XC-152
Compact Controller

Powering Business Worldwide

Break-Down Service
Please call your local representative:
http://eaton.eu/aftersales
or
Hotline After Sales Service:
+49 (0) 180 5 223822 (de, en)
AfterSalesEGBonn@eaton.com

Original operating manual
The German-language edition of this document is the original operating manual.

Translation of the original operating manual
All editions of this document other than those in German language are translations of the original operating manual.

2nd. edition 2017
for further editions see list of revisions

Editorial editing:Antje Panten-Nonnen
Translation:GLOBALDOCS GmbH, Düsseldorf

Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (AWA/IL) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).

Table of Contents

0 About this manual

This manual contains all the information you will need in order to use the XV300 safely and effectively. The XC-152 manual is considered an integral part of the devices and must always be readily available in their close proximity so that users have access to it.

This manual describes all of the devices' lifecycle stages: transportation, installation, commissioning, operation, maintenance, storage, and disposal. It assumes you have electrical engineering knowledge and skills.

It does not, however, go over the corresponding operating system or application software.

Please send any comments, recommendations, and suggestions concerning this document to: AfterSalesEGBonn@eaton.com

0.1 Target group

This manual is intended for engineers, electricians, and automation technicians. Electrical engineering and physics-related knowledge and skills, as well as advanced familiarity with the field bus being used, will be required in order to be able to commission the corresponding devices.
In addition, readers must be familiar with how to use the SmartWire-DT system.

CAUTION

Installation requires qualified electrician

0.2 List of revisions

The following table only lists major modifications.

Publication date	Page	Keyword	New	Modification
01/2013		New edition	✓	
12/2014		expansion	✓	
05/2017		Revision, Marine approvals, SWD	✓	✓

0.3 Documents with additional information

For more information on the operating system and application software, as well as on additional devices and modules, please refer to the following documents:

- Installation instructions XC-152 IL05003006Z
- User manual XSOFT-CODESYS 2 MN05003007Z
  PLC programming XC-152
  (explains how to use the XSoft-CoDeSys-2 programming tool and the PLC runtime system for the XC-152 device model with Windows CE)
- User Manual XSOFT-CODESYS 3 MN048008ZU,
  PLC programming

The following documents may also be helpful in relation to the use of this device:

- System Description Windows CE MN05010007Z
  (operation of the Windows CE operating system on touch displays)
- Networks in Brief MN05010009Z
  (information on networks in general and on how to integrate PCs and touch displays in networks)

In addition to the information in this document, you will also need the information in the following documents in order to set up a SWD- network and install and operate it using the SWD- master.

- Manual SmartWire-DT The SystemMN05006002
  (system description, engineering, installation, commissioning, and diagnostics for a SWD network)
- Manual SWD- modules (IP20) MN05006002Z
  Manual SWD- Modules IP67MN120006
  (setup, engineering, installation, etc. for the individual SWD modules)

The SWD-Assist planning and ordering program can be extremely useful when planning and configuring an SWD- network in terms of hardware and software.
SWD-Assist is available for download free of charge at Eaton's website.

The aforementioned documents, as well as the manual you are reading right now, can also be downloaded free of charge in PDF format at:
http://www.eaton.eu/doc

→ Enter the document number ("IL05003006Z" or "MN05003007Z", for example) or "XC-152" into the Quick Search text field.

For the latest information on the product, please visit the Automation, Control & Visualization section at:
http://www.eaton.eu/xc-152

Eaton Online Catalog

Enter "XC-152" into the search box and the catalog will take you directly to the corresponding product group in the Automation, Control and visualization section.
http://www.eaton.eu/ecat

0.4 Reading conventions

Symbols used in this manual have the following meanings:

▶ Indicates instructions to be followed.

0.4.1 Hazard warnings of material damages

NOTICE

Warns about the possibility of material damage.

0.4.2 Hazard warnings of personal injury

CAUTION

Warns of the possibility of hazardous situations that may possibly cause slight injury.

WARNING

Warns of the possibility of hazardous situations that could result in serious injury or even death.

DANGER

Warns of hazardous situations that result in serious injury or death.

0.4.3 Tips

Indicates useful tips.

1 Description

1.1 Function

XC-152 Compact Controllers are programmable logic control (PLC) systems with field bus interfaces.
With their computing power, SmartWire-DT interface, and a broad range of additional interfaces, XC-152 Compact Controllers make it possible to implement cost-effective solutions for automation tasks.

An important feature is their ability to be integrated in modern communication concepts. Data exchange via the Ethernet interface to OPC clients or the integrated WEB servers enables the creation of innovative solutions.
The compact PLCs combine PC performance with a range of communication interfaces.

1.1.1 Features

- 24 V DC power supply
- RUN/STOP switch and LED displays
- OPC Server
- Web-server
- Remote Server
- OS: Windows CE 5.0 (License incl.)
- Processor: RISC CPU, 32 bit, 400 MHz
- Program, data, and retentive tag memory:
  Application: 64 MB / Flags: 4 KB / Retentive data: 32 KB
- External memory: 1 SD memory card slot
- Programming: CODESYS
- Target visualization: GALILEO/CODESYS (remote visualization capabilities)
- Communication interfaces
  USB (USB device 2.0, USB host 2.0)
  10/100 Mbps Ethernet port

1.1.2 Options

- Additional communication interfaces depending on the specific model: SmartWire-DT, RS232, RS485, PROFIBUS/MPI, and CAN

1.1.3 SWD coordinator special feature

XC-152-E... devices featuring the optional SmartWire-DT interface can be used as SWD coordinators for Lean Automation.

SmartWire-DT can prove to be invaluable when implementing Eaton's Lean Automation concept, which, as part of the company's Lean Solution approach, offers several significant advantages. More specifically, SmartWire-DT integrates the I/O level directly into the switchgear being used, enabling a PLC to use SmartWire-DT to directly access digital and analog data from control circuit devices all the way to circuit-breakers. This eliminates the need for a separate gateway and I/O layer, reducing the number of components and engineering work and enabling users to create flexible, yet streamlined automation solutions. Eaton calls this concept Lean Automation, and uses it to provide users in the machine building and plant engineering industries with unparalleled freedom so that they can design creative and profitable solutions.

1.2 Intended use

XC-152 compact PLCs are used primarily in machine and system building applications. They are intended exclusively for operating and controlling machines and systems.
The device is designed to be flush mounted in control cabinets, control panels, or control consoles.

Any other use must be discussed and agreed upon with the manufacturer in advance.

XC-152 compact PLCs are approved for use in closed spaces.

WARNING

The XC-152 must be used only in locations for which the XC-152 is approved. Make sure to read and follow the information and labels on the nameplate, as well as section Approvals and declarations in the appendix.

WARNING

It is strictly prohibited to use the XC-152 in order to implement safety-relevant functions (in the sense of personal and machine protection).

1.3 Part numbers

In addition to a number of basic interfaces, XC-152 compact PLCs feature additional communication interfaces in the form of external connectors.

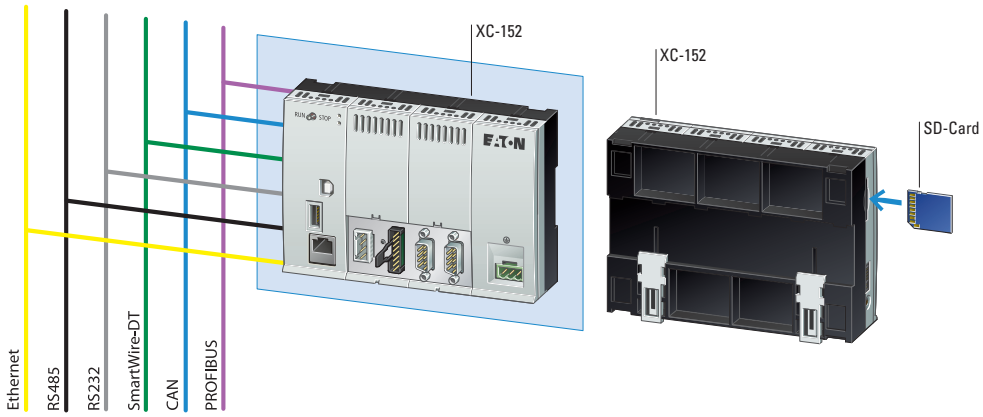


Figure 1: Overview of external connectors in the Compact PLC XC-152 (1) and external memory: SD memory card (2)

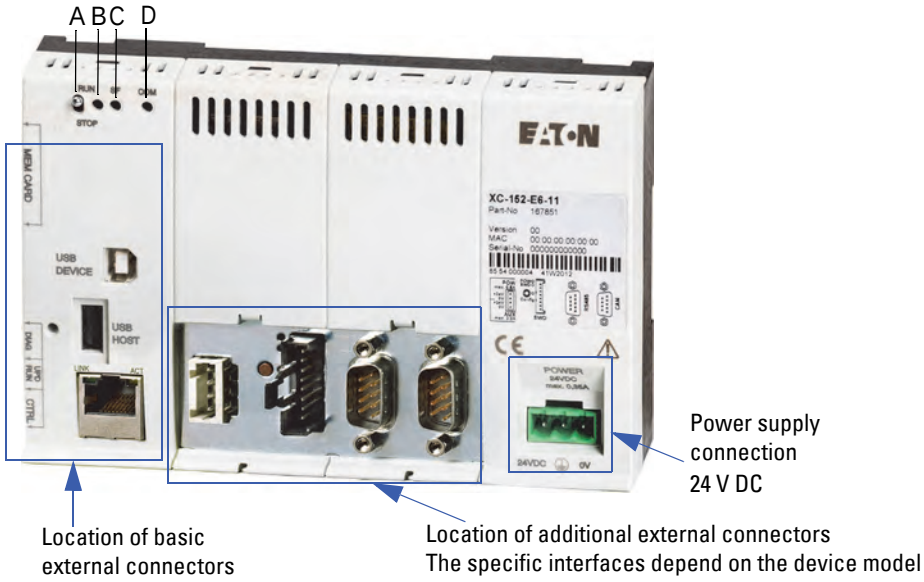
The following table provides an overview of the configurations for the available device models:

Basic interfaces				Additional integrated interfaces					Type	Article no.
1 x Memory card	1 x Ethernet 10/100 Mbps	1 x USB device 2.0	1 x USB host 2.0	1 x RS232	1 x RS485	1 x CANopen®/easyNet	1 x PROFIBUS/MPI	1 x SmartWire-DT		
✓	✓	✓	✓	✓	-	-	-	✓	XC-152-E3-11	167850
✓	✓	✓	✓	-	✓	✓	-	✓	XC-152-E6-11	167851
✓	✓	✓	✓	-	✓	-	✓	✓	XC-152-E8-11	167852
✓	✓	✓	✓	✓	✓	✓	-	-	XC-152-D6-11	167855
✓	✓	✓	✓	✓	✓	-	✓	-	XC-152-D8-11	167849

1.4 Operator control and display elements

1.5 Front

In addition to its external connectors, the device has the following operator control and display elements in the front:



Operator control and display elements		Function
A	RUN/STOP switch	Used to switch between the following PLC program operating modes: RUN (warm start): When the PLC program starts, the retentive (RETAIN, RETAIN PERSISTENT) tags in the PLC program will maintain their current values. If the PLC program is being started for the first time, a cold start will be triggered even if this mode is selected. STOP (cold start): Before the PLC program is started, all the tags in the PLC program will be set to their initialization values.
B	RUN/STOP LED	Lights up when the device is powered. Indicates whether the PLC program is running → Page 65
Cc	SF-LED	This LED is used to indicate various device and software statuses → Page 65
D	COM-LED	Lights up green when data is being transmitted via the CAN or Profibus interface. Other LED states → Page 65

1.6 Service side

The device features the following controls on the service side:

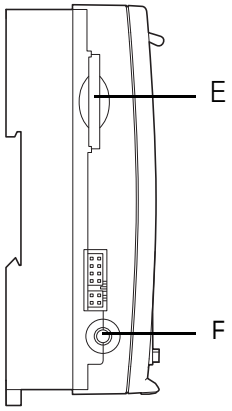


Figure 2: Operator Controls on service side

Element		Function
E	MEM CARD-Slot	Memory card (SD card) slot
F	CTRL button	Used to force the device to start with the DHCP function: If the CTRL button is held down while the device is being powered up (until the SF LED lights up green), the device will obtain an IP address via DHCP. If the CTRL button is then held down for 5 seconds (until the SF LED flashes green), the device will be assigned IP address 192.168.1.1 temporarily. In this mode, the Autoexec.bat, Autoexec.reg, and Autoexec.bmp files will not be executed. If the operating system on the memory card is invalid or is not found there to begin with (COM LED flashing red or orange), the CTRL button can be pressed in order to boot up with the internal operating system.

1.7 Accessory devices

A variety of accessories are available for Compact Controllers, for example

article no.	Type	
256487	XT-CAT5-X-2	Ethernet cross cable, 2m
256488	XT-CAT5-X-5	Ethernet cross cable, 5m
061360	ZB4-101-GF1	Fixing bracket for easy500, 700, 800, EC4P, ES4P, easy200, MFD-CP8/CP10, XC-152
181638	MEMORY-SD-A2-S	SD memory card with min. 1 GB without operating system
139807	MEMORY-SD-A1-S	SD memory card with min. 256 MByte without operating system

NOTICE

Only use original accessories.
Order accessories through your supplier or through the Eaton online catalog www.eaton.eu/ecat

1.8 Nameplate

The device has a nameplate on rear. This nameplate makes it possible to identify the device and includes the following information:

- Manufacturer
- Part number
- Article no.
- version
- Date of manufacture (Week/Year)
- Required power supply
- Serial no.
- Type approval and certification marks and information
- Layout of ports/interfaces and controls
- Permissible mounting options (top edge «Top»)

1.9 Support

In the unlikely event that you run into a problem with your device, please contact your local sales office or Eaton After-Sales Service for service and warranty questions. When you call, please have the following information ready:

- The exact part No.
  (see the information on the nameplate, article No. (Part No. or Art. No.))
- The date of purchase, serial number (Serial No.)
- A detailed description of the problem

Information concerning the guarantee can be found in the Terms and Conditions Eaton Industries GmbH.

24-hour hotline: +49 (0) 180 5 223 822
e-mail: AfterSalesEGBonn@Eaton.com

1.10 Marine approvals

Obtained type approvals

XC-152 compact PLCs have been granted the required shipping classification by Det Norsk Veritas / Germanischer Loyd (DNV GL)

- DNVGL-CG-0339 type approval, November 2015 edition, "Environmental test specification for electrical, electronic and programmable equipment and systems"
  Certificate No.: TAA00000NC

Location classes

temperature	B	Ambient air temperature: 0°C to + 55°C
Humidity	B	Relative humidity up to 100 % at all relevant temperatures.
Vibration	A	Bulkheads, beams, deck, bridge, acceleration amplitude: 0.7 g
emc	B*	All locations (including bridge and open deck)
Input		Required protection according to DNV-GL Rules shall be provided upon installation on board

* Filters / Ferrites maybe required to fulfil. See installation restrictions

Installation restrictions

- Install and commission referring to XC-152 manuals
- Screened communication cables improve EMC behavior
- PE connection of communication cables improve EMC behavior (e.g. earth-connection kit: EATON ZB4-102-KS1)

Location class	External connector	Installation
EMC B	Power Supply	Place noise filter
	Ethernet	Place the ferrite core or snap-together ferrites at a max. distance of 20 cm from the external device plug.
	SWD communication	
	SWD power supply	
	RS485	
	RS232	

→ Section "3.2 Conditions for marine approval (DNV GL)", page 26
→ Section "3.2.1 Radio interference suppression filter for the 24 V DC supply", page 27
→ Section "3.3.2 Screening the communication cables used", page 30

2 Safety regulations

2.1 Basics

The device has been designed according to the state of the art and all generally accepted safety rules and standards. However, this alone cannot eliminate all potential hazards, which is why it is necessary for you to be aware of all hazards and residual risks.

Do not run the device unless it is in perfect technical condition. Make sure to always operate it as specified in this document and for the intended purpose.

WARNING

The XC-152 must be used only in locations for which the XC-152 is approved. Make sure to read and follow the information and labels on the nameplate, as well as section Approvals and declarations in the appendix.

WARNING

It is strictly prohibited to use the device in order to implement safety-relevant functions (in the sense of personal and machine protection).

NOTICE

Follow the safety instructions for the XC-152!
The section on safety instructions must be read and understood by everyone who will be working with the Compact Controller before the actual work is performed.

NOTICE

Pay attention to the hazard severity levels used throughout this documentation whenever a hazard is indicated. The hazard symbol and signal word used and the corresponding text will provide information regarding the specific hazard and how to avoid or prevent it.

2.2 Mandatory requirements, personnel requirements

2.2.1 Occupational safety

All generally accepted occupational health and safety rules and standards (internal and national) must be complied with, as must be all applicable laws and regulations in the relevant country.

2.2.2 Personnel qualifications

The personnel responsible for installation, operation, maintenance, and repairs must have the necessary qualifications for the work they will be performing. They must be appropriately trained and/or briefed and be informed of all hazards and risks associated with the device.

2.2.3 Device documentation

This manual is considered an integral part of the Compact PLC XC-152 and must always be readily available in the device's close proximity so that users have access to it.

Additional parts of the documentation and information, including the installation instructions, can be found at the Eaton Download Center - Documentation and at the product pages on the Internet.

http://www.eaton.eu/doc
http://www.eaton.eu/xc-152

WARNING

INCOMPLETE OPERATOR MANUAL COPIES.

Working with individual pages taken out from the operator manual may lead to bodily injury and property damage due to missing safety information.

▶ Always work with the full document.

2.2.4 Prerequisites for proper operation

In order for the device to be able to meet the contractually stipulated terms, the following must be observed:

- Only qualified personnel should be allowed to work with the device.
- The personnel working with the device must have read the manual and must follow all the instructions in it.
- The ambient conditions stated must be observed.
- Maintenance work must be carried out correctly.
- Potentially explosive atmosphere, Zone 22:
  The ground resistance of accessible metal parts must be less than 10^9 Ohm.

Please note that we assume no liability for damages, consequential damages, and/or accidents caused by the following:

- Failure to follow any applicable occupational health and safety rules, standards, and/or regulations
- Device failures or function disturbances
- Improper use and/or handling
- Not following the instructions or observing the information in the documentation for the device
- Alterations, changes, and repairs to the device

2.3 Device-specific hazards

DANGER

EXPLOSION HAZARD

Death, serious injury, and property damage may occur if the device is being used in a potentially explosive (classified) location and, during operation, an electrical plug-in connection is disconnected or the device is exposed to dangerous impacts or other types of dangerous mechanical shock.

▶ Use the device in the following environments only:

- Non-hazardous (non-explosive) areas
- Potentially explosive atmosphere, Zone 22 (according to ATEX Directive)

▶ Do not expose the device to any dangerous impacts or other types of dangerous mechanical shock!

▶ Do not operate the device in hazardous (classified) locations unless it is mounted correctly!

▶ De-energize the device before disconnecting plug-in connections!

DANGER

EXPLOSION HAZARD LITHIUM BATTERY

The lithium battery inside the device may explode if handled incorrectly.

▶ Dispose of the device properly.

CAUTION

The voltage being applied must meet the requirements for safety extra-low voltages (SELV) set forth in IEC 60950.
Pay attention to the polarity!
The device should only be run with this functional extra-low voltage with protective separation.
The power transformer must meet all applicable standards.

CAUTION
DESTRUCTION

The device should only be opened by the manufacturer or by an authorized repair center. Operate the device until only with the enclosure fully closed and sealed.

CAUTION
ELECTROSTATIC DISCHARGE

Do not touch components (e.g., connector pins) that are electrostatic-sensitive.

- ▶ Discharge (by touching a grounded metal object) any static charge accumulated in your body before touching the device.

Electrostatic discharges may damage or ruin assembly parts. Because of this, it is necessary to take precautions whenever handling the cards.
Please refer to the guidelines for electrostatic-sensitive components for more information (ESD guidelines).

CAUTION
INTERFERENCES

The values specified in the technical data, as well as the device's electromagnetic compatibility (EMC), cannot be guaranteed if the following are used: unsuitable cables, improperly assembled and terminated cables, and/or wiring that does not conform to the applicable standards. Only use cables assembled and terminated by professionals.

The cables being used must be assembled and terminated as required by the port/interface description in this document. When wiring the devices, follow all instructions regarding how to wire the corresponding port/interface.
All general Directives and standards must be complied with.

CAUTION
INTERFERENCES

Screw all plug-in connections or lock them into place in order to improve screening.
Signal cables must not be routed in the same cable duct with power cables.
Before putting the system into operation, check all cable connections to make sure that everything has been wired properly. Make sure that all voltages and signals have the required values as specified in the technical data.

DANGER
STRAY CURRENTS

Large equalizing currents between the functional earthing system and the ground system of different devices may result in fire or in malfunctions due to signal interference.

▶ If necessary, route an equipotential bonding conductor, with a cross-sectional area that is several times larger than that of the cable shielding, parallel to the cable.

CAUTION
NON-GALVANICALLY-ISOLATED INTERFACES

The device may be damaged by potential differences.

▶ The GND terminals of all bus modules must be connected.

▶ Do not connect the connector to the device or disconnect it without first de-energizing the system.

CAUTION
DATA LOSS

If the SD card is being written to and a voltage drop occurs or the card is removed, data may be lost or the SD card may be ruined.

▶ Insert the SD card only when the device is de-energized.

Avoid writing to SD cards. Reasons:

- SD cards have a limited number of write cycles.
- If there is a voltage drop while a write operation is in progress, data loss is highly likely to occur.

▶ Remove the SD card only when the device is de-energized.

▶ Before switching off the device, make sure that there are no programs writing to the SD card.

CAUTION
SHORT-CIRCUIT HAZARD

If the device is or has been exposed to environmental fluctuations (ambient temperature, air humidity), condensation may form on or inside it. As long as this condensation is present, there will be a short-circuit hazard.
Do not switch on the device when it has condensation in or on it.
If the device has condensation in or on it, or if the panel has been exposed to environmental fluctuations, let the panel settle into the existing ambient temperature before switching it on. Do not expose the device to direct thermal radiation from heating appliances.

CAUTION
UV LIGHT

Plastics will become brittle when exposed to UV light.
This artificial aging will reduce the device's lifespan. Protect the device from direct sunlight and other sources of UV radiation.

CAUTION
POINTY, SHARP OBJECTS AND CORROSIVE LIQUIDS

Do not use any pointy or sharp objects (e.g., knives) for cleaning. Do not use aggressive or abrasive cleaning products or solvents.

Make sure that no liquids get into the device (short-circuit hazard) and that the device is not damaged in any way.

CAUTION

When using commercially available peripheral devices (e.g., with the USB port), it is important to keep in mind that their EMC interference immunity parameters may render them unsuitable for use in industrial environments.
The USB ports (USB host and USB device) on the device unit are meant for maintenance work only.

CAUTION
FORCES ON THE ETHERNET INTERFACE

Communications may be affected, and the connection's mechanical components may be damaged, if the Ethernet interface is subjected to strong vibrations or the RJ45 plug-in connection is subjected to pulling.

- ▶ Protect the RJ45 plug-in connection from strong vibrations.
- ▶ Protect the RJ45 plug-in connection from tensile forces at the socket.

WARNING

The devices are products designed for use in industrial environments as defined in ICE/EN 6100–6-4. These products can cause radio interference in domestic environments. In this case, the party operating the products must implement appropriate radio interference suppression measures.

CAUTION

Installation requires qualified electrician.

NOTICE

Arrange for an electrician to put together the cables for the power supply and the external connectors.

3 Installation

CAUTION

Installation requires qualified electrician.

NOTICE

Arrange for an electrician to put together the cables for the power supply and the external connectors.

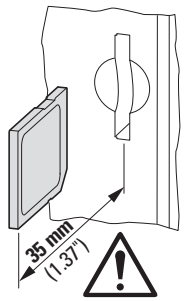
3.1 Prerequisites for the location of use

The device must be used exclusively in locations for which the compact PLC has been approved/certified.
A 24V DC power supply that conforms to specifications must be provided.

3.1.1 Installation position

The following must be taken into account when selecting the installation position:

- If you will be using the device in a hazardous (explosive) location, make sure it is not exposed to any dangerous impacts or other types of dangerous mechanical shock.
- It must be ensured that the controls on the device's service side, as well as all cable connectors, remain accessible once the device has been installed.
- The devices can be installed in a horizontal or vertical position.
  If the device is used with an SD card, it must not be installed with the MEM CARD slot facing downwards, as the SD card may fall out.



→ The MEM CARD slot is located on the side of the device.
Make sure to take the space required to remove the SD circuit card into account.

3.1.1.1 temperatures

- ▶ Do not let the device overheat.
- ▶ Do not expose the device to direct sunlight or other sources of heat.

The environmental ambient conditions for operation must not exceed the specified values.

3.1.1.2 Aeration and de-aeration

▶ Do not block the ventilation openings when mounting the device.

The XC-152 uses natural convection-based passive cooling, i.e., it does not use fans.

▶ Make sure that there will be enough volume for air changes inside the control panel, etc.

The specified clearance around the XC-152 is:
≧ 30 mm (1.18"), ϑ 0 °C (32°F) ≦ T ≦ 55°C (131°F)

The minimum clearance to components emitting heat, such as transformers under heavy loads, is 15 cm.

3.2 Conditions for marine approval (DNV GL)

The following DNV GL rules for shipping classification in accordance with DNVGL-CG-0339 type approvals must be observed:

1. Complete and proper installation and commissioning in accordance with DNV GL rules and Eaton requirements and specifications.
2. Installation of radio interference suppression filters for the 24 V DC supply.
3. Screening the communication cables used.

3.2.1 Radio interference suppression filter for the 24 V DC supply

Additional interference filters must be installed for the power supply in order to adhere to the EMC provisions.

▶ Integrate a radio interference suppression filter into the wiring.

Depending on the output, the following filters can be used:

- XT-FIL-1 radio interference suppression filter for 24 V DC supply up to 2.2 A (Eaton article no. 285316) or
- XT-FIL-2 radio interference suppression filter for 24 V DC supply up to 12 A (Eaton article no. 118980)

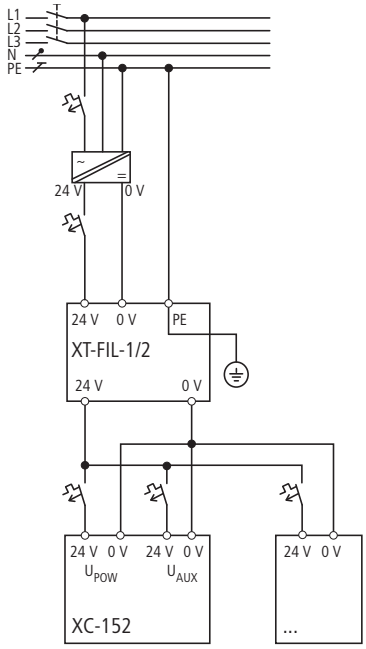


Figure 3: Power supply with EMC filter

Grounding is ensured either by using

- the filter's integrated contact fields onto a grounded metal plate

or using

- a separate line to the filer's PE connection.

Depending on the current consumption or configuration, several filters may be used as well.

3.3 Communication cables

DANGER
STRAY CURRENTS

Large equalizing currents between the functional earthing system and the ground system of different devices may result in fire or in malfunctions due to signal interference.

- ▶ If necessary, route an equipotential bonding conductor, with a cross-sectional area that is several times larger than that of the cable shielding, parallel to the cable.

CAUTION
INTERFERENCES

The values specified in the technical data, as well as the device's electromagnetic compatibility (EMC), cannot be guaranteed if the following are used: unsuitable cables, improperly assembled and terminated cables, and/or wiring that does not conform to the applicable standards. Only use cables assembled and terminated by professionals.

The cables being used must be assembled and terminated as required by the port/interface description in this document. When wiring the devices, follow all instructions regarding how to wire the corresponding port/interface.
All general Directives and standards must be complied with.

3.3.1 Preparing the cables with the SUB-D plug

The design of the wiring is an essential factor for reliable operation and electromagnetic compatibility (EMC).

> *NOTICE*
>
> The EMC values stated in the technical data (immunity and emission) can only be guaranteed by observing this prescribed preparation!

3.3.1.1 Wiring requirements

- The cables must be screened.
- The cable screen must consist of a copper braid.
- This cable screen must be terminated to the connector shell with a low-impedance bond across a large area.

3.3.1.2 Connecting the cable screen

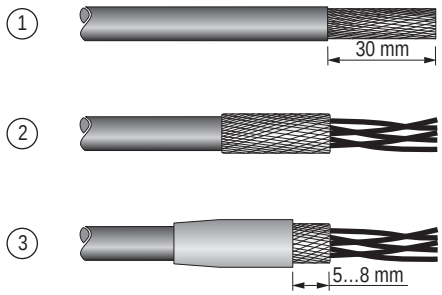


Figure 4: Connecting the cable screen

▶1. Insulate the cable end so that approx. 3 cm of screen braid is exposed ①.
▶2. Fold back the screen braid over the cable sheath ②.
▶3. Attach heat-shrink tubing approx. 3 cm in length over the folded screen braid or use a rubber grommet.
   - 5…8 mm of the screen braid must be exposed at the cable end.
   - The folded screen braid end must be covered by the heat-shrink tubing or the rubber grommet ③.

▶4. Fit the SUB-D plug to the cable end:
   - The exposed metal screen braid must be clamped to the connector casing with the cable clamp.

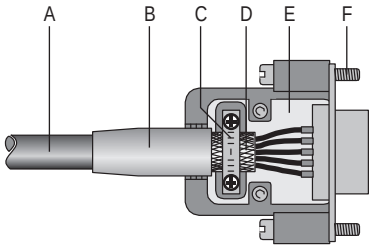


Figure 5: prefabricated SUB-D plug

A Cable with sheath
B Heat-shrink tubing or rubber grommet
C Strap
D Screen braid
E SUB-D plug
F Fixing screw UNC

3.3.2 Screening the communication cables used

In order to ensure that signals are transmitted without noise so as to comply with EMC B requirements, the communication cables used must be screened.

- Use screened cables or screen the cables yourself with a ferrite ring such as:
  Würth STAR-RING snap-together ferrite, split ferrite core, 30 x 20 x 20 mm, for cables with a diameter of 8 mm
  Würth STAR-GAP snap-together ferrite, split ferrite core, 31.5 x 35 x 28.3 mm, for cables with a diameter of 13 mm
- Make sure to properly place the ferrite ring on the communication cable at a location close to the connection side (max. distance of 20 cm from the external device plug) on the device.

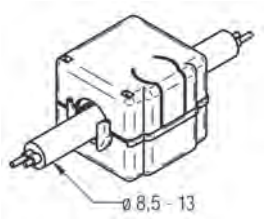


Figure 6: Screening with snap-together ferrite ring

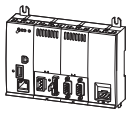
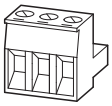
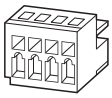
Figure 7: Ethernet cable shielding example: double loop through ferrite core

3.4 Unpacking and checking the equipment supplied

- Check the device's packaging for transit damage.
- Carefully remove the packaging in order to avoid damaging the device.
- Check the package contents for visible transit damage.
- Use the information in Installation instructions to make sure that the contents are complete.

Keep the original packaging so that you will be able to use it in the future if you need to transport or ship the device.
Make sure to also keep the documents enclosed with the device and/or to give them to the end customer.

The Compact PLC XC-152 package includes:

Unit		Description	
1		Compact Controller XC-152...	
1		Plug-in connection MSTB 2.5/3-ST-5.08	Connector for 24 VDC power supply
1 optional		Plug-in connection WAGO, article no. 734-104	Required only for devices with a SmartWire-DT connection XC-152-E....

The device is sturdily built, but the components inside it are sensitive to excessively strong vibrations and/or mechanical shock.

Accordingly, make sure to protect the device from mechanical loads that exceed the scope of the unit's intended use.

The device should only be transported in its original packaging after being packed properly.

Missing parts or damage

If you notice anything wrong, please contact your distributor or Eaton Service:

24-hour hotline: +49 (0) 180 5 223 822
e-mail: AfterSalesEGBonn@Eaton.com

3.5 Mounting

CAUTION

The device must only be installed and commissioned in perfect technical condition and in compliance with this document.

CAUTION
SHORT-CIRCUIT HAZARD

If the device is or has been exposed to environmental fluctuations (ambient temperature, air humidity), condensation may form on or inside it. As long as this condensation is present, there will be a short-circuit hazard.
Do not switch on the device when it has condensation in or on it.
If the device has condensation in or on it, or if the panel has been exposed to environmental fluctuations, let the panel settle into the existing ambient temperature before switching it on. Do not expose the device to direct thermal radiation from heating appliances.

▶1. Check to make sure that all the prerequisites for the location of use are being met.
▶2. Check the device for transit damage.
▶3. Choose a device installation location based on your specific engineering documents.
▶4. Mount the device:
- On a DIN-rail or
- With additional fixing tabs

3.5.1 DIN-rail mounting

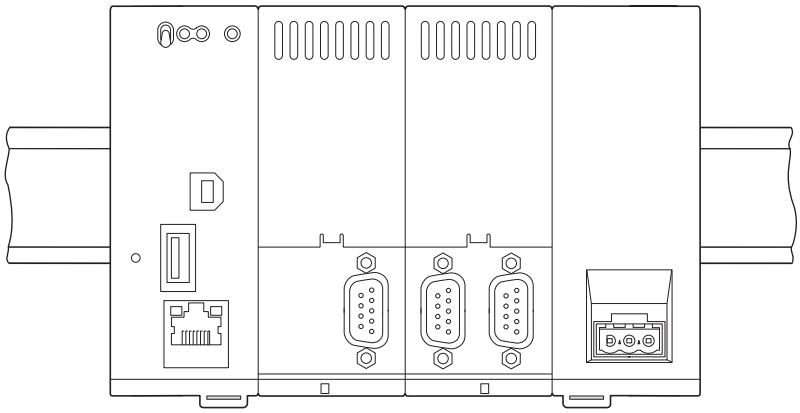


Figure 8: Example showing XC-152-D6-11 mounted on a DIN-rail

3.5.1.1 Mounting

▶1. Hook the device onto the mounting rail from above.
▶2. Push the bottom of the device against the DIN-rail until the device locks into place.
▶3. Push the two locking sliders towards the back of the device in order to make sure that the DIN-rail is engaged properly.

The device must securely engage the DIN-rail.

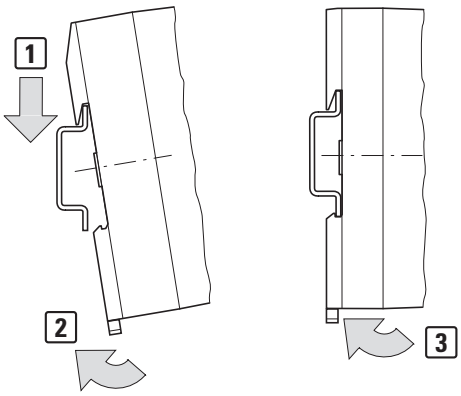


Figure 9: Mounting on top-hat rail

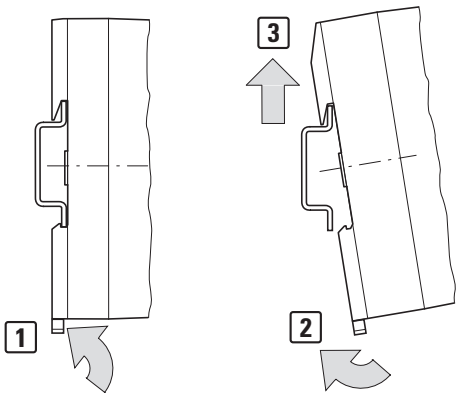


Figure 10: Dismantling

3.5.1.2 Dismantling

▶1. Use a flat screwdriver to pull the two locking sliders downwards until they lock into place.
▶2. Remove the device from the DIN-rail.

3.5.2 Screw fixing

Use genuine Eaton accessories for the Compact PLC XC-152.
ZB4-101-GF1 (Eaton article No. 061360)

▶1. Insert a tab into each of the fixing points at the back of the XC-152.
You will need a total of four tabs.

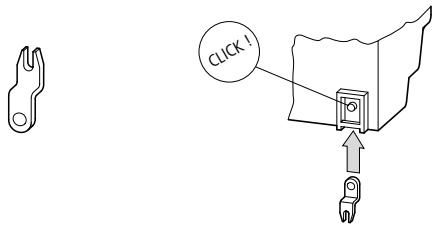


Figure 11: Installing a ZB4-101-GF1 tab

▶2. Push each tab into the corresponding fixing point until it locks into place.
▶3. Properly mount the XC-152 at the location you want using appropriate M4 fixing screws.

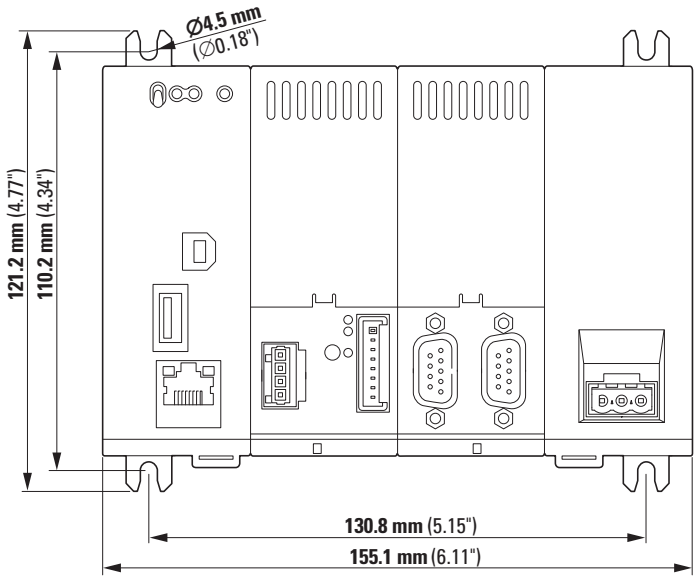


Figure 12: screw mounting

3.6 Preparing the device for operation

CAUTION
INTERFERENCES

Screw all plug-in connections or lock them into place in order to improve screening.
Signal cables must not be routed in the same cable duct with power cables.
Before putting the system into operation, check all cable connections to make sure that everything has been wired properly.
Make sure that all voltages and signals have the required values as specified in the technical data.

CAUTION
SHORT-CIRCUIT HAZARD

If the device is or has been exposed to environmental fluctuations (ambient temperature, air humidity), condensation may form on or inside it. As long as this condensation is present, there will be a short-circuit hazard.
Do not switch on the device when it has condensation in or on it.
If the device has condensation in or on it, or if the panel has been exposed to environmental fluctuations, let the panel settle into the existing ambient temperature before switching it on. Do not expose the device to direct thermal radiation from heating appliances.

Before commissioning, connect the device as required for your application:

▶1. Electrical connection
   24 VDC power supply
   and, if applicable, SmartWire-DT network POW/AUX power supply
▶2. Connect the cables for the external connectors.
▶3. If applicable, shield the communication cables.

3.6.1 Power supply 24 V DC

The device has an internal fuse and protection against polarity reversal.
The power supply for the device is not galvanically isolated.
The device requires a rated operating voltage of 24 VDC.
The functional earth is connected to the connector cover only, and not to 0 V.
The housing is made of plastic and is isolated.

CAUTION

The voltage being applied must meet the requirements for safety extra-low voltages (SELV) set forth in IEC 60950.
Pay attention to the polarity!

- SELV (safety extra low voltage):
  circuit in which no dangerous voltage occurs even in the event of a single fault.

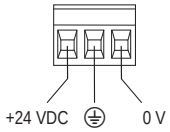
→ Chapter 9 „Technical data"
→ Section "9.3 Power supply", page 73

Connector MSTB 2.5/3-ST-5.08 is included as standard.

Cable and terminal specifications

Terminal type:	Screw terminal plug-in
Cross section	min. 0.75 mm^2 / max. 2.5 mm^2 (drain wire or conductor) min. AWG18 / max. AWG12
Strip length	7 mm
Max. tightening torque	0.6…0.8 Nm / 5…7 Lb. In.

Wiring

Plug-in connection MSTB 2.5/3-ST-5.08	Connection	Configuration
view from wiring side  	+24 VDC	Supply voltage +24 VDC
	⏚	Does not have to be connected. If necessary due to the installation environment, the protective earth can be connected here.
	0 V	Supply voltage 0 V

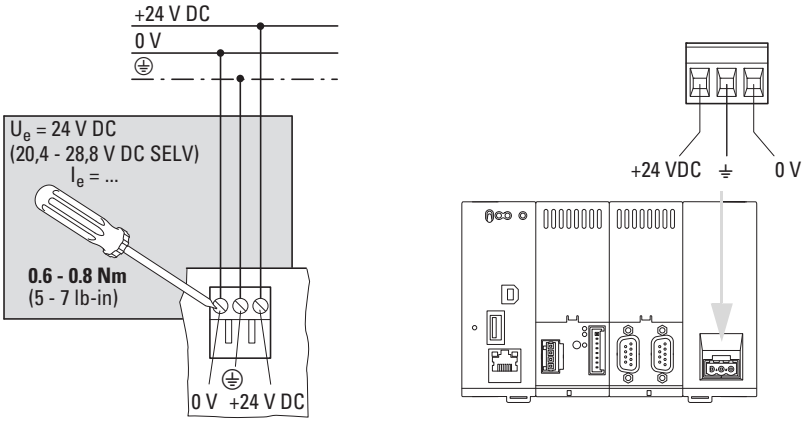


Figure 13: Connecting the screw terminals on the connector

▶1. Use the plug-in connection to terminate the connection cable for the power supply in advance.
▶2. Plug the pre-assembled plug into the socket on the enclosure.
▶3. Pay attention to the polarity.
▶4. Connect the power supply cable to a 24 VDC supply voltage that meets the requirements for safety extra-low voltages (SELV) set forth in IEC 60950.

▶ The torque used to tighten the screw terminals on the connector for the supply voltage must not exceed:
0.6 to 0.8 Nm (5 to 7 lb-in)

CAUTION

The device does not have an ON/OFF switch.
If the power supply is not provided with a switch,
the device will start up (boot) as soon as it is connected to the power supply.

4 Commissioning

CAUTION
SHORT-CIRCUIT HAZARD

If the device is or has been exposed to environmental fluctuations (ambient temperature, air humidity), condensation may form on or inside it. As long as this condensation is present, there will be a short-circuit hazard.
Do not switch on the device when it has condensation in or on it.
If the device has condensation in or on it, or if the panel has been exposed to environmental fluctuations, let the panel settle into the existing ambient temperature before switching it on. Do not expose the device to direct thermal radiation from heating appliances.

CAUTION

The device does not have an ON/OFF switch.
If the power supply is not provided with a switch,
the device will start up (boot) as soon as it is connected to the power supply.

▶ Apply the supply voltage to the device.

The device will boot.

The runtime software for the PLC is installed on the device.

4.1 Initial Commissioning

Carry out the following steps once:

▶ Configure the system settings for the XC-152 as necessary.

You can force the device to start with the DHCP function as follows:

▶ When powering up the device, hold down the CTRL button until the SF LED lights up green.

In this mode, the Autoexec.bat, Autoexec.reg, and Autoexec.bmp files will not be executed.

4.1.1 Configuring the system settings

In order to configure the system settings, you will need a computer that is connected to the XC-152.

The XC-152 features the following default network configuration:

- IP address:192.168.1.1
- Subnet mask:255.255.255.0

If you press the CTRL button while the device is being powered up and hold it down until the SF LED lights up green, the XC-152 will obtain an IP address using the Dynamic Host Configuration Protocol (DHCP).
If you hold down the CTRL button (approx. 5 seconds) after the device is on and wait until the SF LED flashes green, IP address 192.168.1.1 will be temporarily assigned to the XC-152.

Remote Client

The Remote-Client program is part of the Xsoft-CoDeSys and/or GALILEO package and can be found in the computer's Start menu.

The Remote-Client detect function is based on DHCP and uses ports 67 and 68 (UDP). This means that if these ports are blocked by a firewall, the detect function will not work. Please also note that Remote-Client must be whitelisted if a firewall program is being used.

Once access to the XC-152 is established for the first time, configure the XC-152 with the computer.

4.1.2 Connect Computer and XC-152 in the network

Condition:
There must not be a firewall blocking the DHCP ports.

- ▶ Open Remote-Client on the computer and click on the "Detect" menu option.
- ▶ Power up the XC-152 while pressing the CTRL button and hold the button down until the SF LED lights up green.

Information on the detected XC-152 will be displayed.

Variant a:
A DHCP server on the LAN will have assigned the XC-152 an IP address.

Variant b:
A prompt with a suggested IP address will be shown. Once you click on OK, the XC-152 will be assigned this IP address.

- ▶ Click on OK to connect.

Please note that the IP address assigned to the XC-152 is only temporary.

4.1.3 Connect Computer and XC-152 connected directly with a cable

Condition:
It must be possible to change the computer's IP address.

- ▶ Configure the computer's network settings:

- IP address: 192.168.1.2
- Subnet mask: 255.255.255.0

- ▶ Power up the XC-152 and wait until the COM LED turns off.
- ▶ Open Remote-Client on the computer and connect to the XC-152.

4.1.4 Setting the IP address with an SD card

Condition:
SD card reader on computer.

You will need to create two files and save them in the SD card's root directory.

“autolaunch.inf” file with the following contents:
[autolaunch]
open = SetIpAddress.bat
RunOnBoot = 1

"SetIpAddress.bat" file with the following contents:
ipsetup.exe -a 172.16.10.20 -r

Once you insert this SD card into the XC-152 and restart it, the XC-152 will always have IP address 172.16.10.20.

More information:

→ System Description Windows CE, MN05010007Z, Network setting (Network) and AutoLaunch sections.

4.2 Running the XC-152

Once the device has been initially commissioned, it will run whenever it is connected to the supply voltage.
In other words, it does not have to be separately switched on and off.

Operating states

Operating system running:

Operating system started in detect mode:

→ If the device will not start, or if the LEDs are signaling an error message, follow the instructions in the "Faults" section.

4.3 External memory

Depending on how the system setting for booting up has been configured, the operating system can also be loaded from an SD card used as an external memory unit.

4.3.1 Inserting and removing the SD card

The slot for the SD card is on the side of the device.

An SD card is not included.
Use genuine Eaton accessories for the Compact PLC XC-152.

CAUTION
DATA LOSS

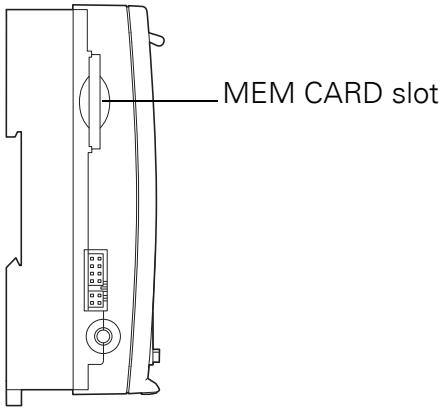
If the SD card is being written to and a voltage drop occurs or the card is removed, data may be lost or the SD card may be ruined.

- ▶ Insert the SD card only when the device is de-energized.

Avoid writing to SD cards. Reasons:

- SD cards have a limited number of write cycles.
- If there is a voltage drop while a write operation is in progress, data loss is highly likely to occur.

- ▶ Remove the SD card only when the device is de-energized.
- ▶ Before switching off the device, make sure that there are no programs writing to the SD card.



SD cards cannot be inserted the wrong way around.
Do not use force when inserting the card.

Inserting the SD card

- ▶ Push the SD card into the MEM CARD slot until you feel it lock into place.

Removing the SD card

Push the SD card in the MEM CARD slot all the way in.
This will release the lock mechanism, and the SD card will come out of the SD slot a little.

▶ Remove the SD card from the MEM CARD slot.

5 External connections

DANGER
STRAY CURRENTS

Large transient currents between the functional earthing system and the ground system of different devices may result in fire or in malfunctions due to signal interference.

- ▶ If necessary, route an equipotential bonding conductor, with a cross-sectional area that is several times larger than that of the cable shielding, parallel to the cable.

CAUTION
INTERFERENCES

The values specified in the technical data, as well as the device's electromagnetic compatibility (EMC), cannot be guaranteed if the following are used: unsuitable cables, improperly assembled and terminated cables, and/or wiring that does not conform to the applicable standards. Only use cables assembled and terminated by professionals.

The cables being used must be assembled and terminated as required by the port/interface description in this document. When wiring the devices, follow all instructions regarding how to wire the corresponding port/interface.
All general Directives and standards must be complied with.

CAUTION
NON-GALVANICALLY-ISOLATED INTERFACES

The device may be damaged by potential differences.

- ▶ The GND terminals of all bus modules must be connected.
- ▶ Do not connect the connector to the device or disconnect it without first de-energizing the system.

5.1 Layout overview

With their external connectors, the devices make it possible to connect a variety of peripheral devices and components.

→ The selected device model will determine which interfaces are available. Please refer to the nameplate

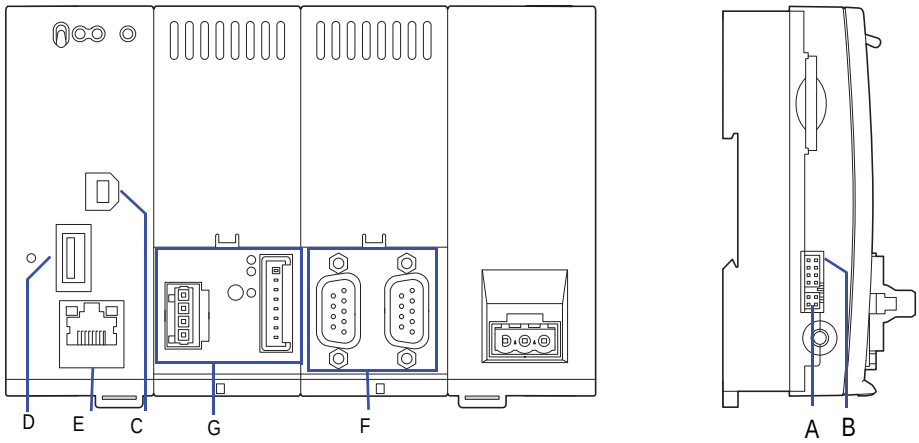


Figure 14: Interface layout example: XV-152-D...-E

Interface	Description
A UPD/RUN jumper	For servicing only
B DIAG	For servicing only
Interfaces, independent on the device version:	
C USB device 2.0 c	USB 2.0, not galvanically isolated, → Page 47
D USB host 2.0	USB 2.0 (1.5/12/480 MBits), not galvanically isolated, → Page 47
E Ethernet 10/100 Mbps	100Base-TX / 10Base-T → Page 48
Additional integrated interfaces depending on the device model:	
F Serial interfaces	
RS232 (System Port)	not galvanically isolated → Page 50
RS485	not galvanically isolated → Page 51
CAN	CANopen®/easyNet, not galvanically isolated, → Page 53
PROFIBUS/MPI	max. 1.5 MBit/s, not galvanically isolated, → Page 55
G SmartWire-DT Master	not galvanically isolated → Section "6 XC-152 as a SmartWire-DT coordinator", page 59

5.2 USB interfaces

The XC-152s feature ports that can be used to connect USB peripheral devices supported by the 's hardware and operating system.

CAUTION

When using commercially available peripheral devices (e.g., with the USB port), it is important to keep in mind that their EMC interference immunity parameters may render them unsuitable for use in industrial environments.
The USB ports (USB host and USB device) on the device unit are meant for maintenance work only.

CAUTION
NON-GALVANICALLY-ISOLATED INTERFACES

The device may be damaged by potential differences.

- ▶ The GND terminals of all bus modules must be connected.
- ▶ Do not connect the connector to the device or disconnect it without first de-energizing the system.

5.2.1 USB device

Characteristics: USB 2.0, not galvanically isolated, plug type B

Figure 15: USB device interface (type B)

5.2.2 USB Host

Characteristics: USB 2.0, not galvanically isolated, plug type A, full power (500 mA)

Figure 16: USB host interface (type A)

5.2.2.1 USB cable

- Use only shielded standard USB cables.
- Maximum cable length: 5 m.

5.3 Ethernet

The Ethernet port on the XC-152 can be used as a communication interface or as a real-time field bus interface.
The Ethernet controllers support transfer rates of 10 Mbit/s and 100 Mbit/s.

Characteristics: RJ-45 socket, 8-pin, 2 LEDs (CAT5e/6), LAN1, 10/100 Mbps

RJ45 socket	Status LEDs	signal	Meaning
	ACT (yellow)	flashes	Data transfers, Ethernet is active
	LINK (green)	lit	Active network, is connected and detected

Max. cable length: 100 m.

CAUTION
FORCES ON THE ETHERNET INTERFACE

Communications may be affected, and the connection's mechanical components may be damaged, if the Ethernet interface is subjected to strong vibrations or the RJ45 plug-in connection is subjected to pulling.

- Protect the RJ45 plug-in connection from strong vibrations.
- Protect the RJ45 plug-in connection from tensile forces at the socket.

To commission the communication between the XC-152 and the device, follow the description for the connected device.

5.4 Serial interfaces to other devices

→ The selected device model will determine which interfaces are available. Please refer to the nameplate

CAUTION
NON-GALVANICALLY-ISOLATED INTERFACES

The device may be damaged by potential differences.

- The GND terminals of all bus modules must be connected.
- Do not connect the connector to the device or disconnect it without first de-energizing the system.

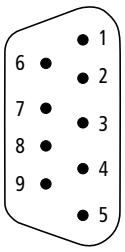
NOTICE

Arrange for an electrician to put together the cables for the power supply and the external connectors.

→ When preparing connections, ensure that the cable shield has a low impedance connection with the connector housing.

5.4.1 RS232 (System Port)

Characteristics: SUB-D plug 9-pole, not galvanically isolated, UNC nuts to keep the connector in place.

SUB-D plug 9-pole	PIN	signal	Configuration
	1	DCD	Data Carrier Detected
	2	RxD	Receive Data
	3	TxD	Transmit Data
	4	DTR	Data Terminal Ready
	5	GND	Ground
	6	DSR	Data Set Ready
	7	RTS	Request to Send
	8	CTS	Clear To Send
	9	RI	Ring Indicator

5.4.1.1 RS-232 wiring

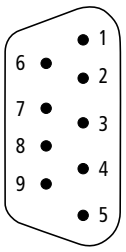
- Screened cables must be used.
- The maximum baud rate (Baud rate) will depend on the cable length.

RS232 cable length based on baud rate

Cable length	Possible baud rate
2.5 m	115200 bit/s
5 m	57600 Bit/s
10 m	38400 Bit/s
15 m	19200 Bit/s
30 m	9600 Bit/s

5.4.2 RS485

Characteristics: SUB-D plug 9-pole, not galvanically isolated, UNC nuts to keep the connector in place

SUB-D plug 9-polie	PIN	signal	Configuration
	1	n.c.	not used
	2	n.c.	not used
	3	B	Cable B
	4	n.c.	not used
	5	GND	Ground
	6	n.c.	not used
	7	A	Cable A
	8	n.c.	not used
	9	n.c.	not used

→ n.c.: PINs 1, 2, 4, 6, 8, and 9 must not be connected.

5.4.2.1 RS485 wiring

- Screened twisted-pair cables must be used.

Rated surge impedance	120 Ω
Permissible surge impedance	108…132 Ω
Max. cable length	1200 m
Possible baud rates	9600 Bit/s
	19200 Bit/s
	38400 Bit/s
	57600 Bit/s
	115200 bit/s

RS485 cable length based on baud rate

Cable length	Possible baud rate
max 1200m	9600 Bit/s
	19200 Bit/s
	38400 Bit/s
	57600 Bit/s
	115200 bit/s

5.4.2.2 RS485 topology

- A bus segment can interconnect up to 32 slaves.
- Multiple bus segments can be connected with the use of repeaters (bi-directional amplifiers).

→ The use of repeaters enables the maximum cable length to be increased. For more details, please consult the documentation for repeaters provided by manufacturer.

A bus segment must be provided with a cable termination (120 Ω) at both ends.
These terminations must be connected inside the plug, directly between PIN 3 and PIN 7.

→ The bus segment must be terminated at both ends.
No more than two terminations must be provided for each bus segment.
Operation without correct cable termination can cause transmission errors.

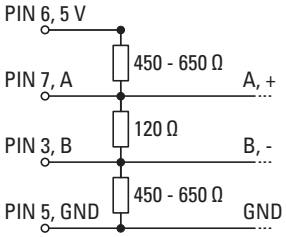


Figure 17: Bus termination RS485 Modbus

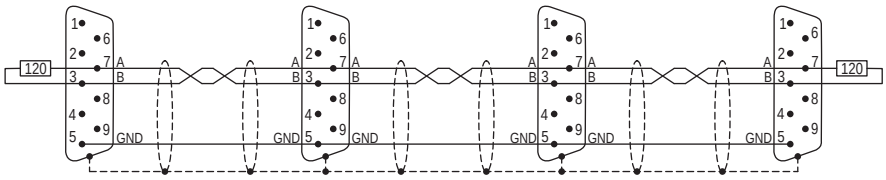
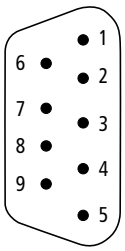


Figure 18: Bus segment with four nodes

5.4.3 CAN

CAN interface for the CANopen® and easyNet (master/slave) protocols and others; for a maximum of 127 modules. The max. baud rate is 1000 kbit/s.

Characteristics: SUB-D plug 9-pole, CAN pin assignment as per CiA, not galvanically isolated, UNC nuts to keep the connector in place

SUB-D plug 9-pole	PIN	signal	Configuration
	1	n.c.	not used
	2	CAN-L	Bus line (dominant low)
	3	CAN-GND	Ground
	4	n.c.	not used
	5	n.c.	not used
	6	GND	Optional Ground
	7	CAN-H	Bus line (dominant high)
	8	n.c.	not used
	9	n.c.	not used

- PINs 3 (CAN-GND) and 6 (GND) are connected to each other internally inside the XC-152.
- n.c.: PINs 1, 4, 5, 8, and 9 must not be connected.
- The power supply of the CAN bus drivers is implemented internally.
- A power supply for third party devices is not provided on the CAN connector.

5.4.3.1 Wiring

- Screened twisted-pair cables must be used.
- The maximum baud rate will depend on the cable length.

Rated surge impedance			120 Ω
Permissible surge impedance			108 … 132 Ω
Capacitance per unit length			< 60 pF/m
Core cross-section	With a max. cable length of	100 m	≥ 0.25 mm²
		250 m	≥ 0.34 mm²
		500 m	≥ 0.75 mm²

CAN relationship between cable length / baud rate

Cable length	Possible baud rate
25 m	1000 kbit/s
50 m	800 kbit/s
100 m	500 kbit/s
250 m	250 kbit/s
500 m	125 kbit/s
500 m	100 Kbit/s (adjustable via software)
1000 m	50 kbit/s
2500 m	20 kbit/s
5000 m	10 kbit/s

5.4.3.2 CAN-Bus-topology

- A bus segment can interconnect up to 32 slaves.
- Multiple bus segments can be connected with the use of repeaters (bi-directional amplifiers).

→ The use of repeaters enables the maximum cable length to be increased.
Repeaters can also be used for galvanic isolation. For more details, please consult the documentation for repeaters provided by manufacturer.
Make sure to follow the recommendations provided by CiA (CAN in Automation) at http://www.can-cia.org.

A bus segment must be provided with a cable termination (120 Ω) at both ends.
These terminations must be connected inside the plug, directly between PINs 3 and 7.

→ The bus segment must be terminated at both ends.
No more than two terminations must be provided for each bus segment.
Operation without correct cable termination can cause transmission errors.

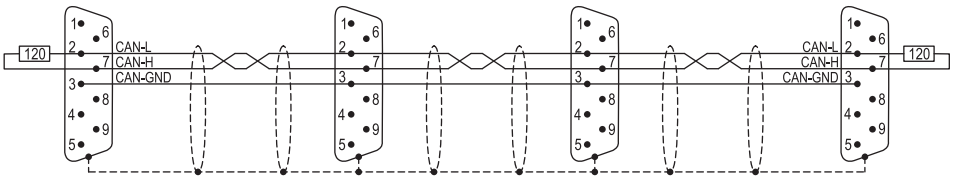
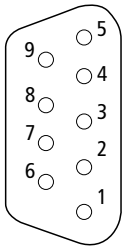


Figure 19: CAN bus segment with four nodes

5.4.4 Profibus

Profibus interface for DP-V1 or MPI (master) for a maximum of 128 modules. The max. transfer rate is 1500 kbit/s.

Characteristics: SUB-D plug 9-pole,
not galvanically isolated, UNC nuts to keep the connector in place

SUB-D socket, 9-pole	PIN	signal	Configuration
	1	n.c.	not used
	2	n.c.	not used
	3	B	EIA RS 485 cable B
	4	RTSAS	Output for controlling a repeater
	5	M5EXT (GND)	Output 0 V for external termination (Ground)
	6	P5EXT	Output 5 V for external termination
	7	n.c.	not used
	8	A	EIA RS 485 cable A
	9	n.c.	not used

- PIN 6 (5 V) must not be used as a power supply for external devices.
- nc: PINs 1, 2, 7 and 9 must not be connected.

5.4.4.1 Wiring

- Screened twisted-pair cables must be used.
- Cable type A (as specified in PROFIBUS standards IEC/EN 61158 and IEC/EN 61784).
- For type A cables, the maximum baud rate will depend on the cable length.

Rated surge impedance	150 Ω
Permissible surge impedance	135…165 Ω
Capacitance per unit length	< 30 pF/m
Loop resistance	< 110 Ω/km
Core cross section	≥ 0.34 mm^2 (22 AWG)

Profibus MPI - relationship between cable length / baud rate

Cable length	**Possible baud rate**
100 m	1000 kbit/s
200 m	1500 kbit/s
400 m	500 kbit/s
1000 m	187.5 kbit/s
1200 m	≤ 93.75 kbit/s

5.4.4.2 Profibus topology

- A bus segment can interconnect up to 32 slaves.
- Multiple bus segments can be connected with the use of repeaters (bi-directional amplifiers).

→ The use of repeaters enables the maximum cable length to be increased.
Repeaters can also be used for galvanic isolation. For more details, please consult the documentation for repeaters provided by manufacturer.
Make sure to follow the recommendations provided by CiA (CAN in Automation) at http://www.can-cia.org.

Only use bus connector plugs specified for use with PROFIBUS networks. These plugs combine both bus cables on a single node and ensure that the cable shield has a low-impedance connection to the node's shield reference potential. These bus terminal connectors contain the PROFIBUS cable termination that can be switched on as required.

A bus segment must be provided with cable termination at both ends. This termination is passive, but is fed from the node. It ensures a defined quiescent signal on the bus if no bus station is sending. These bus terminations are preferably implemented externally in the connector housing as per the PROFIBUS standard (and can be implemented using the aforementioned bus connector plugs).

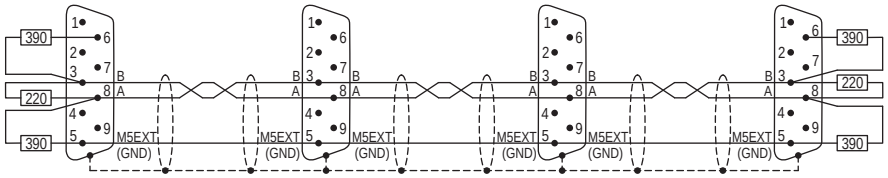


Figure 20: Profibus bus segment with four nodes

→ The bus segment must be terminated at both ends.
No more than two terminations must be provided for each bus segment.
At least one of the two terminations must be fed by the bus user.
Operation without correct termination of the Profibus network can cause transmission errors.

6 XC-152 as a SmartWire-DT coordinator

Applies only to devices with a SmartWire-DT connection.
The starting point of an SmartWire-DT network is always an SmartWire-DT coordinator.
XC-152-E... device models can take over this coordinator function as an SWD- master interface.

In addition to the information in this document, you will also need the information in the following SWD-documents in order to set up a SWD-network and install and operate it as a SWD-coordinator.
→ Section "0.3 Documents with additional information", page 6

The SmartWire-DT coordinator is where the SWD- network starts, and will have a connection to the 8 pole SWD- ribbon cable used inside the control panel in order to connect SWD modules. In addition to communication and control wires, this SWD- ribbon cable also carries the supply voltages for connected SWD- modules (15 VDC) and optionally used switchgear (24 VDC).

These two supply voltages are supplied through the XC-152-E... via connection terminals UPOW and UAUX.

6.1 SmartWire-DT operator control and display elements

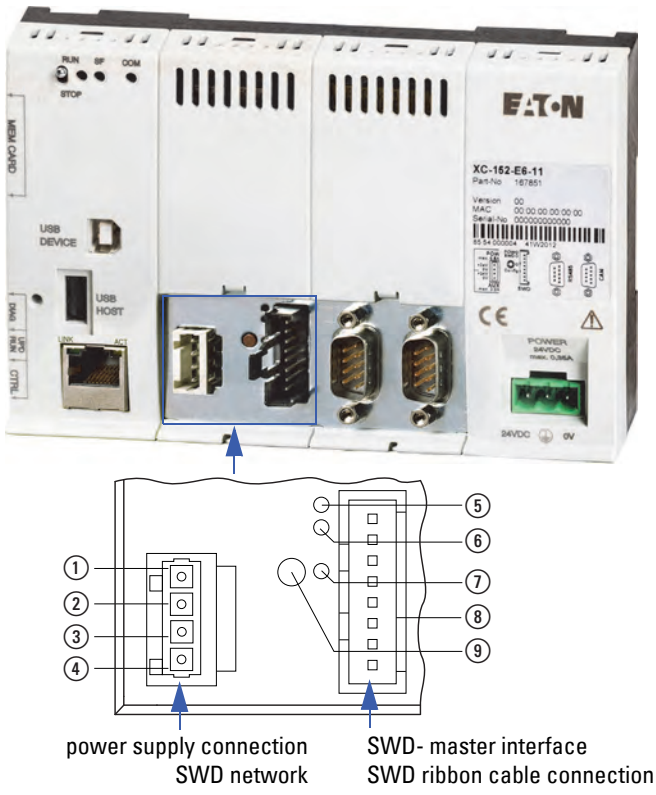


Figure 21: SmartWire-DT connectors

Operator control and display elements for SmartWire-DT		Description
① ②③ ④	POW/AUX SWD power supply	Power supply for the SmartWire-DT network ① +24 V DC POW, ② 0 V DC POW, ③ +24 V DC AUX, ④ 0 V DC AUX
⑤	POW-LED	Lights up when the SmartWire-DT network is powered.
⑥	SWD-LED	Indicates whether the physical configuration of the SmartWire-DT network matches the target configuration stored in the device. The configurations will be compared with each other every time the power is switched on.
⑦	Config-LED	Indicates whether the SWD master project configuration defined in the PLC matches the SmartWire-DT network target configuration stored in the device. The configurations will be compared with each other every time the power is switched on.
⑧	SWD Interface	SmartWire-DT ribbon cable connection
⑨	Config configuration button	Used to configure the SmartWire-DT network.

6.1.1 POW/AUX SWD power supply

This connection ensures that the power required for the SmartWire-DT network will be supplied.

Characteristics: WAGO connector, 4-pole, not galvanically isolated

The following power supplies are required for a SmartWire-DT network:

- POW supply voltage:
  The device supply voltage for the electronics in the downstream SWD-modules (15 VDC) is generated using the 24 VDC supply voltage applied at the POW terminal.
- AUX supply voltage:
  If there are any contactors or motor starters in the SWD- topology, a 24 VDC AUX voltage must be additionally supplied as a control voltage for the contactor coils.

→ If contactors and/or motor starters with a total current draw > 3 A (DIN VDE 0641, Part 11 and IEC/EN 60898) or > 2 A (UL 508 and CSA-22.2, No. 14) are connected, an EU5C-SWD-PF1 or EU5C-SWD-PF2 power feeder module needs to be used.

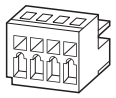
→ If SmartWire-DT modules with a total current draw > 0.7 A are connected, an EU5C-SWD-PF2-1 power feeder module needs to be used.

Conditions for Underwriters Laboratories Inc. (UL) listing

- The SmartWire-DT master interface's U_{Aux} supply voltage must be externally protected against overcurrent and short-circuits with the following:
  - Miniature circuit-breaker 24 VDC, rated operational current 2 A, tripping characteristic Z
  - Or a 2 A fuse

Wiring

The required plug connector is included with the device



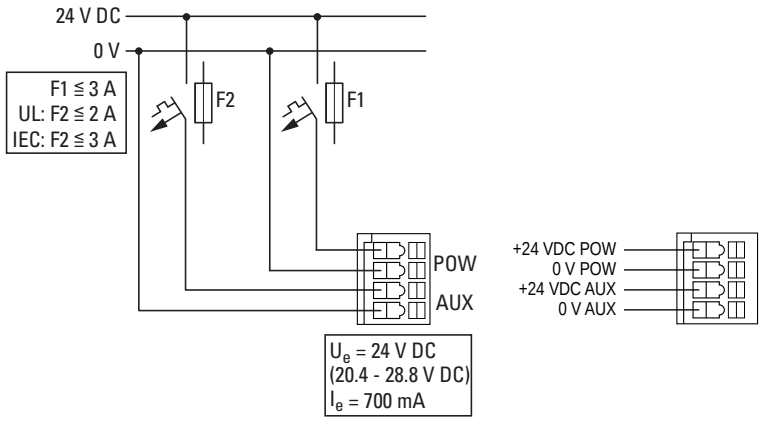
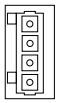


Figure 22: WAGO plug connector (view from wiring side)

plug connector 4 pole	PIN	signal	Configuration
	1	+24 V DC POW	Supply voltage U_{POW} +24 V DC
	2	0 V POW	Supply voltage U_{POW} 0 V
	3	+24 V DC AUX	Supply voltage U_{AUX} +24 V DC
	4	0 V AUX	Supply voltage U_{AUX} +0 V

Observe the following when putting together the wiring for the plug connector:

Plug connector wiring	Description/Value
Terminal type:	spring-cage terminal
Cross section	0.2 - 1.5 mm^2 (connectable conductor, solid) AWG24 - AWG16
Strip length	6 -7 mm

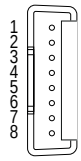
External overcurrent and short-circuit protective device, implemented with a miniature circuit-breaker or a fuse, is required for U_{AUX}.

Standard	Overcurrent and short-circuit protective device
DIN VDE 0641, Part 11 and IEC/EN 60898	24 VDC miniature circuit-breaker, rated operational current of 3 A, trip type Z, 3 A fuse, utilization category gL/gG
UL 508 and CSA-22.2, No. 14	24 VDC miniature circuit-breaker, rated operational current of 2 A, trip type Z, 2 A fuse

6.1.2 SWD master interface

SmartWire-DT uses an 8 pole ribbon cable in control panels.
In addition to communication wires, this ribbon cable carries the power for the SWD modules and the switchgear, as well as the control wires for assigning addresses.

Characteristics: Plug connector, ribbon cable (pin header, 8 pole), not galvanically isolated

pin header 8 pole	PIN	signal	Configuration
	1	+24 V DC	Contactor control voltage
	2	Chassis ground	Contactor control voltage
	3	GND	for device supply voltage and data cable
	4	Data B	Data cable B
	5	Data A	Data cable A
	6	GND	For device supply voltage and data (data A, data B)
	7	SEL	Select cable for automatic addressing of the SWD slaves
	8	+15 V DC	Device supply voltage

Wiring

- Only use the following ribbon cables to connect the SWD- network to the SWD- interface:
  - SWD4-100LF8-24 with the relevant blade terminals SWD4-8MF2 or
  - SWD4-(3/5/10)F8-24-2S (prefabricated cable)

6.1.2.1 Commissioning the SmartWire-DT network

The following requirements need to be met when:

- Switching on the device for **initial commissioning,**
- **Replacing** SWD modules, or
- Using a modified **SWD configuration**

▶1. Switch off the power supply.

- All SmartWire-DT modules must be connected to each other via Smart-Wire-DT cables.

- The power supply for the XC-152 and for SmartWire-DT must be installed (1).
- The SmartWire-DT network must be connected to the SmartWire-DT interface (2).

▶2. Switch on the power supply.

- The SWD- master interface's POW LED must be lit up with a solid light.
- The SmartWire-DT status LEDs of the connected SmartWire-DT modules must be flashing or showing a solid light.
- There must be a PLC project in which the SWD master is configured (project configuration).
- The PLC runtime system must be installed on the XC-152.

SWD module scanning will start automatically when the device is powered.

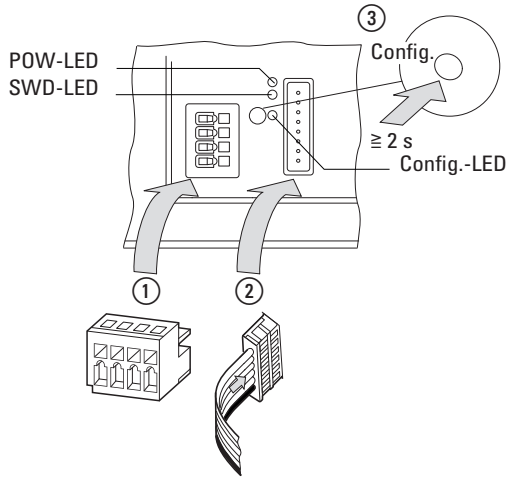


Figure 23: Commissioning SWD

▶3. Press and hold down the "Config" button for at least 2 seconds (3).

- The SWD LED on the SWD master interface must begin to flash orange and the SWD status LEDs on the connected SWD modules must flash.
- The SWD LED on the SWD master interface must start flashing green.
- All SWD modules are addressed.
- The SWD network's physical configuration must be stored in the XC-152's retentive memory as a target configuration.
- The SWD LED on the SWD master interface must light up with a solid green light.

▶4. Load the PLC project (XSoft-CODESYS) onto the XC-152.

- If the project configuration is identical to the stored target configuration, the Config LED lights up green and the data exchange of the input and output data can start.

6.1.2.2 Configuration check

The configuration will be checked every time the supply voltage is switched on:

- The modules that are actually on the network will be compared with the target configuration stored on the device:
  If the SmartWire-DT network's physical configuration matches the target configuration, the SmartWire-DT network will be ready to start transferring data.
- The target configuration stored in the device will be compared with the project configuration defined in the PLC:
  If the target configuration matches the project configuration, the **Config** LED will light up with a solid green light.

SWD and Config LEDs

LED	status	Description
SWD		
	off	No target configuration present
	Red continuous light	• Short-circuit on the 15 V DC power supply. • No SmartWire-DT module found.
	Red flashing	• The modules found in the SmartWire-DT network do not match the target configuration. • A SmartWire-DT module configured as necessary is missing.
	Flashing with an orange light	The SmartWire-DT network's physical configuration is being imported and stored as a new target configuration in the device.
	GREEN flashing	• The physical configuration of the SmartWire-DT network is compared with the target configuration. • The SmartWire-DT modules are addressed.
	Green continuous light	• The modules found in the SmartWire-DT network match the target configuration. • The SmartWire-DT network is ready for data exchange.
Config		
	off	• No project configuration present. • Incorrect target configuration (see LED SWD).
	Red continuous light	The project configuration and the stored target configuration are not compatible with each other.
	GREEN flashing	The project configuration is compatible with the stored target configuration.
	Green continuous light	The project configuration matches the stored target configuration

→ The description of the project configuration (SmartWire-DT configuration in XSoft-CODESYS project) can be found in the SmartWire-DT configuration chapter in the relevant user manual
→ Section "0.3 Documents with additional information", page 6

7 Malfunctions

Error conditions

SD card not found (COM flashing orange)

Solution:

- ▶ Insert SD card
- ▶ Press the CTRL button.
  The device will boot up with the internal operating system.

Operating system obsolete or not found (COM flashing red)

Solution:

- ▶ Copy a new operating system onto the SD card
- ▶ Press the CTRL button.
  The device will boot up with the internal operating system.

Boot error

Occurs if:
An invalid operating system is stored in InternalStorage and this invalid internal operating system is loaded due to the CTRL button being pressed.

Hardware fault

Make sure that the jumper on the UPD/RUN pin header is not set to UPD.

Servicing required: Please contact your supplier.

→ Whenever there is a red LED, there is an abnormal operating state.

LED status			Fault and possible cause	Remedy
RUN/STOP	SF	COM		
			While the device is starting (booting)	
Off	Off	Off	Power supply interface does not have any power.	Check the input wiring.
Orange	Orange	Orange	Hardware fault UPD/RUN jumper is set incorrectly.	Set the UPD/RUN jumper to the RUN position. If the UPD/RUN jumper is set to the RUN position, send in the device for repairs.
Orange	Whatever	Orange flashing	There is no SD card inside the SD slot.	Insert an SD card with the operating system into the SD slot. You can boot the device with the internal operating system by pressing the CTRL button.
Orange	Whatever	Red flashing	The operating system on the SD card is obsolete or was not found.	Copy a new operating system onto the SD card. You can boot the device with the internal operating system by pressing the CTRL button.
Orange	Orange	Off	Boot error. Occurs if:	
			An invalid operating system is stored in InternalStorage.	Store a valid operating system in InternalStorage.
			The internal operating system was started due to the CTRL button being pressed (operating system from InternalStorage).	Store a valid operating system on the SD card.
			During operation	
Off	Off	Off	No power supply voltage.	Check the input wiring.
Orange	Orange	Orange	UPD/RUN jumper set incorrectly.	Set the UPD/RUN jumper to the RUN position.
			Hardware fault	If the UPD/RUN jumper is set to the RUN position, send in the device for repairs.
Orange/green flashing			No PLC program present.	Save PLC Program on device.
Orange	Re		PLC system error	Check the PLC program

8 Maintenance

8.1 Cleaning and maintenance

The devices are maintenance-free.
However, the following work may be necessary:

- Cleaning the device when soiled.

CAUTION
POINTY, SHARP OBJECTS AND CORROSIVE LIQUIDS

Do not use any pointy or sharp objects (e.g., knives) for cleaning. Do not use aggressive or abrasive cleaning products or solvents.

Make sure that no liquids get into the device (short-circuit hazard) and that the device is not damaged in any way.

▶ Carefully clean the device with a clean, soft, damp cloth.
If there are any spots that are proving difficult to get off, spray a little dishwashing liquid on the damp cloth first.

8.1.1 Battery

The internal battery is maintenance-free and is sized for a backup time of typically 10 years when de-energized, provided the corresponding ambient conditions are met and a temperature of 25 °C (77 °F) is maintained.

The battery in the device is soldered and cannot be replaced.

8.2 Repairs

For repairs, please contact your vendor or Eaton's Technical Support.

CAUTION
DESTRUCTION

The device should only be opened by the manufacturer or by an authorized repair center. Operate the device until only with the enclosure fully closed and sealed.

Contact your local supplier or Eaton technical support for repairs.

Use the original packaging to ship the device.

8.3 Storage and transport

CAUTION
UV LIGHT

Plastics will become brittle when exposed to UV light.
This artificial aging will reduce the device's lifespan. Protect the device from direct sunlight and other sources of UV radiation.

CAUTION
SHORT-CIRCUIT HAZARD

If the device is or has been exposed to environmental fluctuations (ambient temperature, air humidity), condensation may form on or inside it. As long as this condensation is present, there will be a short-circuit hazard.
Do not switch on the device when it has condensation in or on it.
If the device has condensation in or on it, or if the panel has been exposed to environmental fluctuations, let the panel settle into the existing ambient temperature before switching it on. Do not expose the device to direct thermal radiation from heating appliances.

The ambient conditions must be met when transporting and storing the device.

The ambient air temperature for storage / transportation must not exceed the maximum specified limit:

Before commissioning
If storing/transporting the device in cold weather conditions or in such a way that it will be exposed to extreme differences in temperature, make sure that no condensation forms on or inside the device.
If there is condensation in or on the device, do not switch on the device until it is completely dry.

▶ Use the original packaging to ship the device.

The device is sturdily built, but the components inside it are sensitive to excessively strong vibrations and/or mechanical shock.

Accordingly, make sure to protect the device from mechanical loads that exceed the scope of the unit's intended use.

The device should only be transported in its original packaging after being packed properly.

8.4 Disposal

CAUTION

Installation requires qualified electrician

IMPORTANT!

Dispose of recyclables as required by your local recycling regulations.

DANGER

EXPLOSION HAZARD LITHIUM BATTERY

The lithium battery inside the device may explode if handled incorrectly.

▶ Dispose of the device properly.

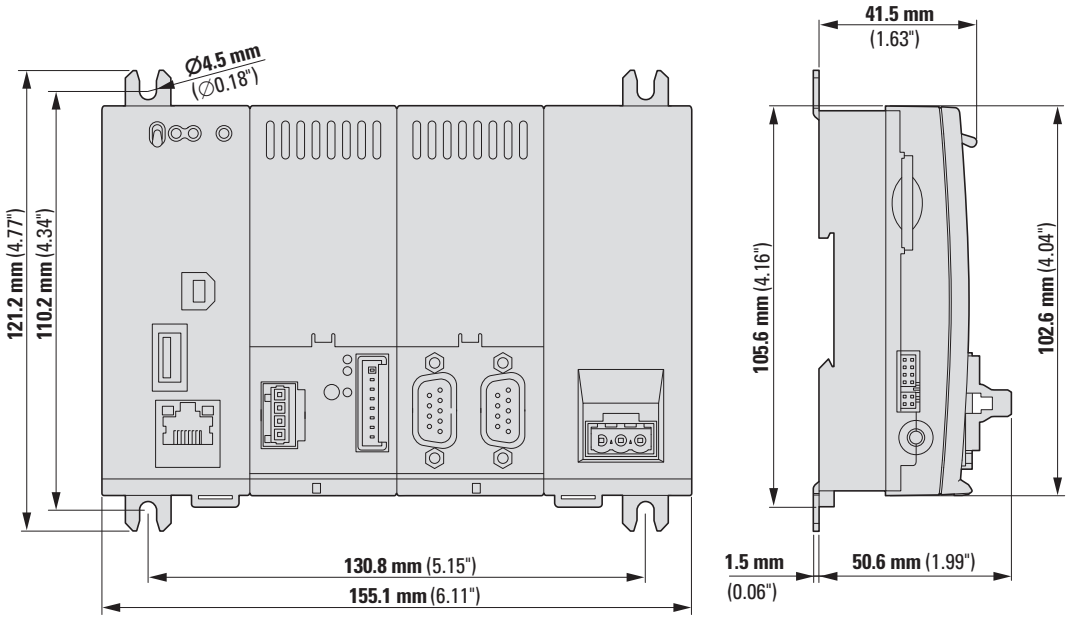
Devices no longer being used must be professionally disposed of as per local regulations or returned to the manufacturer or the relevant sales office.

XC-152	Materials used
Enclosure material	PC-GF (Halogen free)
Battery	Lithium CR 2032, maintenance-free (soldered)
• Battery weight	3.7g
• SVHC Substance	1.2-dimethoxyethane: ethylene glycol dimethyl ether (EGDME)
• Substance weight	2-4 %

Packaging	Materials used
External packaging	Cardboard
Inner packaging	Cardboard with PE sheet Plastic bag: polyethylene (PE)

9 Technical data

9.1 Dimensions and weights



Dimensions and weights	XC-152-D...	XC-152-E...
Height		
Device without fixing brackets	105.6 mm (4.16“)	105.6 mm (4.16“)
Device with fixing brackets	121.2 mm (4,77“)	121.2 mm (4,77“)
Width	155.1 mm (6,11“)	155.1 mm (6,11“)
Depth	30 mm (1,18“)	30 mm (1,18“)
Device without fixing brackets	41.5 mm (1,63“)	50.6 mm (1,99“)
Device with fixing brackets	43 mm (1,69“)	52.1 mm (2,05“)
Weight	Approx. 0.3 kg (0,66 lbs)	Approx. 0.3 kg (0,66 lbs)

9.2 System

General	XC-152
Degree of protection	IP20 /UL Open Type
Processor	RISC CPU, 32 Bit, 400 MHz
Memory	
Program code/program data	64MB
Application/flags/retentive data	64 MB/4 KB/32 KB
Cycle time for 1 k of instructions (Bit, Byte)	typically 004 ms
Internal memory	
DRAM	64 MByte
NAND flash	64 MByte
NVRAM	125 kByte
External memory	
SD card	1× SD-A (**not** for SDHC cards or cards of newer standard)
RTC Real Time Clock	yes, battery back-up
Battery type	Lithium CR 2032, maintenance-free (soldered)
Battery (service life)	Normally 10 years at 25° C (77°F)

9.3 Power supply

Power supply	XC-152
rated operating voltage	24 V DC SELV (safety extra low voltage)
Permissible voltage U_e	Effective: 20.4…28.8 V DC (rated operating voltage -15 % / +20 %) Absolute with ripple: 19.2…30.0 VDC Battery operation: 19.2…30.0 VDC (Rated operating voltage -20 % / +25 %)
Voltage dips	10 ms from rated operating voltage (24 VDC) 5 ms from undervoltage (20.4 VDC)
Power consumption	
Basic device	Max. 6 W
USB device on USB host	Max. 2.5 W
max. heat dissipation P_V	Max. 8.5 W Heat dissipation with a power consumption of 24 V: 6 W for the basic device + 2.5 W for USB modules
Current consumption	
Continuous current	Max. 0.35 A (24 VDC)
Starting current inrush	1.5 A^2s
Protection against polarity reversal	yes
fuse	Yes (replacement only by the manufacturer or by an authorized repair center)
Potential isolation	No

9.4 Interfaces

Basic interfaces	
Ethernet	10/100 Mbps
Profile	FTP SMTP HTTP TCP UDP IP
Baud rate	100Base-TX 10Base-T
Potential isolation	$500V_{eff}$
Programming interface	Yes
Connections	RJ45
USB	not galvanically isolated
USB Host	USB 2.0, (1.5/12/480 MBits)
Potential isolation	none
USB device	USB 2.0
Potential isolation	none

additional interfaces	**XC-152-E3-11**	**XC-152-E6-11**	**XC-152-E8-11**	**XC-152-D8-11**	**XC-152-D6-11**
Article no.	167850	167851	167852	167849	167855
RS485		not galvanically isolated	not galvanically isolated	not galvanically isolated	not galvanically isolated
Baud rate	-	Max. 57.6 kBit/s	Max. 57.6 kBit/s	Max. 57.6 kBit/s	Max. 57.6 kBit/s
Potential isolation	-	none	none	none	none
Connections	-	9 pole SUB-D (plug)	9 pole SUB-D (plug)	9 pole SUB-D (plug)	9 pole SUB-D (plug)
RS232	not galvanically isolated			not galvanically isolated	not galvanically isolated
Baud rate	Max. 57.6 kBit/s	-	-	Max. 57.6 kBit/s	Max. 57.6 kBit/s
Potential isolation	none	-	-	none	none
Connections	9 pole SUB-D (plug)	-	-	9 pole SUB-D (plug)	9 pole SUB-D (plug)
PROFIBUS			not galvanically isolated		
Profile	-	-	DP V1 MPI (Master)	DP V1 MPI (Master)	-
Baud rate	-	-	Max. 1500 kBit/s	Max. 1500 kBit/s	-
Potential isolation	-	-	none	none	-
Number of users	-	-	126	126	-
Connections	-	-	9 pole SUB-D (socket)	9 pole SUB-D (socket)	-
CAN		not galvanically isolated			not galvanically isolated
Profile	-	CANopen®/ easyNet (Master/Device)	-	-	CANopen®/ easyNet (Master/Device)
Baud rate	-	Max. 1000 kBit/s	-	-	Max. 1000 kBit/s
Potential isolation	-	none	-	-	none
Number of users	-	127	-	-	127
Connections	-	9 pole SUB-D (plug)	-	-	9 pole SUB-D (plug)

9.5 SmartWire-DT Master

9.5.1 POW/AUX (power supply interface for SmartWire-DT)

POW/AUX	XC-152
Supply voltage U_{Aux} (control voltage for contactor coils)	
Operational voltage	
rated operating voltage	24 VDC
Permissible voltage	Effective: 20.4…28.8 V DC (rated operating voltage -15 % / +20 %)
Residual ripple of input voltage	Max. 5 %
Protection against polarity reversal	yes
Current	
In accordance with DIN VDE 0641, Part 11 and IEC/EN 60898	Max. 3 A[1)]
In accordance with UL 508 and CSA-22.2, No. 14	Max. 2 A[1)]
Short-circuit rating	No, external protection required (e.g. FAZ Z3, → Chapter → Section "6.1.1 POW/AUX SWD power supply", page 60XC-152)
Heat dissipation	Normally 1 W
Potential isolation	No
Rated operating voltage of 24 V DC slaves	Normally U_{Aux} - 0.2 V
Supply voltage U_{Pow} (for SmartWire-DT slaves)	
Specifications for connection to supply voltage	
rated operating voltage	24 VDC
Permissible voltage	Effective: 20.4…28.8 V DC (rated operating voltage -15 % / +20 %)
Residual ripple of input voltage	Max. 5 %
Protection against polarity reversal	yes
Current	Max. 0.7 A
Overload proof	yes
Inrush current and length	12.5 A/6 ms
Heat dissipation at 24 VDC	1.0 W
Potential isolation between U_{Pow} and 15 V SmartWire-DT supply voltage	No
Bridging voltage dips	10 ms
Repetition rate	1 s
Status indication	Yes (LEDs)

1) If contactors and/or motor starters with a total current draw > 3 A (DIN VDE 0641, Part 11 and IEC/EN 60898) or > 2 A (UL 508 and CSA-22.2, No. 14) are connected, an EU5C-SWD-PF1 or EU5C-SWD-PF2 power feeder module needs to be used.

9.5.2 SWD (SmartWire-DT interface)

SmartWire-DT interface	XC-152-E...
SmartWire-DT supply voltage U_{VP}	
Rated operating voltage (internally converted supply voltage U_{POW})	14.5 V DC ±3 % (14.0 … 15.0 VDC)
Current	Max. 0.7 A[1)]
Short-circuit rating	yes
Number of SmartWire-DT modules on the SmartWire-DT network	Max. 99
SmartWire-DT module address setting	Automatic
Potential isolation	none
Baud rate	Max. 250 kBit/s
Baud Rate	125 kbit/s 250 kBit/s (= default settings)
Connections	Blade terminal SWD4-8MF2

1) If SmartWire-DT modules with a total current draw > 0.7 A are connected, an EU5C-SWD-PF2-1 power feeder module needs to be used.

9.6 Approvals and declarations

Approvals and declarations	XC-152
Standards	EN 61131, UL 508
Approvals	CE, cULus
emc	2004/108/EEC
cULus	Devices delivered with gasket adhesively bonded in place: UL 508, File no. E205091
Marine approvals (shipping classification)	Type approval – provided that a radio interference suppression filter for the device is installed in the wiring and that the communication cables are screened. DNVGL-CG-0039, since 11/2015 Certificate No.: TAA00000NC

9.7 Applied standards and directives

Directives and standards	XC-152
EMC (relevant for CE)	
IEC/EN 61000-6-2	Interference immunity for industrial environments
IEC/EN 61000-6-4	Emitted interference for industrial environments Devices meeting this standard may not be used in residential areas
EMC (for marine approvals)	
2004/30/EU	Electromagnetic Compatibility (EMC) Directive
Security	
UL 508	Industrial Control Equipment
Product standards	
EN 50178	Electronic equipment for use in power installations
IEC/EN 61131-2	Programmable logic controllers: Equipment requirements and tests
IEC/EN 60068-2-27	Mechanical shock resistance with 15 g / 11 ms
IEC/EN 60068-2-31	Fall test
IEC/EN 60068-2-6	Vibration Displacement: 5 to 8.4 Hz: 3.5 mm; Acceleration: 8.4 to 150 Hz: 1 g

9.8 Environmental conditions

Environmental conditions	XC-152
Degree of protection	IP20/UL Open Type
temperature	
Ambient temperature	± 0 – +55 °C
operation	± 0 – +50 °C (+32 – +122 °F)
Storage / Transport	-20 – + 60 °C (-4 – +140 °F)
Humidity/Condensation	Relative humidity 10 - 95 % non-condensing

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