X3 pro 10
User Guide

BeiJer
ELECTRONICS

Table of Contents

1. Introduction

1.1. About This User Guide

This guide contains information on the **hardware** features of the X3 HMI panel. It provides in-depth specifications and guidance on installation and briefly describes configuration.

For more information on the **software** features, configuration, and operation, see OS3 User Guide.

1.1.1. Warning, Caution, Note, Important and Tip Icons

This document may include Warning, Caution, Note, Important and Tip icons where appropriate to point out safety-related, or other important, information. The icons should be interpreted as follows:

WARNING

The **Warning** icon indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury, and major damage to the product.

CAUTION

The **Caution** icon indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, and moderate damage to the product.

NOTE

The **Note** icon alerts the reader to relevant facts and conditions.

IMPORTANT

The **Important** icon highlights important information.

TIP

The **Tip** icon indicates helpful advice, recommendations, or best practices that can improve the user experience or make a task easier. It highlights useful, non-critical information that can assist the reader but is not mandatory for completing the task.

1.2. About X3 HMI Panels

Beijer Electronics **X3 HMI panels** are designed to meet the needs of human-machine interaction. They come with built-in features like text display and control, dynamic indicators, time channels, as well as alarm and recipe management. The panels operate in an object-oriented manner, making them intuitive and user-friendly. Configuration is typically done on a PC using the **iX Developer** software, after which the software project can be transferred to and stored in the HMI panel itself as an **App**. These panels can connect to various automation devices such as PLCs, servos, and drives. In this manual, the term "controller" refers to this connected automation equipment.

1.3. Naming Convention

Each panel's name is determined by its properties. The available properties are listed in the following table.

X3 family name	Display size (inches)	Options
pro marine extreme	7 10 12 15 21	The following options are available: 1. **web**: Web HMI with HTML5 web client 2. **P**: "Plus" version supporting additional features such as isolated COM ports, CAN bus, extra USB port etc. 3. **HB**: High brightness display 4. **CT**: Capacitive touch screen (PCAP) 5. **WebIQ**: HMI bundled with WebIQ license

Examples

X3 pro 7: X3 pro 7 inch HMI. Standard version.

X3 extreme 12 web P CT: X3 extreme 12 inch web panel. Plus version including capacitive touch screen (PCAP).

X3 extreme 12 web P HB WebIQ: X3 extreme 12 inch web panel. Plus version including high brightness display, bundled with 4 000 tags WebIQ license.

NOTE
Not all combinations are available.

1.4. References

Name
iX Developer 3 documentation
OS3 documentation

2. Safety Precautions

Both the installer and users of the HMI panel must read and understand this manual.

2.1. General

• Read all safety precautions carefully.

• Inspect the delivered items for transportation damage. In the event of any damage, inform the supplier.

• Do not use the HMI 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 from the supplier.

• Read the installation and operating instructions carefully before installing, using or repairing the HMI panel.

• Never allow fluids, metal filings or wiring debris to enter any openings in the HMI panel. This may cause fire or electrical shock.

• Only qualified personnel may operate the HMI panel.

• Storing the HMI panel in environments with temperatures either lower or higher than those specified below, may lead to the congealing and isotropic transformation of the LCD display liquid.
X3 pro, marine: -20°C to +70°C
X3 extreme: -30°C to +80°C

• 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 images 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 images.

• The supplier does not provide a guarantee that the HMI panel is suitable for any specific application, and also disclaims responsibility for product design, installation, or operation.

• Power on and power off the HMI panel at least once before installing any new components or connecting it to external devices (e.g., serial devices).

2.2. During Use

• Keep the HMI panel clean.

• Do not perform control of emergency stop and other safety functions from the HMI panel.

• Do not use excessive force or sharp objects when operating the touch screen.

2.3. During Installation

• Install the HMI panel according to the accompanying installation instructions.

• Ground the HMI panel according to the accompanying installation instructions.

• Only qualified personnel should perform the installation of the HMI panel.

• Separate high voltage cables from signal and supply cables.

- Prior to connecting the HMI panel to the power outlet, verify that the voltage and polarity of the power source are correct.
- Peripheral equipment must be suitable for the application and the specific location in which it will be used.
- Use shielded communication cables.

2.4. 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	Cr^{6+}	PBB	PBDE	DBP	BBP	DEHP	DIBP
PCB and electronic components PCB 和电子元件	X	O	O	O	O	O	O	O	O	O
Housing 外壳	O	O	O	O	O	O	O	O	O	O
Display / touch 显示屏 / 触控	X	O	O	O	O	O	O	O	O	O
Cables and connectors 电缆和连接器	O	O	O	O	O	O	O	O	O	O

O: Indicates that the concentration of the hazardous substance in all homogeneous materials in the parts is below the relevant threshold of EU RoHS 2 Directive 2011/65/EU, China RoHS GB/T 26572-2011 standard and EU Directive 2015/863 Annex II.

O: 表示该有害物质在该部件所有均质材料中的含量均在欧盟 RoHS 2 指令 2011/65/EU, 中国 RoHS 标准 GB/T 26572-2011 及欧盟指令 2015/863 附件 II 规定的限量要求以下。

X: Indicates that the concentration of the hazardous substance of at least one of all homogeneous materials in the parts is above the relevant threshold of the GB/T 26572-2011 standard. But still complies with the EU RoHS Directive 2011/65/EU.

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 GB/T 26572-2011 规定 的限量要求。但仍然符合 EU RoHS 指令 2011/65/EU。

Environmental protection use period: 50 years
环保使用期限 50 年

2.5. 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.

3. Product Overview

3.1. Technical Data

3.1.1. X3 pro 10

Front panel, W × H × D	292 × 194 × 8 mm
Cutout dimensions, W × H	275 × 177 mm
Mounting depth	58 mm
Standalone mounting	VESA 75 × 75
Front panel seal	IP 65 (not evaluated by UL), Type 4X and Type 12, indoor use, wet
Rear panel seal	IP 20 (not evaluated by UL), open type (for UL only)
Touch screen material	Polyester on glass, ITO film, resistive
Frame overlay	Autoflex EB
Touch screen operations	1 million finger touch operations
Reverse side material	Powder-coated aluminum
Frame material	Powder-coated aluminum
Weight	1.9 kg
CPU	i.MX 8M Plus Quad Cortex®-A53 1,6GHz
D-SUB 1	9-pin D-sub contact with: 1 × RS-232 1 × multi function: 1 × RS-422, or 2 × RS-485, or 1 × RS-485 + 1 × CAN
Ethernet LAN A	10/100/1000 Mbit/s, shielded RJ 45
Ethernet LAN B	10/100/1000 Mbit/s, shielded RJ 45
USB	1 × USB host 2.0, 1 × USB host 3.0
External storage media	1 × SD card
Flash memory (application memory)	32 GB EMMC (NAND Flash)
Memory RAM	4 GB (DDR4)
LED	1 × multi color
Real time clock	Yes
Battery	Lithium battery type BR 2450A
Power consumption (typ) / (max)	12 W / 18 W
Fuse	Internal DC fuse, 4 AT

Power supply	+24 VDC (18–32 V DC) isolated
	CE: The power supply must conform with the requirements according to EN/IEC 60950 and EN/IEC 61558-2-4.
	UL and cUL: For use in North America and/or Canada.
	The unit shall be supplied by an isolated power source which fulfils the requirements of:
	• Limited-Energy Circuit in accordance with UL/CSA 61010-1/ UL/CSA 61010-2-201 or,
	• Limited Power Source (LPS) in accordance with UL/CSA 60950-1 or,
	• a Class 2 supply source which complies with the National Electrical Code (NEC), NFPA 70, Clause 725.121 and Canadian Electrical Code (CEC), Part I, C22.1. (Typical examples are a Class 2 transformer or a Class 2 power sources in compliance with, UL 5085-3/ CSA-C22.2 No. 66.3 or UL 1310/CSA-C22.2 No. 223).
Pollution degree	Front: 3 Rear: 2
Altitude	3000 m
Overvoltage category	II
Display	TFT-LCD with LED backlight 10.1”, 1024 × 600 pixels, 262 k colors
Active area of display, W × H	222.72 × 125.28 mm
Pixel errors	Class I (ISO 9241-307)
Backlight brightness	500 cd/m2 semi dimmable
Backlight lifetime	50 000 hours
Operating temperature	-10°C to +60°C
Storage temperature	-20°C to +70°C
Relative humidity in operation	5% to 85% non-condensation
Vibration	1 g, according to IEC 60068-2-6, Test Fc
Mechanical shock	15 g, half-sine, 11 ms according to IEC60068-2-27
Approvals and certifications	CE/FCC/KCC

3.2. HMI Panel Drawings

3.2.1. HMI Panel Outline

Pro & Marine Standard Variant
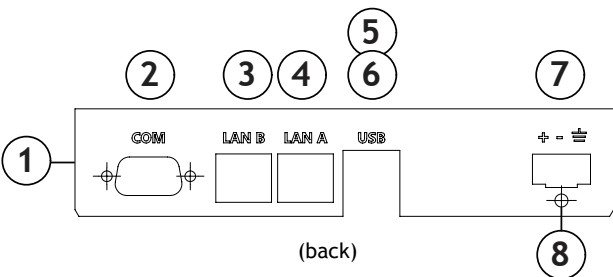
Pro & Marine P (plus) Variant

> **NOTE**
> Minimum thickness for the front plate is 2.0 mm.

> **NOTE**
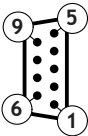> A STEP CAD file is available on the Beijer Electronics website.

3.2.2. Connectors

(back)

Pos	Connector	Description
1	SD Card	SDHC, SDXC High Speed, UHS-I (1.8 V)

Pos	Connector	Description
2	COM-A	DSUB (9-pin, female), serial communication port
3	LAN-B	RJ45 (shielded), 10/100/1000 Mbit
4	LAN-A	RJ45 (shielded), 10/100/1000 Mbit
5	USB-A	USB 2.0 Host, max output current 500 mA
6	USB-B	USB 3.0 Host, max output current 900 mA
7	Power supply	3-pin screw connector, +24 V DC (18-32 V DC)
8	Ground screw	Screw to connect functional ground

Power supply pin assignment	
Pos	**Description**
+	Vin+ (main input supply voltage)
-	Vin- (power ground)
≐	FG (frame ground)

COM							
Fe-male DB9	**Pin**	**Serial port pin assignment**					
		COM 1	**Alt 1 (RS-422)**	**Alt 2 (2 × RS-485)**		**Alt 3 (CAN + RS-485)**	
			COM 2	**COM 2**	**COM 3**	**CAN 1**	**COM 3**
	1		RS-422 TX+	RS-485 TX+/RX+		CAN1-H	
	2	RS-232 RXD					
	3	RS-232 TXD					
	4		RS-422 RX+		RS-485 TX+/RX+		RS-485 TX+/RX+
	5	GND					
	6		RS-422 TX-	RS-485 TX-/RX-		CAN1-L	
	7	RS-232 RTS					
	8	RS-232 CTS					
	9		RS-422 RX-		RS-485 TX-/RX-		RS-485 TX-/RX-

The connector supports up to three independent serial communication channels and can be configured for RS-232 together with:

- RS-422 (alternative 1)
- 2 × RS-485 (alternative 2)
- CAN + RS-485 (alternative 3)

3.3. Chemical Resistance

3.3.1. Touch Screen and Overlay Material

3.3.1.1. Protective Film

The Autoflex protective film covers the overlay surrounding the screen.

Solvent Resistance

The protective film withstands exposure of more than 24 hours duration under DIN 42115 Part 2 to the following chemicals without visible change:

Acetonitrile	Diesel	Petroleum spirit[1]
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

[1]Extremely faint glossing of the texture was noted.

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

The Autoflex protective film 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

3.3.1.2. Touch Screen Surface

3.3.1.3. Touch Screen Protector

To safeguard the touch screen from damage in harsh environments and outdoor exposure, it is advisable to use a protective film. This optional part can be ordered from Beijer Electronics.

4. Configuration and Operation

Power on your X3 HMI panel and follow the instructions on the screen.

For more information on configuration and operation, see OS3 User Guide.

4.1. General Information

4.1.1. Default IP Addresses

These are the default IP addresses for the X3 HMI panels:

Port	IP address
LAN A	DHCP
LAN B (if available)	DHCP

4.1.2. Open Ports

In the firmware, certain ports are open by default either due to the operating system or as required by internal applications.

Type	Description	Open by default
TCP	HTTPS interface for app transfer and API access (443)	Yes
UDP	Netbios (137)	Yes
UDP	Netbios (138)	No[1]

[1]Filtered.

> **NOTE**
>
> Some communication drivers use fixed ports, while others use dynamic ports. For details, refer to the documentation for the specific driver, see iX Developer 3 Driver List for the specific driver.

4.1.3. USB Ports

If there is only one USB port, it follows the 3.0 standard. For devices with two USB ports, USB-A supports the 2.0 standard, while USB-B supports 3.0.

Both ports are compatible with FAT16, FAT32, and exFAT file systems for USB flash drives (sold separately).

Size limitations for file systems:

- FAT16: up to 2 GB
- FAT32: up to 32 GB
- exFAT: up to 2 TB

The USB port(s) also support connecting a keyboard and mouse.

4.1.4. External Storage Media

> **IMPORTANT**
>
> Beijer Electronics recommend using industrial grade SDHC or SDXC cards.

An external memory card (SD, SDHC or SDXC, with FAT16, FAT32 or exFAT file systems) can be inserted (option, sold separately).

Size limitations for file systems:

- FAT16: up to 2 GB (SD)

- FAT32: up to 32 GB (SDHC)

- exFAT: up to 2 TB (SDXC)

The SD card slot is located on the left side of the back cover when the screen is facing you.

> **NOTE**
>
> Extensive data logging and other write-intensive operations on the internal storage may wear out the flash memory. The recommendation is therefore to store data on an SD card.

4.1.4.1. Reduce Flash Wear by Storing Data on SD Cards

Beijer Electronics recommend using industrial SD card instead of the built-in flash memory when data logging is performed. Since extensive writing to the flash memory can cause wear problems and possibly premature failures, the alternative to write to an exchangeable SD card will potentially lengthen the lifetime of the panel. An SD card is easy to replace compared to a built-in memory. In addition, the memory size of the SD card is normally much larger than the built-in flash memory.

To set up the SD card database in iX Developer:

1. Open the **Project** tab and select **Settings**.

2. Select **Database** and choose **SD Card** as **Database Location**.

3. Click on the **OK** Button to confirm the new settings.

When the location of the database is changed from flash to SD card (or vice versa) in an existing application, the database will be automatically copied to the new location once the project is transferred to the panel. This will be started immediately after the project transfer has taken place and hence a somewhat slower project start-up time can be noticed.

It is advisable to do a backup of the database in case something happens during the database copy operation.

If during runtime of the panel, the SD card is removed and the chosen location for the database is the SD card, the panel will close the application and attempt to reboot until either an SD card is reinserted into the panel, or a project is downloaded to the panel with the location set to "Hard disk".

Please note that if any scripting has been done towards the database, then these scripts need to be manually adapted to work with the new location (flash or SD card).

If Audit Trail is enabled for the project and if the database is stored on an SD card, the transfer client will not provide the option to keep/remove audit trail in an existing project. It will always keep the audit trail database. If the user wants to clear the audit trail database for the same project, the SD card needs to be inserted into a PC and the audit trail database file needs to be manually deleted.

It is also recommended to track the flash wear status in your iX Developer project.

The following **System Tags** can be used for that purpose:

System Tag	Description
Flash Memory Life Time Used	The usage of the device lifetime (in percent).
Flash Memory EOL Info	Information about the flash memory end of life. The three possible values are: • Normal • Warning - Consumed 80% of reserved block • Urgent

4.1.4.2. General Advice for Writing to Flash

In cases where an SD/SDHC card cannot be used, the advice below will reduce the risk of premature wear out and improve the lifetime of the built-in flash memory.

Remember that a non-working flash memory stops the panel from operating:

• Do not log values with higher accuracy than needed. For example, avoid logging of floating point values.

• Reduce high fluctuating values by using the hysteresis functionality in the connected controller.

• Collect values with high fluctuating values in the same logger and do not mix with stable values. Collect slow changing values in other loggers.

• Do not log with higher refresh rate than needed.

• Disable logging completely when information is not needed, for example when the machine is not running.

• Use the default setting "Log changes only" in the property setting of the Data logger.

• Keep the log size to a minimum, as few rows as needed.

• Avoid extensive file writing when controlling storage via script.

5. Mounting and Installation

5.1. Space Requirements

The following table specifies the necessary free space around the mounted HMI panel.

Max. installation plate thickness (for cutout mounting)	7 mm
Space above and below the HMI panel	100 mm
Space to the left and right of the HMI panel	50 mm
Space behind the HMI panel	100 mm

5.2. Installation Process

⚠ **CAUTION**

- Before installation, ensure that the operating temperature meets the following specifications:
  -10°C to +60°C
- If condensation is present, ensure that the HMI panel is dry before connecting it to the power outlet.
- Ensure that the HMI panel and the controller system have the same electrical grounding (reference voltage level). Otherwise, communication errors may occur.
- Verify that the voltage and polarity of the power source is correct.

There are two recommended methods for mounting the HMI panel:

- Use Method 1 to mount the HMI panel in a cutout.
- Use Method 2 to mount the HMI panel on a VESA mount or other flat surface.

5.2.1. Method 1: Mount the HMI Panel in a Cutout

This section explains how to install the HMI panel in a metal sheet cutout, such as on an electrical cabinet door.

Required tools

- Phillips/slot screwdriver

Mounting instructions

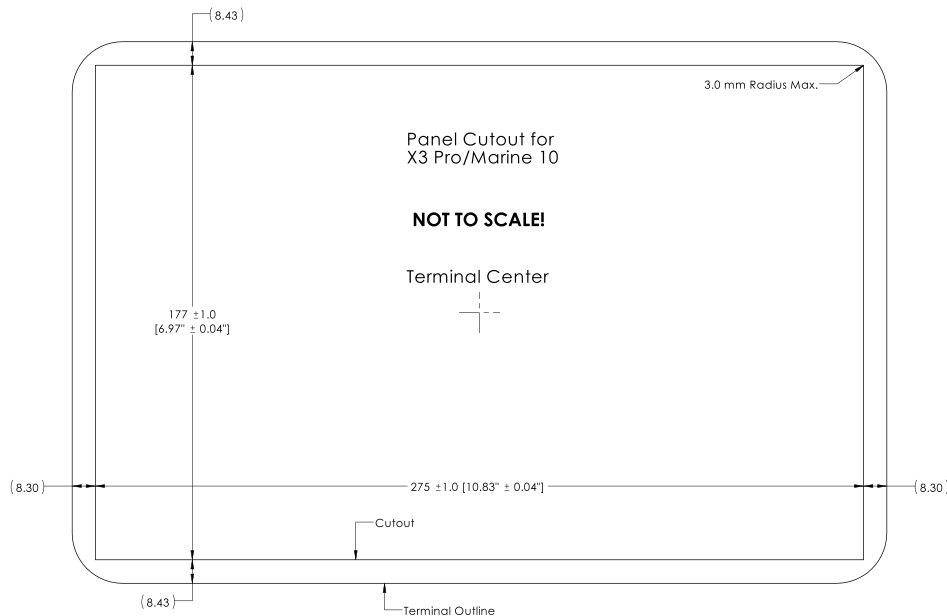1. Unpack and check the delivery. If any damage is found, contact the supplier.

⚠ **CAUTION**
Place the HMI panel on a stable surface during installation. Dropping or allowing the panel to fall may cause damage.

2. Create the cutout for the HMI panel based on the following dimensions:
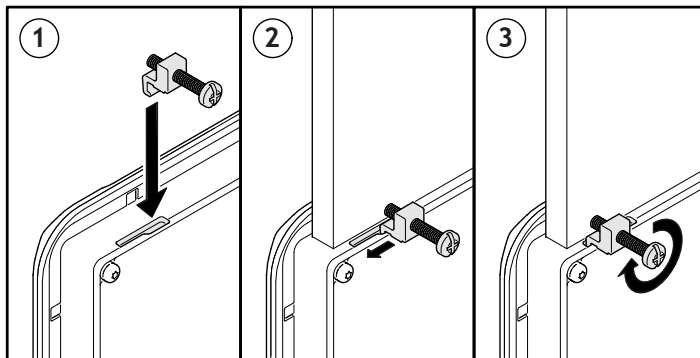   **275 × 177 mm**

> **NOTE**
> The above dimensions are roughly 2 mm larger in both width and height than the actual back cover of the panel.
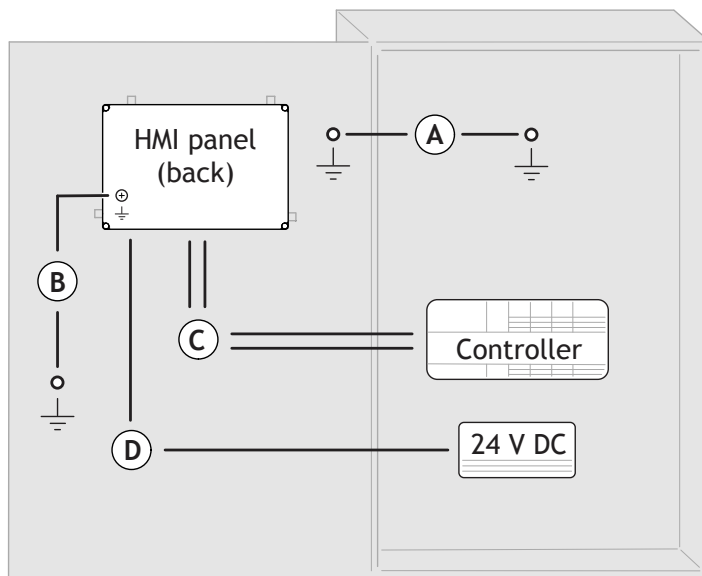
Cutout drawing

Measurements in millimeters [inches]

3. Ensure that the mounting surface of the cutout is smooth and cleaned from any burrs or debris.

4. Place the HMI panel in the cutout.

5. Secure the HMI panel in position, using all the fastening holes and the provided brackets and screws. Tighten the screws to a torque of 0.5 - 1.0 Nm.

6. In cases where the front panel seal (IP54 or greater, NEMA-4X) is critical, use a torque wrench to ensure all screws are tightened to the specified torque.

7. Follow the steps below to connect the cables in the correct order as shown in the drawing:

    a. Connect grounding cable.

    b. Connect grounding cable.

    c. Connect serial and Ethernet cable(s).

    d. Connect power cable.

8. Carefully peel off the protective film covering the HMI panel display to avoid generating static electricity, which could potentially damage the panel.

5.2.2. Method 2: Mount the HMI Panel on a VESA Mount or Other Flat Surface

The following section describes how to install the HMI panel on a VESA mount or a flat surface.

Required tools

- Phillips/slot screwdriver
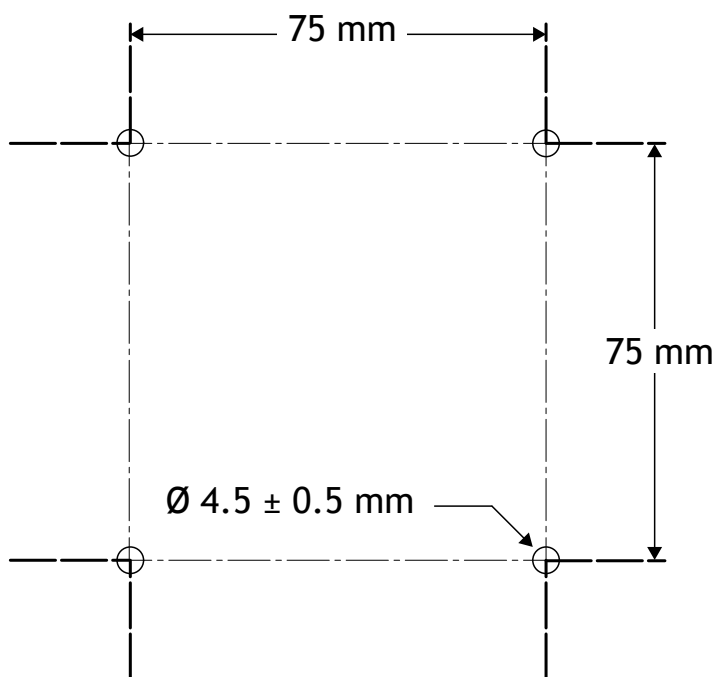- Four M5 × 0.8 screws

Mounting instructions

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

> ⚠ **CAUTION**
>
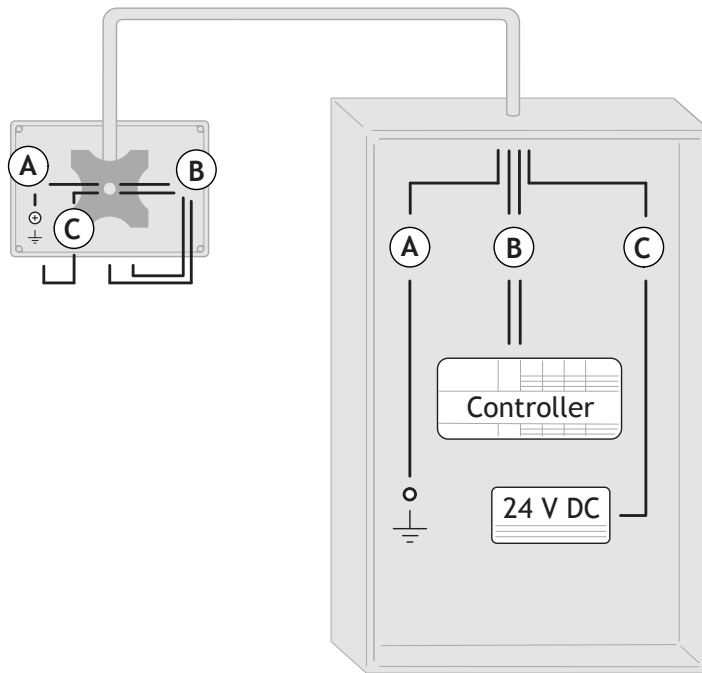> Place the HMI panel on a stable surface during installation. Dropping or allowing the panel to fall may cause damage.

2. Install the unit on a VESA compliant mounting bracket, or drill the correct hole pattern according to the following drawing,

75 mm

75 mm

Ø 4.5 ± 0.5 mm

3. Fasten the HMI panel according to the following specifications.

Measurement	Value
Screw thread type	M4 × 0.7 mm
Screw thread depth	Max. 7 mm
Required engagement	Min. 5 mm
Torque	Max. 3.5 Nm

4. Follow the steps below to connect the cables in the correct order as shown in the drawing:

a. Connect grounding cable.

b. Connect serial and Ethernet cable(s).

c. Connect power cable.

5.2.3. Controller Cabling Requirements

For details on the cables required to connect the HMI panel to the controller, consult the documentation for the corresponding controller's driver.

5.2.4. Other Connections and Peripherals

Ensure that cables, peripheral equipment, and accessories are appropriate for the application and its environment. For additional details or recommendations, consult the supplier.
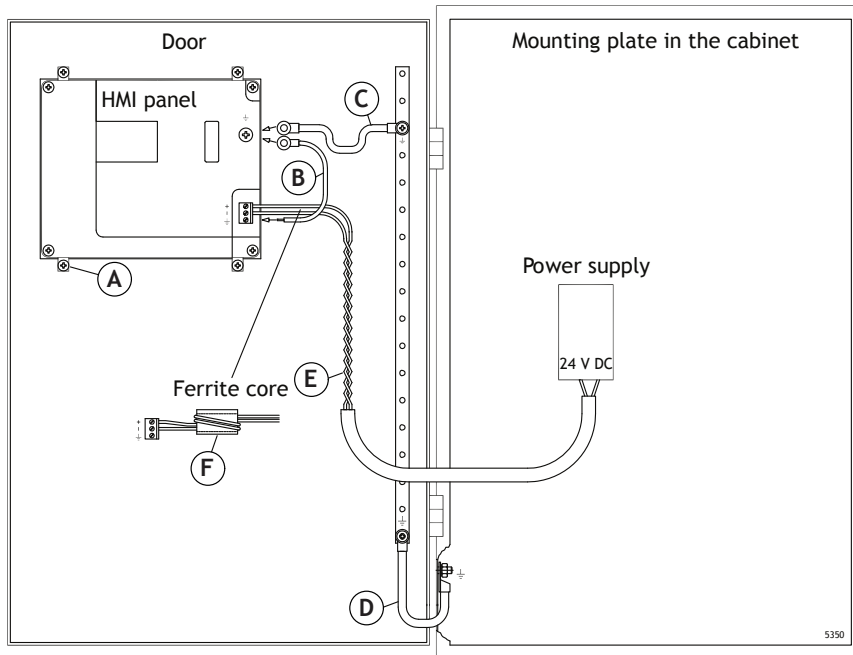
5.3. Additional Installation Tips

For optimal product longevity, operate the device under standard ambient conditions, typically at temperatures between 20°C and 25°C and with low to moderate humidity.

If you experience communication problems or when operating close to temperature limits, the following recommendations are to be noticed.

5.3.1. Ground the HMI Panel

The mounting clamps, **(A)** in the drawing below, do not provide a secure grounding connection between the panel and the device cabinet. The following section describes how to ground the HMI panel correctly.
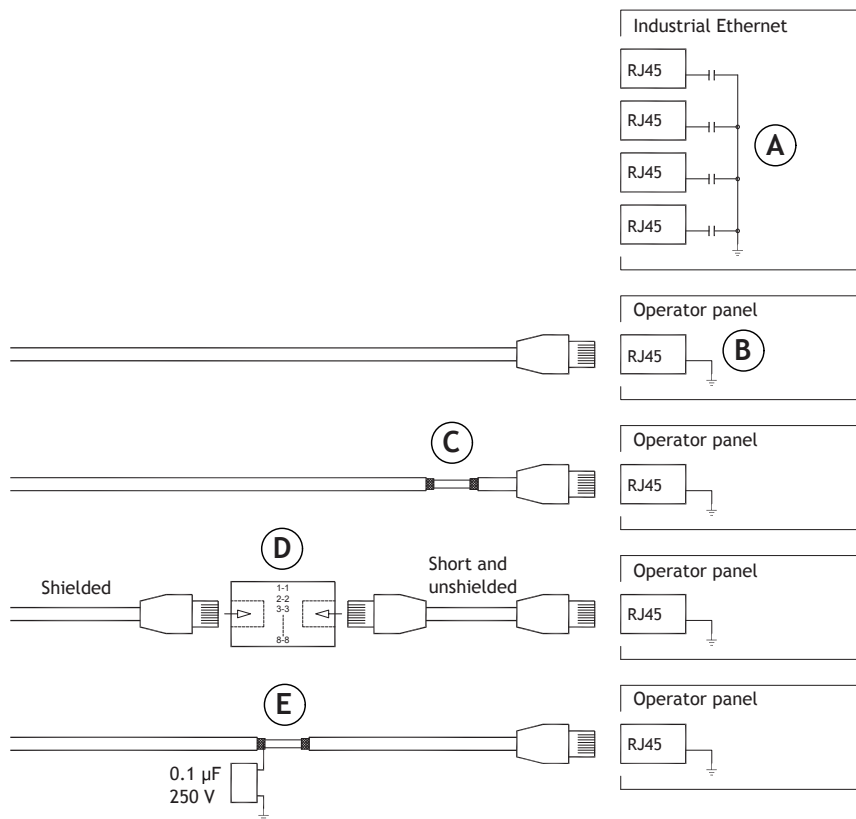
Cable recommendations

- Grounding wires should be short and have a large conductor area. A long, thin grounding wire has high impedance (resistance) at high frequencies and may not effectively direct disturbances to the ground. Multi-wire conductors are better than single-wire conductors of the same area. A braided conductor wire with the same area is even better.

Grounding instructions

1. Connect a wire **(B)**, sized according to local electrical codes, between the quick-connect terminal connector on the HMI panel and the chassis of the panel.

2. Connect a wire or grounding braid **(C)**, sized according to local electrical codes, between the chassis of the HMI panel and the closest grounding point on the door.

3. Connect a strong but short grounding braid **(D)** between the door and the device cabinet.

4. Twist the cables onto the 24 V DC feed **(E)**.

   - 2 turns around the ferrite core **(F)** provide 4 times the suppression of 1 turn.

   - 3 turns around the ferrite core **(F)** provide 9 times the suppression of 1 turn.

5.3.2. Grounding and Shielding Options for Ethernet Cabling

In some industrial Ethernet units, the RJ45 contact's shield may be connected to the chassis via a capacitor **(A)** or directly to the chassis **(B)**. Check whether the shield of the other Ethernet unit is grounded directly or via a capacitor. Connecting shielded Ethernet cabling to the chassis at both ends can create grounding loops and increase communication errors. In some cases, using unshielded cabling might reduce communication errors. Consider the following options:

- Use a shielded Ethernet cable but connect the shield at only one end (recommended).

- Break the shield **(C)**.

- Expand the shielded Ethernet cabling with a section of unshielded Ethernet cable **(D)**.

- Ground the shield via an external 0.1 µF/250 V film capacitor **(E)** to connect high-frequency transients to the ground.

5.3.3. Improve EMC Protection

To improve EMC protection, follow the instructions below:
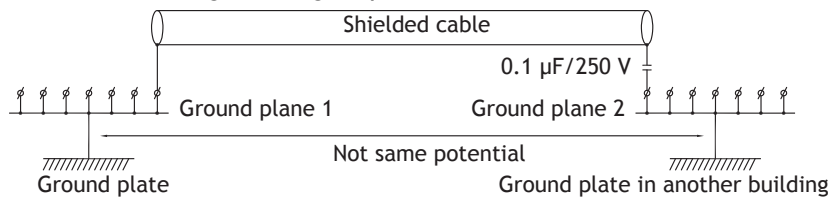
Cable recommendations

- Use original cabling from Beijer Electronics primarily.

- Use shielded cables for RS-232 communication.

- Use twisted pair and shielded cabling for RS-422 and RS-485.

- Use the cabling intended for the bus type; Ethernet, Profibus, CC-Link, CAN, DeviceNet etc.

- Install and connect according to the specifications for the relevant bus standard.

- Use shielded cabling for Ethernet, preferably with foil and a braided shield.

- Shielded D-sub covers are recommended. The shield should be connected to the cover at 360° where the cable enters.

- 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.
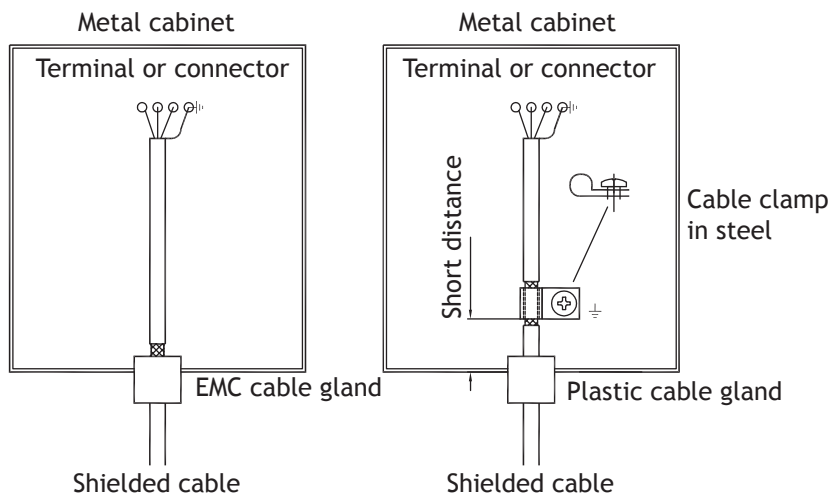
Instructions

1. Connect the shield at both ends.
    For longer distances, there is a risk of different ground potentials. In such cases, connect the shield at one end only. Alternatively, connect the other end of the shield to ground via a 0.1 µF / 250 V film capacitor, see image above. This setup connects both ends to ground in terms of high frequency (HF) while only grounding at one end in terms of low frequency (LF), mitigating the risk of 50/60 Hz grounding loops.

2. 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.
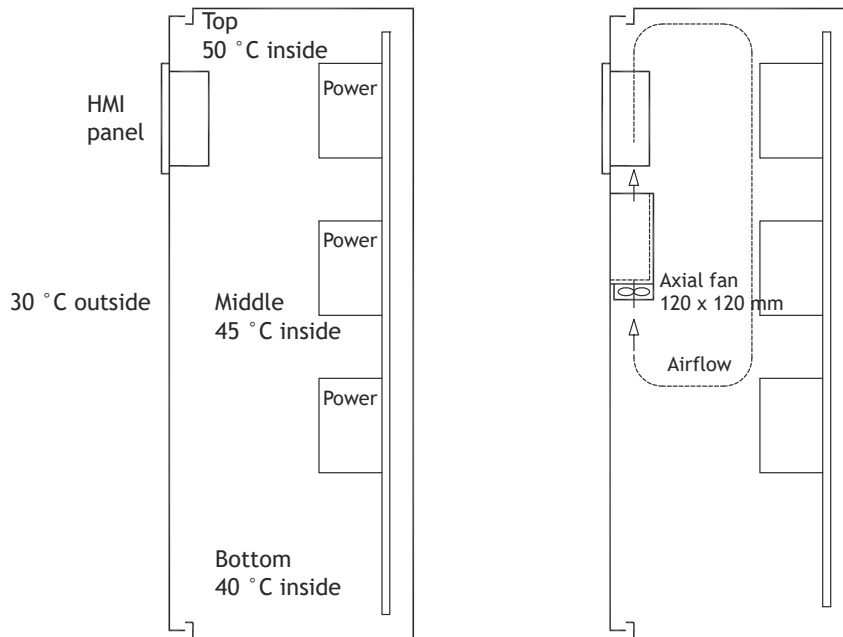

3. Place the 24 V DC and communications cabling in one cable trunk/cable duct and 230/380 V AC in another. If the cables need to be crossed, cross them at 90° only. Avoid combining the cabling for stronger 24 V DC outputs with the communication cabling.

5.3.4. Ambient Temperature

> **IMPORTANT**
> Ensure that the temperature inside the cabinet does not exceed the maximum ambient operating temperature specified.

Ambient temperature is the temperature inside the cabinet that cools the HMI panel's electronics. Refer to the specifications for the maximum ambient temperature of the HMI panel.

Other heat-generating devices can affect this temperature. In many cases, the ambient temperature around the HMI panel can be significantly higher than the cabinet's ambient temperature.

If the cabinet is tall and contains several heat-generating devices, the temperature at the top of the cabinet may rise considerably. Electronic components are sensitive to heat. For example, an 8-10°C temperature increase can halve the lifespan of an electrolytic capacitor, and a 15-20°C increase can reduce its lifespan to a quarter.

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

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

> **TIP**
> *Rittal* has a good program for estimating the anticipated average temperature in the cabinet, and another program for controlling the cabinet temperature.

5.3.4.1. Install a Fan

Installing a fan inside the cabinet helps distribute the temperature evenly and enhances cooling.
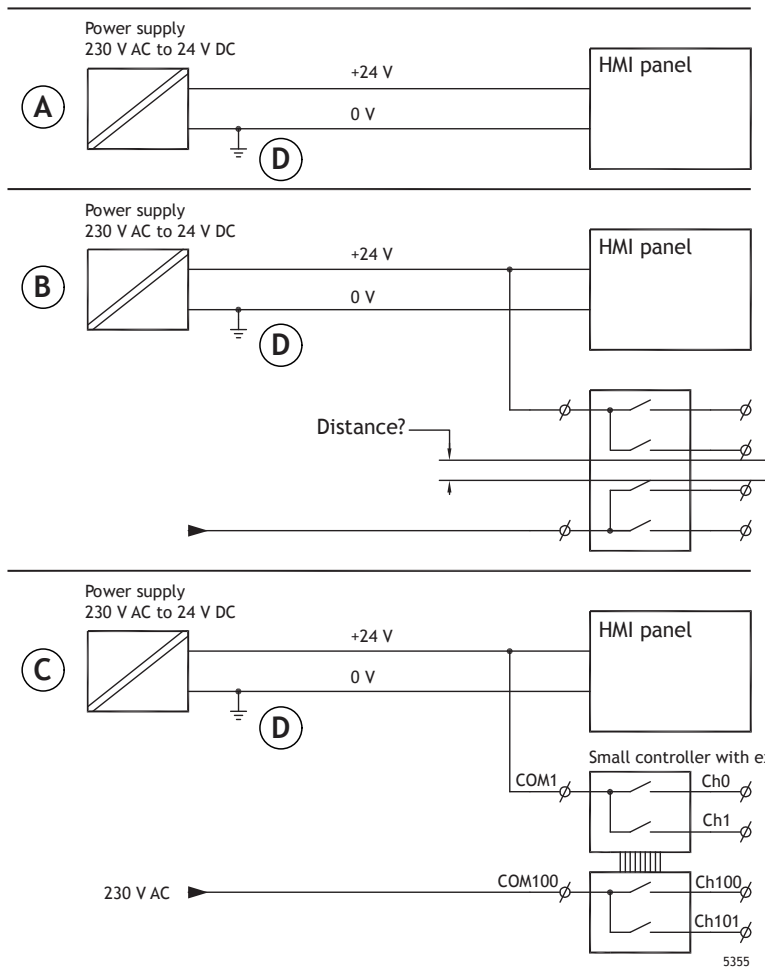
Installation recommendations

• Position the fan in a cooler area to blow cold air onto the HMI panel.

• Do not mount the fan at the top, where it will draw in warm air. This can shorten the fan's lifespan.

5.3.5. Power Supply Safety

> **WARNING**
> Ensure that the power supply meets the current safety standards.

5.3.5.1. Power Supply for Single Unit

If the power supply is dedicated solely to the HMI panel, see section **(A)** in the drawing above.

5.3.5.2. Power Supply for Multiple Units

⚠️ **WARNING**

Verify that the power supply meets SELV (Safety Extra Low Voltage) requirements according to EN 60950 (protection against electric shock) or UL 950.

If the power supply is powering multiple units, see section **(B)** in the drawing above. Verify that the clearances and creepage distances between 24 V DC and 230 V AC fulfill **EN 60950** or **UL 950**. The HMI panel lacks insulation to handle potential short circuits between 230 V AC and 24 V DC. Mixing 24 V relay contacts with 230 V AC relay contacts in a smaller controller can damage the panel.

If the power supply does not meet these standards, use a separate 24 V unit for the HMI panel. An exception is possible if there is significant separation between 24 V DC and 230 V AC relay contacts, allowing a single 24 V unit to safely power all feeds, see section **(C)** in the drawing above.
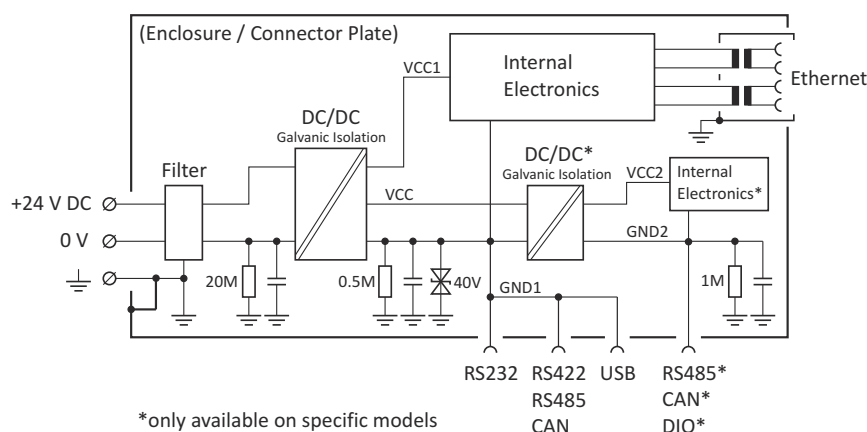
5.3.5.3. Grounding

Connect the 0 V of the 24 V power supply to the ground, shown as **(D)** in the drawing above. This provides the following benefits:

- Increases safety by ensuring the 24 V power supply is not live in case of a fault or short circuit between 0 V (24 V) and 230 V phase.

- Transients on the 24 V feed are directed to the ground.

- Reduces the risk of the 24 V feed being at a high potential relative to the ground, which can occur due to static electricity.

5.3.6. Galvanic Isolation

The HMI panel provides galvanic isolation from the 24 V DC power supply but lacks galvanic isolation between the communication ports for RS-232, RS-422, RS-485, and USB. Only the Ethernet connection is galvanically isolated.
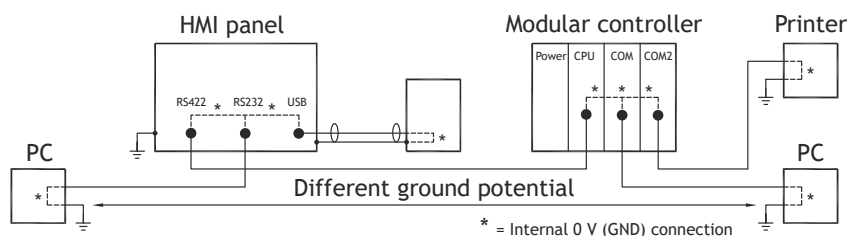

When connecting a PC to the HMI panel, the internal 0 V (GND) of the panel connects to the protective ground through the PC. Many USB devices also connect their shields to the protective ground. In the drawing below, the 0 V (GND) of the HMI panel is linked to the protective ground when a USB memory stick, keyboard, or similar device is plugged in.

⚠ **CAUTION**

Connecting multiple units with both 0 V and ground connections to different grounding points poses a risk. Grounding currents may flow through communication cables, the controller's rear plate, and internally within the HMI panel, potentially causing errors.

5.3.6.1. External Units for Galvanic Isolation

External units can enhance communication and provide galvanic isolation. However, this solution might introduce other issues when interfacing with other devices. It is essential to carefully assess compatibility to avoid unforeseen problems.

> **⚠ IMPORTANT**
>
> Ensure that the 24 V feed in the external insulation unit is not connected to any communication outlets. Inadequate insulation against the 24 V feed can cause disturbances and grounding currents from the 0 V on the 24 V side, disrupting communication.

> **💡 TIP**
>
> *Westermo* offers reliable industry-standard insulators that are also insulated from the 24 V DC feed.

5.3.7. RS-485 Communication

For optimal performance in maximum transfer distance and speed, use shielded and twisted pair cables for RS-485 communication. The mutual capacitance should not exceed 52.5 pF/m, and the cable cross-sectional area should be at least 0.25 mm² (AWG 24).

Include the 0 V reference voltage for communication in the cabling. For two-way communication, use two pairs of wires: one pair for communication and one pair for 0 V.

Ground the shield at one end of the cable. Typically, the other end is also grounded. For longer distances or when ground potentials differ, connect the shield to the ground through a 0.1 µF / 250 V film capacitor to prevent ground currents in the shield. Some manufacturers recommend grounding the shield at each node. Consult the specific guidelines from bus termination system manufacturers as they may vary.

Depending on the design of the recipients, the bus wires may need to be at the same level or require pull-up or pull-down resistors to ensure no faulty signals are detected when the bus is idle (all transmitters are disconnected).

5.3.8. Image Sticking

When utilizing TFT LCD HMI panels in applications where a fixed or partially fixed image remains displayed on the screen for extended periods of time, users may experience a phenomenon referred to by the LCD industry as **Image Sticking**. Image sticking, sometimes also called "image retention" or "ghosting", is a phenomenon where a faint outline of a previously displayed image remains visible on the screen when the image is changed.

Potential causes of image sticking:

- Static images.
- No screensaver.
- Sharp contrast transition (e.g. black/white).
- High ambient temperatures.

Strategies for preventing or minimizing image sticking:

- Use the screensaver functionality.
- Changing constantly between static and dynamic images.
- Avoid excessive brightness differences between foreground and background elements.
- Use colors with similar brightness.
- Use complementary colors in follow-up images.

6. Service and Maintenance

> ⚠️ **WARNING**
> **Read before service or maintenance:**
>
> • Repairs must be performed by qualified personnel only.
>
> • The agreed warranty applies.
>
> • Before conducting any service, maintenance or cleaning, disconnect the equipment from the electrical supply.

6.1. Service Warnings

OS3 1.0 does not include any service warnings.

6.2. Clean the Display

Cleaning recommendations

• Regularly wipe off dust using a dry, clean cloth.

• Use alcohol or ammonia-based cleaning agents only when necessary. Follow manufacturers' instructions for other solvents. Ammonia-based glass cleaners (5-10% ammonia) or 75% alcohol are suitable for cleaning PCAP and resistive touch panels.
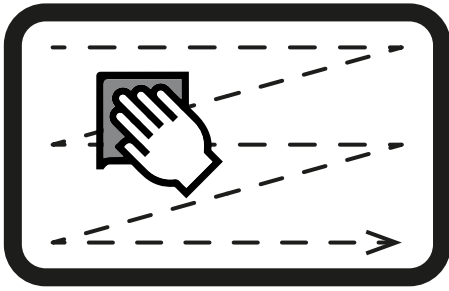
> ⚠️ **CAUTION**
> Do not mix bleach and ammonia, as this may result in a dangerous chemical reaction.

• Cleaning agents with bleach, alcohol, or ammonia can be corrosive to touch panel coatings and ITO film. Do not leave the agent on the surface for more than 2 minutes and ensure all residue is removed.

• Avoid using sharp tools for cleaning.

• Do not use air guns, water jets, or steam to clean the touch screen, as these can damage its functionality.

• Immediately clean any spills of condiments, food, or drinks from the touchscreen surface.

• Prevent moisture from seeping through the cable connection area during cleaning.

Cleaning instructions with cleaning agents

1. Apply cleaning agent (alcohol, bleach, or glass cleaner) to a clean cloth. Make sure the cloth is well saturated. Do not spray the cleaning solution directly onto the display.

2. Wipe the touch panel surface in a "Z" motion.

3. Dry the panel thoroughly with a dry cloth, removing as much of the cleaning solution as possible.

6.3. Air Bubbles in Touch Screen

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

6.4. Replace the Battery

The battery must be replaced by an authorized Beijer Electronics service center.

7. Dismantling and Disposal

- Recycle the HMI panel and parts of it according to local regulations.
- The following components contain substances that might be hazardous to health and the environment: lithium battery, electrolytic capacitor, and display.

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