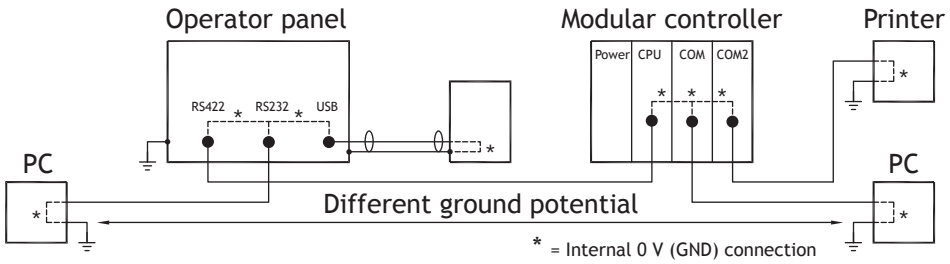
Connect 0 V on the 24 V feed to the ground, see 4 in drawing above. This offers three advantages:

- Safety is increased. The 24 V feed 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.

6.6 Galvanic Isolation



The operator panel has galvanic isolation against the 24 V DC feed but no galvanic isolation between the communication ports for RS232, RS422/485 and USB. Only the Ethernet connection has 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, and 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 disrupts 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.

6.7 Cable and Bus Termination RS485

- 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 mm^2 (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 plastic 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. The RS485 standard does not describe how the "Fail Safe" function would be carried out, just that the system should be able to handle the error.

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).

Head office

Beijer Electronics AB

Box 426

201 24 Malmö, Sweden

www.beijerelectronics.com / +46 40 358600