ABB industrial drives

Safety instructions
ACS880 multidrive cabinets and modules

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Safety instructions

ACS880 multidrive cabinets and modules

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Introduction to the manual

Contents of this chapter

This chapter contains general information of the manual, a list of related manuals, and a list of terms and abbreviations.

Applicability

This manual applies to ACS880 multidrive cabinets and modules.

Target audience

This manual is intended for people who plan the installation, install, start up, use or do service work. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

Terms and abbreviations

Term	Description
BCU	Type of control unit
Brake unit	Brake chopper modules under control of one control board, and related accessories
Cabinet	An enclosure that consists of one or more cubicles
Control board	Circuit board in which the control program runs
Control unit	Control board built in a housing (often rail-mountable)
Cubicle	One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.
DC link	DC circuit between rectifier and inverter
DDCS	Distributed drives communication system protocol
Diode supply unit	Diode supply modules under control of one control board, and related components.
Drive	Frequency converter for controlling AC motors
DSU	Diode supply unit
EMC	Electromagnetic compatibility

Term	Description
Frame (size)	Physical size of the drive or power module
FSO-12, FSO-21	Optional functional safety modules
Intermediate circuit	DC link
INU	Inverter unit
Inverter	Converts direct current and voltage to alternating current and voltage.
Inverter module	Inverter bridge, related components and drive DC link capacitors enclosed in a metal frame or enclosure. Intended for cabinet installation.
Inverter unit	Inverter module(s) under control of one control board, and related components. One inverter unit typically controls one motor.
ISU	IGBT supply unit
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Power module	Common term for drive module, inverter module, supply module, brake chopper module etc.
Rectifier	Converts alternating current and voltage to direct current and voltage
RFI	Radio-frequency interference
RRU	Regenerative rectifier unit
STO	Safe torque off (IEC/EN 61800-5-2)
Supply module	Rectifier bridge and related components enclosed in a metal frame or enclosure. Intended for cabinet installation.
Supply unit	Supply module(s) under control of one control board, and related components.

Related manuals

Cabinet-installed multidrive manuals

Manual	Code
General manuals	
Safety instructions for ACS880 multidrive cabinets and modules	3AUA0000102301
Electrical planning instructions for ACS880 multidrive cabinets and modules	3AUA0000102324
Mechanical installation instructions for ACS880 multidrive cabinets	3AUA0000101764
Supplement for ACS880 +C132 marine type-approved cabinet-built drives	3AXD50000039629
Supply unit manuals	
ACS880-207 IGBT supply units hardware manual	3AUA0000130644
ACS880 IGBT supply control program firmware manual	3AUA0000131562
ACS880-307 +A003 diode supply units hardware manual	3AUA0000102453
ACS880-307 +A018 diode supply units hardware manual	3AXD50000011408
ACS880 diode supply control program firmware manual	3AUA0000103295
ACS880-907 regenerative rectifier units hardware manual	3AXD50000020546
ACS880 regenerative rectifier control program firmware manual	3AXD50000020827
Inverter unit manuals	
ACS880-107 inverter units hardware manual	3AUA0000102519
ACS880 primary control program firmware manual	3AUA0000085967
ACS880 primary control program quick start-up guide	3AUA0000098062
Manuals for application programs (Crane, Winder, etc.)	
Brake unit and DC/DC converter unit manuals	
ACS880-607 1-phase brake units hardware manual	3AUA0000102559
ACS880-607 3-phase brake units hardware manual	3AXD50000022034

Manual	Code
ACS880 (3-phase) brake control program firmware manual	3AXD50000020967
ACS880-1607 DC/DC converter units hardware manual	3AXD50000023644
ACS880 DC/DC converter control program firmware manual	3AXD50000024671
Option manuals	
ACS-AP-x assistant control panels user's manual	3AUA0000085685
Drive composer start-up and maintenance PC tool user's manual	3AUA0000094606
Manuals for I/O extension modules, fieldbus adapters, safety options etc.	

You can find manuals on the Internet. See www.abb.com/drives/documents. For manuals not available in the document library, contact your local ABB representative.

Multidrive module manuals

Manual	Code
General manuals	
Safety instructions for ACS880 multidrive cabinets and modules	3AUA0000102301
Electrical planning instructions for ACS880 multidrive cabinets and modules	3AUA0000102324
Cabinet design and construction instructions for ACS880 air-cooled and liquid-cooled multidrive modules	3AUA0000107668
ACS880 +C132 marine type-approved drive modules and module packages supplement	3AXD50000037752
Supply module manuals	
ACS880-204 IGBT supply units as modules hardware manual	3AUA0000131525
ACS880 IGBT supply control program firmware manual	3AUA0000131562
ACS880-304 diode supply modules (+A003) hardware manual	3AUA0000102452
ACS880-304 +A018 diode supply modules hardware manual	3AXD50000010104
ACS880 diode supply control program firmware manual	3AUA0000103295
ACS880-904 regenerative rectifier modules hardware manual	3AXD50000020457
ACS880 regenerative rectifier control program firmware manual	3AXD50000020827
Inverter module manuals and guides	
ACS880-104 inverter modules hardware manual	3AUA0000104271
ACS880 primary control program firmware manual	3AUA0000085967
ACS880 primary control program quick start-up guide	3AUA0000098062
Manuals for application programs (Crane, Winder, etc)	
Brake module and DC/DC converter module manuals	
ACS880-604 1-phase brake chopper modules hardware manual	3AUA0000106244
ACS880-604 3-phase brake chopper modules hardware manual	3AXD50000022033
ACS880 (3-phase) brake control program firmware manual	3AXD50000020967
ACS880-1604 DC/DC converter modules Hardware manual	3AXD50000023642
ACS880 DC/DC converter control program firmware manual	3AXD50000024671
Module package hardware manuals	
ACS880-04 module packages hardware manual	3AUA0000138495
ACS880-14 and -34 module packages hardware manual	3AXD50000022021
Option manuals	
ACX-AP-x assistant control panels user's manual	3AUA0000085685

Manual	Code
Drive composer start-up and maintenance PC tool user’s manual	3AUA0000094606
Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.	

You can find manuals on the Internet. See www.abb.com/drives/documents. For manuals not available in the document library, contact your local ABB representative.

You can find all documentation related to the multidrive modules on the Internet at https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content.

2

Safety instructions

Contents of this chapter

This chapter contains the safety instructions which you must obey when you install, start up and do maintenance work on the drive. If you ignore the safety instructions, injury, death or damage can occur.

Use of warnings and notes

Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. Notes draw attention to a particular condition or fact, or give information on a subject.

The manual uses these warning symbols:

WARNING!

Electricity warning tells about hazards from electricity which can cause injury or death, or damage to the equipment.

WARNING!

General warning tells about conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment.

WARNING!

Electrostatic sensitive devices warning tells you about the risk of electrostatic discharge which can cause damage to the equipment.

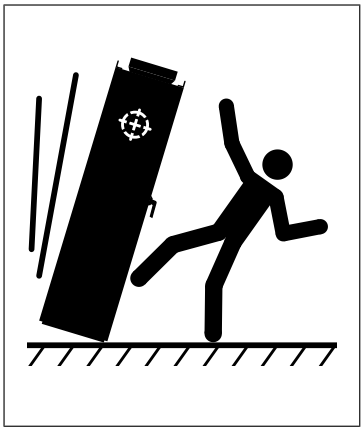
General safety in installation, start-up and maintenance

These instructions are for all personnel who do work on the drive.

WARNING!

Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

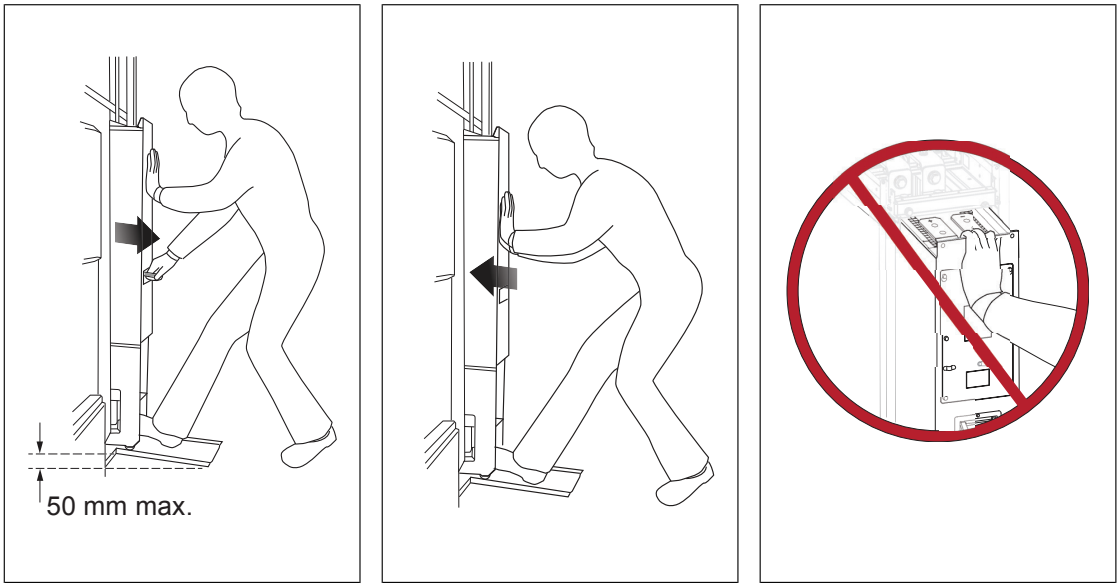
- Keep the drive in its package until you install it. After unpacking, protect the drive from dust, debris and moisture.
- Use the required personal protective equipment: safety shoes with metal toe cap, protective gloves, etc.
- Lift the drive with a lifting device. Use the designated lifting points. See the dimension drawings.
- Secure the drive cabinet to the floor to prevent it from toppling over. The cabinet has a high center of gravity. When you pull out heavy components or power modules, there is a risk of overturning. Secure the cabinet also to the wall when necessary.



- Be careful when handling a tall module. The module overturns easily because it is heavy and has a high center of gravity. Whenever possible, secure the module with chains. Do not leave an unsupported module unattended especially on a sloping floor.

- Do not use the module installation ramp with plinth heights which exceed 50 mm [1.97 in].
- Secure the module extraction/installation ramp carefully.
- Push the module into the cabinet and pull it from the cabinet carefully preferably with help from another person. Keep a constant pressure with one foot on the base of the

module to prevent the module from falling on its back. Keep your fingers away from the edges of the front flange of the module.



- Beware of hot surfaces. Some parts, such as heatsinks of power semiconductors, and brake resistors, remain hot for a while after disconnection of the electrical supply.
- Vacuum clean the area around the drive before the start-up to prevent the drive cooling fan from drawing the dust inside the drive.
- Make sure that there is sufficient cooling. See the technical data.
- Keep the cabinet doors closed when the drive is powered. With the doors open, a risk of a potentially fatal electric shock, arc flash or high-energy arc blast exists. If you cannot avoid working on a powered drive, obey the local laws and regulations on live working (including – but not limited to – electric shock and arc protection).
- Before you adjust the drive operation limits, make sure that the motor and all driven equipment can operate throughout the set operation limits.
- Before you activate the automatic fault reset or automatic restart functions of the drive control program, make sure that no dangerous situations can occur. These functions reset the drive automatically and continue operation after a fault or supply break. If these functions are activated, the installation must be clearly marked as defined in IEC/EN 61800-5-1, subclause 6.5.3, for example, "THIS MACHINE STARTS AUTOMATICALLY".
- The maximum number of drive power-ups is five in ten minutes. Too frequent power-ups can damage the charging circuit of the DC capacitors.
- Validate any safety circuits (for example, Safe torque off or emergency stop) in start-up. See separate instructions for the safety circuits.
- Beware of hot air exiting from the air outlets.
- Do not cover the air inlet or outlet when the drive is running.

Note:

- If you select an external source for the start command and it is on, the drive will start immediately after fault reset unless you configure the drive for pulse start. See the firmware manual.
- Depending on the configuration of the drive, the stop key on the control panel may not stop the drive.
- Only authorized persons are allowed to repair a malfunctioning drive.

Electrical safety in installation, start-up and maintenance

Electrical safety precautions

These electrical safety precautions are for all personnel who do work on the drive, motor cable or motor.

WARNING!

Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrician, do not do installation or maintenance work. Go through these steps before you begin any installation or maintenance work.

1. Keep the cabinet doors closed when the drive is powered. With the doors open, a risk of a potentially fatal electric shock, arc flash or high-energy arc blast exists.
2. Clearly identify the work location.
3. Disconnect all possible voltage sources.
   - Open the main disconnecting device of the drive.
   - Open the charging switch if present.
   - If the main disconnecting device does not disconnect the voltage from the AC input power busbars of the drive, open the disconnector of the supply transformer. (The main disconnecting device is in the drive cabinet does not disconnect the voltage from the AC input power busbars.)
   - Close the grounding switch or switches (option +F259, Q9) if present. Do not use excessive force as the switch has electromagnetic interlocking.
   - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
   - Make sure that re-connection is not possible. Lock the disconnectors to open position and attach a warning notice to them.
   - Disconnect any external power sources from the control circuits before you do work on the control cables.
   - After you disconnect the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
4. Protect any other energized parts in the work location against contact.
5. Take special precautions when close to bare conductors.
6. Measure that the installation is de-energized. If the measurement requires removal or disassembly of shrouding or other cabinet structures, obey the local laws and regulations applicable to live working (including – but not limited to – electric shock and arc protection).
   - Use a multimeter with an impedance of at least 1 Mohm.
   - Make sure that the voltage between the drive input power terminals and the grounding (PE) busbar is close to 0 V.
   - Make sure that the voltage between the drive DC busbars (+ and -) and the grounding (PE) busbar is close to 0 V.

7. Install temporary grounding as required by the local regulations.
8. Ask the person in control of the electrical installation work for a permit to work.

Additional instructions and notes

WARNING!

Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- If you are not a qualified electrician, do not do electrical installation or maintenance work.
- Do not install the drive if the electrical power network, motor/generator, or environmental conditions do not agree with the drive data.
- Do not install a drive with EMC filter (option +E200 or +E202) on an ungrounded power system or a high resistance-grounded (over 30 ohms) power system.
- We do not recommend that you secure the cabinet by arc welding. If you have to, obey the separate welding instructions in the drive manuals.
- Remove the code labels attached to mechanical parts such as busbars, shrouds and sheet metal parts before installation. They may cause bad electrical connections, or, after peeling off and collecting dust in time, cause arcing or block the cooling air flow.
- Do not do insulation or voltage withstand tests on the drive.

Note:

- The motor cable terminals of the drive are at a dangerous voltage when the input power is on, regardless of whether the motor is running or not.
- When the input power is on, the drive DC bus is at a dangerous voltage. If brake chopper and resistor are in use, they are also at a dangerous voltage. (Option +D150)
- External wiring can supply dangerous voltages to the relay outputs of the control units of the drive.
- The Safe torque off function does not remove the voltage from the main and auxiliary circuits. The function is not effective against deliberate sabotage or misuse.

Optical components

WARNING!

Obey these instructions. If you ignore them, damage to the equipment can occur.

- When you unplug the fibre optic cables, always hold the connector, not the cable itself.
- Do not touch the ends of the fibers with bare hands as the ends are extremely sensitive to dirt.
- Do not bend the fiber optic cables too tightly. The minimum allowed bend radius is 35 mm (1.4”).

Printed circuit boards

WARNING!

Use a grounding wrist band when you handle printed circuit boards. Do not touch the boards unnecessarily. The boards contain components sensitive to electrostatic discharge.

Grounding

These instructions are for all personnel who are responsible for the grounding of the drive.

WARNING!

Obey these instructions. If you ignore them, injury or death, or equipment malfunction can occur, and electromagnetic interference can increase.

- If you are not a qualified electrician, do not do grounding work.
- Always ground the drive, the motor and adjoining equipment. This is necessary for the personnel safety. Proper grounding also reduces electromagnetic emission and interference.
- Make sure that the conductivity of the grounding conductors is sufficient. See the electrical planning instructions of the drive. Obey the local regulations.
- Connect the power cable shields to protective earth (PE) of the drive to make sure of personnel safety.
- Make a 360° grounding of the power and control cable shields at the cable entries to suppress electromagnetic disturbances.
- In a multiple-drive installation, connect each drive separately to the protective earth (PE) busbar of the switch board or the transformer.

Note:

- You can use power cable shields as grounding conductors only when their conductivity is sufficient.
- As the normal touch current of the drive is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth connection. See standard IEC/EN 61800-5-1, 4.3.5.5.2.

Additional instructions for permanent magnet motor drives

Safety in installation, start-up, maintenance

These are additional warnings concerning permanent magnet motor drives. The other safety instructions in this chapter are also valid.

WARNING!

Obey these instructions. If you ignore them, injury or death and damage to the equipment can occur.

- Do not do work on the drive when the permanent magnet motor is rotating. A rotating permanent magnet motor energizes the drive including its input power terminals.

Before installation, start-up and maintenance work on the drive:

- Stop the drive and do the steps in section *Electrical safety precautions (page 14)*.
- Disconnect the motor from the drive with a safety switch or by other means.

- If you cannot disconnect the motor, make sure that the motor cannot rotate during work. Make sure that no other system, like hydraulic crawling drives, can rotate the motor directly or through any mechanical connection like felt, nip, rope, etc.
- If the motor is connected to an inverter unit with a DC switch-disconnector, open the disconnector, lock it, and tag it. If the motor is connected to an inverter unit with DC fuses, remove the fuses.
- Measure that the installation is de-energized.
- Install temporary grounding to the drive output terminals (U2, V2, W2). Connect the output terminals together as well as to the PE.

During the start up:

- Make sure that the operator cannot run the motor over the rated speed. Motor overspeed causes overvoltage which can damage the capacitors in the intermediate circuit of the drive.

Safety in operation

WARNING!

Do not run the motor over the rated speed. Motor overspeed causes overvoltage which can damage the capacitors in the intermediate circuit of the drive.

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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