Safety instructions

ACS880 liquid-cooled multidrive modules

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Introduction to this 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 liquid-cooled multidrive 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

<table>
<thead>
<tr>
<th>Term/Abbr.</th>
<th>Description</th>
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<tbody>
<tr>
<td>BCU</td>
<td>Type of control unit</td>
</tr>
<tr>
<td>Control board</td>
<td>Circuit board in which the control program runs</td>
</tr>
<tr>
<td>Control unit</td>
<td>Control board built in a housing (often rail-mountable)</td>
</tr>
<tr>
<td>Cubicle</td>
<td>One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.</td>
</tr>
<tr>
<td>DC link</td>
<td>DC circuit between rectifier and inverter</td>
</tr>
<tr>
<td>DDCS</td>
<td>Distributed drives communication system protocol</td>
</tr>
<tr>
<td>Diode supply unit</td>
<td>Diode supply modules under control of one control board, and related components.</td>
</tr>
<tr>
<td>Drive</td>
<td>Frequency converter for controlling AC motors</td>
</tr>
<tr>
<td>DSU</td>
<td>Diode supply unit</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>Frame (size)</td>
<td>Physical size of the drive or power module</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Term/Abbr.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSO-12, FSO-21</td>
<td>Optional functional safety modules</td>
</tr>
<tr>
<td>Intermediate</td>
<td>DC link</td>
</tr>
<tr>
<td>circuit</td>
<td></td>
</tr>
<tr>
<td>INU</td>
<td>See Inverter unit</td>
</tr>
<tr>
<td>Inverter</td>
<td>Converts direct current and voltage to alternating current and voltage.</td>
</tr>
<tr>
<td>Inverter module</td>
<td>Inverter bridge, related components and drive DC link capacitors enclosed</td>
</tr>
<tr>
<td></td>
<td>inside a metal frame or enclosure. Intended for cabinet installation.</td>
</tr>
<tr>
<td>Inverter module</td>
<td>Cubicle which includes inverter module(s)</td>
</tr>
<tr>
<td>module cubicle</td>
<td></td>
</tr>
<tr>
<td>Inverter unit</td>
<td>Inverter module(s) under control of one control board, and related</td>
</tr>
<tr>
<td></td>
<td>components. One inverter unit typically controls one motor.</td>
</tr>
<tr>
<td>Multidrive</td>
<td>Drive for controlling several motors which are typically coupled to the</td>
</tr>
<tr>
<td></td>
<td>same machinery. Includes one supply unit, and one or several inverter units.</td>
</tr>
<tr>
<td>Power module</td>
<td>Common term for drive module, inverter module, supply module, brake</td>
</tr>
<tr>
<td></td>
<td>chopper module etc.</td>
</tr>
<tr>
<td>Rectifier</td>
<td>Converts alternating current and voltage to direct current and voltage.</td>
</tr>
<tr>
<td>RFI</td>
<td>Radio-frequency interference</td>
</tr>
<tr>
<td>Single Drive</td>
<td>Drive for controlling one motor</td>
</tr>
<tr>
<td>STO</td>
<td>Safe torque off</td>
</tr>
<tr>
<td>Supply module</td>
<td>Rectifier bridge and related components enclosed inside a metal frame or</td>
</tr>
<tr>
<td></td>
<td>enclosure. Intended for cabinet installation. The bridge rectifies AC</td>
</tr>
<tr>
<td></td>
<td>voltage and current of AC power line to DC voltage and current of the drive</td>
</tr>
<tr>
<td></td>
<td>DC link. Regenerative supply module can also feed energy back into the</td>
</tr>
<tr>
<td></td>
<td>supply network.</td>
</tr>
<tr>
<td>Supply module</td>
<td>Cubicle which includes supply module(s)</td>
</tr>
<tr>
<td>module cubicle</td>
<td></td>
</tr>
<tr>
<td>Supply unit</td>
<td>Supply module(s) under control of one control board, and related components.</td>
</tr>
</tbody>
</table>

Related manuals

<table>
<thead>
<tr>
<th>Manual</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>General manuals</td>
<td></td>
</tr>
<tr>
<td>Safety instructions for ACS880 liquid-cooled multidrive cabinets and</td>
<td>3AXD50000048633</td>
</tr>
<tr>
<td>modules</td>
<td></td>
</tr>
<tr>
<td>Electrical planning instructions for ACS880 liquid-cooled multidrive</td>
<td>3AXD50000048634</td>
</tr>
<tr>
<td>modules</td>
<td></td>
</tr>
<tr>
<td>Cabinet design and construction instructions for ACS880 air-cooled</td>
<td>3AUA0000107668</td>
</tr>
<tr>
<td>and liquid-cooled multidrive modules</td>
<td></td>
</tr>
<tr>
<td>Inverter module manuals and guides</td>
<td></td>
</tr>
<tr>
<td>ACS880-104LC inverter modules hardware manual</td>
<td>3AXD50000045610</td>
</tr>
<tr>
<td>ACS880 primary control program firmware manual</td>
<td>3AUA0000085967</td>
</tr>
<tr>
<td>ACS880 primary control program quick start-up guide</td>
<td>3AUA0000098062</td>
</tr>
<tr>
<td>Option manuals and guides</td>
<td></td>
</tr>
<tr>
<td>ACX-AP-x assistant control panels user’s manual</td>
<td>3AUA0000085685</td>
</tr>
<tr>
<td>Manuals and quick guides for I/O extension modules, fieldbus adapters.</td>
<td></td>
</tr>
</tbody>
</table>

Safety instructions

Contents of this chapter

This chapter contains the safety instructions which you must obey when you install and operate the drive and do maintenance 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!](image)

**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 that install and commission the drive, and do maintenance work on it.

**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 protection 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.
- 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.
- 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.

**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.
- When the control location is set to Remote in the control panel, the stop key on the control panel will not stop the drive.
- Only authorized persons are allowed to repair a malfunctioning drive.

**Work on the liquid cooling system**

These instructions are intended for all personnel that do installation and maintenance work on the liquid cooling system.

**WARNING!**

Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.
• Beware of hot liquid. Do not work on the liquid cooling system until the pressure is lowered down by stopping the pumps. High-pressure warm coolant (6 bar, max. 50°C) is present in the internal cooling circuit when it is in operation.

• Before power switch-on, make sure that the internal cooling circuit is filled up with coolant, and the cooling is in operation (coolant circulates).

• Make sure that coolant meets the ABB specification. See the appropriate hardware manual of the drive/unit.

• Avoid skin contact with coolant. Do not syphon it by mouth. If you swallow or get it into the eyes, seek medical advice.

• To avoid breaking the coolant pipes, do not overtighten the nuts of the unions. Leave 2 to 3 millimeters of thread visible.

• If you need to store the drive in temperature below -15 °C (5 °F), drain the cooling circuit, or make sure that it is filled with the coolant specified by ABB.
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.
   • If the drive is equipped with a charging circuit: Open the disconnecting device of the charging circuit.
   • 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.
   • 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 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.
- 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.

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

- Handle fiber optic cables with care:
  - When you unplug the 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").

**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 electrical planning instructions. 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 12).
• 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.
• 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.

Providing feedback on ABB manuals
Your comments on our manuals are welcome. Navigate to new.abb.com/drives/manuals-feedback-form.

Document library on the Internet
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