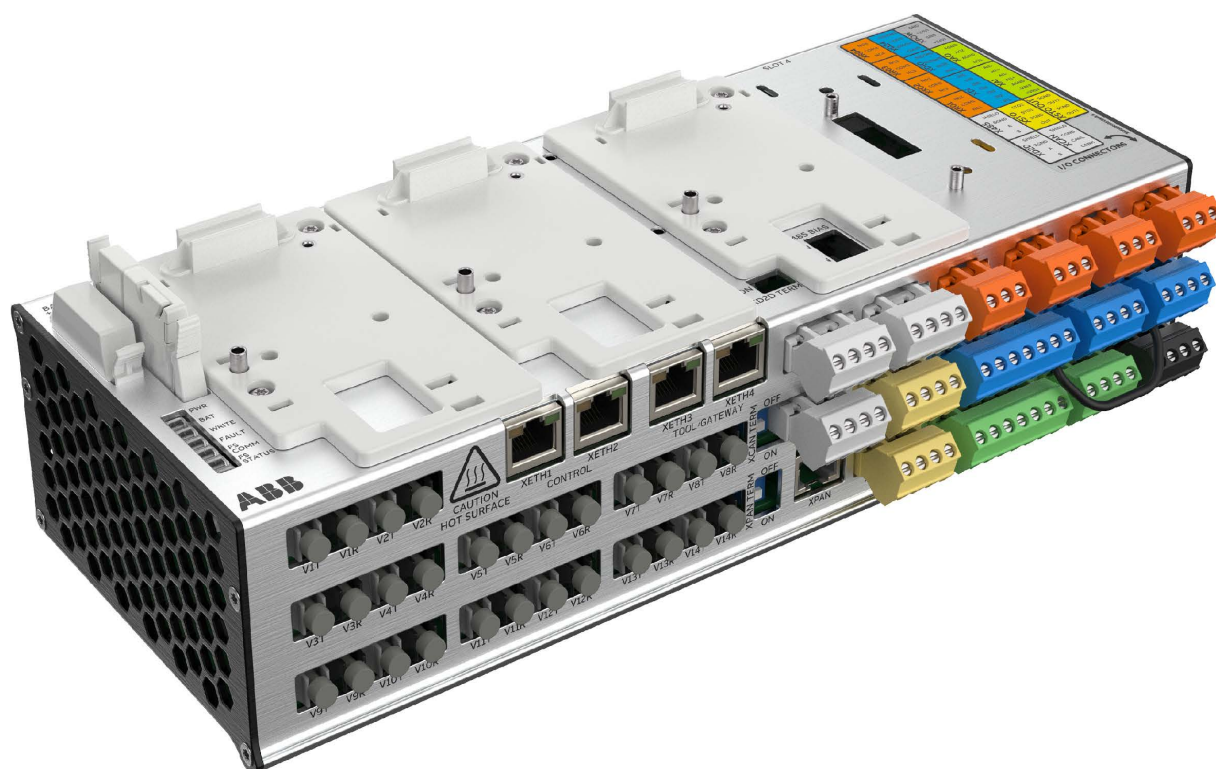


ABB INDUSTRIAL DRIVES

UCU-22/23/24/25/26 control units

Hardware manual



UCU-22/23/24/25/26 control units

Hardware manual

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1

Introduction to the manual

Contents of this chapter

This chapter gives information on the manual.

Safety

**WARNING!**

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

Terms and abbreviations

Term	Description
Converter	Converts direct current and voltage to alternating current and voltage, or vice versa.
Drive	Frequency converter for controlling AC motors
Inverter	Converts direct current and voltage to alternating current and voltage.
RDCO	Optical DDCS communication module
STO	Safe torque off (IEC/EN 61800-5-2)
UCU	Type of control unit

Later in this manual, the term *converter* covers the terms drive, converter, inverter and brake chopper.

Related documents

You can find manuals on the Internet. See below for the relevant code/link. For more documentation, go to www.abb.com/drives/documents.

Name	Code
General manuals	
ACS880 multidrive cabinets and modules safety instructions	3AUA00000102301
ACS880 liquid-cooled multidrive cabinets and modules safety instructions	3AXD50000048633
ACS880 multidrive cabinets and modules electrical planning instructions	3AUA00000102324
ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions	3AXD50000048634
Drive modules cabinet design and construction instructions	3AUA00000107668
UCU-22/23/24/25/26 hardware manual	3AXD50000817726
Option manuals	
FDPI-02 diagnostics and panel interface user's manual	3AUA00000113618
RDCO-0x DDCS Communication option modules user's manual	3AFE64492209

2

Operation principle and hardware description

Contents of this chapter

This chapter gives information about the hardware of the control units.

Hardware description

The UCU control units are used for controlling converters via fiber optic links. They contain integrated branching unit functionality for collecting and storing real-time data from the modules to help fault tracing and analysis. The data is stored on the microSDHC memory card inserted into the microSD card slot in the UMU-01 memory unit and can be analyzed by ABB service personnel.

The control unit requires an external 24 V DC power source. It has three option slots for I/O extensions, encoders and fieldbus adapters, and a removable memory unit. If you need to replace the control unit, you can keep the parameter settings by moving the memory unit from the defective control unit to the new one. The control unit also has one option slot for connecting a RDCO-0x DDCS communication option board.

The drive-to-drive link (XD2D) is a daisy-chained RS-485 transmission line that allows basic master/follower communication with one master and multiple followers. The control unit has two Ethernet ports for control network and two Ethernet ports for tool/gateway network. The control unit also has a connection for control panel. The X485 connection provides a connection for optional CIO-01 I/O module. Environmental sensors measure humidity and temperature.

Fiber optic connections

The different control unit types have a different number of fiber optic connections.

Type	No. of fiber optic connections
UCU-22	2 (V1...V2)
UCU-23	8 (V1...V8)
UCU-24	14 (V1...V14)
UCU-25	20 (V1...V20)
UCU-26	26 (V1...V26)

The maximum length of the cables with 1 mm plastic optical fiber cable is 35 m (115 ft).

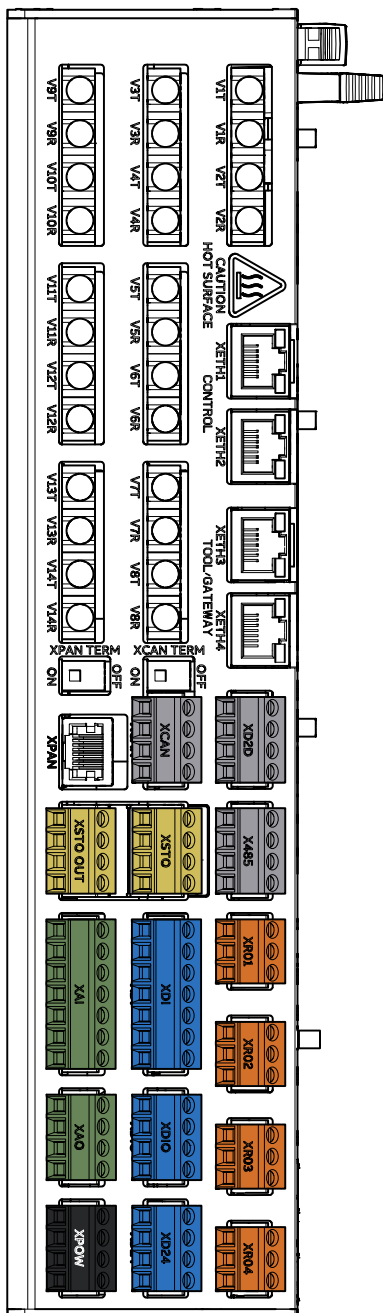
Make sure that:

- both cables in a fiber optic pair have the same length, and
- each fiber optic pair connected to one control unit has the same length.

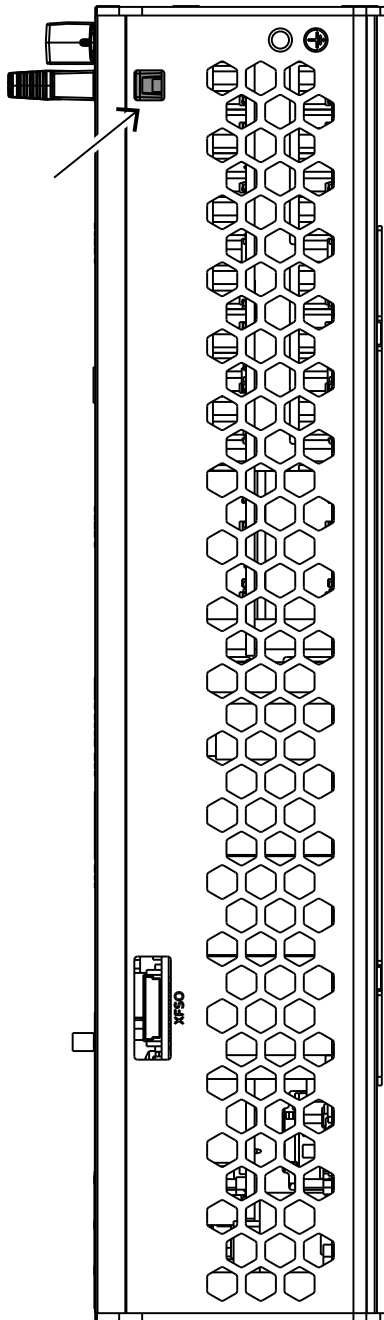
With long distances, cables of different lengths cause different delays, which can have an unwanted effect on the operation.

For instructions on how to connect the control unit to the converter module(s), refer to the applicable hardware manual.

12 Operation principle and hardware description



	Description
XAI	Analog input
XAO	Analog output
XCAN	CAN bus
XCAN TERM	CAN bus termination switch
XDI	Digital input
XDIO	Digital input/output
XD2D	Drive-to-drive link
XD24	+24 V output (for digital input)
XETH1	Ethernet ports for fieldbus, internal switch
XETH2	
XETH3	Ethernet ports for tool communication, internal switch
XETH4	
XPAN	Control panel connection
XPAN TERM	Panel bus termination switch
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XRO4	Relay output RO4, reserved.
XSTO	Safe torque off connection (input signals)
XSTO OUT	Safe torque off connection (to inverter modules)
X485	RS-485 link
V1T/V1R ... V26T/V26R	Fiber optic connections to converter modules (VxT = transmitter, VxR = receiver)



	Description
XFSO	Not in use
Environmental sensors	Humidity and temperature measurements

3

Mechanical installation



Contents of this chapter

This chapter describes the installation procedures and the contents of the delivery.

Examining the delivery

Make sure that these items are included:

- control unit with the I/O connector plugs
- UMU-01 memory unit
- microSDHC flash memory card (inserted in its slot inside the UMU memory unit)
- BR2032 battery
- USCA-02 option slot adapters.

Make sure that there are no signs of damage to any of the items.

■ Identifying different control unit types

Before you install the control unit, make sure that it has the correct control program for the hardware in question. The control program is shown on the label attached to the memory unit.

Make sure that the control unit is correct for your equipment configuration.

Installing the control unit on a DIN rail



WARNING!

Do not install the control unit adjacent to electromagnetic disturbance sources, such as relays, contactors, brake choppers, power and motor cabling. The minimum recommended distance from such components is 200 mm (7.9 in). ABB recommends to install metallic screening between the control unit and the source of disturbance. This can reduce the required distance.



WARNING!

Install the control unit so that air can pass freely through the ventilation holes in the housing. Do not install the control unit directly above heat generating equipment.

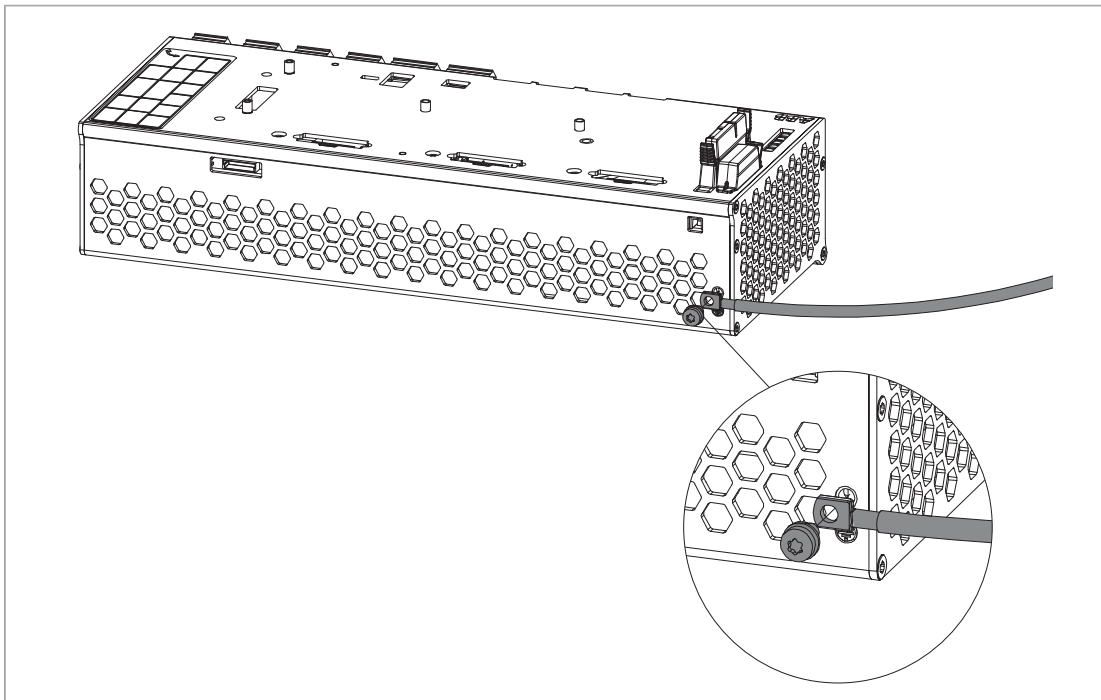
You can install the control unit on a horizontal or vertical standard 35 × 7.5/15 mm DIN rail. In horizontal direction, make sure that the connectors are pointing downwards. In vertical direction, the connectors can point to left or right.

Leave enough space for:

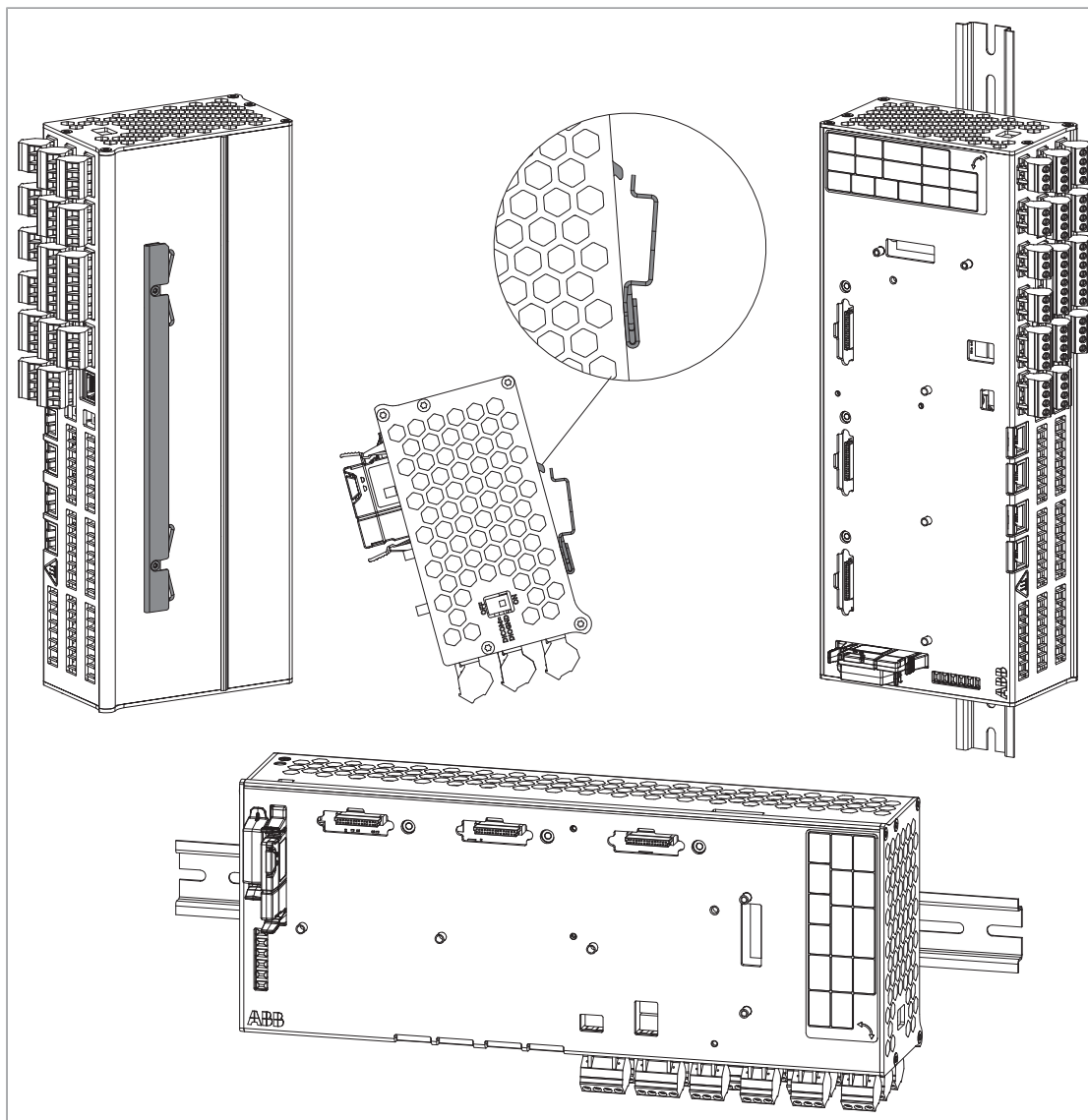
- cabling
- environmental sensors
- replacing the UMU-01 memory unit and real-time clock battery.

The control unit is grounded through the DIN rail and the grounding screw

1. Attach the grounding screw (M4×6 or M4×8) and wire to the control unit. Ground the control unit to the cabinet frame with the grounding wire. The minimum cross-sectional area of the ground conductor is 4 mm² (12 AWG).



2. Push the control unit to the DIN rail. It makes a click. To prevent the movement of the control unit, attach it to the DIN rail with end brackets (optional).



Installing the slot adapter



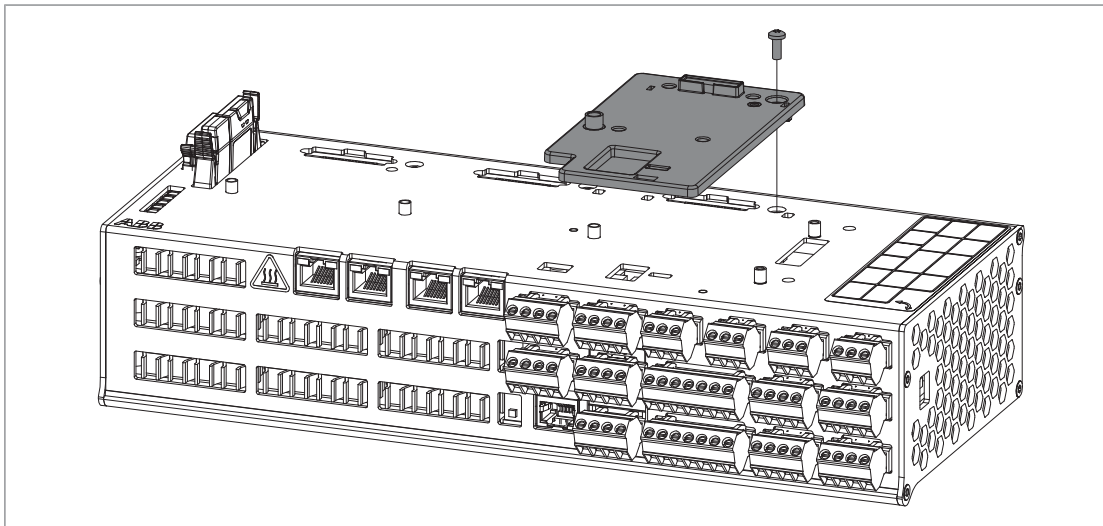
WARNING!

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

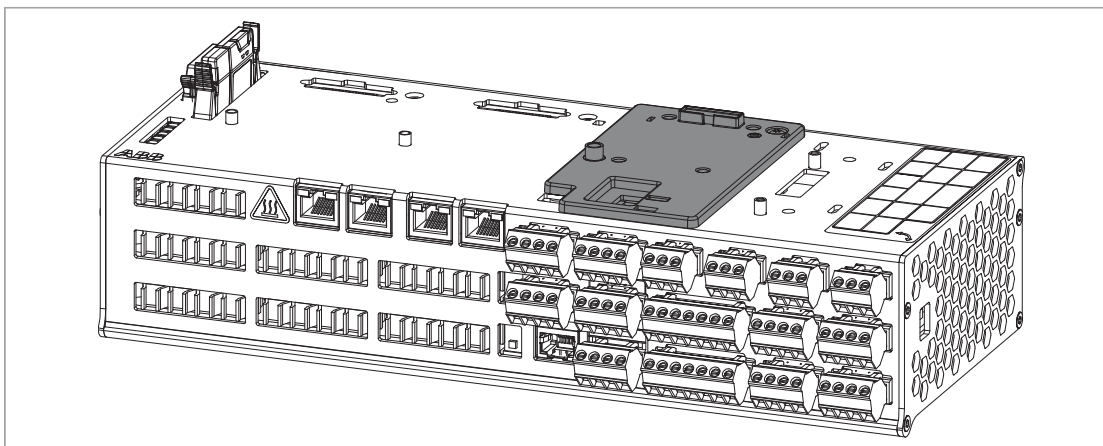
A slot adapter is necessary if you install F-series option modules onto the control unit. You can install a maximum of 3 slot adapters per control unit.

Note: It is possible to install RDCO-0x communication option module directly onto the control unit without the slot adapter.

1. Stop the drive and do the steps in section *Electrical safety precautions* in the applicable hardware manual before you start the work.
2. Attach the slot adapter onto slot 1, slot 2 or slot 3 with a screw.



3. Torque the screw to 0.8 N·m (7.1 lbf·in).



4

Electrical installation

Contents of this chapter

This chapter describes the electrical installation of the control units.

Installation procedure

**WARNING!**

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

1. Connect the +24 V external power supply to the control unit connector XPOW. You can connect a second power supply for redundancy.
2. Connect the fiber optic cables from the converter module to the control unit. Refer to the instructions given in the converter module hardware manual.
3. Connect the control cables to the control unit. Refer to the instructions given in the converter module hardware manual.

Related documents

For the default I/O connection diagrams and more information on the connections, refer to the applicable converter module hardware manual.



5

Maintenance

Contents of this chapter

This chapter gives instructions on how to do maintenance on the control unit.

Replacing the real-time clock battery

**WARNING!**

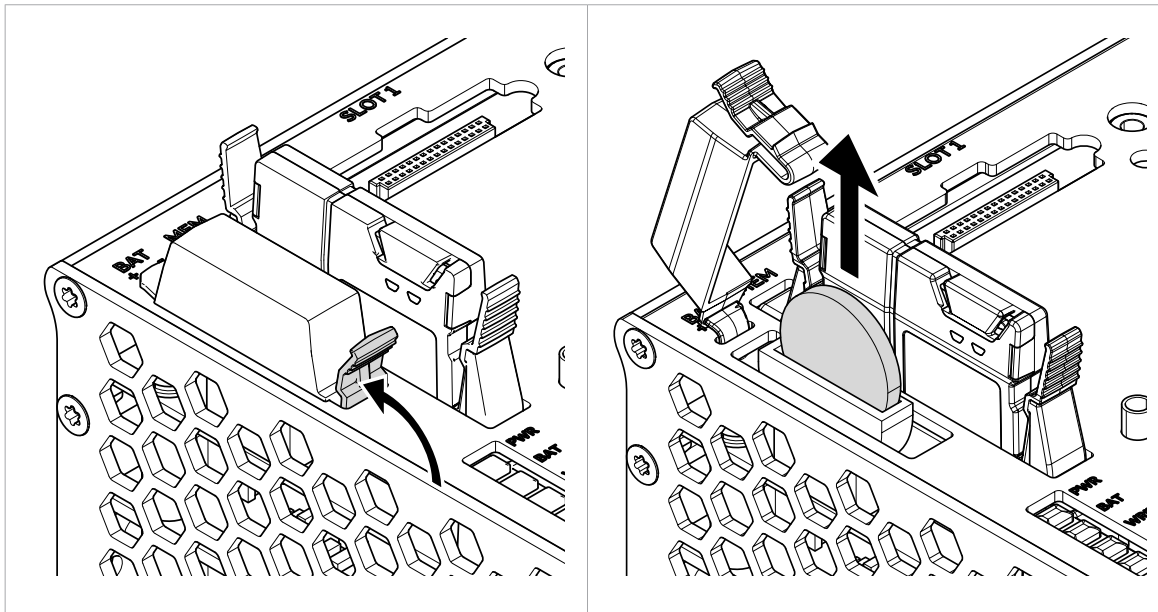
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

Replace the real-time clock battery if the BAT LED is off when the control unit is powered.

1. Stop the drive and do the steps in section *Electrical safety precautions* in the applicable hardware manual before you start the work.
2. Open the battery cover.
3. Replace the battery with a new BR2032 battery.

Note: The real-time clock stays set for 2 minutes without battery.

4. Close the battery cover.
5. Set the real-time clock if necessary.
6. Dispose of the old battery according to local disposal rules or applicable laws.



Replacing the memory unit

**WARNING!**

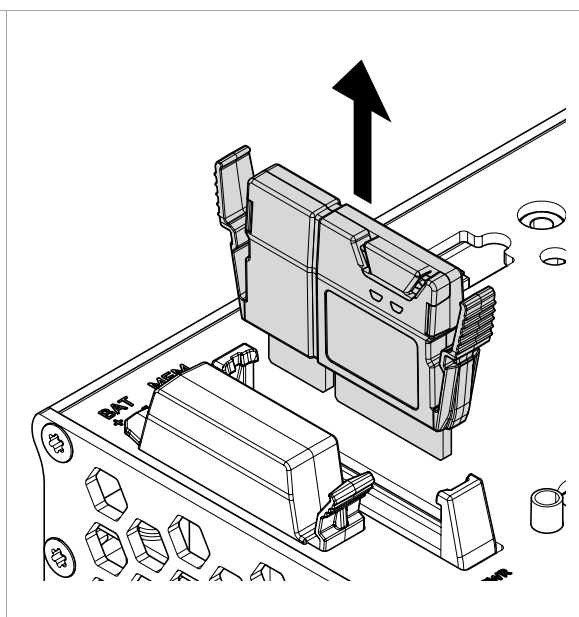
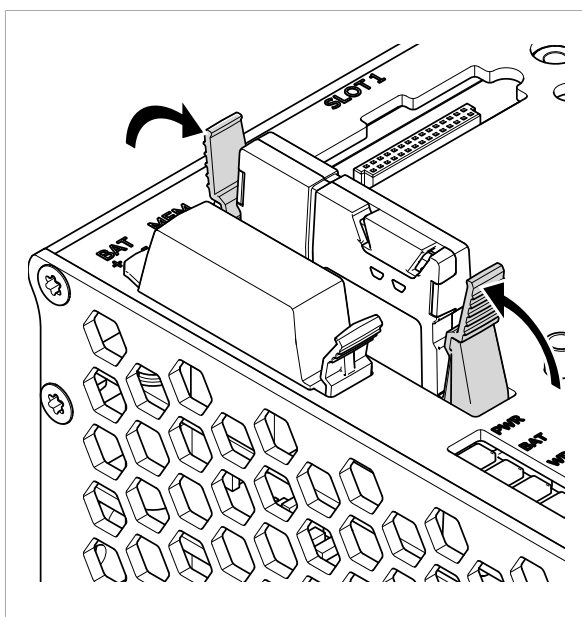
Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

After replacing a control unit, you can keep the existing parameter settings by transferring the memory unit from the defective control unit to the new control unit.

**WARNING!**

Do not remove or insert the memory unit when the control unit is powered.

1. Stop the drive and do the steps in section *Electrical safety precautions* in the applicable hardware manual before you start the work.
2. Make sure that the control unit is not powered.
3. Push and hold in the clips on the memory unit. Pull the memory unit out.
4. Push the new memory unit in.



Replacing the microSDHC memory card

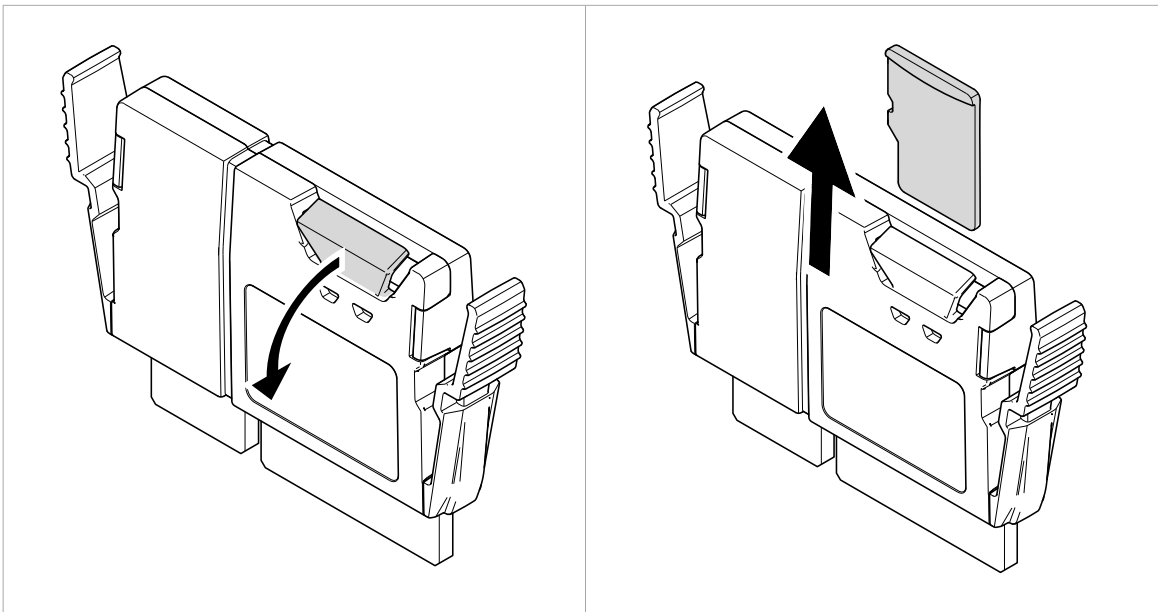


WARNING!

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

For the replacement card type, refer to the technical data.

1. Remove the UMU-01 memory unit from the control unit. Refer to [Replacing the memory unit \(page 23\)](#).
2. Move away from the cabinet before you remove the microSDHC card from the memory unit. The card is small and can fall into the cabinet.
3. Open the memory card cover in the memory unit.
4. Push the card to remove it.
5. Install a new card in reverse order.



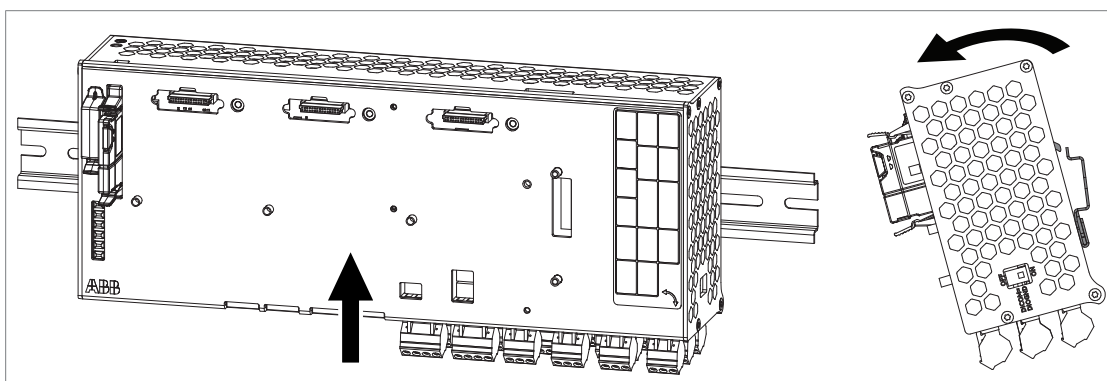
Replacing the control unit



WARNING!

Obey the safety instructions of the drive. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation, commissioning or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions* in the applicable hardware manual before you start the work.
2. Remove the fiber optic cables and detachable terminal blocks that have control cables connected.
3. If the control unit is attached to the rail with end brackets, remove them.
4. Remove the control unit from the DIN rail:
 - a. Push the control unit against the mounting spring until it releases from the DIN rail.
 - b. Tilt the control unit away from the DIN rail and lift it out.



5. Make sure that the type of the new unit is correct.

Type	Can be replaced with
UCU-22	UCU-22, UCU-23, UCU-24, UCU-25, UCU-26
UCU-23	UCU-23, UCU-24, UCU-25, UCU-26
UCU-24	UCU-24, UCU-25, UCU-26
UCU-25	UCU-25, UCU-26
UCU-26	UCU-26

6. Install the new control unit in reverse order.

If there is a safety circuit connected to the STO terminals (XSTO) of the control unit, do the acceptance test of the safety function after replacing the control unit. Refer to the converter module hardware manual or safety option user's manual.

6

Technical data

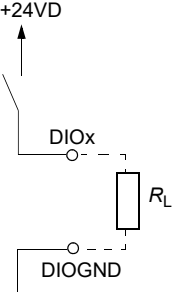
Contents of this chapter

This chapter contains the technical data for the control units.

Connector data

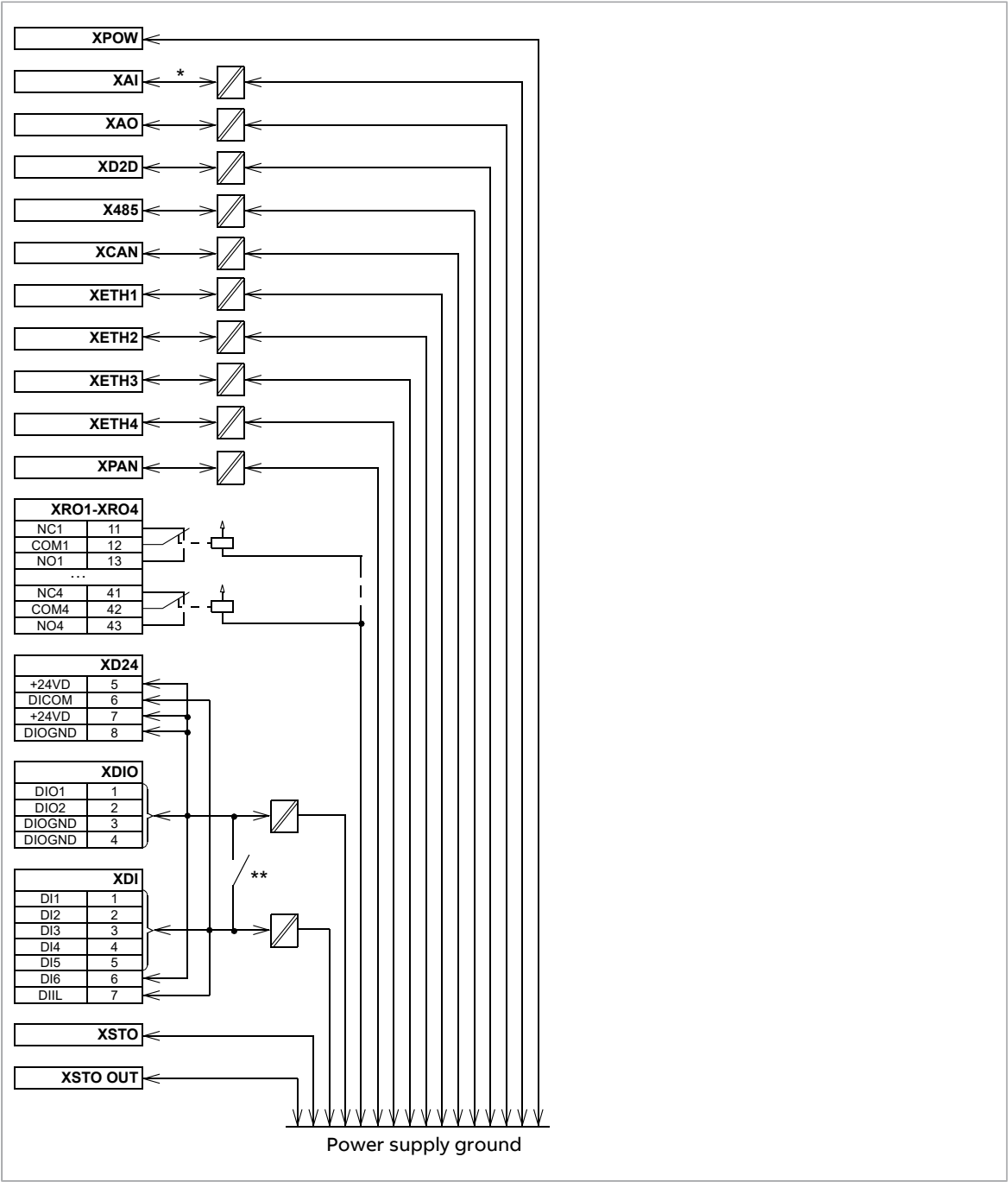
Power supply (XPOW)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 19...32 V DC, 2.9 A External power input. Two supplies can be connected to the UCU-22...26 for redundancy.
Relay outputs RO1...RO4 (XRO1...XRO4)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 250 V AC / 30 V DC, 2 A Protected by varistors
+24 V output (XD24:2 and XD24:4)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.
Digital inputs DI1...DI1L (XDI:1...XDI:7)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 24 V logic levels: "0" < 5 V, "1" > 15 V R_{in}: 2.0 kohm Input type: NPN/PNP (DI1...DI5), PNP (DI6) I_{max}: 15 mA (DI1...DI5), 5 mA (DI6)

28 Technical data

Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2) Input/output mode selection by parameters. DIO1 can be configured as a frequency input (0...100 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). In some control programs, DIO2 can be configured as a 24 V level square wave frequency output. Refer to the firmware manual, parameter group 11.	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) <u>As inputs:</u> 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in}: 2.0 kohm. Filtering: 1 ms. <u>As outputs:</u> Total output current from +24VD is limited to 200 mA 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 10 V ±1% and -10 V ±1%, R_{load} 1...10 kohm Maximum output current: 10 mA
Analog inputs AI1 and AI2 (XAI:4 ... XAI:7).	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Current input: -20...20 mA, R_{in} = 100 ohm Voltage input: -10...10 V, R_{in} > 200 kohm Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 0...20 mA, R_{load} < 500 ohm Frequency range: 0...500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
XD2D connector	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 ... 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination and bias by switch
RS-485 connection (X485)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Physical layer: RS-485 Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 ... 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination and bias by switch (X485 TERM and X485 BIAS)

CAN connection (XCAN)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Termination by switch (XCAN TERM)
Safe torque off connection (XSTO)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Input voltage range: -3...30 V DC Logic levels: "0" < 5 V, "1" > 17 V. Note: For the unit to start, both connections must be "1". This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but SIL/PL classified Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. Current consumption: 10 mA (continuous) per STO channel EMC (immunity) according to IEC 61326-3-1 and IEC 61800-5-2
Safe torque off output (XSTO OUT)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) To STO connector of inverter module.
Control panel connection (XPAN)	Connector: RJ-45 Cable length < 50 m (164 ft) Termination by switch (XPAN TERM)
Fieldbus Ethernet connection with internal switch (XETH1 and XETH2) Tool Ethernet connection with internal switch (XETH3 and XETH4)	Connector: RJ-45 Cable type: minimum requirement CAT5e
microSDHC memory card slot (microSDHC CARD)	Memory card type: microSDHC (minimum of class 4 speed grade) Supported memory size: 4 GB...32 GB
Battery	Real-time clock battery type: BR2032
The terminals of the control unit fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.	

■ UCU-22...26 ground isolation diagram



*The maximum common mode voltage between each AI input and AGND is ± 30 V

****Ground selector (DIOCOM=DIOGND) settings**

DIOCOM=DIOGND: ON
All digital inputs share a common ground (DIOCOM connected to DIOGND). This is the default setting.
DIOCOM=DIOGND: OFF
Ground of digital inputs DI1...DI5 and DIIL (DIOCOM) is isolated from DIO signal ground (DIOGND). Isolation voltage 50 V.

Additional information on the connections

■ External power supply for the control unit (XPOW)

The control unit is powered from a 24 V DC, 2.9 A supply through terminal block XPOW.

Using an external supply is recommended if

- the control unit needs to be kept operational during input power breaks, for example, because of continuous fieldbus communication
- immediate restart is needed after a power break (that is, no control unit power-up delay is allowed).

■ DIIL input

By default the DIIL input is used to implement stop as a part of safety function. The input is parametrized to stop the unit when the input signal is lost.

A jumper wire set installed at the factory connects the DIIL input to +24 V, which enables the drive to start. If this function is used as a part of safety function implementation, the jumper wire set must be removed.

Note: This input is NOT SIL or PL classified.

■ The XD2D connector

The XD2D connector provides an RS-485 connection that can be used for

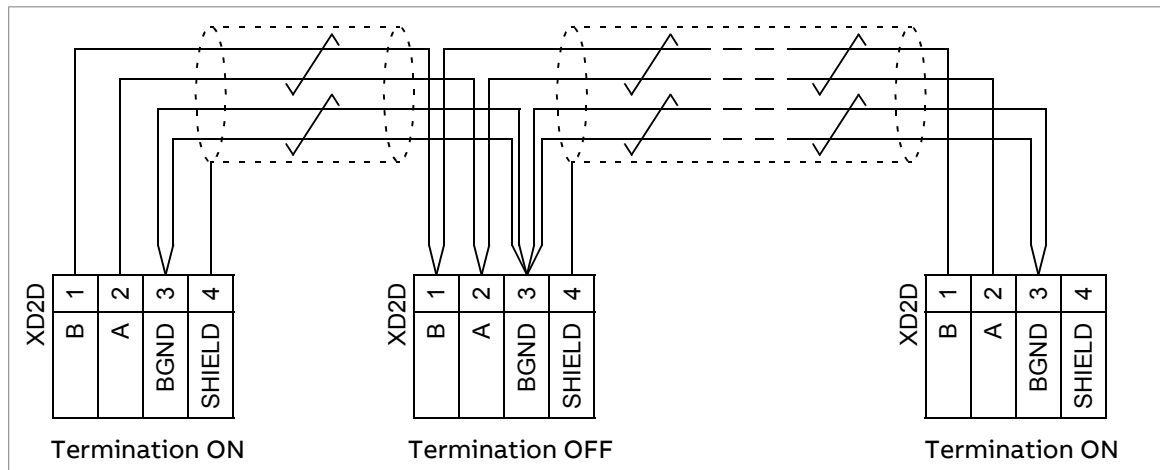
- basic master/follower communication with one master drive and multiple followers,
- fieldbus control through the embedded fieldbus interface (EFB), or
- drive-to-drive (D2D) communication implemented by application programming.

Refer to the firmware manual of the drive for the availability of these features and related parameter settings.

Terminate the bus on the units at the ends of the drive-to-drive link. Disable bus termination on the intermediate units.

Use shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100...165 ohm, for example Belden 9842) for the wiring. For best immunity, ABB recommends high quality cable. Keep the cable as short as possible. Avoid unnecessary loops and parallel runs near power cables such as motor cables.

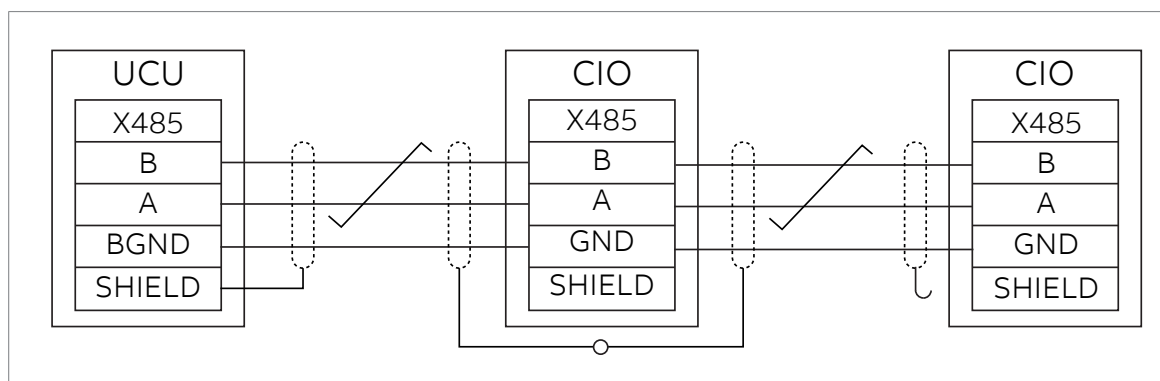
The following diagram shows the wiring between control units.



■ The X485 connector

The X485 provides a connection for optional CIO-01 I/O module. Refer to [CIO-01 I/O module for distributed I/O bus control user's manual \(3AXD50000126880 \[English\]\)](#) for more information.

The following diagram shows the wiring for the module.



Terminate the I/O bus at its physical ends:

1. Set the termination resistor switch of the CIO-01 module on the end of the I/O bus to ON position.
2. Set the X485 termination switch (X485 TERM) of the UCU control unit to ON position to terminate the other end of the I/O bus.
3. Set the termination resistors of all other CIO-01 modules to OFF position.

Make sure that two devices in the I/O bus have the biasing on:

1. Set the X485 bias switch (X485 BIAS) of the UCU control unit to ON position.
2. Make sure that the termination resistor switch in one of the CIO-01 modules is set to ON position. This automatically starts the biasing.

■ MicroSDHC memory card slot

The control unit has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the microSDHC memory card inserted into the UMU memory unit and can be analyzed by ABB service personnel.

Other information

Weight	1.70 kg (3.75 lb)
Protection classes	
Degree of protection (IEC/EN 60529)	IP20
Enclosure type (UL 508C)	UL Open Type
Overvoltage category (IEC 60664-1)	II
Protective class (IEC/EN 61800-5-1)	I
Protective class (IEC 62109-1)	II
Ambient conditions	
Air temperature in operation	-10...70 °C (14...158 °F)
Storage and transportation conditions	
Air temperature	-40...85 °C (-40...185 °F)
Relative humidity	Maximum allowed relative humidity is 95%. No condensation allowed.
Materials	
Housing	Conversion coated and anodized aluminum
Package	Cardboard
Applicable standards	
IEC 61800-5-1:2007 + AMD1:2016 EN 61800-5-1:2007 + A1:2017 + A11:2021	<i>Adjustable speed electrical power drive systems. Part 5-1: Safety requirements – electrical, thermal and energy</i>
IEC 61800-3:2018 EN 61800-3:2004 + A1:2012	<i>Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods</i>
IEC/EN 62109-1:2010	<i>Safety of power converters for use in photovoltaic power systems Part 1: General requirements</i>
UL 61800-5-1, 1st edition	<i>Adjustable speed electrical power drive systems. Part 5-1: Safety requirements – electrical, thermal and energy</i>
CSA C22.2 No. 274-17	<i>Adjustable speed drives</i>
Note: For other standards, refer to the applicable hardware and functional safety manuals.	
Markings	
cULus	The control unit is cULus Listed.

Cyber security disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

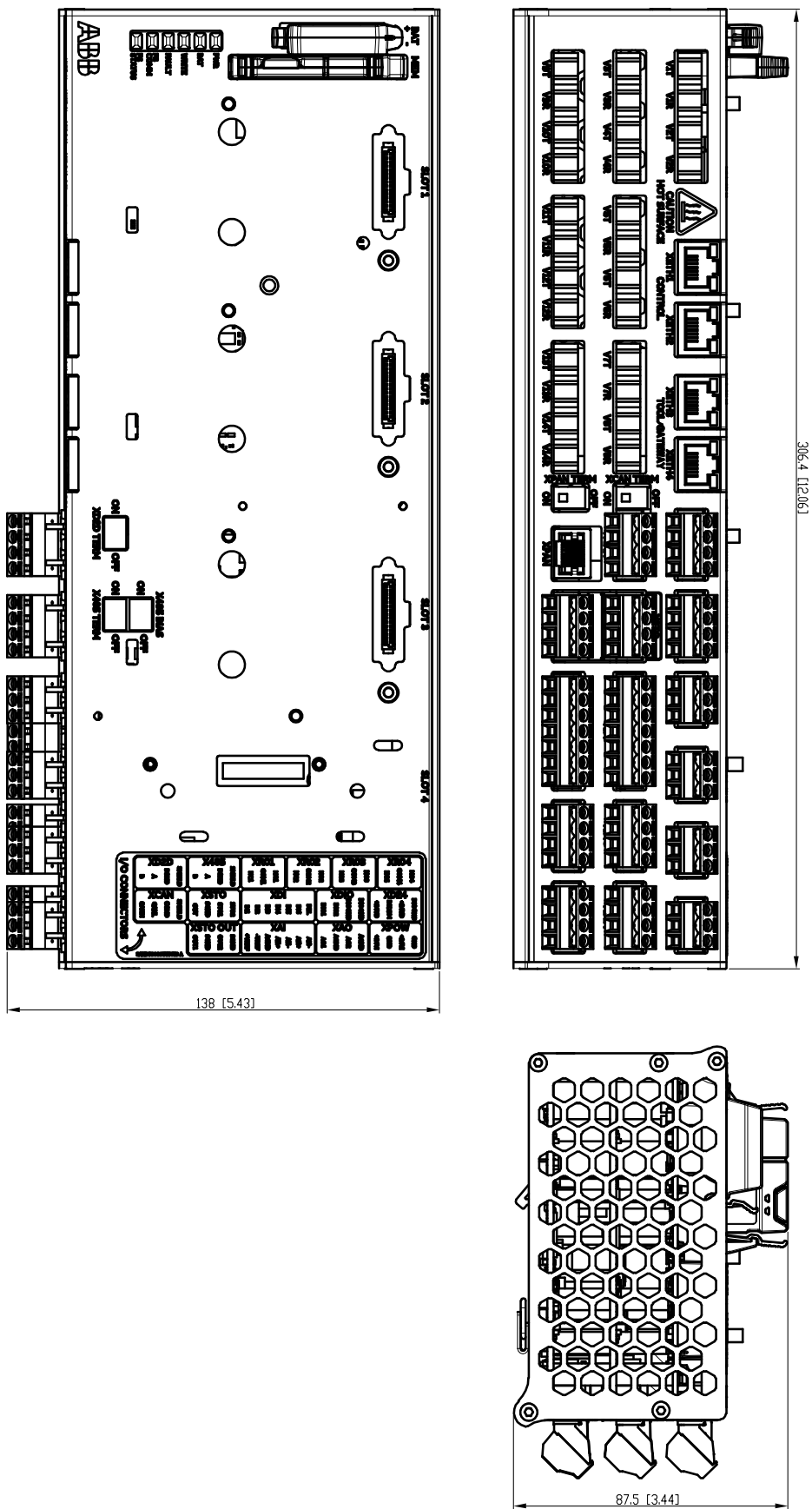
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Dimension drawings

Contents of this chapter

This chapter shows the dimensions of the control unit.

Dimension drawings of the control unit





Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

Product training

For information on ABB product training, navigate to new.abb.com/service/training.

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